

**POLICY NOTE**  
**Updating Poverty Profiles**  
**A Case Study of Moldova**

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**DRAFT: NOT FOR QUOTATION**

**I. Introduction**

The compilation of Moldova's poverty trends and poverty estimates from 1997 until 2005 was facilitated by the use of a single sampling frame and design: the 45 enumeration areas drawn in 1997 to be representative of the national population at the city, town and rural level remained unchanged until 2005; while the sample size stayed around 6,000 households. Meanwhile, the questionnaire remained mainly unchanged, in particular the chapters used to monitor poverty and welfare.

However, in 2006 the National Bureau of Statistics (NBS) chose to update the Moldovan Household and Budget Survey (HBS). It was changed with respect to two major areas: (i) the sampling frame and design were updated and the substitution practice<sup>3</sup> was abolished; while (ii) the questionnaire used to monitor poverty and living standards was modified. The unfortunate negative aspect of these changes is the fact that data for 2006 are not comparable with data for previous years. In this context, it is difficult to evaluate the impact of policies developed by the Government on the target set for the reporting period: poverty reduction and improvement of people's wellbeing.

Since the changes in methodology are bound to explain some of the changes in poverty estimates from 2005 to 2006, economists wanting to compare welfare over the last two

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<sup>3</sup> Until 2005, if a household did not want to be interviewed, it was substituted with another household. This created a selection problem: households with children tended to refuse interviews more than old people. From the enumerator perspective some households were easier to interview and the practice of substitution may have created some distortions. From 2006 substitution was no longer allowed.

rounds of HBS should try to correct this important potential measurement problem. Ignoring these potential comparability issues leads to poverty estimates of 2006 that are similar to those of 2005 (30.2% versus 29.1%<sup>4</sup>), but extreme poverty estimates that are drastically lower than in 2005 (4.5% versus 16.1%). But to what extent is this evidence of impressive poverty reduction driven by the problems of non-comparability outlined above?

The comparability issue could be largely overcome by replicating Kijima and Lanjouw's (2003) Small Area Estimates (SAE) methodology applied to the case of India in the 1990's. Their idea is to predict per capita consumption at the level of each household in the later round (in our case HBS-06) based on a model of consumption estimated using the earlier round (in our case HBS-05), thereby ensuring that the definition of consumption remains the same across the two data sources. Following that methodology, we estimate poverty in the 2006 round based on the imputed consumption aggregate computed from 2005, and track changes in poverty over time by comparing these poverty estimates with those derived from the 2005 round. This approach of imputing consumption from one data source into another data source has been applied by Elbers, Lanjouw and Lanjouw (2002, 2003) in a number of countries in the context of producing "maps" of poverty and inequality by imputing consumption from a household survey into the population census.

## **II. Data**

### **1. Datasets used**

The data used here come from two rounds of the Moldovan HBS: 2005 and 2006. The 2005 dataset comprises 6,089 households, yielding a population of 16,255 individuals. The 2006 dataset comprises 5,748 households, yielding a population of 17,352 individuals. All descriptive statistics and poverty estimates have been computed using household weights.

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<sup>4</sup> Republic of Moldova – Ministry of Economy and Trade, (2007), "Poverty and Policy Impact Report 2006".

Poverty estimates for 2005 were directly computed from HBS-05 using the per capita consumption aggregate constructed by the NBS using adult equivalence scale<sup>5</sup>. The poverty lines used were the national poverty lines, i.e. 353.87 MDL per adult equivalent per month and 278.52 MDL per adult equivalent per month for the extreme poverty line. Poverty numbers for 2006 were estimated using the Kijima and Lanjouw (2003) methodology described in the following chapter.

## 2. Sets of common variables

All variables used for matching HBS-05 and HBS-06 were formatted so that they would be defined exactly the same way in both surveys. These variables can be regrouped into six different categories:

- Land ownership: plot owner;
- Dwelling characteristics: dwelling ownership and type, year building was built, walls material, number of rooms, floor space, electricity, water, sewerage, WC, hot water, gas, electric cooker, heating, bath or shower, telephone, garage, other house;
- Assets ownership: color or BW television, cassette, VCR, home cinema, stereo, camera, video camera, computer, fridge, washing machine or dishwasher, vacuum cleaner, microwave, bicycle, motorcycle, car, boat;
- Access to public service: distance to medical center, policlinic, hospital, chemist's shop, library, cinema, post office, city hall, kindergarten, primary, secondary school, telephone booth, social assistance;
- Household demographics: household size, number of males, females, kids, children, adults, elders, highest educational attainment, number of members working, numbers of members unemployed;
- Household head characteristics: gender, age, civil status, education, main and secondary activity, industry code, and main source of income.

Unfortunately, due to the limited information we so far have on geographic

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<sup>5</sup> Adult Equivalence Scales were computed using the OECD methodology:  $AE = 1 + 0.7 * (adults - 1) + 0.5 * children$ , where *adults* refers to the numbers of adults in the household and *children* refers to the number of household members aged less than 15.

characteristics, we were unable to match geographic origin at a lower level than urban-rural disaggregation<sup>6</sup>.

### **3. Differences between HBS-05 and HBS-06**

The Moldovan HBS has been conducted from 1997 to 2005 in the same enumeration areas (villages and city districts). Such enumeration areas were considered to be representative and were selected based on population information gathered through the 1996 electoral lists (the sampling frame). At that time the electoral lists were the best information available, in particular better than the 1989 Census. Because of population changes and migration, information in the electoral lists was becoming increasingly biased, in some villages the list of households was exhausted. In 2005 the NBS obtained updated and more comprehensive information through the 2004 Census as well as a database of electricity consumers. Therefore, from 2006 both the Census and the electricity database were used to select the HBS sample.

Starting with 2006, the NBS made substantial changes to the HBS. These changes consisted of a new sampling framework, improvements to the data collection toolkit (questionnaires) and creation of a unified data collection network for social surveys. Unlike the old survey, the new survey does not apply the method of substitution of households in case of non-response. The practice of substitution showed that in case of a household's refusal to take part in the survey, it was substituted with another household from the back-up list, which included households who would most likely participate in the survey, such as elderly persons or persons without any occupation. As a result, households with elderly persons were overrepresented in the sample, which thus lead to errors in the final survey estimators. A substantial increase in the number of primary sampling units from which households are selected for HBS ensures a much better coverage of all localities of the Republic of Moldova (45 to 120). Changes made to the HBS in 2006 contributed to a better quality of data obtained and a better alignment of poverty measurement methodology to international standards.

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<sup>6</sup> See Chapter VI for more details on the shortcomings of this analysis.

### III. Methodology

In this paper, we rely on poverty estimates produced by the application of the poverty mapping approach developed by Elbers, Lanjouw and Lanjouw (2003). This approach typically involves a household survey and a population census as data sources. First, the survey data are used to estimate a prediction model for either consumption or incomes. The selection of explanatory variables is restricted to those variables that can also be found in the census (or some other large dataset) or in a tertiary dataset that can be linked to both the census and survey. The parameter estimates are then applied to the census data, expenditures are predicted, and poverty (and other welfare) statistics are derived. The key assumption is that the models estimated from the survey data apply to census observations.

Let  $W$  be a welfare indicator based on the distribution of a household level variable of interest,  $y_h$ . Using a detailed household survey sample, we estimate the joint distribution of  $y_h$  and observed correlates  $x_h$ . By restricting the explanatory variables to those that also occur at the household level in the population census, parameter estimates from this “first stage” model can be used to generate the distribution of  $y_h$  for any target population in the census conditional on its observed characteristics and, in turn, the conditional distribution of  $W$ . Elbers et al (2003) study the precision of the resulting estimates of  $W$  and demonstrate that prediction errors will fall (or at least not rise) with the number of households in the target population, and will also be affected by the properties of the first stage models, in particular the precision of parameter estimates. A general rule of thumb is that welfare estimates obtained on this basis will be estimated fairly precisely as long as the target population comprises at least 1,000-5,000 households.

The first-stage estimation is carried out using household survey data<sup>7</sup>. The empirical models of household consumption allow for an intra-cluster correlation in the disturbances (see Elbers et al. (2003) for more details). Failing to take account of spatial

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<sup>7</sup> These surveys are stratified at the region or state level, as well as for rural and urban areas. Within each region there are further levels of stratification, and also clustering. At the final level, a small number of households (a cluster) are randomly selected from a census enumeration area.

correlation in the disturbances would result in underestimated standard errors in the final poverty estimates. Different models are estimated for each region and the specifications include census mean variables and other aggregate level variables in order to capture latent cluster-level effects. All regressions are estimated with household weights and with parsimonious specifications to be cautious about overfitting. Heteroskedasticity is also modeled in the household-specific part of the residual.

Parameter estimates from all the first-stage models are then taken, in the second stage, to the population census. Since predicted household-level per capita consumption in the census is a function not only of the parameter estimates from the first stage consumption models estimated in the survey, but also of the precision of these estimates and of those parameters describing the disturbance terms in the consumption models, we do not produce just one predicted consumption level per household in the census. Rather,  $r$  predicted expenditures are simulated for each household (typically around 100 simulations). The full set of simulated household-level per capita expenditures are then used to calculate estimates of the welfare estimates of each target population. Demombynes et al. (2007) describe a variety of simulation approaches that are available and document that these all yield closely similar welfare estimates.

We introduce a slight change to that methodology and replace the census by the 2005 HBS. We restrict explanatory variables of the  $\beta$ -model to those that are strictly comparable across the HBS-05 and HBS-06 (described in Section 2). We use two different specifications: one that models per adult equivalent total expenditure as a function of all variables. The explanatory variables employed in the second specification all come from the first pages of the questionnaire before any information on consumption and assets has been solicited. The results of the second specification are only presented at the national and urban-rural disaggregation to conduct a robustness check of the first-specification results. For reasons of data availability we were unable to estimate the two specifications with geographic indicators, as the territory codes of 2005 and 2006 could not be matched.

#### IV. Moldovan Specifications

The first-stage estimation was carried out using the HBS-05. This survey was stratified at the regional level (urban-rural) and was intended to be representative at that level. Within each group (urban and rural) the population was clustered into 45 groups. Our empirical model of household consumption allowed for an intra-cluster correlation of the error term. We also modeled heteroskedasticity in the household-specific part of the residual. All regressions were estimated with household weights. One model was used for the whole population. The  $R^2$ -adjusted is not very high (0.429) but in the range of the poverty maps drawn from the Moldovan data. The ratio of variance-of- $\eta$  over MSE is quite high (0.148) due to the absence of means at the cluster level and territory dummies.

**Table 1:  $\beta$ -model with assets**

	<i>Coefficient</i>	<i>Std. Err.</i>	<i>t-value</i>	<i>p-value</i>
intercept	6.28	0.08	81.11	0.00
rural	0.18	0.06	3.04	0.00
<b>ASSETS</b>				
bike	0.09	0.02	4.11	0.00
camera	0.08	0.02	3.65	0.00
car	0.14	0.02	6.45	0.00
cassette	0.05	0.02	3.15	0.00
computer	0.19	0.04	4.93	0.00
fridge	0.06	0.02	2.99	0.00
oven	0.27	0.05	4.96	0.00
phone	0.12	0.02	7.11	0.00
black and white television	0.07	0.02	3.16	0.00
color television	0.18	0.02	8.08	0.00
VCR	0.09	0.03	3.37	0.00
<b>DWELLING</b>				
good household living conditions	0.21	0.03	6.04	0.00
satisfactory household living conditions	0.03	0.02	2.02	0.04
very bad household living conditions	-0.12	0.04	-2.86	0.00
dwelling built after 1991	0.06	0.03	2.02	0.04
dwelling ownership: department	0.31	0.09	3.35	0.00
dwelling ownership: cooperative	0.20	0.07	2.78	0.01
dwelling ownership: privately rented	0.25	0.05	5.56	0.00
number of rooms	-0.03	0.01	-2.41	0.02
living area (sq. m.)	0.00	0.00	3.27	0.00
plot	0.05	0.03	1.43	0.15

no gaz	-0.11	0.04	-2.66	0.01
public heating	0.24	0.05	4.47	0.00
own (autonomous) heating	0.07	0.05	1.42	0.15
acqueduct water	0.29	0.05	6.40	0.00
well water	-0.05	0.03	-1.44	0.15
concrete walls	0.09	0.04	2.47	0.01
stone/brick walls	-0.07	0.02	-3.52	0.00
wooden walls	-1.10	0.55	-1.98	0.05
<b>PUBLIC SERVICE</b>				
distance to hospital	-0.02	0.01	-2.85	0.00
distance to social assistance	-0.01	0.00	-1.79	0.07
<b>DEMOGRAPHICS</b>				
household size	-0.22	0.02	-12.24	0.00
squarred household size	0.01	0.00	4.84	0.00
age of household head	0.00	0.00	-4.56	0.00
highest education = university	0.44	0.04	11.19	0.00
number of children (less than 15)	0.04	0.01	3.33	0.00
number of elderly (more than 60)	0.05	0.02	2.32	0.02
<b>HOUSEHOLD HEAD CHARACTERISTICS</b>				
hh head educacion = vocational/college	0.07	0.03	2.55	0.01
hh head main source of income = priv. ag.	-0.07	0.04	-2.01	0.04
hh head main source of income = handicraft	0.15	0.05	2.82	0.00
hh head main source of income = priv. non-ag.	0.06	0.02	2.93	0.00
hh head main source of income = social welfare	-0.08	0.03	-3.06	0.00
<b>INTERACTION OF VARIABLES</b>				
HH_AGE * (HH_EDUC=gymnasium)	0.00	0.00	2.72	0.01
HH_AGE * (HH_EDUC=secondary general)	0.00	0.00	-1.43	0.15
hh head educ = none * hh head source of income = other	-1.12	0.55	-2.03	0.04
hh head educ = primary * hh head source of income = priv. ag.	-0.51	0.20	-2.48	0.01
hh head educ = primary * hh head source of cinome = other	-0.84	0.19	-4.52	0.00
hh head educ = gymnasium * source = self, housekeeping	-0.21	0.03	-6.14	0.00
hh head educ = gymnasium * source = priv. ag.	-0.12	0.05	-2.16	0.03
hh head educ = secondary * source = pension	-0.40	0.24	-1.71	0.09
hh head educ = secondary * source = other	0.36	0.06	5.88	0.00
hh head educ = college * source = self, housekeeping	-0.09	0.06	-1.67	0.10
hh head educ = college * source = priv. ag.	0.21	0.09	2.51	0.01
hh head educ = college * source = pension	-0.78	0.55	-1.42	0.16
hh head educ = university * source = self, housekeeping	-0.32	0.09	-3.37	0.00
hh head educ = primary * hh head = male	0.07	0.04	1.81	0.07
urban * number unemployed	-0.14	0.03	-4.82	0.00
rural * distance to hospital	0.03	0.01	4.99	0.00
rural * distance to social assistance	-0.01	0.00	-3.86	0.00
rural * number of elder	0.00	0.02	0.20	0.84
rural * total area	0.00	0.00	1.56	0.12
urban * dwelling built in 1981-1990	-0.08	0.03	-2.79	0.01
urban * apartment	-0.06	0.08	-0.77	0.44
rural * no heating	0.16	0.06	2.56	0.01
urban * max education = secondary	0.09	0.04	2.33	0.02
urban * max education = college	0.14	0.04	3.12	0.00

rural * max education = primary	0.06	0.03	1.59	0.11
rural * max education = university	-0.26	0.05	-5.19	0.00
urban * toilet	-0.22	0.08	-2.68	0.01

## V. Results

Table 2 presents national and urban-rural level estimates of poverty in Moldova from the HBS-05 and HBS-06. Columns 1 and 2 present the poverty estimates that we get directly from the two datasets. Columns 3 and 4 reproduce the poverty estimates presented by the Moldovan Ministry of Economy and Trade (MET), which are slightly different from our estimates but not significantly different. Columns 5 and 6 present the poverty estimates for 2006 corrected by the Kijima-Lanjouw methodology. The slight increase in poverty from 29.1% to 30.2% that was concluded from previous studies is now reverted: poverty slightly decreased from 29.1% to 27.5% (prediction with all variables) or 26.7% (prediction without assets). But the biggest change can be seen in the estimates of extreme poverty: in lieu of estimates stagnating around 4.5%, both specifications give figures of about 16%, suggesting that extreme poverty did not drastically change (let alone decrease) between the two rounds. As suggested by the two last rows, both urban and rural FGT<sub>0</sub> improved by 2 to 3 percentage points.

**Table 2: Poverty trends - National and urban-rural levels**

	<i>HBS-05</i>	<i>HBS-06</i>	<i>Official Publications</i>		<i>Predictions (Kijima-Lanjouw)</i>	
			<i>HBS-05</i> <sup>2</sup>	<i>HBS-06</i> <sup>3</sup>	<i>w/o assets</i>	<i>w/ assets</i>
Poverty Line	353.57MDL	747.4MDL				
Extreme PL	278.52MDL	404.2MDL				
HCR	27.7%	30.8%	29.1%	30.2%	26.7%	27.5%
HCR <sub>e</sub>	15.7%	4.4%	16.1%	4.5%	15.6%	16.4%
<i>HCR (urban)</i>	19%				13.7%	16.1%
<i>HCR (rural)</i>	38%				35.7%	35.4%

<sup>1</sup>: All poverty lines are the official poverty lines given by MET. They are constructed per adult equivalent per month, according to the OECD methodology ( $AE=1+(0.7*(adults-1))+0.5*children$ ).

<sup>2</sup>: MET, "Policy and Poverty Impact Report 2005", Chisinau, November 2006.

<sup>3</sup>: MET, "Policy and Poverty Impact Report 2006", Chisinau, November 2007.

Tables 3 and 4 present poverty estimates from the HBS-05 and HBS-06. Some main results can be drawn from those tables: (i) poverty reduction was more visible in male-headed households; (ii) lower educated households (less than primary and primary

education) saw a poverty increase while higher educated households experienced a reduction in poverty.

**Table 3: HBS-05 Poverty Estimates**

	<i>FGT<sub>0</sub></i>	<i>FGT<sub>1</sub></i>	<i>FGT<sub>2</sub></i>	<i>FGT<sub>0</sub> (ext)</i>
<b><i>regional</i></b>				
overall	0.31	0.09	0.04	0.31
urban	0.19	0.05	0.02	0.19
rural	0.38	0.12	0.05	0.38
<b><i>demographics</i></b>				
male	0.33	0.10	0.04	0.33
female	0.29	0.08	0.03	0.29
<b><i>education</i></b>				
Without primary	0.45	0.13	0.06	0.45
Primary	0.40	0.12	0.06	0.40
Gymnasium	0.45	0.14	0.06	0.45
Secondary general	0.34	0.09	0.04	0.34
Sec vocational, college	0.15	0.04	0.01	0.15
University	0.08	0.02	0.01	0.08
<b><i>Main source of income</i></b>				
Self, housekeeping	0.47	0.15	0.06	0.47
State Ag. sector	0.46	0.04	0.00	0.46
Private Ag. sector	0.43	0.14	0.06	0.43
Enterprise income	0.03	0.00	0.00	0.03
Handicraft	0.10	0.02	0.01	0.10
State non-ag. sector	0.18	0.04	0.02	0.18
Private non-ag. sector	0.20	0.05	0.02	0.20
Unemployment compensation				
Scholarship				
Pension	0.30	0.08	0.03	0.30
Social welfare	0.82	0.33	0.16	0.82
Other source	0.21	0.05	0.02	0.21
<b><i>Employment type</i></b>				
Worked	0.32	0.09	0.04	0.32
On leave	0.20	0.02	0.01	0.20
At work but firm not functioning	0.00	0.00	0.00	0.00
Looking for a job	0.15	0.05	0.02	0.15
Housewife/keeper	0.50	0.40	0.32	0.50
Studied	0.33	0.11	0.05	0.33
Phy. disabled	0.45	0.17	0.08	0.45

Age disabled	0.01	0.00	0.00	0.01
Other	0.31	0.09	0.03	0.31

**Table 4: HBS-06 Poverty Estimates**

	<i>FGT<sub>0</sub></i>	<i>FGT<sub>1</sub></i>	<i>FGT<sub>2</sub></i>	<i>FGT<sub>0</sub> (ext)</i>
<b><i>regional</i></b>				
overall	0.27	0.08	0.03	0.16
urban	0.16	0.04	0.02	0.09
rural	0.35	0.11	0.05	0.22

<b><i>demographics</i></b>				
male	0.27	0.08	0.03	0.16
female	0.28	0.08	0.04	0.17

<b><i>education</i></b>				
Without primary	0.49	0.16	0.08	0.32
Primary	0.41	0.13	0.06	0.26
Gymnasium	0.39	0.12	0.05	0.25
Secondary general	0.30	0.09	0.04	0.18
Sec vocational, college	0.15	0.04	0.01	0.07
University	0.09	0.02	0.01	0.04

<b><i>Main source of income</i></b>				
Self, housekeeping	0.39	0.12	0.05	0.24
State Ag. sector	0.30	0.10	0.05	0.20
Private Ag. sector	0.41	0.13	0.06	0.27
Enterprise income	0.10	0.03	0.01	0.06
Handicraft	0.14	0.03	0.01	0.07
State non-ag. sector	0.19	0.05	0.02	0.10
Private non-ag. sector	0.16	0.04	0.02	0.09
Unemployment compensation	0.22	0.06	0.02	0.12
Scholarship	0.06	0.01	0.00	0.02
Pension	0.33	0.09	0.04	0.19
Social welfare	0.58	0.26	0.16	0.45
Other source	0.20	0.07	0.03	0.13

<b><i>Employment type</i></b>				
Worked	0.23	0.07	0.03	0.15
On leave				
At work but firm not functioning	0.21	0.06	0.02	0.13
Looking for a job	0.28	0.09	0.04	0.17
Housewife/keeper	0.11	0.02	0.01	0.05
Studied	0.33	0.09	0.04	0.19
Phy. disabled	0.21	0.06	0.03	0.13
Age disabled				
Other				

## **VI. Conclusion**