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Logistic regression in the analysis of unexpected household expenses: Cross-country evidence

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Abstract. Changes unfolding in the households' structure coupled with the shifting role of the family have been affecting household financial decision-making. Among numerous financial decisions made by households (including consumption decisions, loan decisions, saving decisions, investment decisions and those on risk management), many are related to financial resources spending. In a situation of unexpected expenses, financial problems may arise ultimately undermining household's financial security. The paper pursues two objectives. The first one is to identify the factors determining households' capacity to face sudden unexpected expenses. The second objective is to evaluate how the selected factors affect this capacity. To achieve these aims the Eurostat data were used[1]. Given the fact that the dependent variable is a dichotomous one, a logistic regression model has been applied in this study. The findings served as the basis for identification of the factors that determine the ability of households to cope with unexpected expenditures. Only some of the factors proved statistically significant for all the Central and Eastern European countries under study.

Keywords: economic security, household, unexpected expenses, logistic regression.

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[1]This paper is based on data from Eurostat, *The European Union Statistics on Income and Living Conditions, 2018*. The responsibility for all conclusions drawn from the data lies entirely with the authors.

1. INTRODUCTION

Świecka (2009) distinguishes five types of household financial decisions, each arising from a specific area of households' activities. They include decisions made in relation to consumption, savings, investments, loan and risk management.. The literature on the subject suggests that households' financial decisions tend to be made based on households' financial planning. According to Garman et al. (1985), financial planning involves a long-term pursuit of financial goals, both individual (of each household member) and of the household as a whole. Kapoor et al. (2007), on the other hand, are correct in their argument that financial goals of individual household members can be achieved across the three time horizons: short-term (up to one year), medium-term (from two to five years) and long-term (over five years). These largely depend on what needs are to be satisfied. Madura (2014) sees the following components as crucial for the household financial plan: budgeting and tax planning, liquidity management, financing considerable purchases, income and assets protection, investment of financial resources and pension planning. One of the key groups in decisions for all households is consumption decisions. They are made with a view to meet all the needs of each household member to the utmost and most rational extent, based on subjective preferences, likings, habits and traditions, as well as the existing constraints (e.g. current income, market prices of goods and services) (Zalega, 2012).

Economic security also plays an important role in financial functioning of households. Piotrowska (2017) defines economic security as "the household's ability to meet its needs while being able to build financial reserves for adverse events". Whether a household will be economically secure is certainly affected by the skills in economic decision-making, also including financial decisions, which all make up the so-called economic resourcefulness (Piotrowska, 2017). Undoubtedly, financial stability is what underpins household's economic security. Meanwhile, one of the factors determining financial security is household's capacity to face unexpected expenses, which will form the subject of this paper's investigation.

The paper sets two objectives. The first one is to identify the factors determining the household's ability to cope with sudden unexpected expenses in the selected Central and Eastern European countries. The second objective is to evaluate how these selected factors affect the ability to cope with those expenses. To achieve these aims, the data from the Eurostat were used. Given the fact that the dependent variable is a dichotomous one, a logistic regression model was applied in the study.

The objective set leads to formulating the following hypotheses:

H1: It is possible to identify financial and non-financial factors which determine the household's ability to cope with unexpected expenses.

H2: It is possible to build explanatory models for the relationship between the identified factors and the household's capacity to face unexpected expenses.

H3: It is possible to identify the factors which are independent for any of the countries examined.

The paper consists of five sections. Following this introductory part, Section two provides a literature review showing the most important aspects associated with households' ability to cope with unexpected expenses, including research results in the analyzed area. Section 3 presents the research method used in the study as well as descriptions of both explained (dependent) variable and the potential explanatory (independent) variables. Section 4 provides the overview of the results obtained for each country. Conclusions and discussion of the results are provided in Section 5.

2. LITERATURE REVIEW

The research conducted on over-indebtedness has found that it is generated by a variety of causes. According to Katona (1975), there are three reasons which explain why individuals have debt arrears, meaning they spend more than they earn. Firstly, it is attributable to low income which does not cover basic needs. Secondly, it is high earnings coupled with a strong desire for spending. And thirdly, creating debt is brought about by being unwilling to save (regardless of income). Over-indebtedness is conceptually linked the household's economic security and its economic resourcefulness. The research which has been carried out has contributed to devising a number of definitions relating to the above concepts (e.g. Brunetti et al., 1997, Piotrowska, 2017, Lusardi et al., 2011). It is possible to demonstrate a string of interactions unfolding between economic security, stability/financial instability and economic resourcefulness. For a household to be economically resourceful, it also needs to be secure economically and stable financially, perceived in the more narrow sense.

Households which are distinctive for lacking economic security, financial instability and/or failing to be economically resourceful are vulnerable to falling into excessive debt. In the literature, financial stability/instability is specified by a number of indicators referring to the household's ability to service its financial obligations such as the debt-to-income ratio, saving-to-income ratio, and mortgage debt (e.g. Brown & Taylor, 2008; Faruqui, 2008), as well as economic and demographic indicators like unemployment, having children and the death of a family member (Keese, 2009; Mutsonziwa& Fanta, 2019).

An interesting finding is that by Fuenzalida and Ruiz-Tagle (2009) who argue that since over-indebtedness pertains predominantly to low-earners, unemployment has no significant impact on the financial stability. Whether households enjoy financial stability or not can also be inferred from the following qualitative questions: "Does the household make ends meet" (Christelis et al., 2009; McCarthy, 2011) and "can the household cope with unexpected expenses" (Lusardi et al., 2011). The information on whether the household has the capacity to face unexpected expenses is the focus of this paper's examination.

Unexpected expenses are to be understood as unplanned outflows associated with the need to restore the level of the household's assets including cars, flats with their furnishing and appliances and other durables; unexpected medical expenses or temporary loss of income arising from, for example, a job change, reduced remuneration or employment dismissal or temporary employment termination (Brunetti et al., 1997).

The households' ability to cope with unexpected expenses has been the focus of academic research. What can be observed is that the capacity to face unexpected expenses is linked to savings. For instance, Lusardi et al. (2011) have demonstrated that nearly half of the American population may find it difficult to deal with an unexpected expenditure of USD 2000. The findings suggest that the ability to cope with unexpected expenses is equally dependent not only on the level of income but also on the amount of savings held by the households with higher earnings. The study has found a relatively high level of financial instability among American households. The authors are right that the lack of financial stability among households may have an impact on various industries of the economy.

Moreover, the research carried out by Brobeck (2008) shows that most households with low and moderate income do not have sufficient savings to cover unexpected expenses in emergency situations, or lack financial resources to pay for sudden, unexpected expenses. This implies that a critical factor affecting the household's ability to cope with an unexpected expenditure is holding savings (in the form of an emergency fund for sudden expenses) which can then be used to pay for it. Emergency funds are defined as liquid assets easily and promptly convertible in cash to cover unexpected expenses (Johnson

&Widdows, 1985, Prather, 1990). The empirical studies(Chang et al., 1997; Sherraden& Grinstein-Weiss, 2015)show that most households do not have emergency funds at levels recommended for ensuring the household's financial stability, should unexpected expenses occur. By setting aside, on a regular basis, even small amounts, the households can prepare themselves financially for unexpected events so that these events do not undermine their financial stability, nor do they put the household at risk, for example, of losing access to services, losing housing stability (even losing a house/flat) and creditworthiness (Collins et al., 2013). The lack of savings coupled with unexpected expenses also represent the risk factors associated with the household's food security (Olson et al., 1997), which only gives further evidence how critically important the household's capacity to face unexpected expenses is.

That is why this study investigates the factors which can be conducive (or restrictive) to the household's ability to cope with unexpected expenses. Given that the previous research tends to analyze samples from only one country, this study's considerable contribution lies in providing more insight into how various factors affect the ability to cope with unexpected expenses, and thus they are linked to household financial stability/instability in Central and Eastern European countries.

3. RESEARCH METHOD AND DATA

The objective of the paper was an empirical evaluation of the household's ability to cope with unexpected expenses. To this end, a logistic regression model was used (discussed in detail in the literature (Gruszczyński, 2002; Gruszczyński, 2012; Maddala, 2013), applied in describing how several variables $X_1, X_2, \ldots, X_k$ interact with a dichotomous variable *Y*.

One of the measures of goodness of fit for logistic regression models is Hosmer-Lemeshow test. The null hypothesis for this test is that the probabilities estimated in the model agree with real outcomes (Hosmer & Lemeshow, 2000); hence a null hypothesis which can be maintained implies that the model has been well-fitted. The quality of the logistic regression model can also be evaluated using the equivalent of multiple determination coefficient R^2 estimated for linear multiple regression. For logistic regression, the most frequently applied measure is the Nagelkerke's adjusted pseudo R^2 (Nagelkerke, 1991) or Cox and Snell R^2 (Cox & Snell, 1989).

In the interpretation of this model, an odds ratio is used defined as the probability ratio for a given event to occur to the probability that it will not occur (Stanisz, 2007).

The study was carried out based on the household data from EU-SILC Eurostat for the year 2018. The variable in the form of a binary variable was adopted for the dependent variable – if a household declares that it has the capacity to face unexpected expenses, then the variable value equals 1, otherwise it is 0.

The potential independent variables used in the study were as follows:

1) *Total disposable household income*- a qualitative variable whose value equals 1 for a household with its total disposable income lower than the first quartile; value 2 for a household with its total disposable income higher than the first quartile but lower than the median; value 3 for a household with total disposable household income higher than the median and lower than the third quartile, and value 4 for a household whose total disposable income is higher than the third quartile;
2) *Family/Children related allowances* - a binary variable whose value equals 1 if the household receives allowances, and 0 if it does not;
3) *Interests, dividends, profit from capital investment in unincorporated business*- a binary variable whose value is 1 if the household receive profits, and 0 if it does not;
4) *Income from rental of a property or land* - a binary variable whose value is 1 if the household receives the income and 0 if it does not;

5) *Arrears on mortgage or rent payments* - a qualitative variable whose value is 1 if arrears happened only once, value 2 if they happened twice or more, and value 3 if such incidence did not occur;
6) *Arrears on utility bills* - a qualitative variable whose value equals 1 if the arrears happened once, value 2 if they happened twice or more, and value 3 if no such incidence ever occurred;
7) *Arrears on hire purchase installments or other loan payments* - a qualitative variable whose value equals 1 if the arrears happened once, value 2 if they happened twice or more and value 3 if no such incidence ever occurred;
8) *Capacity to afford paying for one week annual holiday away from home* - a binary variable whose value equals 1 if the household has this capacity, and 0 if it does not;
9) *Owing a telephone* (*Do you have a telephone (including mobile phone)?*) - a qualitative variable whose value equals 1 if the household owns a phone, value 2 if the household does not own a phone because it cannot afford it, and value 3 if the household does not own a phone for other reasons;
10) *Owing a computer* (*Do you have a computer?*) - a qualitative variable whose value equals 1 if the household owns a computer, value 2 if the household does not own a computer because it cannot afford it, and value 3 if the household does not own a computer for other reasons;
11) *Owing a car* (*Do you have a car?*) - a qualitative variable whose value equals 1 if the household owns a car, value 2 if the household does not own a car because it cannot afford it, and value 3 if the household does not own a car for other reasons;
12) *Financial burden of the total housing cost* - a qualitative variable whose value equals 1 if the financial burden is heavy, value 2 if the financial burden is small and value 3 if the total housing cost is not a burden;
13) *Financial burden of the repayment of debts from hire purchases or loans* - a qualitative variable whose value equals 1 if repayment is heavy burden, value 2 if repayment is a small burden and value 3 if repayment is no burden at all;
14) *Dwelling type*- a qualitative variable whose value equals 1 if the household lives in a detached house, value 2 if the household lives ina semi-detached house, value 3 if the household lives in an apartment or flat in a building with < 10 dwellings; value 4 if the household lives in an apartment or flat in a building with ≥10 dwellings;
15) *Tenure status* - a qualitative variable whose value equals 1 if the household is an outright owner, value 2 if the household is an owner paying mortgage, value 3 if the household is a tenant/subtenant paying rent at prevailing or market rate, value 4 if the household pays the rent at a reduced rate (lower price than the market price), value 5 if the accommodation is free of charge;
16) *Household size* - a qualitative variable whose value equals 1 for one-person household, value 2 for a two-person household, value 3 for a three-person household, value 4 for a four-person household, value 5 for a five-person household, value 6 if there are six or more persons in the household;
17) *Household type* –a qualitative variable whose value equals 1 for one-person households, value 2 for households with 2 adults, no dependent children, both adults under 65 years; value 3 for households with 2 adults, no dependent children, at least one adult ≥ 65 years; value 4 for other households without dependent children; value 5 for single-parent households, one or more dependent children; value 6 for households with 2 adults, one dependent child; value 7 for households with 2 adults, two dependent children; value 8 for households with 2 adults, three or more dependent children; value 9 for other households with dependent children; value 10 for other (these households are excluded from Laeken indicators calculation);
18) *At- risk-of-poverty*–a binary variable whose value equals 1 if the household's equivalised disposable income< at-risk-of-poverty threshold (60% of median equivalised disposable income), and 0 if the

household's equivalised disposable income ≥ at risk-of- poverty threshold (60% of median equivalised disposable income).

In the study, the Eurostat data were used derived from EU-SILC 2018 on the household samples for individual EU countries.The data used in the survey are available from Eurostat, which conducted relevant surveys. Both sample sizes and variables were selected by Eurostat. Data about individual records that were used in the study are not public.

4. EMPIRICAL RESULTS

The study was conducted for those Central and Eastern European countries for which there were comparable data for 2018. In the case of the Czech Republic, Slovakia and Slovenia it was not possible to build a model for which the probabilities estimated in the model would agree with real probabilities, hence the null hypothesis for Hosmer-Lemeshow test was rejected. For the four other countries, i.e. Poland, Croatia, Romania and Hungary the estimation results for the logistic regression model are presented farther on in this chapter. For each country, the initial set of potential independent variables was the same. However, some variables were ultimately excluded from individual models as statistically insignificant. The calculations were carried out using IBM SPSS Statistics.

4.1. Empirical results for Poland

The study was carried out on 14974 households. From the set of potential independent variables, two variables were not incorporated in the model because of their statistical insignificance. They include: poverty indicator and household size. The estimation results for the logistic regression model for Poland are presented in Table 1.

The estimation results for the parameters of the logistic regression model contained in Table 1 suggest that in households where total disposable household income is smaller than the first quartile, the odds of coping successfully with unexpected expenses are 79.6% smaller than in households with total disposable household income larger than the third quartile. For households for which total disposable household income is larger than the first quartile but smaller than the median and those with total disposable household income larger than the median and smaller than the third quartile, the odds of coping successfully with unexpected expenses are lower, respectively by: 61% and 38.5%.

The results further suggest that the households which have additional sources of income are better at coping with unexpected expenses than those with no extra sources of income. For households with no income from rental of a property or land, the odds for coping with unexpected expenses are smaller by 43.4% than for households who have this type of income. Meanwhile, for households with no profits from capital investment the odds are smaller by as many as 75.1% than in households who enjoy this type of income.

Owning a computer or and/or car allows for having a greater capacity to face unexpected expenses. For households who own a car the odds are by 57.9% higher than for those who do not own a car (not because of lacking financial resources). Having a computer raises the odds by 27.7%.

Table 1

Estimation results for logistic regression model for Poland

Variable	B	Significance	Level of significance	Exp (B)
Total disposable household income (base: larger than the third quartile)		***	0.000	
smaller than the first quartile	-1.589	***	0.000	0.204
larger than the first quartile and smaller than median	-0.941	***	0.000	0.390
larger than median and smaller than the third quartile	-0.487	***	0.000	0.615
Income from rental of a property or land	-0.569	***	0.006	0.566
Interests, dividends, profit from capital investment in unincorporated business	-1.390	***	0.000	0.249
Arrears on utility bills (base: no)		***	0.000	
yes, once	-0.922	***	0.000	0.398
yes, twice or more	-1.298	***	0.000	0.273
Capacity to afford to pay for one week annual holiday away from home	-1.762	***	0.000	0.172
Do you have a car? (base: no – other reason)		***	0.000	
yes	0.457	***	0.000	1.579
no – cannot afford	-0.543	***	0.000	0.581
Financial burden of the total housing cost (base: not a burden at all)		***	0.000	
a heavy burden	-1.364	***	0.000	0.256
somewhat a burden	-0.416	***	0.001	0.659
Dwelling type (base: apartment or flat in a building with ≥10 dwellings)		***	0.000	
detached house	0.340	***	0.000	1.405
semi-detached house	-0.029		0.778	0.972
apartment or flat in a building with < 10 dwellings	-0.216	***	0.004	0.806
Tenure status (base: accommodation is provided free)		***	0.000	
outright owner	0.423	***	0.000	1.527
owner paying mortgage	0.227	*	0.034	1.255
tenant/subtenant paying rent at prevailing or market rate	-0.014		0.904	0.986
accommodation is rented at a reduced rate (lower price that the market price)	0.086		0.701	1.089
Do you have a telephone (including mobile phone)? (base: no –other reason)		**	0.010	
yes	-0.32	***	0.003	0.726
no – cannot afford	-0.497		0.079	0.609
Do you have a computer? (base: no - other reason)		***	0.000	
yes	0.244	***	0.000	1.277
no – cannot afford	-0.546	***	0.000	0.579
Family/Children related allowances	0.378	***	0.000	1.459
Household type (base: other households with dependent children)		***	0.000	
one-person household	-0.052		0.678	0.949
2 adults, no dependent children, both adults under 65 years	-0.058		0.618	0.944
2 adults, no dependent children, at least one adult ≥ 65 years	0.104		0.373	1.110
other households without dependent children	-0.140		0.870	0.695
single-parent household, one or more dependent children	-0.768	***	0.000	0.464
2 adults, one dependent child	-0.004		0.975	0.996
2 adults, two dependent children	-0.137		0.225	0.872
2 adults, three or more dependent children	-0.224		0.054	0.800
Constant	4.213	***	0,000	67.554
Nagelkerke R^2	0.495			
Cox and Snell R^2	0.365			
Hosmer and Lemeshow test	0.209			
N included in the analysis	14974			

Source: Authors' results. * – indicates significance level at 0.05 level; ** – indicates significance level at 0.01 level; *** – indicates significance level at 0.005 level

What also affects the capacity to face unexpected expenses is whether or not a household has arrears. For households who happened to be in arrears only once the odds are smaller by 60.2% than for households who never had to encounter this situation. Being in arrears more frequently makes the odds of coping with unexpected expenses lower by as many as 72.7%

It is worth highlighting that households with no family/children related allowances have better odds by 45.9% of coping with unexpected expenses than households who receive these allowances.

In the survey carried out for Poland, a factor that also proved very significant was the financial burden of the total housing cost. The odds of being capable of facing unexpected expenses for households for whom housing cost represent a heavy burden are smaller by 74.4% than for households who do not feel burdened by their housing costs.

The capacity to face unexpected expenses is further affected by the type of dwelling and capacity to afford to pay for one week annual holiday away from home. The odds for households living in detached houses are higher by 40.5% than for households living in an apartment or flat in a building with ≥10 dwellings. The odds of coping with unexpected expenses are lower by 82.8% for households with no capacity to afford to pay for one week annual holiday away from home than for households who can afford this.

Another important factor affecting the capacity to handle unexpected expenses is tenure status. For households who are outright owners the odds are higher by 52.7% than for households whose accommodation is provided for free.

4.2. Empirical results for Croatia

The study was carried out on 8236 households. From the set of potential independent variables, the following variables were not incorporated in the model because of their statistical insignificance: household size, owning a phone, household type, family/children-related allowances. The estimation results for the logistic regression model for Croatia are presented in Table 2.

The estimation results for the parameters of the logistic regression model included in Table 2 suggest that the odds of coping successfully with unexpected expenses are lower by 69.8% for households where total disposable household income is smaller than the first quartile than in households with total disposable household income larger than the third quartile. For households whose total disposable household income is larger than the first quartile and smaller than the median and for those where total disposable household income is larger than the median and smaller than the third quartile the odds of being capable of facing unexpected expenses are lower by, respectively: 50.9% and 43.5%.

The results produced by the study further suggest that households with additional sources of income are better at coping with unexpected expenses than households with no such income. For households with no income from rental of a property or land the odds of coping with unexpected expenses are lower by 40.3% than for households who have this type of income. Moreover, for households who do not receive profits from capital investment the odds are by 51.7% lower than for households who have this type of income.

Having a car enables one to cope better with unexpected expenses. For households who own a car the odds are higher by 39.1% than for households who do not own a car (for other than financial reasons).

Table 2

Estimation results for logistic regression model for Croatia

Variable	B	Significance	Level of significance	Exp (B)
Total disposable household income (base: larger than the third quartile)		***	0.000	
smaller than the first quartile	-1.196	***	0.000	0.302
larger than the first quartile and smaller than the median	-0.711	***	0.000	0.491
larger than the media and smaller than the third quartile	-0.571	***	0.000	0.565
Income from rental of a property or land	-0.516	***	0.000	0.597
Interests, dividends, profit from capital investment in unincorporated business	-0.728	***	0.000	0.483
Arrears on utility bills (base: no)				
yes, once	-0.876	***	0.000	0.417
yes, twice or more	-1.233	***	0.000	0.291
Capacity to afford paying for one week annual holiday away from home	-1.708	***	0.000	0.181
Do you have a computer? (base: no - other reason)		***	0.002	
yes	0.025		0.747	1.026
no – cannot afford	-0.771	***	0.001	0.463
Do you have a car? (base: no – other reason)		***	0.000	
yes	0.330	***	0.000	1.391
no – cannot afford	-0.433	*	0.012	0.648
Financial burden of the total housing cost (base: not a burden at all)		***	0.000	
a heavy burden	-2.169	***	0.000	0.114
somewhat a burden	-1.326	***	0.000	0.265
Dwelling type (base: apartment or flat in a building with ≥10 dwellings)		***	0.000	
detached house	0.422	***	0.000	1.525
semi-detached house	0.781	***	0.000	2.184
apartment or flat in a building with < 10 dwellings	0.278		0.054	1.320
Tenure status (base: accommodation is provided free)			0.080	
outright owner	0.271	*	0.046	1.311
owner paying mortgage	0.230		0.232	1.259
tenant/subtenant paying rent at prevailing or market rate	-0.271		0.425	0.762
accommodation is rented at a reduced rate (lower price that the market price)	-0.124		0.689	0.884
At-risk-of-poverty (poverty indicator)	0.392	***	0.000	1.480
Constant	3.077	***	0.000	21.695
Nagelkerke R^2	0.525			
Cox and Snell R^2	0.390			
Hosmer-Lemeshow test	0.099			
N included in the analysis	8236			

Source: Authors' results. * – indicates significance level at 0.05 level; ** – indicates significance level at 0.01 level; *** – indicates significance level at 0.005 level

What further affects the capacity to face unexpected expenses is whether or not a household has arrears. For households who happened to be in arrears only once the odds are lower by 58.3% than for households who never had arrears. Being in arrears more frequently makes the odds of coping with unexpected expenses lower by 70.9%

The capacity to face unexpected expenses is also affected by the financial burden of total housing cost. The odds of being capable of facing unexpected expenses for households for whom housing cost represent a heavy burden are smaller by as many as 88.6% than for households who do not feel burdened by their housing costs.

The household's capacity to face unexpected expenses is further affected by the factor relating to being at-risk-of poverty. For households who are not at risk of poverty the odds are higher by 48% compared to households who face this risk.

The last two factors affecting the ability to cope with unexpected expenses are the dwelling type and the capacity to afford to pay for one week annual holiday away from home. The odds for households living in detached houses are higher by 52.5% than for households living in an apartment or flat in a building with ≥10 dwellings. Households who cannot afford such holidays have lower odds of coping with unexpected expenses by as many as 81.9%.

4.3. Empirical results for Romania

The study was carried out on 6812 households. From the set of potential independent variables, the following variables were not incorporated in the model because of their statistical insignificance: income from rental of a property or land, household size, receiving family/children-related allowances, household type, receiving interests, dividends, profit from capital investment in unincorporated business. The estimation results for the logistic regression model for Romania are presented in Table 3.

The estimation results for the parameters of the logistic regression model contained in Table 3 suggest that in households where total disposable household income is smaller than the first quartile, the odds of coping with unexpected expenses are lower by 45.4% than for households with total disposable household income larger than the third quartile. For households where total disposable household income is larger than the first quartile and smaller than the median and for those with total disposable household income larger than the median and smaller than the third quartile the odds are lower by, respectively: 39% and 27.4%.

Whether or not a household has arrears also influences the ability to cope with unexpected expenses. For households who happened to have arrears only once the odds are lower by 39.9% than for households who never happened to have arrears. Being frequently in arrears make the odds of coping with unexpected expenses lower by 36.9%.

Housing costs (financial burden of the total housing cost) also affect the ability to cope with unexpected expenses. For households where housing costs are a heavy burden the odds are lower by as many as 88.6% than for households where this burden is not felt. A statistically significant factor also proved to be the capacity to afford to pay for one week annual holiday away from home. The odds for households who do not have this capacity are by 76.5% lower than households who can afford these holidays. What further affects the ability to cope with unexpected expenses is the dwelling type. This mainly pertains to households living in detached houses and in an apartment or flat in a building with < 10 dwellings. The odds for the former are 22.7% higher than for households living in apartment or flat in a building with ≥10 dwellings. For the latter, the odds are by 65.4% higher.

The two other factors affecting the capacity to face unexpected expenses are owning a computer and owning a phone. For households with no computer because of financial reasons the odds are by 41.5% lower than for households who do not own a computer for other than financial reasons. Moreover, for households who own a phone the odds are twice as high compared to households who do not own a phone for other than financial reasons.

Table 3

Estimation results for the logistic regression model for Romania

Variable	B	Significance	Level of significance	Exp (B)
Total disposable household income (base: larger than the third quartile)		***	0.000	
smaller than the first quartile	-0.605	***	0.000	0.546
larger than the first quartile and smaller than the median	-0.494	***	0.000	0.610
larger than the median and smaller than the third quartile	-0.321	***	0.000	0.726
Arrears on utility bills (base: no)		***	0.000	
yes, once	-0.509	***	0.000	0.601
yes, twice or more	-0.460	***	0.000	0.631
Capacity to afford paying for one week annual holiday away from home	-1.447	***	0.000	0.235
Do you have a car? (base: no – other reason)		***	0.000	
yes	0.279	***	0.002	1.322
no – cannot afford	-0.084		0.359	0.919
Financial burden of the total housing cost (base: not a burden at all)		***	0.000	
a heavy burden	-2.130	***	0.000	0.119
somewhat a burden	-1.057	***	0.000	0.347
Dwelling type (base: apartment or flat in a building with ≥10 dwellings)		***	0.001	
detached house	0.204	***	0.002	1.227
semi-detached house	0.193		0.465	1.213
apartment or flat in a building with < 10 dwellings	0.503	***	0.001	1.654
Tenure status (base: accommodation is provided free)			0.080	
outright owner	0.607	*	0.023	1.836
owner paying mortgage	0.829		0.096	2.292
tenant/subtenant paying rent at prevailing or market rate	0.481		0.212	1.617
accommodation is rented at a reduced rate (lower price that the market price)	1.209	**	0.008	3.351
Do you have a telephone (including mobile phone)? (base: no – other reason)			0.000	
yes	0.750	***	0.000	2.116
no – cannot afford	0.035		0.924	1.035
Do you have a computer? (base: no - other reason)		***	0.000	
yes	0.161		0.057	1.175
no – cannot afford	-0.536	***	0.000	0.585
At risk-of-poverty (poverty indicator)	0.534	***	0.000	1.706
Constant	0.730		0.070	2.075
Nagelkerke R^2	0.410			
Cox and Snell R^2	0.307			
Hosmer-Lemeshow test	0.481			
N included in the analysis	6812			

Source: Authors' results. * – indicates significance level at 0.05 level; ** – indicates significance level at 0.01 level; *** – indicates significance level at 0.005 level

For Romanian households, a statistically significant factor is being at risk of poverty. For households who are not at this risk the odds of coping with unexpected expenses are higher by as many as 70.6% than for households who are at risk of poverty.

4.4. Empirical results for Hungary

The study was carried out on 7320 households. From the set of potential independent variables, the following variables were not incorporated in the model because of their statistical insignificance: owning a

phone, owning a computer, household size and household type. The estimation results for the logistic model of regression for Hungary are presented in Table 4.

Table 4

The estimation results for the logistic regression model for Hungary

Variable	B	Significance	Level of significance	Exp (B)
Total disposable household income (base: larger than the third quartile)		***	0.000	
smaller than the first quartile	-3.135	***	0.000	0.043
larger than the first quartile and smaller than the median	-1.764	***	0.000	0.171
larger than the median and smaller than the third quartile	-1.139	***	0.000	0.320
Income from rental of a property or land	-1.178		0.057	0.308
Interests, dividends, profit from capital investment in unincorporated business	-0.279		0.097	0.756
Arrears on utility bills (base: no)		***	0.000	
yes, once	-0.946	***	0.000	0.388
yes, twice or more	-1.441	***	0.000	0.237
Capacity to afford paying for one week annual holiday away from home	-1.190	***	0.000	0.304
Do you have a car? (base: no – other reason)		***	0.000	
yes	-0.041	***	0.630	0.959
no – cannot afford	-0.357	***	0.000	0.699
Financial burden of the total housing cost (base: not a burden at all)		***	0.000	
a heavy burden	-2.074	***	0.000	0.126
somewhat a burden	-1.417	***	0.000	0.242
Dwelling type (base: apartment or flat in a building with ≥10 dwellings)		***	0.001	
detached house	-0.308	***	0.000	0.735
semi-detached house	0.019		0.911	1.019
apartment or flat in a building with < 10 dwellings	0.006		0.974	1.006
Tenure status (base: accommodation is provided free)			0.000	
outright owner	0.145		0.312	1.155
owner paying mortgage	-0.123		0.481	0.884
tenant/subtenant paying rent at prevailing or market rate	-0.493	*	0.032	0.611
accommodation is rented at a reduced rate (lower price that the market price)	-0.531	*	0.024	0.588
Family/Children related allowances	1.888	***	0.000	6.604
At-risk-of poverty (poverty indicator)	0.583	***	0.000	1.792
Constant	4.410	***	0.000	82.274
Nagelkerke R^2	0.542			
Cox and Snell R^2	0.391			
Hosmer-Lemeshow test	0.356			
N included in the analysis	7320			

Source: Authors' results. * – indicates significance level at 0.05 level; ** – indicates significance level at 0.01 level; *** – indicates significance level at 0.005 level

The estimation results for the parameters of the logistic regression model contained in the table suggest that for households with total disposable household income smaller than the first quartile the odds of having the capacity to face unexpected expenses are higher by 95.7% than in households where total disposable household income is larger than the third quartile. For households for which total disposable household income is larger than the first quartile and smaller than the median and for those with total

disposable household income larger than the median and smaller than the third quartile the odds are lower by, respectively: 82.9% and 68%.

The results of the research carried out on the Hungarian households suggest that the other factors exerting influence and being statistically significant regarding the capacity to face unexpected expenses proved to be whether or not a household has arrears and the capacity to afford to pay for one week annual holiday away from home. In the case of the first factor, households who happened to have arrears only once have the odds lower by 61.2% than households who never happened to have arrears. Having arrears more frequently makes the odds of coping with those expenses lower by 76.3%. As for the second factor, households with no capacity to afford to pay for one week annual holiday away from home have the odds lower by 69.6% compared to households who have this capacity.

The other important factor was the financial burden of the total housing cost. For households where housing costs represent a heavy burden the odds of having the capacity to face unexpected expenses are lower by as many as 87.4% than households who are not burdened by these costs. On the other hand, for households where these costs represent somewhat a burden the odds are lower by 75.8%.

Owning a car and receiving family/children-related allowances are yet two further factors affecting the Hungarian households' capacity to face unexpected expenses. For the first factor mentioned, the research results differ from the other countries in that households who own a car have the odds lower by 4.1% than households who do not possess a car for reasons other than financial. With respect to the second factor, for households with no family/children-related allowance the odds are even six times higher than for households who receive this type of allowance.

The last factor worth emphasizing is being at risk of poverty. For households who are not at this risk the odds of having the capacity to face unexpected expenses are by 79.2% higher than for households who are at risk of poverty.

5. DISCUSSION AND CONCLUSIONS

The paper addresses important issues of household financial stability/instability and the household's corresponding capacity to face unexpected expenses. The research so far has tended to focus on the analysis of financial factors such as income level (e.g. Brobeck, 2008), and savings (e.g. Johnson & Widdows, 1985; Prather, 1990; Chang et. al., 1997). The research presented in this paper takes into consideration nonfinancial factors, which offers further insight into the phenomenon discussed.

Moreover, the previous research has largely centered around a single country while this study covers Central and Eastern European countries for which comparable household survey data were available. It is worth stressing that for the countries from this part of the world this kind of research has not yet been conducted. The data were derived from the Eurostat database, EU-SILC 2018. The analysis was carried out using logistic regression and the relevant statistical tests attesting to the quality of the models built.

For most of the countries discussed, i.e. Poland, Croatia, Romania and Hungary, it was possible to identify financial and nonfinancial factors which determine the household's capacity to face unexpected expenses, thereby confirming the hypothesis H1. As developing credible models for the Czech Republic, Slovakia and Slovenia proved to be impossible, so was suggesting a set of factors affecting the household capacity to face unexpected expenses.

As mentioned before, the study examined both financial and nonfinancial factors determining the household's capacity to face unexpected expenses. The financial factors included the following factors: total disposable household income, family/children related allowances, interests, dividends, profit from capital investment in unincorporated business, income from rental of a property or land, arrears on mortgage or rent payments, arrears on utility bills, arrears on hire purchase installments or other loan

payments, capacity to afford to pay for one week annual holiday away from home, financial burden of the total housing cost, financial burden of the repayment of debts from hire purchases or loans. The nonfinancial factors encompassed the following factors: owning a phone, owning a computer, owning a car, dwelling type, tenure status, household size, household type. For the logistic regression models developed for each country, the statistically significant variables described both the financial and nonfinancial factors. Thus, the hypothesis H2 was confirmed because the logistic regression results presented in Tables 1,2,3 and 4 pertain exclusively to the models which can be considered as sound in the light of goodness-of-fit for the empirical data.

What bears further significance is that the study identified variables which were significant in all the logistic regression models built. This implies that one can identify both financial and nonfinancial factors which affect the household's capacity to face unexpected expenses thereby impacting household financial stability/instability. The variables which proved to be statistically significant for all the models include the following: total disposable household income, arrears on utility bills, capacity to afford to pay for one week annual holiday away from home, financial burden of the total housing cost, dwelling type, tenure status. Therefore, the hypothesis H3 has been confirmed. In terms of credit risk, these findings may be of special import to the financial institutions providing credits and loans to households. However, it should be stressed at this point that the application of logistic regression allowed for evaluating the household's odds of coping successfully with unexpected expenses. For the same variables the odds vary by the country.

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REFERENCES

Brobeck, S. (2008). Understanding the Emergency Savings Needs Of Low- And Moderate-Income Households: A Survey-Based Analysis of Impacts, Causes, and Remedies. *White Paper*, November. Consumer Federation of America, Washington, DC.

Brown, S., & Taylor, K. (2014). Household finances and the 'Big Five' personality traits. *Journal of Economic Psychology,* 45, 197-212

Brown, S., & Taylor, K. (2008). Household Debt and Financial Assets: Evidence from Germany, Great Britain and the USA. *Journal of the Royal Statistical Society*, Series A, 171, 615–43, 2008.

Brunetti, M., Giarda, E., & Torricelli, C. (2016). Is Financial Fragility a Matter of Illiquidity? An Appraisal for Italian Households. *Review of Income and Wealth*, 62: 628-649. doi:10.1111/roiw.12189

Bylok, F. (2013). Strategie zachowań konsumpcyjnych seniorów na rynku dóbr i usług konsumpcyjnych. *Problemy Zarządzania*, 11, 1(40), t. 1.

Chang, Y.R., Hanna, S., & Fan, X.J. (1997). Emergency fund levels: Is household behavior rational? *Financial Counseling and Planning*, 8(1), 47-55.

Christelis, D., T. Jappelli, O. Paccagnella, & Weber, G. (2009). Income, Wealth and Financial Fragility inEurope. *Journal of European Social Policy*, 19, 359–77.

Collins, J. M.,& Leah Gjertson. (2013). Emergency Savings for Low-Income Consumers. *Focus, 30*, 1, 12-17. https://www.irp. wisc.edu/publications/focus/pdfs/foc301c.pdf.

Cox, D.R., & Snell E.J. (1989). *Analysis of Binary Data*. Second Edition. Chapman & Hall.

Faruqui, U. (2008). Indebtedness and the Household Financial Health: An Examination of the Canadian Debt Service Ratio Distribution. Bank of Canada, *Working Paper,* 46, 2008.

Fuenzalida, M., & Ruiz-Tagle, J. (2009). Households' Financial Vulnerability. Central Bank of Chile. *Working Paper,* 540.

Garman, E.T., Eckert S.W. & Forgue, R.E. (1985). *Personal Finance*. Houghton Mifflin Company, Boston.

Georgarakos, D., & Fürth, S. (2015). Household repayment behavior: The role of social capital and institutional, political, and religious beliefs. *EuropeanJournal of PoliticalEconomy*, 37, 249–265

Gruszczyński, M. (2002).*Modele i prognozy zmiennych jakościowych w finansach i bankowości*. Oficyna Wydawnicza SGH, Warszawa.

Gruszczyński M.[ed.] (2012). *Mikroekonometria.Modele i metody analizy danych indywidualnych*. Wolters Kluwer, Warszawa.

Hosmer, D. W. & Lemeshow, S. (2000). *Applied Logistic Regression*. New York: Wiley.

Johnson, D. & Widdows, R. (1985). Emergency fund levels ofhouseholds. In K. Schnittgrund (Ed.), *The Proceedings ofthe American Council on Consumer Interests 31th AnnualConference*, 235-241.

Kapoor, J.R., Dlabay, L.R., Hughes R.J., & Hoyt W.B. (2007). *Business and Personal Finance*. McGraw-Hill.

Katona, G. (1975). *Psychological Economics*. Elsevier, New York.

Keese, M. (2009). Triggers and Determinants of Severe Household Indebtedness in Germany. *SOEP Paper* 239.

Kuchciak, I. (2013). Nadmierne zadłużenie się gospodarstw domowych – przyczyna i skutek wykluczenia finansowego. *Bezpieczny Bank*, 2-3 (51-52), 135 – 157

Lusardi, A., Schneider, D., & Tufano, P. (2011). Financially Fragile Households: Evidence and Implications, *Brookings Papers on Economic Activity*, Spring, 83–150.

Maddala, G.S.(2013).*Ekonometria*, PWN, Warszawa.

Madura, J. (2014).*Personal Finance*, Pearson

McCarthy, Y. (2011). Behavioural Characteristics and Financial Distress. European Central Bank, *Working Paper*, 1303.

Moschis, G.P. (1996). Life Stages of the Mature Market. *American Demographics*, (9), 44–50.

Mutsonziwa, K., & Fanta, A. (2019). Over-indebtedness and its welfare effect on households. African Journal of Economic and Management Studies.

Nagelkerke, N.J.D. (1991). A note on a general definition of the coefficient of determination. *Biometrika,* 78, 691-692.

Olson, C. M., Rauschenbach, B. S., Frongillo, E. A. & Kendall, A. (1997). Factors contributing to household food insecurity in a rural upstate New York county. *Family Economics and Nutrition Review*, 10, 2–17.

Piotrowska, M. (2017). The impact of education on economic security of households. Social Inequalities and Economic Growth, 51, 9-26

Prather, C. (1990). The ratio analysis technique applied topersonal financial statements: Development of householdnorms. *Financial Counseling and Planning*, 1, 53-69.

Sherraden, M. S., & Grinstein-Weiss, M. (2015). Creating Financial Capability in the Next Generation: An Introduction to the Special Issue. The Journal of Consumer Affairs, 49(1), 1-12.

Solomon, M. Bamossy, G., & Askegaard, S. (2001). Konsumverhalten. Der Europäische Markt. München. *Verlag Person Studium,* München.

Stanisz, A. (2007).*Przystępny kurs statystyki z zastosowaniem STATISTICA PL na przykładach z medycyny. Tom 2. Modele liniowe i nieliniowe*, Statsoft, Kraków.

Stephen, E.G. Lea, Webley P., & Levine, R. M. (1993).The economic psychology of consumer deb. *Journal of Economic Psychology*, 14(1993), 85-119.

Stephen, E.G. Lea, Webley P. & Walker C. M. (1995). Psychological factors in consumer debt: Money management, economic socialization, and credit use. *Journal of Economic Psychology*, 16(4), December 1995, 681-701.

Świecka, B. (2009). Niewypłacalność gospodarstw domowych. Przyczyny – skutki – przeciwdziałanie [Insolvency of households. Causes –effects – prevention]. *Difin*, Warszawa.

Zalega, T. (2012). *Konsumpcja. Determinanty, teorie, modele [Consumption. Determinants, theories, models*]. *PWE*, Warszawa.