Monetary and Non-Monetary Deprivation in Algeria: A Discriminant Method by the ROC Curve

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Paper prepared for the Conference on "Experiences and Challenges in Measuring National Income, Wealth, Poverty and Inequality in African Countries", Cape Town, 28 September to 01 October 2011

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Abstract

Recent literature on poverty alleviation policies has focused on one direction of discourse by considering poverty as a dependant variable based on some objective (monetary) and subjective (social contacts). Results have not been satisfactory so far.

The importance of factors, other than income, in determining living conditions such as housing, gender, water, education and characteristics inherent to society can contribute greatly to explaining the acuteness of poverty and deprivation.

The purpose of this paper is to determine whether focusing on quantify both the non-monetary (material) poverty and the poverty of Algerian households by taking into consideration a set of variables that may reflect deprivation.

We attempt to apply the Receiver Operating Characteristics ROC curve to answer the question: does variables deprivation like education level , type of housing, the employment status, income, equipment, water access, drain, ……help discriminate between the non-monetary deprivation and poverty.

The empirical study concerns a sample of 500 households living in the region of Tlemcen (Maliki, 2002).

Keywords: Poverty – Deprivation– Multi-items- Receiver Operating Characteristic- Algeria.

JEL Classification: D31, D63, I32

1. Introduction

Poverty measurement has always relied on one or multi-dimensional methods that are computed on the basis of the poverty line. However, as measurement problems persist, we propose the Receiver Operating Characteristics method called ROC as a better tool to quantify poverty and to determine items as indicators to non income deprivation. In this case we look at the relationship between monetary poverty and non monetary deprivation criteria thus attempt to know more about variables which may better explain household poverty levels.

Literature on international data gathering can sometimes obscure the way poor households have access to non monetary variables. International statistics help draw a distinction between "improved" and "unimproved" deprivation.

In the case of Algeria, a few studies on the issue of deprivation exist. In addition, we are recording the lack of national surveys devoted to the issue of poverty.

The report published by the Organization for Economic Cooperation and Development (OECD) has drawn attention to the limitations of the conventional income approach to poverty measurement, as:
'Income measures do not provide a full picture of "command over resources": they neglect individuals' ability to borrow, to draw from accumulated savings, and to benefit from help provided by family or friends, as well as consumption of public services such as education, health and housing' (Boarini and d'Ercole, 2006)
This paper aims to analyze main indicators of non income poverty households by 7 variables from a survey of the region of Tlemcen in Algeria. The paper is structured as fellows: after an introduction we develop the measurement of poverty in Algeria. The section 3 consist to explain the methodology of ROC curves as far as the interpretation of the area under the curve . The sample of the survey and results are presented in section 4.

2. Measurement of poverty in Algeria

Literature on poverty is extremely abundant and characterized by an unusual level of ambiguity relative to economic theory. As such, it provides many different definitions of what poverty is; each conceptualization obviously leads to a particular identification of the poor (Asselin, & Dauphin, 2001). The level of poverty can be measured, generally, on the basis of two approaches: the material and non material, the utilitarian and non utilitarian.

The first approach deals only with the material side on the basis of the economic welfare function, and defines poverty in terms of scarcity of goods and resources (Bey, 1999) that puts some limits on the satisfaction of basic needs such as nutrition, clothing and housing. This definition implies two important aspects of "material" poverty regarding low incomes and non-satisfaction of basic needs.

In short, this approach is set exclusively on the basis of income and does not consider non marketable goods and services that have an impact on the household level of living and, may thus, contribute to increase or decrease the poverty level. For this reason, this approach is completed by a conceptualization based on satisfaction of basic needs.

Besides, Sen (1985) avoids this first approach by relying on social justice, equity and equalities. His definition of poverty, based on the capability approach, takes into account not only the economic factors, but also legal, political, social and individual dimensions.

The second approach, the utilitarian, sets some indicators upon goods and services consumed by a household, thus delimiting the notion of "utility" only to the "economic well-being".

The indicators derived from the utilitarian approach are consumption expenditure of goods and services, normalized to take into account price differences and household's characteristics. The non–utilitarian approach, mainly that based on capabilities helps determine the ability to get goods as an explanatory variable of well-being, while keeping consumption as an indicator.

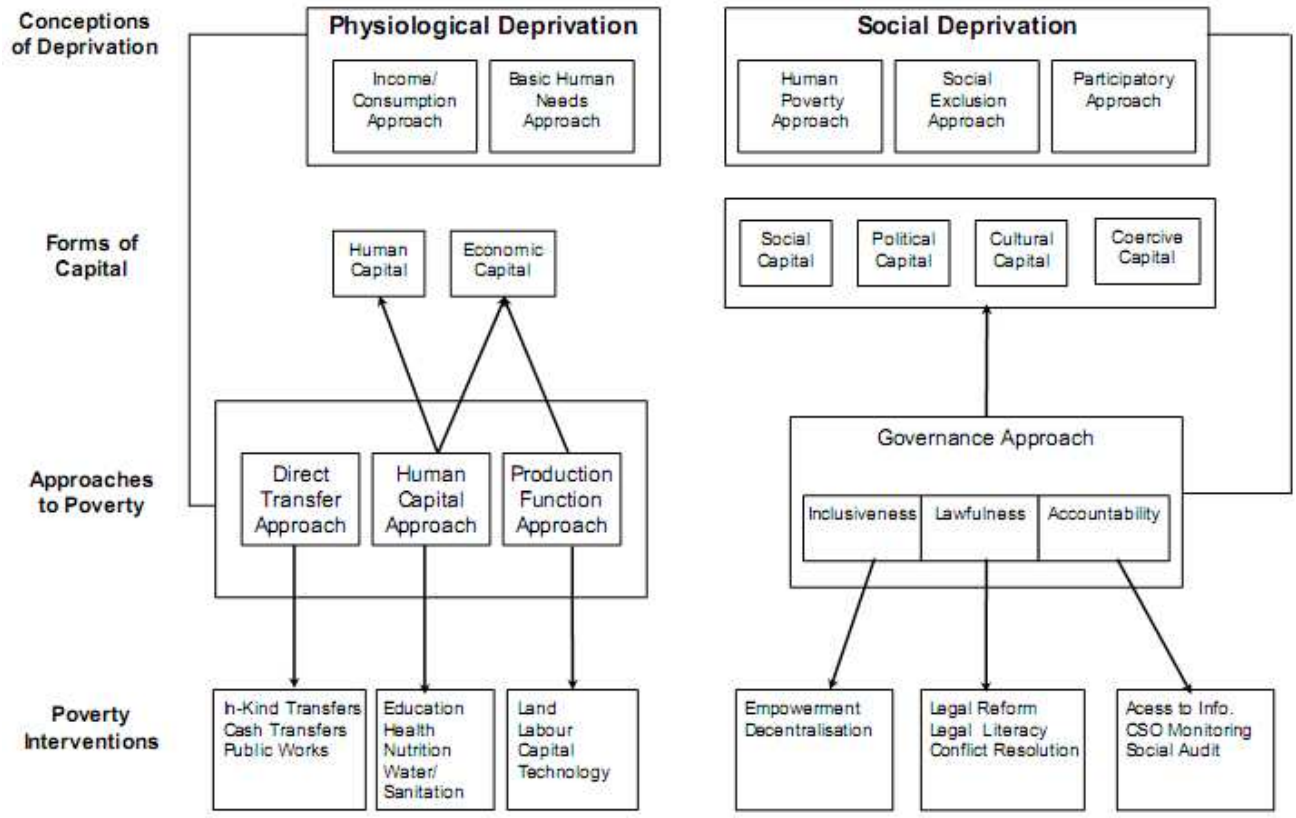
In developing countries, rural dwellers suffer from multiple deprivations that are only inadequately captured by expenditure poverty (Klasen, 2000). In particular, access to services such as water, electricity, modem sanitation, and modem housing is usually much better for the urban poor than the rural poor and most public spending tends to favor urban areas (Lipton, 1977).

In the last decade, Shaffer (2008) considers that there has been a shift from a physiological model of deprivation[2], focused on the non-fulfilment of basic material or biological needs, to a social model of

[2] Deprivation takes many different forms in every known society. The deprivation approach is thus being adopted in many countries to complement, not replace, the income-based measures of poverty that are still widely used. People can be said to be deprived if they lack the types of diet, clothing, housing, household facilities and fuel and environmental, educational, working and social conditions, activities and facilities which are customary, or at least widely encouraged and approved, in the societies to which they belong (Townsend, 1979). Townsend's definition of deprivation implies that poverty is a relative concept, since it focuses on a lack of the resources needed to purchase goods and participate in activities that are 'customary, or at least widely encouraged or approved' in society. It follows that two elements are needed to make

deprivation, focus on elements such as lack of autonomy, power, self-respect / dignity, etc. (See Figure1) In the past, standard analysis of poverty dynamics was based largely, if not exclusively, on economic and human capital that contributes to explaining physiological deprivation. However, five additional forms of capital such as social, political, cultural, coercive and natural capital have come to play an increasingly important role as far as delimitation of social deprivation is concerned (Shaffer, 2008)[3].

Figure 1 : Poverty Reduction Strategies



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the definition operational: first, it is necessary to identify which goods and activities are widely endorsed in society before their absence can be defined as deprivation; second, it must be established that those who do not have these items are constrained by a lack of resources.

[3] 1. ***Economic Capital*** corresponds broadly to those factors of production (land, labour, capital) which generate primary income as well as economic assets (livestock, jewellery, etc.) and credit.

2. ***Human Capital*** refers to individual characteristics or attributes which are central for the achievement of human goals. A short list would include satisfactory levels of physical and cognitive development due to adequate health, nutrition and education.

3. ***Social Capital*** refers to those social organizations, relationships and networks which facilitate co-ordination and management of extra-market and collective tasks and which provide critical support in times of crisis. Social capital relates closely to concepts of trust and reciprocity.

4. ***Political Capital*** comprises the network of informal and formal political alliances which provide access to resources and confer decision-making authority.

5. ***Cultural Capital*** includes those norms, beliefs and values which assign roles, confer status and determine entitlements and obligations of different social groups (based on gender, caste, age, ethnicity, etc.).

6. ***Coercive Capital*** which includes sources of violence, intimidation, force, etc., is a means of enforcing social norms and maintaining (at times, repressive) social relationships.
7. ***Natural Capital*** refers to the quality and quantity of the stock of available natural resources, including common property resources, and to the knowledge/skills required for natural resource management and conservation.

In Algeria, current poverty indicators confirm the existence of some improvements in poverty level. According to the Ministry of employment and national solidarity, poverty level decreased of about 2.3 % between 2000 and 2006. Yet, in contrast, the UNDP considers that the number of poor in Algeria is close to 10 millions, a figure that exceeds largely the figure of 723020 poor's presented by the ministry of employment and solidarity. Moreover, along with the ministry figures, the latest CNES (2007) shows that the proportion of the population living below the nutritional poverty threshold has moved from 3.6% in 1988 to 1.6% in 2004, representing 518000 individuals. From a general angle the global poverty threshold that concerned 3.98 million individuals in 1995 decreased to 2.2 million in 2004 with an annual average decrease of 6.37%. As a result, the measurement of the Human Poverty Index (HPI) shows a decreasing index between 1995 and 2005 (CNES, 2007).

Table1: The HPI in Algeria (1995-2005)

Year	**1995**	**1999**	**2000**	**2004**	**2005**
HPI (%)	25.23	23.35	22.98	18.15	16.60

Source: CNES, 2007

Despite these improvements, poverty research in Algeria has focused so far on the consequences of poverty, i-e bad nutrition, unemployment, exclusion etc…, ignoring the forces that lie behind the existence of this phenomenon. As such, the understanding of the existing relationships between the causes of poverty as well as the forces standing behind these relationships can help decision makers elaborate a better targeting of the poor, and consequently set up an efficient resource allocation (Maliki, 2006).

3. The ROC analysis

The use of the ROC helps determine more effectively on one side, true poor households, and on the other side, allows selecting the variables that can be considered as relevant for targeting indicators.

The ROC approach is a graphical non-parametric technique which has been originally developed in the fields of signal detection, psychology theory and medicine, among other fields. The first application of ROC curves to economics, and more specifically in poverty monitoring and targeting, was initiated by Wodon (1997) using household expenditure survey data from Bangladesh. Since then, the ROC methodology has generally been used in economics to assess the accuracy of a diagnostic test performed to differentiate between two states or conditions, for instance the (income) poor and the (income) non poor (e.g. Fusco, 2009).

A ROC curve is a graph that resembles an inverted Lorenz curve. We plot, on the vertical axis for all

possible cut-off points, known as sensitivity (SE)[4], i.e. the probability that a poor household will be classified as poor, against the probability that a non-poor household will be classified as poor (one minus specificity - SP) on the horizontal axis[5]. It is conventional to link the ROC analysis to the incidence of Type I and Type II statistical errors (Wodon, 1997 and Baulch, 2002) (see table 2).

The probability of Type I error is 1 minus SP (i.e. the probability of identifying a poor household as non-poor) whereas the probability of Type II error is 1 minus SE (i.e. the probability of identifying a non-poor household as poor).

Table 2: Sensitivity, specificity and Type I and Type II errors

	Nonpoor	**Poor**
Predicted Nonpoor	$SP = NP^{-} / NP$	$1 - SE = P^{-} / P$
Predicted Poor	$1 - SP = NP^{+} / NP$	$SE = P^{+}/P$

SP *specificity;* **SE** *sensitivity;*

P *number of the poor;* **NP** *number of the nonpoor;*

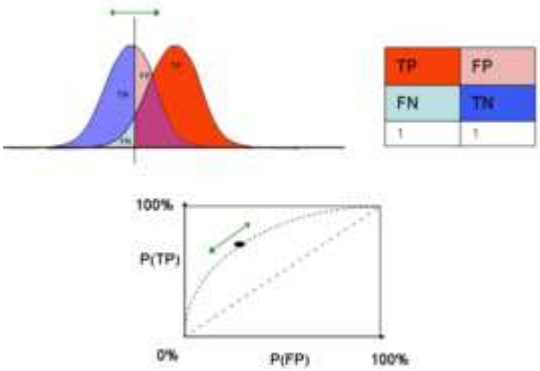
P+ *number of the poor classified as poor;* $\mathbf{P}^{-}$ *number of the poor classified as nonpoor;*
$\mathbf{NP}^{+}$ *number of the nonpoor classified as nonpoor; and* $\mathbf{NP}^{-}$ *number of the nonpoor classified as poor.*

Source: Wodon,(1997)

The ROC curve illustrates how the two types of errors (exclusion of some poor households and inclusion of some non-poor households) vary with the choice of a particular level of the indicators (Minot and Baulch, 2002). Hence, the ROC curve summarizes SE and SP errors obtained along a range of cut-off points on the diagnostic test delimited by zero and unity. The area under the ROC curve (see Figure 2) can be used to provide a statistical summary measure of the overall performance and predictive value of the underlying poverty targeting model (Tuan *et al*., 2004).

[4] SE is the true-positive rate, which is the proportion of positive cases that are correctly classified by the use of the diagnostic test and SP is the true-negative rate, which is the proportion of negative cases that are correctly classified. Therefore, the ROC curve discloses the relationship between the true-positive and the false-positive rate across different cutoff points.

Figure 2: The ROC curve



Source: http://en.wikipedia.org/wiki/Receiver_operating_characteristic

The area below the ROC curve can take on values between zero and one. The greater (smaller) that area, the better (worse) is the power of the model used in prediction. A 45-degree line, corresponding to an area of 0.5, has no explanatory power since the probability that a income poor household be classified as water deprived is no higher than the probability that a non income poor household be classified as a water deprived. A vertical line from the origin followed by a horizontal line extending to the upper-right corner (equivalent to an area of one) has perfect predictive power (Baulch, 2002).

We applied the method ROC to household's data in order to find out whether water indicators can determine true subjective poor households. For this concern, we used the rule of decision as applied to the eight variables as shown in Table 3.

Table 3: Decision matrix for monetary poverty and household deprivation

	No household deprivation	**Household deprivation**	
No monetary poor household	**No consistent poverty SP** **TN**	**Household deprivation** **FP**	TN +FP=1
Monetary poor household	**Subjective poverty** **FN**	**Consistent poverty SE** **TP**	FN+ TP=1

3.1. Comparing ROC curves by the binormal ROC curve

The most common way of smoothing an ROC curve is using the binormal model. It assumes a normal distribution with mean μ_1 and variance σ_1^2 for the poor households and a mean μ_0 with variance σ_0^2 for the non poor.

Then using $G(t) = \phi((\mu_0 - t)/\sigma_0)$, It follows that the threshold *t* can be written as a function of *x* as follows: $t = \mu_0 - \sigma_0\phi^{-1}(x)$. Since a threshold *t* corresponds to the sensitivity, we can write the functional form of the ROC curve as:

$$F(t) = \phi\left(\frac{\mu_1 - t}{\sigma_1}\right) = \phi\left(\frac{\mu_1 - \mu_0 + \sigma_0\phi^{-1}(x)}{\sigma_1}\right) = \phi\left(a + b\phi^{-1}(x)\right) \qquad (1)$$

Where

$$a = \frac{\mu_1 - \mu_0}{\sigma_1}$$
$$b = \frac{\sigma_0}{\sigma_1} \qquad (2)$$

The area under the curve for the binormal model can take the expression of a closed-form:

$$AUC = \phi\left(\frac{a}{\sqrt{1+b^2}}\right) \qquad (3)$$

4. Application to the region of Tlemcen

4.1. Sample and data collection

The sample consists of 500 households living in the wilaya of Tlemcen. A stratified survey is used to measure poverty in both urban and rural areas. As for the choice of the households, a simple random sampling method for each stratum is applied[6] as presented in Table 4. We also used 7 variables with 37 items (see Appendix1) to apply the Roc curves to discriminate between the monetary poverty and the households deprivation who reflect living condition and participate in activities (participate in associations in our survey).

Table 4: Households sample distribution

N° Communes	Communes	Nbr/H surveyed
1	TLEMCEN	86
2	REMCHI	26
3	NEDROMA	21
4	GHAZAOUET	22
5	CHETOUANE	25
6	EL GOR	7
7	OULED MIMOUN	15
8	BENI SNOUS	12
9	BEN SEKRANE	15
10	MAGHNIA	66
	HAMMAM	
11	BOUGHRARA	12
12	M'SIRDA FOUAGUA	6
13	SEBDOU	21
14	BENI OUARSOUS	12
15	SIDI MEDJAHED	7
16	MARSA BEN M'HIDI	7
17	SEBRA	27
18	HONAINE	6
19	BOUHALLOU	6
20	DJEBALA	11
21	MANSOURAH	27
22	AMIEUR	12
23	AIN TELLOUT	9
24	OULED RIAH	5
25	SOUK EL KHEMIS	7
26	AIN GHORABA	5
27	AIN FEZZA	11
28	AIN YOUCEF	14
		500

Source: Maliki, 2002

[6] The wilaya of Tlemcen consists of 53 communes ;10 communes are situated in urban areas, and 43 in rural areas. The number of households in the two strata is estimated at 159105 in 2002.

The choice of the representative sample of 500 households covering the whole wilaya of Tlemcen was made sequentially as follows:

1- The first step concerns the choice of the stratum area (urban and rural) 98252 in urban area corresponding to a sample of 309 , and in rural area 60853 out of 159105 giving 191 rural households.

The sample is distributed proportionally to the total number of households in each stratum:

N1 =(98252/159105).500=308.76309 households

N2 =(60853/159105).500=191.23191 households

2- The second step consists of sorting out the households and the related communes with random sampling method. At this stage, we sorted out the commune number out of 10 for urban and out of 43 for rural areas, and the corresponding number of households within each stratum. The results are as follows:

309 households in the urban stratum were sorted out from 9 communes out of 10, and the like for rural area (19 from 43).

3- The third step is to compute the number of households according to the weight of each commune.

4.2. Results and discussion

The results of the survey are described below (Maliki S.B, 2002): Households are classified using the upper poverty line. Our study explain that 23.8% in the sample are deemed poor (119 households).

The upper poverty line is estimated at 18191 AD (Algerian Dinars) per capita per year while the lower poverty line is estimated at 14827 DA on the basis of O.N.S (Office National Algérien des Statistiques).

The variable area reveals that the rural area is a good discriminate indicator for household deprivation. It's evident for rural areas in general with less service in comparison with urban areas.

If we take in consideration all the 37 items, we can conclude that the Kitchen 1 (Normal Housing with kitchen) is the higher area under the curve and present a good discriminates of households deprivation. In the order we can reveals Assop2, Drain1,Rooms1,Instlevel3, water4, housing4, Hstatus2, Gender2 and PFR3 with respective description the non participation in association, Drain through sewer net, one room, middle instruction, collective wells, Housing-call, Precarious dwelling, Rental housing, women as households head and little social contact with family as a good indicators for a non monetary poverty measure in Algeria (Appendix 2).

Conclusion

The purpose of this paper is to quantify the non monetary poverty of Algerian households by taking into consideration the ROC curves and discriminates it with the monetary poverty measures. The importance of this factors stems from a strong hypothesis that a structurally sound socio-economic policy to reduce poverty must take into consideration, among other variables, the improvement of housing conditions (Benhabib & all, 2007).

The ROC method consists of defining 7 variables with 37 items of monetary poor households on the basis of a comparison of the items of each variable.To do that, we proceed with a field survey on a sample of 500 households in the wilaya of Tlemcen (Maliki, 2002). A classification is made according to the upper poverty line.

The results show that 8 items that characterize the true monetary poor Algerian households. These results may shed some light into the best approach policy makers can take for a pertinent targeting of poor households as far as poverty alleviation is concerned.

References

Asselin, Louis-Marie & Anyck Dauphin (2001), Poverty Measurement: A Conceptual Framework, IDRC, Canada.

Baulch, Bob (2002), Poverty Monitoring and Targeting Using ROC Curves: Examples from Vietnam, IDS Working Paper 161, Institute of Development Studies, University of Sussex, England.

Benhabib and all.(2007), The Analysis of Poverty Dynamics in Algeria : A Multidimensional Approach, Topic in Middle Eastern and North African Economies, electronic journal, Volume 9, Middle East Economic Association and Loyola University Chicago,USA, September.

Bey M. (1999), Recherches sur la pauvreté : état des lieux. Contribution à la définition d'une problématique, *Tiers Monde*, n °180, Paris.

Boarini and d'Ercole (2006), " Alternative Measures of Well-being", Statistics Brief, OCDE, May 2006

CNES (2007), Rapport national sur le développement humain en Algérie 2006, en coopération avec le PNUD, Algiers.

Fusco A. (2009) « Les mesures monétaires et directes de la pauvreté sont-elles substituables ? Investigations sur base de la courbe du ROC". Recherches Economiques de Louvain/Louvain Economic Review à paraître.

Maliki, S. B. E. (2002) 'Quantification de la pauvreté urbaine et rurale en Algérie, cas de la wilaya de Tlemcen', Masters thesis, Faculty of Economics and Management, Tlemcen, Algeria.

Maliki S.B.E. (2007), Conditions eau et pauvreté subjective en Algérie : analyse non paramétrique par les courbes ROC , in Revue *Les Cahiers du MECAS*, n°3, Avril, Université de Tlemcen, Algérie, pp.127-139.

Minot N., & Baulch B. (2002), The Spatial Distribution of Poverty in Vietnam and the Potential for Targeting, Policy Research Working Paper 2829, Washington D.C, the World Bank and IFPRI.

Sen, A. (1985), Commodities and Capabilities, Amsterdam, North-Holland

Shaffer P. (2008), New thinking on poverty: Implications for globalisation and poverty reduction Strategies, Real-World Economics Review, issue n°47, University of Toronto, Canada.

Townsend P. (1979), Poverty in the United Kingdom: A Survey of Household Resources and Standards of Living, Penguin Books, Harmondsworth,London.

Tuan, T., T., Harphan & N.T. Huong (2004), Validity and Reliability of the Self Reporting Questionnaire 20 Items in Vietnam, Hong Kong, *Journal of Psychiatry*, Vol. 14, N° 3

Wodon Q.T. (1997), Targeting the Poor Using ROC Curves, *World Development* Vol. 25, 12: 2083-2092.

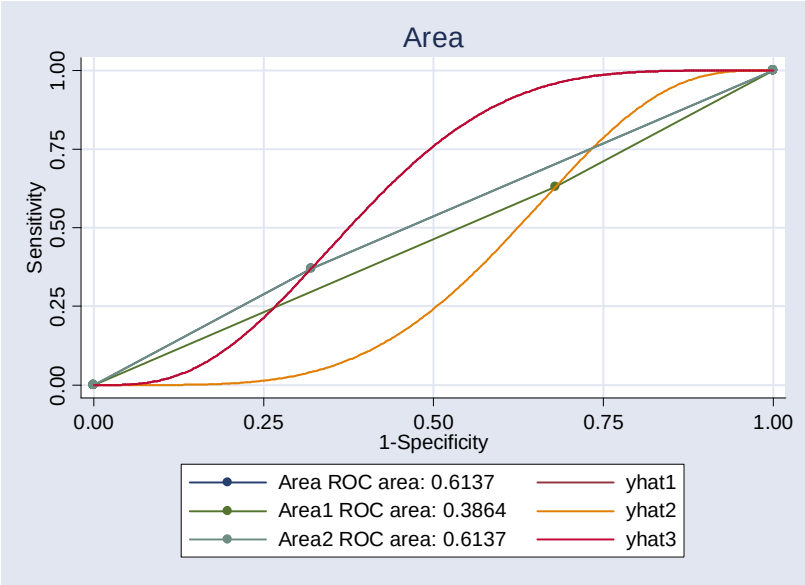
Appendix1: Items of households deprivation

Variables of households deprivation	
Items	**Description**
	Area
Area1	=1 if Households situated in urban areas ; =0 otherwise
Area2	= 1 if Households situated in rural areas ; =0 otherwise
	Housing condition
Housing1	= 1 if Individual house / villa ; =0 otherwise
Housing2	= 1 if Rented accommodation ; =0 otherwise
Housing3	= 1 if Shared building ; =0 otherwise
Housing4	= 1 if Precarious dwelling ; =0 otherwise
	Housing status
Hstatus1	= 1 if Owner ; =0 otherwise
Hstatus2	= 1 if Rental housing ; =0 otherwise
Hstatus3	= 1 if Free accommodation ; =0 otherwise
Hstatus4	= 1 if Housing-call ; =0 otherwise
Rooms1	= 1 if One room ; =0 otherwise
Rooms2	= 1 if 2-3 rooms ; =0 otherwise
Rooms3	= 1 if 4-6 rooms ; =0 otherwise
Rooms4	= 1 if More than 6 rooms ; =0 otherwise
Kitchen1	= 1 if Normal Housing with kitchen ; =0 otherwise
Kitchen2	=1 if A one room-kitchen Housing ; =0 otherwise
	Water and Drain
Water1	= 1 if Connexion to the drinking water network ; =0 otherwise
Water2	=1 if Public source ; =0 otherwise
Water3	= 1 if Private wells ; =0 otherwise
Water4	=1 if Collectif wells ; =0 otherwise
Water5	= 1 if Purchase from a water tank vehicle ; =0 otherwise
Drain1	=1 if Drain through sewer net ; =0 otherwise
Drain2	= 1 if Drain through sewer net ; =0 otherwise
Drain3	=1 if Drain through a septic tank ; =0 otherwise

	Gender of the household head
Gender1	=1 if Household head is man ; =0 otherwise
Gender2	= 1 if Household head is women ; =0 otherwise
	Instruction level of the household head
Instlevel1	= 1 if No education ; =0 otherwise
Instlevel2	= 1 if Primary ; =0 otherwise
Instlevel3	= 1 if Intermediate ; =0 otherwise
Instlevel4	= 1 if Secondary ; =0 otherwise
Instlevel5	= 1 if University ; =0 otherwise
	Social contact
	(personal or family relationships can improve the household situation?)
PFR1	= 1 if Much ; =0 otherwise
PFR2	= 1 if Means ; =0 otherwise
PFR3	= 1 if Little ; =0 otherwise
PFR4	= 1 if Not at all ; =0 otherwise
Assop1	= 1 if Participation in association ; =0 otherwise
Assop2	= 1 if Non-participation in association ; =0 otherwise

Source: Updated from households survey**,** Maliki, 2002

Appendix 2: The ROC Area curves with report of Sensitivity and Specificity for the 7 variables



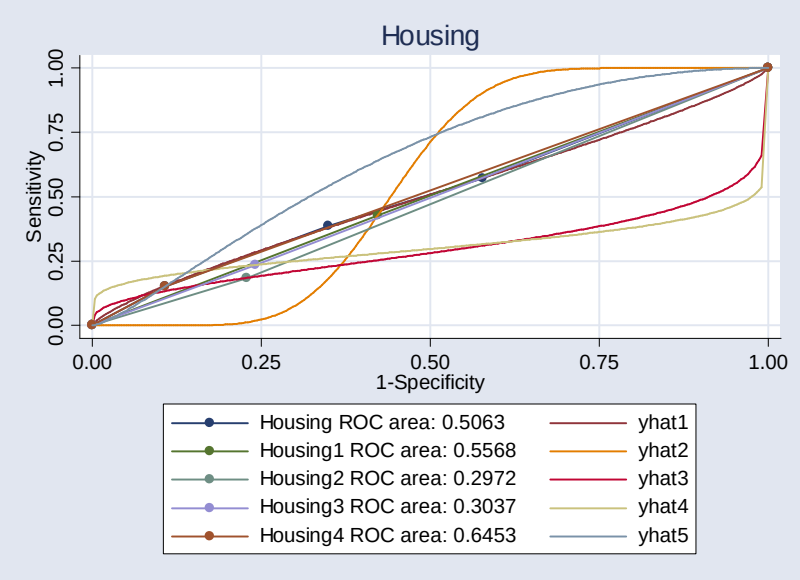
	Obs	Area	Std. Err.	[95% Conf.	Interval]
Area1	500	0.3864	43.7095	-8.5e+01	86.05550
Area2	500	0.6137	0.0297	0.55542	0.67196

Ho: area(Area) = area(Area1) = area(Area2)

chi2(1) = 17.82 Prob>chi2 = 0.0000

Detailed report of Sensitivity and Specificity

Cut point	Sensitivity	Specificity	Correctly Classified	LR+	LR-
(>= 0)	100.00%	0.00%	23.80%		1.0000
(>= 1)	36.97%	67.98%	60.60%	1.1547	0.9271
(> 1)	0.00%	100.00%	76.20%	1.0000	



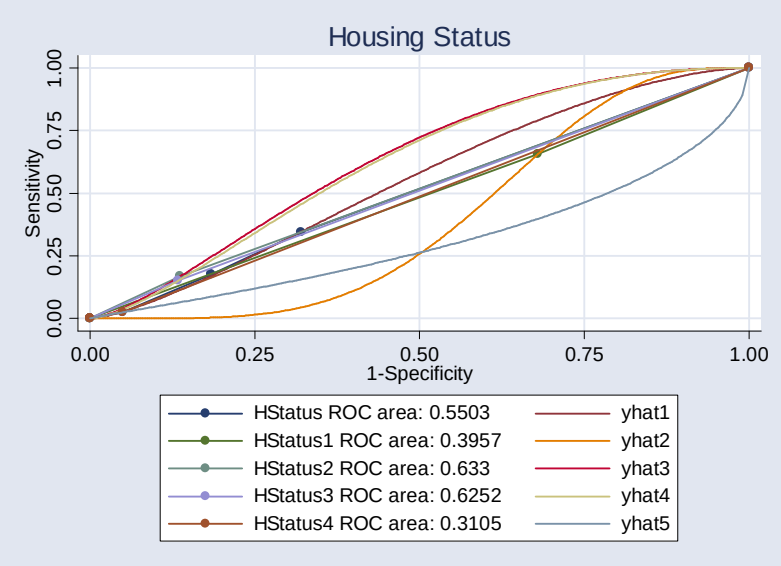
	Obs	Area	Std. Err.	[95% Conf.	Interval]
Housing1	500	0.5568	0.0273	0.50330	0.61031
Housing2	500	0.2972	0.0435	0.21181	0.38252
Housing3	500	0.3037	0.0432	0.21913	0.38831
Housing4	500	0.6453	0.0097	0.62623	0.66430

Ho: area(Housing) = area(Housing1) = area(Housing2) = area(Housing3) = area(Housing4)

chi2(4) = 89.25 Prob>chi2 = 0.0000

Detailed report of Sensitivity and Specificity

Cut point	Sensitivity	Specificity	Correctly Classified	LR+	LR-
(>= 0)	100.00%	0.00%	23.80%	1.0000	
(>= 1)	15.13%	89.24%	71.60%	1.4056	0.9511
(> 1)	0.00%	100.00%	76.20%		1.0000



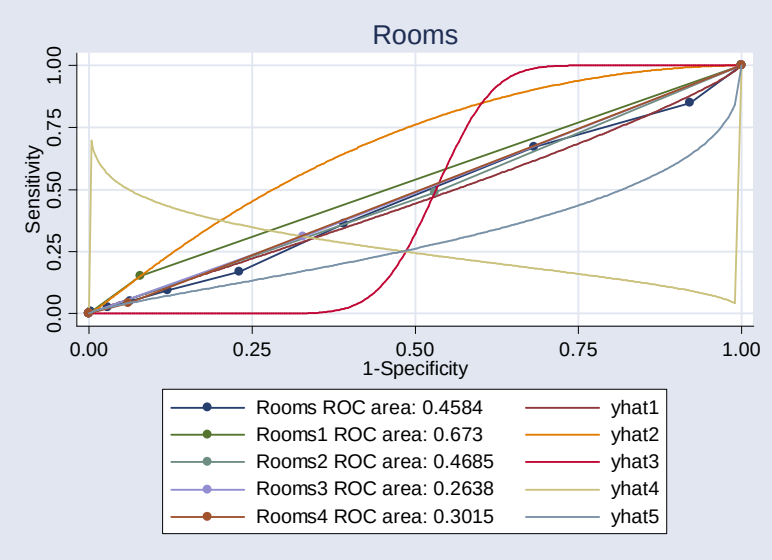
	Obs	Area	Std. Err.	[95% Conf.	Interval]
HStatus1	500	0.3957	40.2741	-7.9e+01	79.33144
HStatus2	500	0.6330	0.0098	0.61380	0.65211
HStatus3	500	0.6252	681.6765	-1.3e+03	1.3e+03
HStatus4	500	0.3105	0.0134	0.28415	0.33676

Ho: area(HStatus) = area(HStatus1) = area(HStatus2) = area(HStatus3) = area(HStatus4)

chi2(4) = 92.12 Prob>chi2 = 0.0000

Detailed report of Sensitivity and Specificity

Cut point	Sensitivity	Specificity	Correctly Classified	LR+	LR-
(>= 0)	100.00%	0.00%	23.80%		1.0000
(>= 1)	16.81%	86.35%	69.80%	1.2314	0.9634
(> 1)	0.00%	100.00%	76.20%	1.0000	



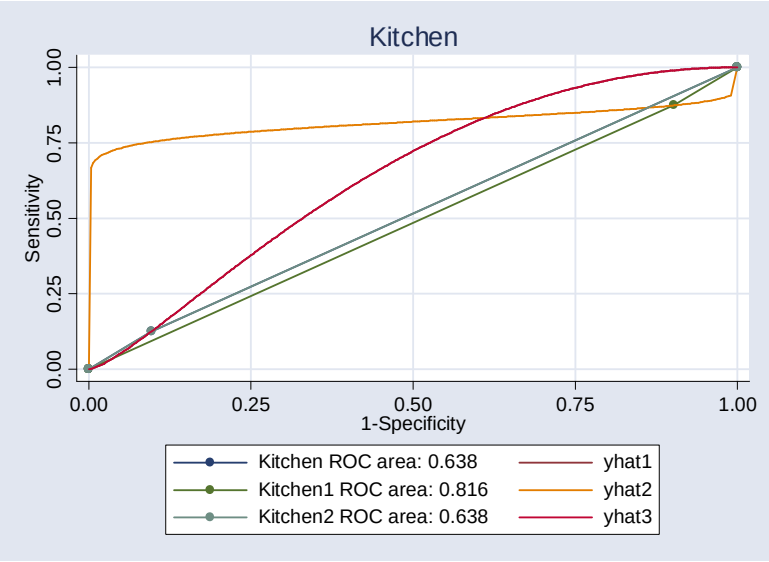
	Obs	Area	Std. Err.	[95% Conf.	Interval]
Rooms1	500	0.6730	0.0102	0.65303	0.69290
Rooms2	500	0.4685	0.0264	0.41678	0.52015
Rooms3	500	0.2638	0.0369	0.19144	0.33616
Rooms4	500	0.3015	0.0119	0.27806	0.32488

Ho: area(Rooms) = area(Rooms1) = area(Rooms2) = area(Rooms3) = area(Rooms4)

chi2(4) = 94.62 Prob>chi2 = 0.0000

Detailed report of Sensitivity and Specificity

Cut point	Sensitivity	Specificity	Correctly Classified	LR+	LR-
(>= 0)	100.00%	0.00%	23.80%	1.0000	
(>= 1)	15.13%	92.13%	73.80%	1.9210	0.9213
(> 1)	0.00%	100.00%	76.20%		1.0000



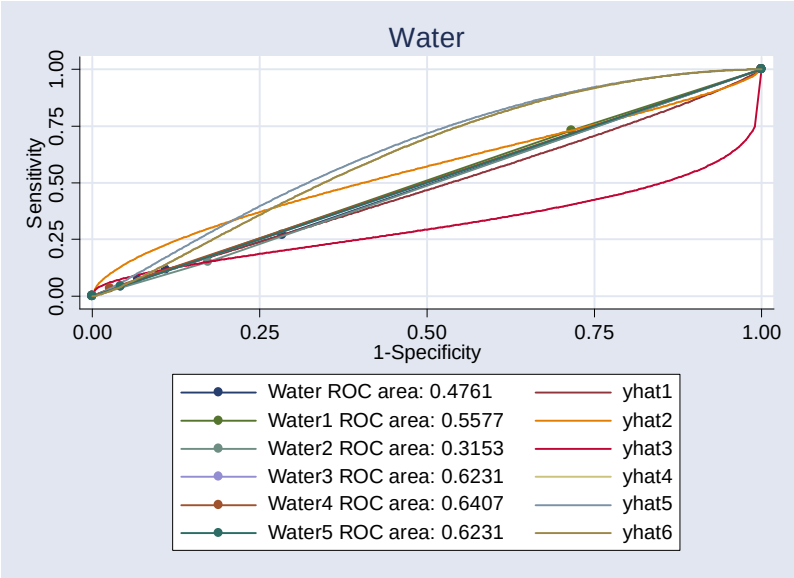
	Obs	Area	Std. Err.	[95% Conf.	Interval]
Kitchen1	500	0.8160	0.0047	0.80683	0.82524
Kitchen2	500	0.6380	0.0092	0.61997	0.65610

Ho: area(Kitchen) = area(Kitchen1) = area(Kitchen2)

chi2(1) = 19.32 Prob>chi2 = 0.0000

Detailed report of Sensitivity and Specificity

Cut point	Sensitivity	Specificity	Correctly Classified	LR+	LR-
(>= 0)	0.00%	100.00%	76.20%		1.0000
(>= 1)	87.39%	9.71%	28.20%	0.9680	1.2980
(> 1)	100.00%	0.00%	23.80%	1.0000	



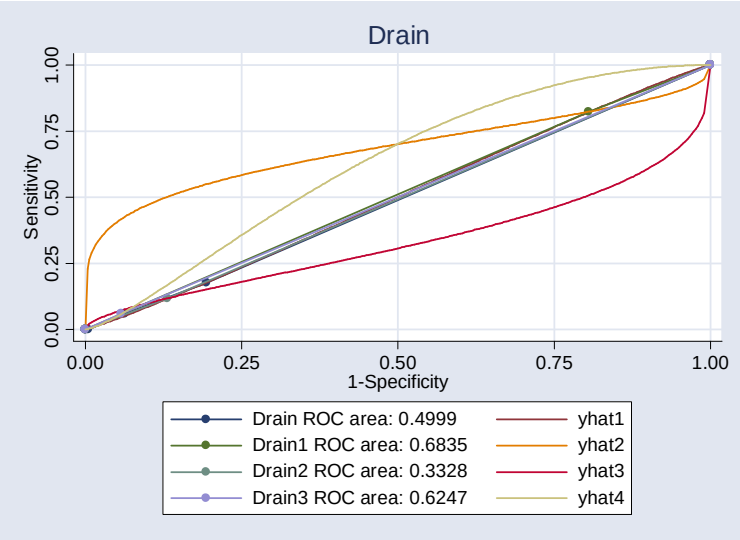
	Obs	Area	Std. Err.	[95% Conf.	Interval]
Water1	500	0.5577	327.4723	-6.4e+02	6.4e+02
Water2	500	0.3153	0.0459	0.22537	0.40524
Water3	500	0.6231	0.0084	0.60655	0.63964
Water4	500	0.6407	0.0094	0.62223	0.65908
Water5	500	0.6231	0.0084	0.60655	0.63964

Ho: area(Water) = area(Water1) = area(Water2) = area(Water3) = area(Water4) = area(Water5)

chi2(5) = 90.49 Prob>chi2 = 0.0000

Detailed report of Sensitivity and Specificity

Cut point	Sensitivity	Specificity	Correctly Classified	LR+	LR-
(>= 0)	100.00%	0.00%	23.80%	1.0000	
(>= 1)	3.36%	97.38%	75.00%	1.2807	0.9924
(> 1)	0.00%	100.00%	76.20%		1.0000



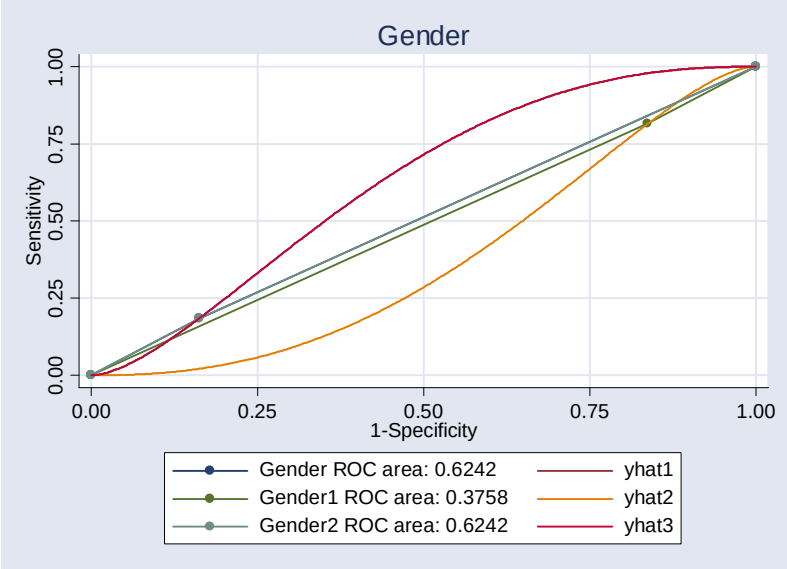
	Obs	Area	Std. Err.	[95% Conf.	Interval]
Drain1	500	0.6835	0.0449	0.59546	0.77145
Drain2	500	0.3328	0.0098	0.31358	0.35201
Drain3	500	0.6247	0.0084	0.60812	0.64122

Ho: area(Drain) = area(Drain1) = area(Drain2) = area(Drain3)

chi2(3) = 82.58 Prob>chi2 = 0.0000

Detailed report of Sensitivity and Specificity

Cut point	Sensitivity	Specificity	Correctly Classified	LR+	LR-
(>= 0)	100.00%	0.00%	23.80%	1.0000	
(>= 1)	82.35%	19.42%	34.40%	1.0220	0.9086
(> 1)	0.00%	100.00%	76.20%		1.0000



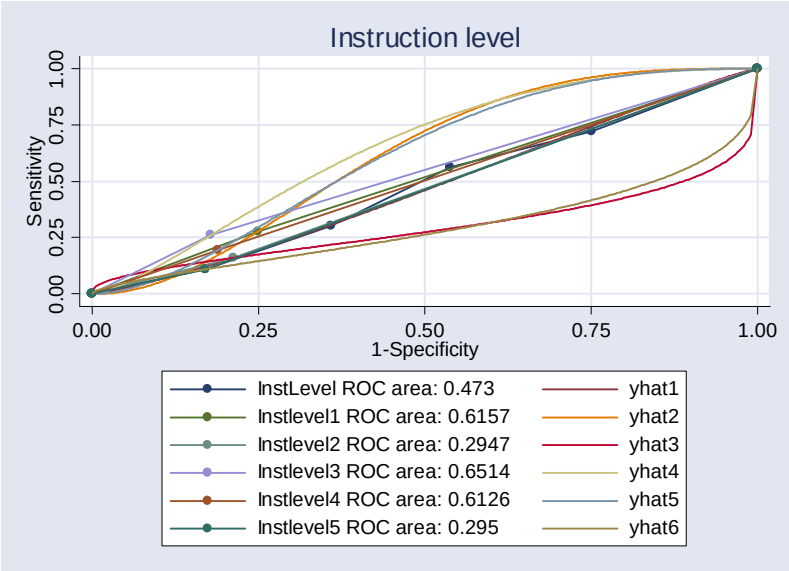
	Obs	Area	Std. Err.	[95% Conf.	Interval]
Gender1	500	0.3758	0.0372	0.30292	0.44864
Gender2	500	0.6242	0.0372	0.55134	0.69708

Ho: area(Gender) = area(Gender1) = area(Gender2)

chi2(1) = 28.00 Prob>chi2 = 0.0000

Detailed report of Sensitivity and Specificity

Cut point	Sensitivity	Specificity	Correctly Classified	LR+	LR-
(>= 0)	100.00%	0.00%	23.80%	1.0000	
(>= 1)	18.49%	83.73%	68.20%	1.1361	0.9736
(> 1)	0.00%	100.00%	76.20%		1.0000



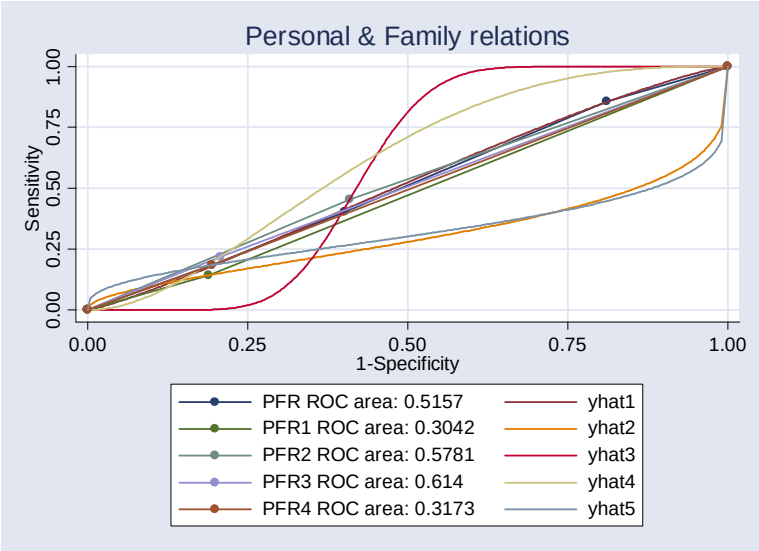
	Obs	Area	Std. Err.	[95% Conf.	Interval]
Instlevel1	500	0.6157	0.0328	0.55144	0.68001
Instlevel2	500	0.2947	0.0441	0.20816	0.38114
Instlevel3	500	0.6514	353.7195	-6.9e+02	6.9e+02
Instlevel4	500	0.6126	0.0361	0.54186	0.68327
Instlevel5	500	0.2950	0.0468	0.20325	0.38679

Ho: area(InstLevel) = area(Instlevel1) = area(Instlevel2) = area(Instlevel3) = area(Instlevel4) = area(Instle> vel5)

chi2(5) = 96.85 Prob>chi2 = 0.0000

Detailed report of Sensitivity and Specificity

Cut point	Sensitivity	Specificity	Correctly Classified	LR+	LR-
(>= 0)	100.00%	0.00%	23.80%	1.0000	
(>= 1)	26.05%	82.15%	68.80%	1.4596	0.9002
(> 1)	0.00%	100.00%	76.20%		1.0000



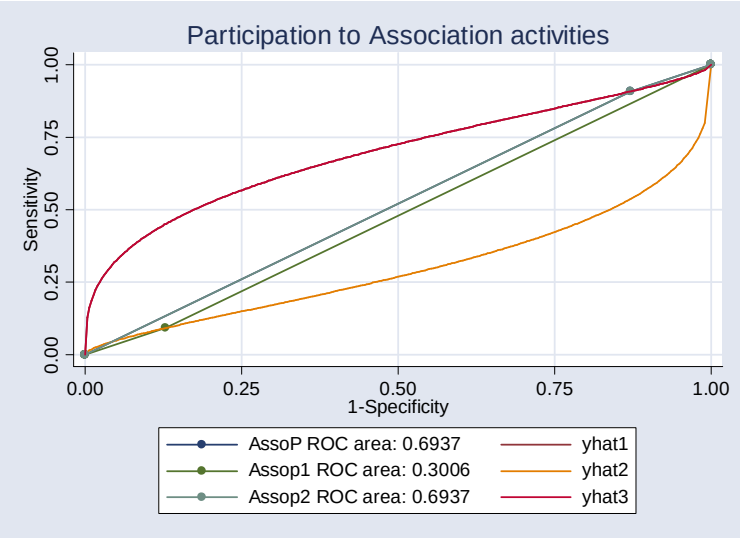
	Obs	Area	Std. Err.	[95% Conf.	Interval]
PFR1	500	0.3042	0.0454	0.21532	0.39314
PFR2	500	0.5781	0.0267	0.52581	0.63039
PFR3	500	0.6140	0.0349	0.54560	0.68247
PFR4	500	0.3173	0.0448	0.22953	0.40509

Ho: area(PFR) = area(PFR1) = area(PFR2) = area(PFR3) = area(PFR4)

chi2(4) = 81.34 Prob>chi2 = 0.0000

Detailed report of Sensitivity and Specificity

Cut point	Sensitivity	Specificity	Correctly Classified	LR+	LR-
(>= 0)	100.00%	0.00%	23.80%	1.0000	
(>= 1)	21.85%	79.27%	65.60%	1.0537	0.9859
(> 1)	0.00%	100.00%	76.20%		1.0000



	Obs	Area	Std. Err.	[95% Conf.	Interval]
Assop1	500	0.3006	0.0121	0.27683	0.32444
Assop2	500	0.6937	0.0120	0.67014	0.71718

Ho: area(AssoP) = area(Assop2) = area(Assop2)

chi2(1) = 63.83 Prob>chi2 = 0.0000

Detailed report of Sensitivity and Specificity

Cut point	Sensitivity	Specificity	Correctly Classified	LR+	LR-
(>= 0)	100.00%	0.00%	23.80%	1.0000	
(>= 1)	90.76%	12.86%	31.40%	1.0415	0.7187
(> 1)	0.00%	100.00%	76.20%		1.0000

Source : Our calculations using Stata 8