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Abstract

In this work, the size and character of poverty in Poland was studied based on a panel data from CHER (Consortium of Household Panels for European Socio-Economic Research) database for the years 1997 - 2000. The analyses have shown a low households' dynamic of income in this period. The sum of years spent in poverty as well as different sequences of entry to and exit from poverty suggest a permanence of this phenomenon in the population. During the period studied, the basis for the calculation of the number of years spent in poverty was the rate of exit from and entry to poverty. The calculations were made using a method of analyzing poverty based on hazard models, considering observed and unobserved heterogeneity of individuals in order to "explain" a chance of exit and return to the sphere of poverty.

Keywords:
permanent poverty, hazard models, multi-time episodes, unobserved heterogeneity

JEL:
I32, C41

Introduction

Poverty has been present throughout all the history of the world. It is experienced not only by citizens of undeveloped countries, but also by those living in highly developed economies. Obviously, dimensions of poverty are different - the scope, reach, depth, as well as causal factors. A presence of poverty in a given society does not mean that every individual must be affected by it. There are countries where most of the society experiences poverty, but a few people live in prosperity.

An existence of poverty on a large scale leads to a wide interest in this topic, although research on the topic of poverty is primarily conducted by countries in which this phenomenon is present to a very limited degree. This is logical as rich countries have means to combat poverty. A different situation persisted in centrally-planned economies where poverty was not officially recognized, as the socialist regimes aimed at eliminating poverty. As a result, in these countries serious studies of poverty have appeared relatively recently.

In the last few years, income dynamic and duration of poverty were more often discussed during public and academia discussions as important additional information on distribution of income. It has been calculated that the best measurement and an understanding of the problem can be obtained by the traditional studies based on cross-series data supplemented with long-term analysis based on panel data.

When a household's gross income declines below a minimum level and there are not enough financial resources to satisfy basic human needs, its members are considered to be poor. When this state persists for an extended period of their lives then an entire society is touched by the effects of poverty. A long-term poverty of the same group of people is difficult to accept and, not only because of social fairness, but also due to high external costs of permanent marginalization and social exclusion. A political stability is also an important reason of interest into the topic of poverty in highly developed as well as developing countries.

Each country leads a particular policy of dealing with poverty. The policy is guided by various criteria of dividing financial resources, goods and other kinds of benefits. Today, frequently the following opinion is formulated: that among types of assistance provided, an important selection criterion is whether the poverty is an incidental or a recurring and long-term phenomenon.

The aim of this work is a study of the duration of poverty in Poland over the period 1997 - 2000, using a panel data from the CHER[1] database. An exact specification of the permanently living in poverty and its differentiation from a category of people who experience this state temporarily may aid in preparing programs of social assistance targeted at these groups that cannot exit poverty by themselves. Studies of this type are needed due to a large scale of this phenomenon as well as a limited amount of resources which, for the sake of a permanent budget deficit problem in Poland, may be

[1] Consortium of Household Panels for European Socio-Economic Research.

dedicated to overcome the problem. If we succeed to define the category of the chronically living in poverty, may prove helpful in more effectively targeting the financial assistance for the poor, while simultaneously cutting the budgetary resources devoted to it.

The time of transformation in Poland increased, as it is commonly thought, the society's income gap. The reasons of increasing income and wealth differentiation of Polish citizenry are varied. It is unquestionable that for some groups of the society the period of systemic transformation created a chance for income and general wealth generation, while for others, it brought a worsening of (an often already low) level of life as well as problems with finding its place in a new reality. The ownership changes and the fast pace of technological progress, new priorities in valuing work, restructuring in many sectors of the economy resulted in a quick rise of unemployment. This phenomenon swelled by liquidation of nationalized agricultural homestead and by slowly diminishing role of the protective state. These are only exemplary factors which contributed to new distribution of wealth and poverty in the Polish society[2].

The main questions put forth by this work are as follows:

- When has a household found itself in poverty and how long has the poverty lasted?
- Does „recurrence of poverty" exist or, in other words, are numerous returns to poverty a right indicator of permanent poverty?
- What socio-economic characteristics of households allow for the best identification of poverty in Poland in the period 1997 - 2000?

In the presented article econometric methods of poverty analysis were used, based on moral hazard including observable and unobservable heterogeneity of individuals. Estimation of two complimentary models type log-log in a discrete time was conducted. These differ in method in which they describe the duration of so-called base hazard function. In the first model, it has a non-parameter shape; while in the second, it is a polynomial time function.

The article is composed of five parts. The first part includes the methodology used in constructing the econometric model. The second part describes the data utilized in the analysis, definition of poverty as well as independent variables of the model. The third part provides a short description of poverty dynamics and its duration in Poland. To introduce a distribution of time spent in poverty an exit rates from and a return rates to poverty were used. A parametric method of analyzing poverty was presented in the fourth part. In the last part, the results and conclusions were summarized.

[2] Ciura (2002).

1. Duration theory

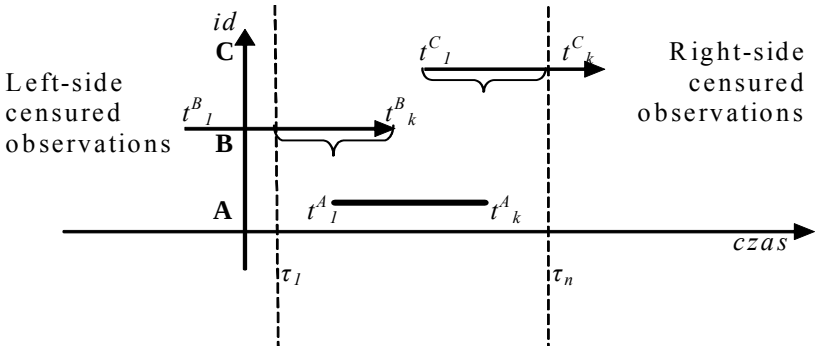
In this work, to study an exit from and return to poverty rates of households a methodology presented by Jenkins (1995, 2004), Devicienti (2000, 2002) was utilized. Using a hazard function, $h(t)$[3] an exit and return probabilities were calculated.

Let $\langle \tau_1, \tau_n \rangle$ be an observation period of the sample, while $\langle t_1, t_k \rangle$ - period of poverty. In the study, one can have censured observations - that is, as such, which include information on how long the person "lived" in poverty, but the exact moments of exit and entry into the poverty are unknown. We can distinguish two types of censure:

- right-sided censure of observations: occurs when the end date of the episode is unknown (then the length of time between the entry and exit from poverty is also unknown);
- left-sided censure of observations: occurs when the beginning date of the episode was not observed (then once again the length of time in poverty is unknown).

  Such situations are depicted on Picture. 1.

Picture 1
Examples of censured observations



Source: Own presentation.

Picture 1 illustrates an occurrence of poverty of three individuals. Family A was studied from the moment of entry into poverty until the exit from this state. Its period of poverty is not censured, but is completely known. Family B - its episode is left-side censured because the beginning of the episode was not recorded (the exact period in poverty is not known). Family C, which was included in the study, was poor until the end of the research - its period in poverty is censured on the right-side.

Let T_i be the length of the poverty episode of i-th individual. Let the length of this time be a realization of a continuous random variable T_i with a disturbance $F(\tau)$ and a density function $f(\tau)$, then the probability that a state of poverty will last shorter than τ years under a condition that it occurred is:

[3] h(t) – hazard rate in discrete time, θ(τ) – hazard rate in continuous time.

$$F(\tau) = \Pr(T_i < \tau) \tag{1}$$

However, probability that an occurrence of poverty will last a minimum of τ years under condition that a survival function is[4]:

$$S(\tau) = 1 - F(\tau) = \Pr(T_i \geq \tau) \tag{2}$$

A hazard rate in the continuous time is:

$$\theta(\tau) = \lim_{\Delta\tau \to 0} \frac{\Pr(\tau \leq T_i < \tau + \Delta\tau \mid T_i \geq \tau)}{\Delta\tau} = \lim_{\Delta\tau \to 0} \frac{F(\tau + \Delta\tau) - F(\tau)}{\Delta S(\tau)} = \frac{f(\tau)}{1 - F(\tau)} = \frac{f(\tau)}{S(\tau)} \tag{3}$$

This rate can be interpreted as a probability of ending an episode of poverty in the range [τ, $\tau + \Delta\tau$] for small $\Delta\tau$ under condition of "survival" to time τ.

It is important to notice that hazard rate in continuous time does not satisfy all properties of probability and especially the hazard rate may be greater than 1.

A survival function as well as hazard rate are connected by simple direct relation, that is:

$$\theta(\tau) = -\frac{S'(\theta)}{S(\theta)} = -\frac{d}{d\tau} \ln S(\tau) \tag{4}$$

and

$$S(\tau) = \exp\left[-\int_0^{\tau} \theta(z) dz \right] \tag{5}$$

In the empirical research, we can study the estimation of the function which has a more convenient form.

In the literature varies specifications for hazard rate are presented[5]. An economic theory does not uniformly designate which of them should be used in a specific case.

This research had begun from non-parametric[6] estimation of survival and hazard functions utilizing the Kaplan-Meier estimator, allowing for preliminary examination of the data.

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[4] The survival function provides a probability that a person will live longer than some given time τ or in other words – that they live until time τ (Stanisz, 2003).

[5] Obviously most proposals pertain to mortality that as the main demographic (eg. Gompertz and Weibull models). An overview of proposals pertaining to other risks is presented by Kiefer (1988).

[6] A non-parametric analysis allows us to analyze data without making assumptions regarding distribution. This has certain benefits as well as pitfalls. On one hand, a possibility to analyze data without making assumptions about the real distribution of "life" lets one to overcome potentially great errors. On the other hand, confidence levels related to non-parametric analysis are generally much wider than those based on parametric calculations; moreover in the latter case forecasts beyond the sample are possible, http://www.weibull.com/LifeDataWeb/nonparametric_analysis.htm

1.1 Kaplan-Meier Estimator

The Kaplan-Meier estimator is calculated based on a following formula[7]:

$$\hat{S}(\tau_j) = \prod_{j|\tau_j<\tau_n} \frac{n_j - h_j}{n_j} = \prod_{j|\tau_j<\tau_n} \left(1 - \hat{\lambda}(\tau_j)\right) \tag{6}$$

where:

$\{\tau_j : j = 1,2,...,k\}$ - is a set of all moments of the events which occurred;

$\tau_1 < \tau_2 < ... < \tau_k < \infty$ - in an order of a duration of the episodes;

n - a number of observations, $k < n$, because a part of the observations is censured;

h_j - a number of completed cases with a duration of τ_j; assumption

m_j - a number of censured observations with a censured duration lasting from τ_j to τ_{j+1};

n_j - a count of the risk set, that is a number of episodes exposed to completion in a time τ_j,

$$n_j = \sum_{i \geq j}^{k} (m_i + h_i);$$

$\lambda(\tau_j)$ - a probability of ending the occurrence in the near (right-sided) τ_j point, under a condition that the episode has lasted until point τ_j. $\lambda(\tau_j)$ is a theoretical hazard function, and $\hat{\lambda}(\tau_j) = \frac{h_j}{n_j}$ is an empirical "estimator" of hazard function at point τ_j.

The Kaplan-Meier estimator can also be set using the life duration table methodology[8]. In this case, the estimator has a form of:

$$\hat{S}(j) = \prod_{k \leq j} \left(1 - \frac{d_k}{r_k}\right) \tag{7}$$

where:

d_k - a number of occurrences which has finished in *k* range;

$r_k^{'} = r_{k-1} - \frac{1}{2} m_k$;

where:

m_k - a number of censured occurrences in a range (a_{k-1}, a_k);

r_{k-1} - a risk set - a set of units that lived to the uppermost part of the range (a_{k-2}, a_{k-1}) and so have a chance to enter (a_{k-1}, a_k) range.

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[7] Kiefer (1988).

[8] This method is the oldest technique of estimating survival and hazard functions.

Therefore, one can see that here a survival function is estimated and its only argument is time. Based on survival function, one can easily transform to hazard function of the following form:

$$\theta(\tau) = -\frac{d}{d\tau}\ln S(\tau) \tag{8}$$

1.2 The parametric method: discrete time model, including observed and unobserved heterogeneity of individuals.

When estimating the hazard rate using the Kaplan-Meier method, one does not consider the heterogeneity of individuals which depends on observed and unobserved variables. This problem is resolved by parametric method.

Although an exit from the poverty can occur at any moment of time (stochastic process for continuous time), usually the duration of poverty episodes is observed in a discrete, not continuous time[9]. The models with a discrete time, however, have some advantages. One of these comes from the fact that discrete time models combine variability in time with elastic specification of duration interdependencies[10].

For the needs of this analysis, discrete models presented by Jenkins (1995) were used:

(1) Prentice-Gloeckler model (1978);

(2) an extended model by Meyer (1990), the Prentice-Gloeckler model (1978) which contains the gamma distribution that includes unobserved individual heterogeneity.

An exit hazard rate from a given state (poverty or wealth) in a discrete time for *i*-th individual in period *t* is specified by Prentice and Gloeckler (1978) as:

$$h_{it} = 1 - \exp[-\exp(\theta_0(t) + \beta' X_{it})] \tag{9}$$

where:

X_{it} - independent variables (variable with time or fixed);

β - a vector of unknown parameters;

$\theta_0(t)$ - a base hazard rate, that is a hazard for a given individual when all independent variables' values are equal to zero.

The model also known as the *„complementary log-log"* can be interpreted as a model with a discrete time which is directly related to hazard in a continuous time[11]. An assumption of a base

[9] Jenkins (2004).

[10] Duration data analyses benefit from the use of discrete-time models. However, available econometric software is usually unable to account for the sampling method used, thereby raising the probability of sample selection bias (Jenkins, 1995).

[11] Jenkins (1995).

hazard form $\theta_0(t)$ may unnecessarily limit the scope of hazard and bring potential bias of the β estimator. That is why, it is especially important to include general nonparametric specifications.

Meyer (1990) used a completely elastic nonparametric specification with uniform range for the base hazard. The author has developed a model (9) utilizing the random variables' gamma distribution in order to include unobserved heterogeneity. Ignoring it may lead to underestimation of a hazard rate which changes with a duration as well as independent variables.

The results obtained after employing a nonparametric method are presented in the third part, yet the results gathered based on the parametric method in the fourth part.

2. Data and variable description and definition of a poverty margin

The data used in this empirical research originated from the CHER database. It is a harmonized and standardized microeconomic database prepared based on already existing panels pertaining to living conditions of persons and households in the European Union before its expansion in 2004 as well as for Poland and Hungry. The database contains detail data of income and professional activities of people, their education, employment, employment history, and others. Here, also variables describing social relations and subjective feelings of the members of the households are included. In the CHER database two Polish panels are available: the first one pertains to years 1994-1996, the second to 1997 - 2000. This research is based on the second panel because of its longer period of observations and due to its modernity. In this panel 12208 households are incorporated.

Defining the category of poverty is a key element of assessing its reach and depth. A kind of definition that is accepted will determine which groups of society may be acknowledged as the most endangered by poverty. This will impact the way social policy is created which is aimed at delineating the border between poverty and wealth. Generally, the method of choice of setting the poverty margin depends on whether poverty is treated as a relative or an absolute category. In the first case, the poverty is understood as a relative depravation, which level is depicted in a relation to wealth of others, better situated members of the society. In the second case, the poverty is understood as a lack of fixed sources of income independent of the level of resources available to overwhelming part of the society which impoverish person is a member of[12].

In topic literature, a household (thus all members of it) is considered impoverished, if its real equivalent income is lower than the poverty margin equal to 50% or 75% real median equivalent income measured using normative OECD scale (100/70/50)[13] or 50 % or 75% real median equivalent income measured using modified normative OECD scale (100/50/30)[14].

[12] Panek, Pogórski, Szulc (1999).
[13] Net equivalent income calculated using the modified equivalence scale gives 1 household member a 0,5 weight to an adult person (aged>15 years) and 0,3 weight to a child (aged =<15 years).
[14] Net equivalent income is calculated using the equivalence scale utilized by GUS and gives 1 household member a 0,7 weight to an adult person (aged>15 years) and 0,5 weight to a child (aged=<15 years).

As Golinowska (1996) writes: "The choice of equivalence scales has a significant impact on the value of poverty measures. An analysis presented by Topińska (World Bank research) and Szulc shows differences in poverty ratios depending on the selected equivalence scale. These are important enough that the problem of selecting equivalence scales becomes equally important in judging poverty as choosing the poverty margin"[15]. Therefore, in this research both equivalence scales were used.

Table 1 and Table 2 present main characteristics of poverty in a studied sample for Poland over the years 1997 - 2000. Within the period, the average income declined by about 2%, a number of persons having an income below a relative poverty margin (based on OECD 100/70/50 scale) after an increase in 1998 have began to decline using both relative poverty margins. However, based on modified OECD 100/50/30 scale, a number of impoverished households does not show a trend, fluctuates over 6,83% - 7,68% range (with a relative poverty margin at 50% median income) and over 23,55% - 24,89% range (with a relative poverty margin at 75% median income). Thus we can reason that the choice of equivalence scale has a minor effect on the value of poverty rate near the poverty margin equal 75% median income. In a case when a margin of 50% median income was used, the calculated values were practically identical. This proves that the income distribution did not suffer major changes.

Table 1
A trend of real average equivalent income (scale 100/70/50) as well as characteristics of impoverished households

Characteristics of impoverished households				1997	1998	1999	2000
Real average equivalent income (for all households)			(in zł)	9360	9130	8940	9200
			(in %)	100	97,52	95,54	98,30
Poverty margin	**50% median income**	Impoverished households (%)		7,16	7,85	7,59	7,55
		Real average equivalent income of poor families (in zł)		2850	2600	2780	2860
		Real average equivalent income of wealthy families (in zł)		10520	10370	10160	10390
		Average poverty gap[16] (in zł)		1050	1215	1055	1015
		Income gap index[17]		0,27	0,31	0,27	0,26
	75% median income	Impoverished households (%)		23,05	22,82	21,97	21,54
		Real average equivalent income of poor families (in zł)		4333	4132	4132	4130
		Real average equivalent income of wealthy families (in zł)		11650	11420	11130	11370
		Average poverty gap (in zł)		1610	1706	1630	1685
		Income gap index		0,27	0,29	0,28	0,29

Source: CHER database: Poland (1997 - 2000); own calculations.

[15] Golinowska (1996).

[16] A poverty gap shows how far poor persons are from the poverty margin, that is, how much on average each family, living in the poverty zone, should receive in order to find itself exactly on the poverty margin.

[17] An index used to synthetically assess a depth of poverty is an income gap index defined as:

$I = \frac{1}{N \cdot z} \sum_{i=1}^{N} \left(z - \frac{y_i}{m_i} \right)$, where: N – a number of households, z – a poverty margin, y_i – an income of household i, m_i – equivalence scale of i-th household (Panek, Pogórski, Szulc, 1999).

Table 2
A trend of real average equivalent income (scale 100/50/30) as well as characteristics of impoverished households

Characteristics of impoverished households				1997	1998	1999	2000
Real average equivalent income (for all households)			(in zł)	11660	11340	11080	11370
			(in %)	100	97.52	95.00	97.53
Poverty margin	**50% median income**	Impoverished households (%)		6,83	7,36	7,19	7,68
		Real average equivalent income of poor families (in zł)		3580	3242	3430	3593
		Real average equivalent income of wealthy families (in zł)		12620	12370	12080	12360
		Average poverty gap (in zł)		1382	1617	1350	1225
		Income gap index		0,28	0,33	0,28	0,25
	75% median income	Impoverished households (%)		24,89	24,37	23,55	23,84
		Real average equivalent income of poor families (in zł)		5470	5185	5230	5250
		Real average equivalent income of wealthy families (in zł)		14130	13760	13350	13670
		Average poverty gap (in zł)		1973	2102	1942	1977
		Income gap index		0,26	0,29	0,27	0,27

Source: CHER database: Poland (1997 - 2000); own calculations.

2.1 Characteristic of independent variables used in the study

The choice of independent variables in a panel model was based on previous studies, which pertained to poverty analysis. Below, variables that were used in two types of models: poverty exit rates and poverty return rates are presented. They include as follows:

- Duration of poverty (in years) - a variable used in exit from poverty model: duration_poverty$_{it}$ (composed of three levels: 1 - exit from poverty after 1 year, 2 - exit from poverty after 2 years, 3 - exit from poverty after 3 years).
- Duration of wealth (in years) - variable used in return to poverty model: duration_wealth$_{it}$ (composed of three levels: 1 - return to poverty after 1 year, 2 - return to poverty after 2 years, 3 - return to poverty after 3 years).
- Gender of the head of the household: gender$_{it}$ (composed of two types: 1 - male, 2 - female).
- Professional status of the head of the household: status$_{it}$ (composed of four levels: 1 - employed and self-employed, 2 - retired, 3 - not employed, 4 - not active professionally for other reasons).
- Education status of the head of the household: education$_{it}$ (composed of three levels: 1 - incomplete primary and primary, 2 - secondary and vocational, 3 - higher).
- Place of employment: city_countryside$_{it}$ (composed of two types: 1 - city, 2 - countryside).
- Geographical region[18]: region$_{it}$ (composed of four types: 1 - Eastern Poland and Warmia and Mazury, 2 - Southern Poland, 3 - Western Poland and Pomeranian, 4 - Centre).

[18] Het following regions compose the voivodships: Eastern Poland and Warmia and Mazury: lubelskie, podkarpackie, podlaskie, warmino-mazurskie; Southern Poland: małopolskie, opolskie, śląskie, świętokrzyskie; Western Poland and Pomeranian: dolnośląskie, lubuskie, pomorskie, zachodnio-pomorskie; Centre: kujawsko-pomorskie, łódzkie, mazowieckie, wielkopolskie. This classification is different from a division of the country into regions by GUS (GUS, 2008), however, for the purpose of this work such an assumption was the most convenient.

Table 3
Characteristics of independent variables on a rate of exit from poverty

Variables	Impoverished families	Wealthy families
Variables pertaining to the head of the family		
Gender (%):		
- male	62	66
- female	38	34
Age (average in years)	45	45
Education (%):		
- incomplete primary and primary	38	32
- secondary and vocational	61	65
- higher	0,84	3
Professional status (%):		
- employed and self-employed	60	70
- retired	10	10
- not employed	5	2
- not active for other reasons	25	18
Extent of the balance in the family budget (%):		
- surplus	4	24
- deficit	96	76
Variables pertaining to the household		
Number of children below six years old (average)	1	0
Number of children between the ages of 6 and 16 (average)	1	0
Number of adults (average)	3	2
Region (%):		
- Eastern Poland and Warmia and Mazury	28	28
- Southern Poland	21	21
- Western Poland and Pomeranian	20	17
- Centre	31	33
Macroeconomic variables		
Unemployment rate (average in %)	14	13
Year of entry into poverty (%):		
- 1997	26	-
- 1998	26	33
- 1999	25	38
- 2000	24	29
Number of households	2722	775

Source: CHER database: Poland (1997 - 2000); own calculations.

- Extent of the balance in the family's budget: $budget_{it}$ (composed of two types: 1 - surplus, 2 - deficit).
- Year of entry into the poverty: $year_{it}$ (composed of four levels: 1 - 1997, 2 - 1998, 3 - 1999, 4 - 2000).
- Age of the head of the household: age_{it} and age squared: age_2_{it} (in literature a nonlinear relation between age and exit from and return to poverty is emphasized).
- Number of adults in a family: $number\_adults_{it}$.
- Number of children below 6 years old: $number\_children6_{it}$.
- Number of children above 6 years old: $number\_children16_{it}$.
- Unemployment rate according to voivodship: $rate\_unemployment_{it}$.

For the correctness of conducted analysis, some variables were transformed into 0-1 variables[19]. Table 3 and Table 4 include characteristics of these independent variables used in the model[20].

Table 4
Characteristics of independent variables of a rate of return to poverty

Variables	Impoverished families	Wealthy families
Variables pertaining to the head of the family		
Gender (%):		
- male	58	65
- female	42	35
Age (average in years)	46	45
Education (%):		
- incomplete primary and primary	32	32
- secondary and vocational	67	64
- higher	1	3
Professional status (%):		
- employed and self-employed	63	69
- retired	9	12
- not employed	5	0
- not active for other reasons	23	18
Extent of the balance in the family budget (%):		
- surplus	77	97
- deficit	23	3
Variables pertaining to the household		
Place of employment (%):		
- city	36	42
- countryside	64	58
Region (%):		
- Eastern Poland and Warmia and Mazury	32	28
- Southern Poland	19	21
- Western Poland and Pomeranian	15	18
- Centre	33	33
Number of households	192	1238

Source: CHER database: Poland (1997 - 2000); own calculations.

[19] Some variables were transformed into 0-1 variables: duration_poverty_02_{it}, duration_poverty_03_{it} (1if a family exits the poverty after 2 years, 3 years, respectively), duration_wealth_02_{it}, duration_wealth_03_{it} (1 if a household returns to poverty after 2 years in wealth, after 1 year in wealth, respectively), gender_02_{it} (1 if the head of the household is a female), status_02_{it}, status_03_{it}, status_04_{it} (1 if the head of the household is: retired, not employed, non active for other reasons), education_02_{it}, education_03_{it} (1 if the head of the household has one of the following education types: vocational and secondary, higher), city_countryside_02_{it} (1 if the household is located in the countryside), region_02_{it}, region_03_{it}, region_04_{it} (1 if the household is located as follows: Southern Poland, Western Poland, the Centre, respectively), budget_02_{it} (1 if the family had a negative balance of the family budget), year_02_{it}, year_03_{it}, year_04_{it} (1 if the household entered the poverty in one of the following years 1998, 1999, 2000, respectively).

[20] In the parametric method property margin of 75% median income was used (100/70/50 scale).

3. Nonparametric method

In this part results of the conducted study, utilizing the nonparametric method[21], on the topic of duration of poverty are presented. Also, distributions of the years spent in poverty in one-time or multi-times episodes are provided as well. In the following parts of this work the normative OECD (100/70/50) scale was used.

3.1 Statistics describing the dynamic of poverty

Table 5 shows that when using a poverty margin of 50% median income, 17% of the population studied was touched by poverty (40% at a poverty margin of 75% median income), in this case, in a prolonged poverty was included 1,2% (8,6%) of population. An expected amount of time spent in poverty at a poverty margin of 50% median income, for those entering the panel and studied during the 4 year period, equals 0,3 part of the year; for the poverty margin of 75% median income, it is equaled to 0,89 part of the year.

Table 5
Household distribution according to years spent in poverty

Number of years	Percentage share of impoverished households using a relative margins of poverty	
	50% median	75% median
0	82,89	60,56
1	8,90	13,79
2	4,56	9,98
3	2,46	7,03
4	1,18	8,64

Source: CHER database: Poland (1997 - 2000); own calculations.

Table 6 presents sequences of income in years 1997 - 2000 for the studied sample. If a household was in poverty in a given year, it undertakes a symbol of "U", a if not, then a symbol of "N". The first column shows how long the poverty lasted, whether the studied individual exited the poverty and whether it returned to it.

A long-term perspective presented in Table 5 and Table 6 might be compared to a short-term cross-section view proposed in Table 1 and Table 2. A rate of poverty at a given point of time equals, on average, approximately 23% at a poverty margin of 75% median income and about 8% at a poverty margin of 50% (Table 1 and Table 2). Table 5 shows though that 40% of the studied population at the poverty margin of 75% median income (17% at a poverty margin of 50%) was touched by poverty at least once. However, the data in Table 6 demonstrates that in many cases individuals experience the

[21] The nonparametric method provides information about a change in individual's behavior dependant on time under assumption of nonexistence of a particular form of an event distribution (Frątczak, Babiker, Gach-Ciepiela, 2005).

poverty in the subsequent years (multi-time episodes). One can thus reason that households entering (or exiting) poverty might be beginning a long time in that state and, what is more important, these are non-differentiable from those, who are located below the poverty margin in only one or two observed years. As a result, an underestimation of the size of the phenomenon of poverty occurs. In every of the four years one can note that this applies only approximately to 8% of impoverished households at a poverty margin of 50% of the median income (23% at a poverty margin of 75%), while in an entire four-year period, shorter or longer episode of poverty was overcome by 17% of households at the poverty margin of 50% median income (40% at the poverty margin of 75%).

Table 6
Household distribution in a 4-year sequence of states (U - poverty, N - not in poverty)

State sequences	Percentage share of impoverished households using a relative margins of poverty	
	50% median	75% median
NNNN	82,89	60,56
NNNU	2,43	3,15
NNUN	1,81	2,66
NNUU	1,18	2,36
NUNN	2,36	3,28
NUNU	0,56	1,18
NUUN	0,66	1,58
NUUU	0,95	2,17
UNNN	2,30	4,70
UNNU	0,53	1,25
UNUN	0,69	1,08
UNUU	0,33	1,41
UUNN	0,95	2,53
UUNU	0,39	1,38
UUUN	0,79	2,07
UUUU	1,18	8,64
Total	100,00	100,00

Source: CHER database: Poland (1997 - 2000); own calculations.

3.2 Rates of exit from and entry to poverty (Kaplan-Meier estimator)

In a study of rates of exit from and return to poverty a nonparametric method was used. According to the definition of Devicienti (2002)[22], an exit rate from poverty pertains to a cohort of individuals falling into poverty and from that point on exposed to remaining in that state; on the other hand, an entry rate to poverty pertains to a cohort of individuals just starting a period of wealth and exposed to reentry into poverty. The rate of exit is a ratio of a number of persons ending a period of *d* years in poverty to a general number of people with a low income over a period of at least *d* years. The rate of entry to poverty was respectively described. To estimate the exit rate the author has used the following sequences: *NUxx* and *xNUx*, where $x = N, U$, however the return rate: *UNxx* and *xUNx*,

[22] Devicienti (2002).

where $x = N, U$. On the contrary to a simple calculation of the number of years in the poverty, such a periodical approach can include right-side censured observations. For the purposes of this analysis, left-side censured observations were excluded, which led to that the research study began from 1998 or from later episodes.

Table 7
Survival function and rates of exit from poverty (Kaplan-Meier estimator)

Years	Relative poverty margin			
	50% median income		75% median income	
	Survival function	Exit rate	Survival function	Exit rate
1	1 (-)	0,6346 (0,0494)	1 (-)	0,6523 (0,0505)
2	0,3654 (0,0299)	0,4082 (0,0913)	0,4781 (0,0228)	0,4318 (0,0991)
3	0,2162 (0,0312)	-	0,2768 (0,0258)	-

*) in brackets standard errors are provided.
Source: CHER database: Poland (1997 - 2000); own calculations.

Table 7 shows exit rates from poverty using a relative poverty margin. An estimated hazard rate confirms a negative relation of poverty duration: the longer the individual lives in poverty, the greater the probability that its state will change in the next period. For the cohort of individuals beginning a period of poverty, a probability of exit after the first year is equal to about 64%, and after two years to approximately 41% (a relative poverty margin of 50% median income), however, for the same cohort a probability of exit from poverty after the first year is equal to about 52%, and after two years to approximately 42% (a relative poverty margin of 75% median income).

Table 8
Survival function and rates of entry to poverty (Kaplan-Meier estimator)

Years	Relative poverty margin			
	50% median income		50% median income	
	Survival function	Return rate	Survival function	Return rate
1	1 (-)	0,2429 (0,0314)	1 (-)	0,2008 (0,0203)
2	0,7571 (0,0273)	0,1860 (0,0465)	0,6992 (0,0203)	0,2099 (0,0341)
3	0,6162 (0,0388)	-	0,5524 (0,0265)	-

*) in brackets standard errors are provided.
Source: CHER database: Poland (1997 - 2000); own calculations.

Generalizing results from Table 7 and Table 8 implies a thesis that a low income contains a wide spectrum of households. Yet, it is not a fixed group, although there are individuals present in it, who are permanently poor, there are many families who exit from and enter poverty.

3.3 Poverty duration in one-time and multi-time episodes

An estimation of exit from and entry to poverty allows us to introduce a "distribution of time spent in poverty". Such a distribution is a basic measure of duration of the poverty.

Distribution of years spent in one-time episodes of poverty was calculated using only exit rates presented in Table 7 (e.g. two years spent in poverty depicted as (*NUUN*), where *N* - a period of

wealth and *U* - a period of poverty). It was assumed that *e*(*d*) and *r*(*d*) are respectively, a exit rate from and entry to poverty after *d* years. With exception of left-side censured periods, a probability of this sequence is calculated as: (*1*-*e*(*1*))***e*(*2*).

A distribution of years spent in poverty in the case of multi-time episodes was calculated using the exit and entry rates presented in Table 7 and Table 8 (e.g. two years in poverty depicted as (*NUNU*)). With exception of the left-side censured periods, a probability of this sequence is calculated as: (*UNU*)=*e*(*1*)***r*(*1*).

To calculate the probability of observing two years of living in poverty within the four years, one must calculate the probability of occurrence of all possible combinations which generate a sum of two years in poverty and summing them. In comparison to the forecasts for one-time and multi-time periods, also a distribution of "time spent in poverty" was calculated using the following sequence: (*N U x x*), where *x = N, U*.

Comparing columns 2 and 3 in Table 9a and Table 9b one can notice that in one-time episodes the distribution of the estimation "time spent in poverty" has a greater proportion of one year spent in poverty. For two-year duration of poverty a use of "one-time episode" approach in every case result in an underestimation of distribution of the time spent in poverty.

Table 9a
Distribution of years spent in poverty for the cohort of individuals beginning a period in poverty in 1998 (relative poverty margin - 50% median income)

Years in poverty	Distribution in one-time episodes	Distribution of years spent in poverty in the following three years	
		expected[23]	actual[24]
1	0,6346	0,4805	0,5217
2	0,1492	0,3033	0,2681
3	0,2162	0,2162	0,2101

Source: CHER database: Poland (1997 - 2000); own calculations.

It is important to emphasize that the above mentioned analysis assumes that all observed episodes pertain to a homogeneous population. However, it is more probable that different families having special characteristics (observed and unobserved) meet various rates of exit and entry to poverty and that is why permanently poor households exist. As a result one must change from unilateral to multilateral approach which allows for dependence of an exit rates and entry rates on important socio-economic correlations. In the parametric method the poverty margin of 75% median income is used because it gives more possibilities to study the processes of exit from and entry to poverty in a short-run.

[23] Expected distribution of years spent in poverty was delineated using exit and entry rates from/to poverty taken from the Kaplan-Maier model (Table 7 and Table 8).
[24] Actual distribution of years spent in poverty was delineated using the following sequence (*NUxx*), where x=*N*,*U*.

Table 9b
Distribution of years spent in poverty for the cohort of individuals beginning a period in poverty in 1998 (relative poverty margin - 75% median income)

Years in poverty	Distribution in one-time episodes	Distribution of years spent in poverty in the following three years	
		expected	actual
1	0,5219	0,3649	0,4000
2	0,2013	0,3583	0,3360
3	0,2768	0,2768	0,2640

Source: CHER database: Poland (1997 - 2000); own calculations.

4. Parametric method: model with discrete time taking into consideration observed and unobserved heterogeneity of individuals

This part presents results of conducted studies of duration of poverty gathered using the parametric method[25].

4.1 Characteristics of permanently impoverished households

To accept the appropriate political strategy directed at diminishing poverty an important aspect is to differentiate the reasons of long-term and short-term poverty. In a long-run, a systematically low income is related to the fact that an individual possesses special characteristics or is permanently impoverished for other reasons. If a second circumstance occurs, there is no special reason to introduce a political program directed at eliminating long-term poverty.

Table 10 presents a household structure (permanently impoverished, impoverished only in 1997, all households together in 1997) according to a various criteria. Based on the data included therein, one can conclude that in the first year of study impoverished families are mainly:

- families with three children (15% in comparison to 11% impoverished households in the first year included by the study) as well as with four or more children (16% in comparison to 9% impoverished households in the first year included by the study),
- sole care-givers, mothers or fathers taking care of children alone (15% in comparison to 11% impoverished households in the first year included by the study),
- households, in which the head of the family or his/her spouse is unemployed (14% in comparison to 12% impoverished households in the first year included by the study),
- families, in which one of the spouses is employed full-time and the other is not active professionally (40% in comparison to 36% impoverished households in the first year included by the study).

[25] About parametric models it is said that the analytical form of probability distribution of density is known.

Table 10
Structure of permanently impoverished households (w %)

Characteristics	Households			
	permanently impoverished (over 4 years)		impoverished in the first year	total in the first year
	in the first year	in the fourth year		
According to the gender of the head of the family				
Female	37	38	37	36
Male	63	62	63	64
According to biological type				
One person household - retired	2	3	3	12
Two person household - retired	2	7	5	7
Marriage:				
- without children	8	11	13	19
- with one child	13	14	18	18
- with two children	19	13	22	16
- with three children	15	11	11	6
- with four or more children	16	14	9	3
One person household without children	8	11	11	14
Mother/father with dependent children	15	14	11	5
According to family's economic status				
Head of the family and its members are self-employed	11	7	13	16
All adult persons in the family are employed full-time	5	3	5	13
Marriage: - one full-time employed person, - second person not active professionally	40	34	36	33
Marriage: - one full-time employed person, - second person part-time employed	7	5	8	16
Head of the family and/or spouse employed part-time	1	5	2	1
Head of the family or spouse - retired	6	9	8	15
Head of the family - unemployed	14	7	11	5
Others	15	30	17	1
Number of households	263	263	702	3045

Source: CHER database: Poland (1997 - 2000); own calculation.

In the fourth year of study the situation of some households, which were permanently impoverished in the first year, have changed. It is an impact of many factors, for example, change of marital status, bearing children, lost of a job, exit from poverty, children becoming independent, etc.

4.2 Characteristic of households exiting and entering poverty

According to Jenkins (1997) definition, an unit exiting poverty is a family which at a time *t* has an equivalent income below the poverty margin, but at (*t+1*) has an income higher than the poverty margin, where *t=1,2,3.* At the same time, a unit entering poverty is a family which at time *t* has an equivalent income above the poverty margin, but at (*t+1*) has an income below the poverty margin. Below are listed factors that are related to temporary poverty of families. The analysis is composed of

two dimensions: first includes characteristics of households exiting and entering poverty and the second describes relations between these families and economic and demographic changes in the economy.

4.2.1 Structure of households exiting and entering poverty

Table 11 presents a structure of households exiting and entering poverty based on age and gender of the head of the households as well as the biological type and economic status of the family. The data included in the table show that households exiting poverty are primarily families in which the head of family is in the age category 25 - 44 years old and married with two children. An interesting fact is that a number of families without children exiting poverty as well as households in which the head of the family is between 45 and 64 years old is higher than the number of the impoverished households in the first year. Therefore, one can suppose that there is a relation between these two groups.

Characteristics of families entering poverty are similar to those exiting poverty. In other words, the group of households entering poverty includes mainly those in which the head of the household is between 25 - 44 years old and families with children. Comparing households entering poverty with a general number of households in the first year, the number of households entering poverty in which the head of the household and/or its members are self-employed and containing sole parents or marriage supporting children is always higher that the general number of households in the first year of study.

4.2.2 Economic and demographic factors associated with households exiting and entering poverty

The value of household income had a large impact on the frequency of exiting and entering poverty. It significantly depends on a professional status of the head of the household. Based on the results presented in Table 12 one can notice that professional status of the head of the family changes for families exiting the poverty by 25% and for families entering poverty by 26%. This percentage is higher than a percentage of a general number of households in which the head of family has changed an economic status. A biological type of a family also has a large impact, although it exists more often among families entering poverty (25% of families) than exiting it (21% of families). Changes in the professional status and biological type of households occurred in 9% of the general number of families. This has led to the fact that 12% of families exited poverty and 12% entered it. In 1997, an increase in the number of employed persons occurred in 12% of total number of households, while among families exiting poverty in years 1997 - 2000 totaled 26%. A decrease in a number of employed persons occurred in 14% of all households and 28% of families entering poverty. One can

notice an interesting demographic change that accompanied the changes in income. There was a decrease in the number of adult persons in the family in 14% of households exiting poverty, while in a total sample a decrease in a number of adult persons in the family in 10% of households. An increase in the number of adult persons in the family was noted in 15% of household entering poverty and in the whole sample the percentage increased to 11%. The changes in the number of children in the family are similar in groups of families exiting and entering poverty.

Table 11
Structure of households exiting and entering poverty (w %)

Characteristics	Households			
	exiting poverty	entering poverty	impoverished in the first year	general number in the first year
According to the age of the head of the household (in 1997)				
< 24 years old	4	3	3	3
25 - 44	53	54	57	45
45 - 64	35	34	31	38
> 64	9	9	9	15
According to the gender of the head of the family				
Female	36	32	37	36
Male	64	68	63	64
According to biological type				
One person household - retired	5	4	3	12
Two person household - retired	7	4	5	7
Marriage:				
- without children	16	17	13	19
- with one child	18	21	18	18
- with two children	23	19	22	16
- with three children	8	11	11	6
- with four or more children	4	5	9	3
One person household without children	14	13	11	14
Mother/father with dependent children	7	6	11	5
According to family's economic status				
Head of the family and its members are self-employed	17	24	13	16
All adult persons in the family are employed full-time	5	10	5	13
Marriage: - one full-time employed person, - second person not active professionally	24	26	36	33
Marriage: - one full-time employed person, - second person part-time employed	7	10	8	16
Head of the family and/or spouse employed part-time	2	1	2	1
Head of the family or spouse - retired	11	9	8	15
Head of the family - unemployed	5	5	11	5
Others	29	15	17	1
Number of households	704	655	702	3045

Source: CHER database: Poland (1997 - 2000); own calculation.

From the study, an outcome can be drawn that the most important characteristic differentiating households according to poverty is a number of employed persons. A second the most important factor is a change in economic status of the head of the family and a change in biological type of the family. The third important characteristic is a number of adult persons in the family. The impact of a change in a number of children in the household has a secondary effect.

Table 12
Economic and demographic factors associated with households exiting and entering poverty

Changes in percentage	Periods			Sample 1997 - 2000	
	1997-1998	1998-1999	1999-2000	Households exiting poverty	Household entering poverty
Changes in the economic status of the head of the family	17	17	16	25	26
Changes in the biological type of the family	19	18	18	21	25
Changes in the economic status and biological type of the family	9	9	8	12	12
Number of employed persons**:**					
- decrease	13	14	12	12	28
- no change	76	76	77	62	63
- increase	12	11	11	26	9
Changes in the number of adult persons in the family:					
- decrease	9	10	9	14	11
- no change	81	79	80	75	74
- increase	10	11	11	11	15
Changes in the number of children in the family:					
- decrease	8	8	9	9	10
- no change	88	89	88	87	83
- increase	4	5	3	3	7

Source: CHER database: Poland (1997 - 2000); own calculation.

4.3 Exit and entry to poverty models

This entails an estimation of a model that contains variables pertaining to characteristics of the head of a household as well as the household itself and also conditions of the job market, which impact the probability of an exit and later re-entry into poverty. An estimation of two complementary log-log models with a discrete time was conducted. The first one (Model I) includes elastic non-parametric specification for the base hazard function. The second one (Model II) describes the base hazard, using a multi-dimensional duration function, that is: $\theta_0(t) = at + bt^2 + ct^3$. Use of these two models was justified by Meyer's (1990) observations that: "parameters of the base hazard function depict an important characteristic of the data, which would be omitted, if the model would have been estimated by a simple parametric base hazard function". Models Ia and IIa that include an unobserved heterogeneity were also estimated.

- ***Who exits poverty?***

Table 13a and Table 13b present an analysis of duration of episodes of poverty that end by the household gaining a wealth status. Model 1 confirms a negative relation between duration of poverty, which was earlier observed based on results gathered in Table 7: the longer a family remains in poverty, the harder it is for them to re-enter the state of wealth. On the probabilities of exit rate from poverty also the characteristics pertaining to a head of a family (e.g. gender, education level) and a household (e.g. number of children, extent of the balance in the family budget) have an effect. Based on the gathered evidence, the households headed by women longer remain in poverty, which is shown by Model II. The probability of exit from poverty decreases along with:

- age, which is analogous to results assembled in empirical research,
- with an increase in a number of children in a household (aged up to 6 years old), which comes from a fact that bearing of children makes full-time employment more difficult (especially in the case of women),
- with an increase in a number of adult family members, who probably still have not undertaken a job or were terminated or retired.

Moreover, the result of the estimation show that the higher the educational level of the head of a family, the lower the chance of experiencing a relatively long periods of poverty by their family and the easier it is to grapple with poverty. Having a higher education gives a many-times greater chance of exit from poverty than in the case where a head of a family has a secondary or vocational education. An important aspect of the possibility to exit the poverty is also a status of the head of the family on the job market. In a decisively worse circumstance are households in which the family is headed by an unemployed person. Furthermore, 1% increase in an unemployment rate in a voivodship, decreases the probability of exit from poverty by approximately 4% according to the Model I (however, by about 13% according to Model II). A negative impact on exit from poverty also has an occurrence of deficit in a family budget. An important factor - delineating a duration of poverty is also dependent on a macroeconomic situation of a country and a period on which the beginning of impoverishment fell (for household which became poor in 1998, 1999 and 2000, a chance to exit poverty was much higher that for those in the base group which entered poverty in 1997). This phenomenon can be caused by an economic growth in Poland[26].

[26] Results of international research (Barro, 1999) and interdependencies between unequal general incomes and economic growth in Poland during the transformation period confirm that one cannot expect, in the conditions of Polish economy, a significant limitation of income disproportions. An observations of annual fluctuation of GDP increase rates and Gini factor over the years 1989 – 1999 confirm that in Poland a higher speed of economic growth was accompanied by a lower build up of inequalities in terms of social division of income(Jabłoński, 2002).

Table 13a

Analysis of poverty duration in Poland - exit from poverty (without considering heterogeneity)

Independent variables	Model I		Model II	
	Parameter	Standard error	Parameter	Standard error
Duration of poverty:				
- two years	- 0,8899*	0,0948	-	-
- three years	- 1,9403*	0,0976	-	-
Year of entry into poverty:				
- 1998	2,3742*	0,2475	-	-
- 1999	2,4472*	0,2560	-	-
- 2000	2,2743*	0,2593	-	-
Variables pertaining to the head of the family				
Gender (female)	-	-	- 0,2445*	0,0817
Age	- 0,0895*	0,0112	-	-
Age_2/100	0,0756*	0,0124	-	-
Professional status:				
- retired	- 0,1877	0,1700	- 0,4973*	0,1329
- unemployed	- 0,9200*	0,3331	- 1,4437*	0,3348
- not active professionally	- 0,3631*	0,1121	- 0,7473*	0,1078
Education:				
- vocational or secondary	-	-	0,0761	0,0845
- higher	-	-	1,1821*	0,2636
Variables pertaining to the household				
Number of children up to 6 years old	- 0,3659*	0,0606	- 0,4358*	0,0564
Number of children between 6 and 16 years of age	- 0,1407*	0,0404	- 0,3364*	0,0399
Number of adults in the family	- 0,1632*	0,0338	- 0,3206*	0,0358
Budget deficit of the family	- 0,8498*	0,0862	- 0,7891*	0,0798
Unemployment rate	- 0,0442**	0,0174	- 0,1369*	0,0175
t	-	-	- 1,7556*	0,2705
t^2	-	-	1,4015*	0,1531
t^3	-	-	- 0,2516*	0,0245
Number of families	3497		3497	
Logarithm of confidence function	- 1281,8654		- 1484,5516	

Stars signify a significant of parameters of the following levels: * 1%, ** 5%,*** 10%.
Source: CHER database: Poland (1997 - 2000); own calculations.

The results of estimations of Models Ia and IIa, taking into consideration unobserved heterogeneity of the studied individuals is included by Table 13b. These differ from results obtained based on Models I and II. In some cases, an absolute value of coefficients is greater which strengthens the impact of the regressors on a chance of exit from poverty. Models Ia and IIa are also characterized by a greater value of a confidence logarithm.

Table 13b

Analysis of poverty duration in Poland - exit from poverty (with consideration of heterogeneity)

Independent variables	Model I		Model II	
	Parameter	**Standard error**	**Parameter**	**Standard error**
Duration of poverty:				
- two years	- 0,7674*	0,1069	-	-
- three years	- 2,4311*	0,1414	-	-
Year of entry into poverty:				
- 1998	1,6698*	0,3208	-	-
- 1999	1,8388*	0,3323	-	-
- 2000	2,3445*	0,3403	-	-
Variables pertaining to the head of the family				
Gender (female)	-	-	- 0,4220*	0,1529
Age	- 0,0845*	0,0145	-	-
Age_2/100	0,0729*	0,0157	-	-
Professional status:				
- retired	- 0,0976	0,1996	- 0,5709**	0,2491
- unemployed	- 1,0524**	0,4529	- 2,0049*	0,5424
- not active professionally	- 0,4978*	0,1369	- 1,1916*	0,2273
Education:				
- vocational or secondary	-	-	0,1211	0,1492
- higher	-	-	2,0979*	0,4602
Variables pertaining to the household				
Number of children up to 6 years old	- 0,2948*	0,0714	- 0,6269*	0,1328
Number of children between 6 and 16 years of age	- 0,1719*	0,0492	- 0,5935*	0,1066
Number of adults in the family	- 0,1599*	0,0404	- 0,5258*	0,0972
Budget deficit of the family	- 0,7063*	0,0949	- 0,8567*	0,1294
Unemployment rate	- 0,0844*	0,0279	- 0,1751	0,0283
t	-	-	- 1,1529*	0,4269
t^2	-	-	1,1908*	0,2312
t^3	-	-	- 0,2002*	0,0359
Number of families	3497		3497	
Logarithm of confidence function	- 1044,9061		- 1269,6673	

Stars signify a significant of parameters of the following levels: * 1%, ** 5%,*** 10%.
Source: CHER database: Poland (1997 - 2000); own calculations.

- ***Who returns to poverty?***

The results of the estimated models of chances of the families to return to poverty are included in Tables 14a and 14b. It is important to notice that estimated coefficients are characterized by a greater variability and precision than in the case of exit rates. Model I shows an existence of positive interdependence between duration in wealth after an exit from poverty and a entry it, which weakens with an increase in years spent in wealth. On the contrary, based on the model including heterogeneity of the studied individuals, one can discern that even after two years spent in wealth there is a negative relation with an entry to poverty. Therefore, the longer a person stays untouched by poverty, the lower the chance of entering it. Moreover, the probability of a return to poverty decreases if:

- families live in a city,
- the head of a family is a male (an interesting fact is that in the Model I for estimating a rate of exit from poverty that variable was insignificant),
- when the education level of the head of the family increases.

Model II also includes variables describing a geographical region in which the household lives. The results of estimations do not show a significant differences between voivodships (in each case there was a negative relation). Households in voivodships in Western Poland are, however, in a better situation in comparison to households in voivodships from the Eastern Poland and Warmia and Mazury.

Table 14a
Analysis of poverty duration in Poland - return to poverty (without considering heterogeneity)

Independent variables	Model I		Model II[27]	
	Parameter	Standard error	Parameter	Standard error
Duration of wealth:				
- two years	0,4555**	0,1916	-	-
- one year	1,4607*	0,1866	-	-
Variables pertaining to the head of the family				
Gender (male)	- 0,4958*	0,1459	- 0,6870*	0,1395
Age_2/100	-0,0408*	0,0053	- 0,0354*	0,0060
Professional status: unemployed	1,1905*	0,4109	1,2971*	0,3642
Education:				
- vocational or secondary	-0,6716*	0,1446	- 0,5452*	0,1541
- higher	-1,7189**	0,7166	- 2,0022*	0,7199
Variables pertaining to the household				
Budget deficit of the family	1,1010*	0,0889	-	-
Region:				
- South	-	-	- 0,5939*	0,2010
- Eastern	-	-	- 0,7703*	0,2205
- Centre	-	-	- 0,5518*	0,1658
Place of living: countryside	- 0,2868**	0,1460	-	-
t	-	-	- 0,5451**	0,2546
t^2	-	-	0,2861*	0,0715
Number of families	1430		1430	
Logarithm of confidence function	- 487,9392		- 552,70384	

Stars signify a significant of parameters of the following levels: * 1%, ** 5%,*** 10%.
Source: CHER database: Poland (1997 - 2000); own calculations.

[27] Null hypothesis (unobserved heterogeneity does not impact the return to poverty) was not discarded by the Model II.

Table 14b

Analysis of poverty duration in Poland - return to poverty (with consideration of heterogeneity)

Independent variables	Model Ia	
	Parameter	**Standard error**
Duration of wealth:		
- two years	- 0,1307	0,5404
- one year	1,6253*	0,2192
Variables pertaining to the head of the family		
Gender (male)	- 0,5528**	0,2783
Age_2/100	- 0,0416*	0,0074
Professional status: unemployed	0,8029***	0,4633
Education:		
- vocational or secondary	- 0,7756**	0,3331
- higher	- 1,5274**	0,7246
Variables pertaining to the household		
Budget deficit of the family	1,1178*	0,0976
Place of living - countryside	- 0,3429**	0,1549
Number of families	1430	
Logarithm of confidence function	- 412,1271	

Stars signify a significant of parameters of the following levels: * 1%, ** 5%,*** 10%.
Source: CHER database: Poland (1997 - 2000); own calculations.

Conclusions

The poverty was and still is one of the latest problems of the modern Poland. The study of major determinants of long-term poverty is very important as it helps to identify this part of society which is the most touched by consequences of poverty. The research based on, a representative for the whole country, panel data has shown a low dynamic of incomes of families living in Poland in the period 1997 - 2000. The sum of years spent in poverty and various sequences of entry into and exit from poverty has indicated a permanence of this phenomenon in the population.

In the article the problem of effect of equivalent income scales on the measure of poverty, using two types of so-called OECD scales, was analyzed. These scales in an obvious way impact the measurement of the level of the wealth. In a conducted study, it was discerned that at a poverty margin of 50% median income, the effect of the scale on a poverty measure is insignificant. However, it becomes visible at higher poverty margins.

From the conducted analysis, one can reason that a small number of families (less than 1,5% of the population at a poverty margin 50% of median income and less than 9% at a poverty margin equal 75%) was impoverished for the entire period of study, yet a much higher percentage of the entire population experienced poverty at least once (17% at a poverty margin 50% of median income and 40% at a poverty margin 75%). A low income includes relatively wide array of households. However, this is not a fixed group. Even though there are some individuals who are permanently impoverished, generally many families exit from and enter poverty. Approximately 65% of the studied families at a poverty margin equal 50% (52% at a poverty margin equal 75%) come out of poverty after the first

year of being impoverished. Nevertheless, only 25% at a poverty margin equal 50% (20% at a poverty margin equal 75%) becomes poor once again. After two years of living in poverty, 40% of families exit it, but 18% at a poverty margin equal 50% (20% at a poverty margin equal 75%) re-enter a group of impoverished families. Because of a short time period of the sample, a study could not incorporate a wider analysis of this type. One can however assume that the longer the family lives in poverty, the more difficult it is for it to change this state and, even in the case of an increase in income above the poverty margin, the probability of becoming poor once again for these households is still quite high.

It is important to analyze the distribution of number of years spent in poverty, considering exits and re-entries of families back to that state. Taking into account sequences of states of being impoverished and wealthy, in which the families found themselves in the particular years, one can forecast that as much as 50% of the studied families at a poverty margin equal 50% (65% at a poverty margin equal 75%) will spent at least 2 following years in poverty. However, when including only one-time episodes of becoming impoverished, these prognoses come to a level of around 35% of the studied families at a poverty margin equal to 50% (48% at a poverty margin equal 75%). In reality, these values amount to 40% at a poverty margin of 50% (59% at a poverty margin equal 75%) that is, including the sequences of the states, improves the results. The observed results also emphasize that the length of time of poverty can be dependent on the type of definition of rates of exit from and entry to poverty that are accepted. From the analysis utilizing a parametric method, one can see that there are groups of population more vulnerable to dropping below the poverty margin and with higher probability of remaining impoverished over a long period of time. These are households composed of a larger number of not only children, but also adults, where the head of the family is an older person (mainly a woman) with a low education level. A life in voivodships with high levels of unemployment is a factor facilitating poverty, especially endangered are households where the head of the family is unemployed.

The most considered matter in a modern debate on poverty is a poverty trap. A poverty trap pertains to a relatively small number of households, but leads to a situation where they stay impoverished for the most life of their functioning. A permanence of poverty can stem from the fact that being poor “today” has a direct effect of staying poor “tomorrow”. It is possible as well that other factor such as, for example, preferences or the current condition of the job market have an effect on the permanence of poverty. Understanding of dynamic aspects of poverty is extremely significant in the context of specifying an appropriate policy having as its aim, reduction of poverty. Depending on the nature of poverty, different policies may come to be effective. Specifying the factors causing an entry into poverty as well as exit from that state will allow for better description of “the population of impoverished” every year, and moreover, will allow for identification of the groups, which shall be targeted with the policy aimed at reduction of poverty.

The results of the estimation of models including unobserved heterogeneity of the studied individuals confirm a negative interdependence between the rate of exit from poverty and its duration.

For parents staying a relatively long periods of time in poverty it is much more difficult to exit it on its own. Though, the longer a household which exited the poverty remains outside that state, the lower the chance that they will return (a negative relation exists after two years of being above the poverty margin).

The above conclusions may be useful for preparing plans to deal with long-term poverty in Poland. They will allow for a better understanding of the poverty phenomenon in Poland and of the factors which case it. The results obtained might assist in preparation of effective policy: adding to an income of employed household members, yet before an identification of families often entering the sphere of poverty and permanently impoverished, modeling conditions on the job market such as to lower the incidence of poverty in Poland.

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