L. Krasnikova, T. Podvysotskaya, Yu. Podvysotskiy

### QUANTITATIVE ASSESSMENT OF HOUSEHOLD POVERTY DETERMINANTS IN UKRAINE

The paper investigates determinants of households' poverty in Ukraine. We use Ukrainian Household Survey for three years – 2006, 2009 and 2010. Poverty in our paper is measured using an income and expenses approach, three different poverty lines are investigated. In this paper we aim to investigate the determinants of poverty among households, identify the most vulnerable and prone types of households, depending on a set of parameters – such as social, economic, demographic, and geographic. The main research outcome is that most welfare and poverty determinants change over time, as the economic situation changes, although such determinants as education and work experience are equally important in all periods.

Keywords: welfare function, determinants of poverty, survey, Ukraine.

#### Literature review

Despite quite a huge range of papers devoted to the research of poverty determinants across countries, the empirical investigation of poverty determinants in an individual country, based on household surveys or similar type of data in most post-Soviet countries require more thorough investigation. As for Ukraine quite comprehensive research of household poverty determinants was done by Brück Tilman et. al (2010), but this research covered the period prior to 2004. Their paper investigates the effect of explanatory variables grouped into household characteristics, productive assets and human capital, as well as geographic controls on welfare and poverty. The authors analyzed both an income-based and an expenses-based welfare and poverty function. They found that during 1996-2004 poverty and inequality slightly declined, identified the poverty risk related to having children, and the importance of having productive assets (land plots) especially for poorer people. However, the paper did not aim to implement policy analysis and provide respective policy implications.

Several seminal policy papers on poverty estimation and poverty-reduction policies were prepared by the World Bank and European Commission, with contribution from the local experts and scientists. Overview of the policy recommendations from such papers is useful for several reasons: it provides description of best-practice poverty-reduction policies, besides it gives benchmarks to compare the results of our paper.

The report on "Social Protection and Social Inclusion in Ukraine" (2009), which was prepared by scientists of Ukrainian National Academy of Sciences for the use of European Commission, ar-

gues that current social policies are oriented to provide assistance to broad range of population, but vulnerable groups are not considered in comprehensive manner. The main risk groups are families with many children, elderly, unemployed, and persons with low education. Another conclusion of the paper is that there is no state strategy of social policy development and integration. The authors argue that accumulation of budget deficit is a serious risk for stability of social net policies and support for vulnerable groups.

In current research we aim to investigate the determinants of poverty among households, identify the most vulnerable and prone types of households, depending on a set of parameters – such as social, economic, demographic, and geographic. We also extend the time-line by survey data for three years – 2006, 2009 and 2010, which besides general estimation allows considering for crises effect on household poverty in Ukraine.

The availability of household-level data *before*, *during* and *after* the crisis allows to adopt the mainstream methodology and investigate the peculiarities of the crisis effect on various groups and to formulate policy recommendations.

### Data analysis

Our investigation relies on Ukrainian household survey (UHS), that contains a wide set of indicators regarding households' characteristics, income and expenses, as well as those of individual members. UHS is updated annually since 1999 and includes most types of households, excluding the following groups of persons: in military service, imprisoned ones, permanent residents in orphanages and marginalized segments of the population. Number of

observed households for the UHS is approximately 13 000 households and 25 000 individuals. In 2010 the sample size was 10 428 households and 25 906 members (2009–10 459 households and 25 095 members; 2006–11 161 households and 26 253 members). Available data for years 2006 ("before the crisis"), 2009 ("during the crisis") and 2010 ("after the crisis") makes it possible to test difference in parameters between the three years – 2006, 2009 and 2010.

During 2006–2010 certain changes occurred in demographic patterns (table 1). The key changes include the following ones: decreasing share of male population, shrinkage of rural population due to urbanization and negative natural population dynamics, decrease in the number of households with children. Average monthly wage increased from EUR 412 in 2006 to EUR 538 in 2010.

Table 1. Key household indicators

As the economic needs of a household do not grow with each additional member in proportion, because of economies of scale in consumption, we used a special equivalence scale to determine the number of equivalent members for each household. In our research we used the three most widely used equivalence scales – the OECD equivalence scale, the OECD-modified scale, and the square-root scale, as suggested by OECD (2009). The scaling methodology is as follows:

- the number of equivalent members based on the OECD scale: 1 household head, 0,7 each additional adult member, 0,5 each child;
- the number of equivalent members based on the Modified OECD scale: 1 – household head, 0,5 – each additional adult member, 0,3 – each child;
- the number of equivalent members based on the Square root scale: square root of the number of actual household members.

Indicator	2006	2009	2010
Share of males (%)	49,7	43,6	44,3
Share of rural population (%)	38,6	34,1	34,2
Average household size (persons)	2,5	2,5	
Share of households with children (%)	34,1	32,3	29,2
Average number of children* (persons)	1,4	1,4	1,4
Mean monthly wage (UAH)	2 610	4 904	5 661
Mean monthly wage (EUR)	412	451	538

<sup>\*</sup> For households with children

The household survey provides detailed information on income and expenses by different categories of households (including social benefits received, nutrition expenses, and health-care preferences). Household categorizations include these ones: urban / rural, with children /without children, type of dwelling; included are several quantifiable household parameters, such as the number of children, number of working adults, years of academic study, years of work experience, employment status, amount of social benefits received, health and life styles.

In order to develop the dataset to be used in the regression analysis we transformed the initially separate databases on households and on individuals into equivalent members database using the following algorithm: first, we collapsed the selected data on individual members into sums grouped by household number; second, we merged the later subset into the household database of the respective year; third, we calculated the number of equivalent household members for each household (using several equivalency scales) and calculated values of numeric variables per each equivalent household member.

Summary statistics of the datasets for years 2006, 2009, and 2010 used for regression analysis are presented in Table 2.

#### **Poverty function estimation methodology**

In order to assess the determinants of poverty, we are going to follow the estimation approach by Brück et al. (2010), and estimate "poverty function", which is a binary variable defined on the basis of the poverty line. One of the advantages of "poverty function" is that it pays explicit attention to the poor.

We follow Libanova and Makarova (2009) and use three poverty lines:

- Official poverty line: calculated as 75 % of the median equivalent total expenditures;
- Extreme poverty line: calculated as 60 % of the median equivalent total expenditures;
- OECD extreme poverty line: calculated as 60 % of the median equivalent total income;

We assume the old OECD equivalence scale in our paper for the calculation of the abovementioned poverty lines for years 2006, 2009 and 2010.

Table 2. Selected summary statistics

X72-11-	2006			2009			2010		
Variable	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
head_gender	0,458	0	1	0,450	0	1	0,438	0	1
head_married	0,537	0	1	0,528	0	1	0,519	0	1
region_kyiv	0,077	0	1	0,076	0	1	0,074	0	1
region_west	0,157	0	1	0,172	0	1	0,170	0	1
businessman	0,009	0	1	0,011	0	1	0,008	0	1
Eq.members1	1,91	1	5,9	1,91	1	5.2	1,86	1	4,9
Eq.members2	1,62	1	4,5	1,62	1	4	1,59	1	3,5
Eq.members3	1,52	1	3,46	1,52	1	3.6	1,49	1	3,6
Total_Inc	17670	138	317257	32666	362	1996125	37197	3050	660251
Total_Exp	16483	1337	506063	31206	1633	1162579	34317	3013	857267
Rural	0,36	0	1	0,32	0	1	0,32	0	1
# children	0,48	0	5	0,46	0	5	0,42	0	5
#work_age	1,05	0	3	1,05	0	3	1,02	0	3
Age	99	13	431	98	16	330	98	16	344
Education	23	0	106	24	0	90	24	0	92
Experience	43	0	225	42	0	161	42	0	154
Exercising	0.68	0	9	0,69	0	7	0,67	0	6
Living area	60	12	260	60	10	500	60	12	279
Land area	123	0	10060	113	0	5258	115	0	38225
Subsidies	4724	0	68988	9434	0	79085	11145	0	192000

Eq.members1, Eq.members2 and Eq.members3 – number of equivalent household members, according to respectively, the OECD scale, the modified OECD scale, and the square root scale.

Total Inc and Total Exp – quarterly income and expenses of households.

Rural – dummy variable, 1 for rural area and 0 otherwise.

# children - number of children in a household.

#work age – number of working adults within household.

Age and Education – respectively, total age and education level of the household. In regression analysis Age and Education per equivalent member were used.

Living area and Land area – respectively, dwelling area and land area owned/rented by a household. In regression analysis Living area and Land area per equivalent member were used.

Subsidies – total quarterly amount of government payments (stipend, pensions, benefits etc.) per household. In regression analysis Subsidies per equivalent member were used.

The official subsistence level, which is calculated by the Ukrainian health-care authority, based on WHO norms of food and nutrition needs, as well as needs for clothes and social goods, is rarely used for policy and academic analysis of poverty issues. According to the Law, the subsistence minimum is the nominal amount for the provision of a food products set, which is sufficient to provide for the normal functioning of the human organism and the maintenance of health, as well as a minimum set of non-food items and minimum set of services to satisfy basic social and cultural needs of a personality. Despite its definition, the subsistence minimum is not free of subjective influences, because it is the base for most social allowance and assistance programs.

In 2009 there was a significant depreciation of the Ukrainian currency Hryvnia – from 7,34 to 10,87 UAH per EUR<sup>1</sup>. Even though the subsistence mini-

Table 3. Poverty lines and poverty rates dynamics

Poverty indicator*	2006			2009	2010		
	UAH	Poverty rate, %**	UAH	Poverty rate, %	UAH	Poverty rate, %	
75 % expenses line	5 601	27,0 %	10 929	26,5 %	12 440	23,9 %	
60 % expenses line	4 481	13,3 %	8 743	12,6 %	9 952	10,2 %	
60 % income line	4 841	7,4 %	9 077	8,6 %	10 572	6,6 %	

<sup>\*</sup> Based on "Old OECD" equivalency scale. Amounts in UAH represent poverty line per equivalent household member.

<sup>\*\*</sup> Share of all households below the indicated poverty line.

<sup>&</sup>lt;sup>1</sup> Ukrainian Central Bank applies exchange rate targeting policy based on the US Dollar exchange rate. In our paper all translations into Euro were performed using European Central Bank indicative exchange rates.

mum, expressed in UAH, increased in 2009 by 4,6 %, it decreased by 25 % expressed in Euro.

Having obtained the poverty line, we will estimate the "poverty function" (equation 1).

Pr 
$$ob(p_i = 1 | L_i, A_i, V_i) = F(L_i\beta + A_i\gamma + V_i\delta + \varepsilon_i)$$
 (1) Where,

Prob (pi=1|Li, Ai, Vi) – the probability of a household to move below the poverty line, given the explanatory variables below.

Li – household characteristics;

Ai – productive assets and human capital indicators;

Vi – geographic controls;

 $\varepsilon i$  – error term.

As poverty is expressed by a binary variable, we employ Probit model for estimation of poverty function. In equation 3, F(.), our Probit model, is standard normal cumulative distribution function, which is between zero and one for all values of explanatory variables. Probit parameters are estimated via the maximization of the maximum likelihood function (Woldridge, 2003).

For a Probit model a measure for goodness of fit statistic is the pseudo R-squared, measured as  $\{1 - LUR/L0\}$ , where LUR – is the log-likelihood value (unrestricted) for the estimated model, and L0 is the log-likelihood value for the model with an intercept only.

Having estimated equation 3 for years 2006, 2009 and 2010 separately, we could analyze the effect of structural changes due to the financial crisis, similar to the abovementioned analysis for the equation 1. Also we should use the likelihood ratio statistic for Probit models in order to compare differences in coefficients between years 2006, 2009 and 2010 (Wooldridge, 2003).

The likelihood ratio statistic is obtained as LR = 2 (LUR - LR), where LUR – is the log-likelihood value for the non-restricted value, while LR – log-likelihood value for restricted model (e.g. one or several coefficients of the 2010 and 2009 models are restricted to their values in 2006 model).

The empirical results obtained based on this approach are presented in Appendix.

## Poverty function estimation results and analysis

Poverty function estimation results in details are presented in the Table A1 and Table A2 of the Appendix. The overall explanatory power of Probit poverty regressions is lower than that of welfare regressions, it varies from 0,095 to 0,2. The lower explanatory power is one of the minuses of this approach with the binary dependent variable. The analysis of the estimated coefficients by variable is presented below.

Gender of head. Households with a male head have on average somewhat higher chances of becoming poor. This somewhat contradicts to the outcome obtained for the welfare empirical analysis. Although the effect is not pronounced, as it is insignificant for the 60 % income poverty line.

Marital status of head. Households with a married head have a lower probability (by 11–47 %) of getting poor, the highest effect was observed for the 60 % income line. This effect did not seem to change across years in a statistically significant manner.

Residence in Kyiv. Households residing in the capital city Kyiv were 22–27 % less probable of getting poor during the crisis in 2009 and were 26–48 % less probable of getting poor after the crisis in 2010. The effect of this regional variable was insignificant before the crisis in 2006.

Residence in Western regions. Residing in a western region was a factor to decrease the probability of getting poor by 28–33 % before the crisis in 2006. But this effect shrank to 19 % during the crisis in 2009. Still, the evidence is such that remittances from household members working abroad provide an important coupling instrument in Western Ukraine, although it usually does not provide high welfare (as evidenced in sub-section 6.1).

Being an employer: Operating one's own business is another important factor that could prevent getting poor. Although due to the small number of observations of businessmen (over 100), the coefficients should be treated critically.

Rural residence. Before year 2010 residing in a rural area was a significant factor for increasing probability to go below a poverty line. Rural households were on average by 16–20 % more probable to become poor, compared to urban ones in years 2006 and 2009. But in 2010 the effect seems to have disappeared in the case of extreme poverty lines, although it remains for the 75 % expense line.

On average, each additional child increases the probability of poverty by 9–12 %. The effect is not significantly different across the years of study. At the same time each additional working adult decreased the probability of poverty by a quarter before the crisis and by a third during and after the crisis.

Average age of equivalent member. After age of 52, which is the mean age of an equivalent member (based on OECD scale), each additional year increases the probability of poverty by 0,5–1,9 %. The relation did not change significantly during the time-span.

Education. For the two expenses poverty lines each additional year of education (above the mean of 12 years per equivalent member) decreased the probability of poverty by 3–5 %. During the crisis

year education was significant for the income line as well – each additional year decreased the probability by 2 %. Each additional *year of work experience* helps to decrease the probability of poverty by 2 %. In this respect a program of implementing internship opportunities for students and schoolchildren could become an effective factor of social support and poverty reduction.

Households *doing physical exercises* at least once per week are by 18–20 % less probable to become poor. Although during the crisis this effect somewhat shrank.

Proxies for *Physical assets*. The availability of living area and productive land decreases the probability of poverty in a statistically significant manner, although the coefficients are not high.

Public social policies is a significant variable to combat poverty. It contributes for about 19–25 % of the poverty probability decrease, and its effect strengthened during the crisis year.

## Inference on household groups and policy implications

In order to answer our research question as stated in the introduction, based on the empirical results here we specify most (least) vulnerable types of households during the crisis, and also specify households that were most (least) successful in improving their welfare after the crisis. Table 4 summarizes the results.

Of course, table 4 summarizes certain "corner solution" types of households. But it helps to understand the features that make households more (or less) prone to financial crises and more (or less) capable of reviving after the crisis. Also, this might be useful for providing social policy implications.

Empirical results suggest some policy implications, which could be useful for improving social net policies and decreasing poverty:

- first, we found that households with married heads are more advantaged in terms of welfare, and have a lower poverty probability. This finding provides evidence in favor of family-supporting policies;
- second, heads that earn income from own business, have higher welfare, and halved probability of getting poor. Providing state policies to support small businesses, such as developing business incubators, granting tax vacations, could help save work places and salary levels during a crisis;
- third, policies aimed at support for new employment and improved employability among rural population could be useful in combatting poverty. Examples of such policies are subsidizing job creation, subsidies for houses, modernizing infrastructure (wireless and broadband internet, roads, social and cultural infrastructure) within new production projects within rural areas. Similar programs are to some extent already implemented in other CIS countries, including Russia and Belarus;
- fourth, having a child increases poverty risk by itself, besides one working adult member becomes unemployed for a couple of years, therefore there is a need for more public investment in proper child care such as kindergartens and child daycare centers. State could initiate creation of part-time employment schedules for persons from households with small children. Thus households will be able to combine employment status and related income with bringing-up children;
- fifth, healthy lifestyle contributes towards greater social inclusion and, hence, poverty decrease; its effect is comparable to that of education. Policies to support creation of sports infrastructure and improving its accessibility, combatting alcoholism, would provide contribution towards social welfare and poverty reduction.

Table 4. Portrait of targeted household groups

Groups of households	During crisis – 2009	After crisis – 2010
Least vulnerable/ Most capable to revive	Households with married head (operating own business), consisting of two or more well-educated and well-experienced working adults aged over 18 years old (a couple + one's parent(s), without children, exercising regularly, residing in Kyiv.	Households with married head (operating own business), consisting of two or more well-educated and well-experienced working adults aged over 18 years old (a couple + one's parent(s), without children, exercising regularly, residing in Kyiv.
Most vulnerable/ Least capable to revive	Households consisting of a single adult aged over 55-60 years, having low education and poor experience, not actively exercising, with one or more children, residing in rural area of a western region, living mainly on social contributions.	Households consisting of a single adult aged over 55-60 years, having low education and poor experience, not actively exercising, with one or more children, residing in urban area of a western region, living mainly on social contributions.

To our mind, each of the suggested policy implications requires a separate investigation and research. We plan to investigate some of the suggested policy-measures in our future research.

### **Summary and Concluding Remarks**

We analyzed the determinants of poverty for Ukrainian households. We analyzed the determinants that explain welfare differentials, including the analysis of those at different quartiles, of equivalent members, as well as poverty probability determinants; besides we tested whether respective coefficients were different in periods prior to the crisis, during crisis, and after the crisis. Having analyzed the UHS dataset for the years before, during and after the financial crisis of 2008–2009, we were able to determine the most

vulnerable household groups as those consisting of a single adult aged over 55–60 years, having low education and poor experience, not actively exercising, with one or more children, residing in a western region, and living mainly on social contributions; also most economically sound households were those with married head, consisting of two or more well-educated and well-experienced working adults aged over 18 years old (a couple + one's parent (s), without children, exercising regularly and residing in Kyiv.

Based on the empirical results obtained, we formulated several policy implications, such as family-support policies, subsidizing new job-creation, healthy life-style policies, public investment into child daycare facilities, and well improved job-matching and professional training. Some of these issues will be investigated in our future analysis.

# Appendix Table A1. Poverty equation (based on OECD Scale equivalency): Estimation results

Prob of	75 % line – Expenses			60 % line – Expenses			60 % line – Income			
(poor=1)	2006	2009	2010	2006	2009	2010	2006	2009	2010	
head gender	0.1103***	-0.0093	0.0927**	0.0479	-0.0082	0.1171**	0.0467	-0.1008	0.0831	
head married	-0.1966***	-0.1117**	-0.1559***	-0.1806***	-0.1577***	-0.2049***	-0.3659***	-0.4559***	-0.4731***	
region_kyiv	0.0115	-0.2211***	-0.2627***	0.0019	-0.2399***	-0.2723***	-0.1799	-0.2691**	-0.4778***	
region_west	-0.2847***	-0.1905***	-0.1441***	-0.3303***	-0.1960***	-0.2777***	-0.2814***	-0.0759	0.0642	
business	-0.5372**	-0.5200**	-0.7803**	-0.1390	-0.8682**	(omitted)	-0.0427	-0.9201*	(omitted)	
rural	0.1620***	0.1901***	0.1161***	0.2101***	0.1826***	0.0547	-0.0308	0.0107	0.0783	
# children	0.1240***	0.1200***	0.1325***	0.0940***	0.0978***	0.0701*	0.1286***	0.1202***	0.0725*	
# working	-0.2421***	-0.3124***	-0.2749***	-0.2528***	-0.3035***	-0.2525***	-0.5109***	-0.5951***	-0.5369***	
age	0.0182***	0.0186***	0.0168***	0.0175***	0.0179***	0.0147***	0.0056**	0.0053**	0.0024	
educ	-0.0547***	-0.0426***	-0.0503***	-0.0403***	-0.0308***	-0.0458***	-0.0034	-0.0206***	-0.0008	
exper	-0.0215***	-0.0195***	-0.0188***	-0.0234***	-0.0220***	-0.0209***	-0.0288***	-0.0208***	-0.0196***	
sports	-0.2199***	-0.1757***	-0.2354***	-0.2004***	-0.1803***	-0.2427***	-0.3709***	-0.0947	-0.1583*	
space	-0.0150***	-0.0123***	-0.0149***	-0.0169***	-0.0172***	-0.0179***	-0.0172***	-0.0138***	-0.0175***	
land	-0.0003***	-0.0005***	-0.0003***	-0.0003***	-0.0003**	-0.0001	-0.0005***	-0.0009***	-0.0009***	
log_policy	-0.1913***	-0.2699***	-0.2411***	-0.1989***	-0.2555***	-0.2258***	-0.3374***	-0.3691***	-0.3910***	
cons	1.8403***	2.4193***	2.3630***	1.3521***	1.8569***	1.8474***	2.7386***	3.3328***	3.3598***	
pseudo R²	0,095	0,098	0,100	0,095	0,103	0,105	0,197	0,191	0,200	
No obs	7 474	7 456	7 429	7 474	7 456	7 395	7 474	7 456	7 395	

Table A2. Poverty equation (based on OECD Scale equivalency): Parameter testing

Prob of	75 % line	<ul><li>expenses</li></ul>	60 % line	– expenses	60 % line – income		
(poor=1)	2009 vs 2006 (probability)	2010 vs 2009 (probability)	2009 vs 2006 (probability)	2010 vs 2009 (probability)	2009 vs 2006 (probability)	2010 vs 2009 (probability)	
head gender	0.0028	0.0115	0.2446	0.0144	0.0162	0.0047	
head married	0.0559	0.3252	0.6655	0.4044	0.1783	0.8103	
region_kyiv	0.0009	0.5771	0.0071	0.7496	0.4334	0.1643	
region_west	0.0343	0.3100	0.0131	0.1777	0.0014	0.0371	
business	0.9425	0.4392	0.0149	n/a	0.0774	n/a	
rural	0.4783	0.0653	0.5556	0.0106	0.4724	0.2915	
children	0.8894	0.6721	0.9103	0.4421	0.8356	0.2488	
#working	0.0062	0.1625	0.1062	0.1425	0.0486	0.2036	
age	0.8338	0.3341	0.8710	0.1676	0.9191	0.3248	
educ	0.0218	0.1644	0.1333	0.0339	0.0276	0.0296	
exper	0.4526	0.7988	0.6370	0.7358	0.0308	0.7819	
sports	0.3930	0.2594	0.7525	0.3715	0.0003	0.4388	
space	0.0215	0.0279	0.8687	0.6800	0.0558	0.0800	
land	0.0290	0.0281	0.8759	0.0806	0.0639	0.9997	
policy	0.0002	0.1954	0.0209	0.2556	0.2523	0.4480	
cons	0.0025	0.7821	0.0218	0.9694	0.0211	0.9244	

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Краснікова Л. І., Подвисоцька Т. О., Подвисоцький Ю. А.

### КІЛЬКІСНА ОЦІНКА ДЕТЕРМІНАНТ БІДНОСТІ ДОМОГОСПОДАРСТВ УКРАЇНИ

У статті досліджено різні фактори впливу на рівень бідності домогосподарств України, визначено найбільш вразливі типи домогосподарств залежно від різних соціальних, економічних, демографічних та географічних чинників. Дослідження проведено на основі даних Ukrainian Household Survey. Для вимірювання рівня бідності було використано два підходи: обчислення за доходами та обчислення за витратами, також побудовано криву бідності. Виявлено, що більшість факторів впливу на бідність з часом змінюються, тоді як роль таких детермінант, як освіта і досвід роботи є однаково важливою у всі періоди дослідження.

Ключові слова: детермінанти бідності, кількісна оцінка бідності, Ukrainian Household Survey, бідність домогосподарств України.

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