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AGNIESZKA WAŁĘGA

Cracow University of Economics, Poland

GRZEGORZ WAŁĘGA

Cracow University of Economics, Poland

INDEBTED HOUSEHOLDS IN POLAND AND THEIR ECONOMIC SITUATION: ASSESSMENT USING MOBILITY INDICES

Abstract:

Economic situation is one of the major determinants of household debt. The analysis of changes in borrowing levels in the global economic context allows for better understanding of household behaviours in the financial markets. The increase in income levels results in upgrading consumer aspirations, especially in developing countries. With some household expenses financed by credit, a growth in household debt levels can be observed. This research is based on panel data at the micro level for Polish households, obtained from the Social Diagnosis (Diagnoza Społeczna) study in 2009 and 2015. The purpose of this paper is to assess the impact of changing household incomes on their debt levels. The overall change in household debt levels is examined using mobility indices.

The results show that the general improvement in the income situation of indebted households varies depending on the level of debt. The subjective perception of the income situation of the low-debt households has improved. In addition, the heavier the burden of loan repayments, the less likely it is that households can benefit from the favourable economic situation.

Keywords:

indebted household, economic situation, mobility indices

JEL Classification: D12, D14, D31

1 Introduction

Household borrowing behaviours are generally as understudied despite the rising household debt in many countries. Some aspects of household debt are commonly discussed. Many studies have been published regarding personal bankruptcy filings (Gropp et al., 1997; Fay et al. 2002; Pace, Lown, 2016) and arrears (Duygan-Bump, Grant, 2009; Jappelli et al., 2013; Gerlach-Kristen, Lyons, 2017). The links between sensitivity of household arrears and macroeconomic situation have been widely investigated by Jappelli et al. (2013). The latest lending crisis has underscored the importance of the household credit market in determining both the stability of the financial system and the level of economic activity.

It is well known that borrowing is the one of key factors accelerating economic activity. Bhaduri et al. (2006) highlight the relationship between economic growth, capital markets and borrowing. Economic expansion can be continued so long as the private sector remains sufficiently creditworthy from the point of view of lending institutions. However, constant credit expansion is pushing up the debt-to-income ratio. With high accumulated debt, the household burden is so heavy that deleveraging is needed (Palley, 2010). Thus, a double squeeze may be observed. A decrease of borrowing coupled with an increase of repayments check consumer spending, often leading to economic slowdown. These processes eventually favour economic recovery. An understanding of the links between household repayments and macroeconomic shocks is essential for policy makers and financial institutions.

To the best of our knowledge, this study is one of the first to use the Markov mobility indices for the analysis of debt and income changes. Moreover, the issue has not been dealt with before in any detail in case of Polish households. The aim of the study is to extend the existing knowledge about how changes in income levels impact debt levels. Our research should help better understand the role of household income and how it affects debt levels over time. Furthermore, it can be used to identify households which default on loan repayment.

2 Income and borrowing

According to the life-cycle model, households borrow in anticipation of future income growth or to buy goods such as durables or housing. The use of loans for intertemporal substitution of consumption has been widely examined in literature (Wałęga, 2013). Households plan consumption spending taking into account the anticipated discounted revenues earned throughout their lifetimes. Income is the basic determinant of debt repayment (DeVaney, Lytton, 1995). Outside income, household consumption is influenced by the current value of disposable assets (both financial and material).

Households use credit to fill the gap between permanent and transitory income. Research confirms that the bigger the gap, the greater the borrowing levels (Park, Rodrigues, 2000;

Jappelli et al., 2013). An increase in transitory income, with the proviso that permanent income level remains unchanged, reduces the tendency to borrow. On the other hand, there is a positive correlation between the size of a household's permanent income, together with its wealth, and a household's demand for credit. This dependence can be explained – firstly – by the desire to go up the consumption path, and – secondly – by the possibility of taking out mortgage loans (Grant, 2007). It is believed that households with higher permanent income are more secure in terms of employment stability and, therefore, can keep savings low, while showing greater willingness to borrow. However, some researchers point out that households with a high level of wealth can meet their consumption needs without resorting to credit (Vandone, 2009).

Another variable that may affect households' debt repayments is incentives provided by the government to encourage homeownership (Jappelli et al., 2013). The rising prices of real estate after Poland's accession to the European Union and limited mortgage funding possibilities for families with lower creditworthiness were the reason for the introduction of a housing support programme in Poland. The possibility of taking out preferential loans resulted in an increase in household mortgage debt (over 12 months).

3 Data and methods

The analysis of the economic situation of indebted households was based on data from the Social Diagnosis study (Czapiński, Panek, 2009, 2015), which was carried out in 2009 and 2015 in Poland. The object of the analysis was households, but only those that participated in the study in both years and were indebted at the time. In the end, the database consisted of 1,050 indebted households, which accounts for 21% of households studied in those years.

The assessment of the economic situation of households was carried out using the Markov chains. The Markov chain is one of the methods for dynamic analysis of phenomena. The initial income distribution is divided into a finite number of ranges (income classes)¹, on the basis of which the transition matrix is estimated (Kot, Podolec, Ulman, 1999). The elements constituting the matrix are the probabilities p_{ij} for particular households to make transition from income class i into income class j ($i, j = 1, \dots, m$) within a fixed time unit t ($t = 0, 1, 2, \dots, T$)². The probabilities inform about the percentage of households that initially belonged to one income class, and subsequently remained in it or moved to other classes.

¹ Arbitrary selection of intervals separating individual income classes is a weakness of the described method – different intervals may lead to different results (Fields, Ok, 1999).

² If the probabilities p_{ij} do not depend on time t , then this process is called a stationary or homogeneous Markov chain (Ulman, 2011).

Since the number of income classes at any given moment is m , the individual probabilities p_{ij} form a matrix of transition probabilities $m \times m$, which has two properties: $p_{ij} \geq 0$ for $i, j = 1, 2, \dots, m$ and $\sum_{j=1}^m p_{ij} = 1$ for $i = 1, 2, \dots, m$ (Paul, 2009; Ulman, 2011).

The elements p_{ij} ($i=j$) on the main diagonal of the matrix indicate the probabilities that a household will not change the income class in the next time unit. This testifies to stability of the structure under examination. By contrast, the elements p_{ij} ($i \neq j$) outside the main diagonal point to changes in the analysed structure.

Individual probabilities can be estimated on the basis of both micro and macro data. An estimator of an unknown transition probability p_{ij} , obtained by means of the maximum likelihood method, can be expressed by a formula (Ulman, 2011):

$$p_{ij} = \frac{n_{ij}}{\sum_{j=1}^m n_{ij}} \text{ for } i, j = 1, 2, \dots, m, \quad (1)$$

where n_{ij} stands for the number of households that belonged in the base year to the i income class, and, in the next period, moved to the j category. The standard error of the estimator is expressed by the following formula (Kot, Podolec, Ulman, 1999):

$$D(p_{ij}) = \sqrt{\frac{p_{ij}(1-p_{ij})}{n_{i.}-1}}, \text{ where } n_{i.} = \sum_{j=1}^m n_{ij} \quad (2)$$

The transition probability matrix can be used to assess the stability of the structure by calculating the stability index S , which for the $m \times m$ transition matrix takes the form $S = \sum_{i=1}^m \sum_{j=1}^m p_{ij} / m$, where the fraction's numerator stands for the sum of elements on the diagonal.

It takes values from 0 to 1, with high values indicating a stable process in which the odds of change are rather small.

The transition matrix can be used to develop summary measures of mobility. Relatively few attempts are made to create mobility indices based on transition matrices (e.g. Prais, 1955; Bartholomew, 1973; Bibby, 1975).

Mobility of the analysed structure can be measured using, among others, the Bartholomew index defined as follows:

$$I_B = \frac{1}{m-1} \sum_{i=1}^m \sum_{j=1}^m \pi_i p_{ij} |i-j|, \quad (3)$$

where i, j – row and column identifiers, p_{ij} – elements of the transition probability matrix, π_i – structure of the household's belonging to the income class in the base year. The structure of the index ensures mobility by more than one income class. The weight is settled based on the income class the household belonged to in the initial period. If I_B assumes a value of 0, it means no changes (mobility). The greater the value of this index, the greater the scale of changes (mobility) in the analysed structure (Ulman, 2005; Jäntti, Jenkins, 2015). On the basis of this index, it is also possible to examine mobility in terms of improvement (I_A – refers to the elements of the transition matrix above the main

diagonal) and deterioration of the financial situation of households (I_D – refers to elements below the main diagonal).

4 Empirical results

The assessment of the economic situation requires looking at the same households (panel data) from the perspective of several years. The years 2009 and 2015 were selected for the study due to the appropriately long period (6 years) in which it is possible to observe changes in the economic situation.

In order to assess the change in the economic situation in 2009–2015, indebted households were characterised in terms of the following features:

- income level (six income groups in PLN were singled out): up to 2,000; (2,000; 4,000>; (4,000; 6,000>; (6,000; 8,000>; (8,000; 10,000); above 10,000;
- the amount of debt measured in relation to the amount of monthly income: below the monthly income; 1 to 3 monthly incomes; 3 to 6 monthly incomes; 6 to 12 monthly incomes; over 12 monthly incomes;
- economic situation assessed on the basis of the ability to make ends meet with current income: with great difficulty; with difficulty; with some difficulty; rather easily; easily.

The examined households were most often indebted to banks (nearly 95%) (Table 1). In 2015, the share of households indebted to institutions other than banks was noticeably lower. In the examined period, the amount of debt also changed. The percentage of households with debt of up to three months' income and with debt of 6 to 12 months' income decreased in favour of those with debt exceeding the annual income (increase in share by 6 percentage points).

Table 1. Selected characteristics of households in Poland in 2009 and 2015

| Specification | 2009 | 2015 |
|-----------------------|-------|-------|
| level of income (PLN) | | |
| <=2000 | 37.96 | 19.75 |
| (2000; 4000> | 41.62 | 40.08 |
| (4000; 6000> | 14.07 | 23.22 |
| (6000; 8000> | 3.28 | 7.80 |
| (8000; 10000> | 1.45 | 2.12 |
| >10000 | 1.64 | 7.03 |
| economic situation | | |
| With great difficulty | 22.55 | 16.44 |
| With difficulty | 22.02 | 18.55 |
| With some difficulty | 34.14 | 37.09 |
| Rather easily | 15.70 | 23.08 |
| Easily | 5.58 | 4.85 |

| level of indebtedness | | |
|---|-------|-------|
| < 1 mth | 19.69 | 19.13 |
| (1 mth; 3 mths> | 25.14 | 21.80 |
| (3 mth; 6 mths> | 17.46 | 17.46 |
| (6 mth; 12 mths> | 15.57 | 13.24 |
| > 12 mths | 22.14 | 28.36 |
| place of taking out the loans or credits | | |
| In banks | 94.33 | 89.62 |
| SKOK* | | 4.97 |
| From credit agencies offering instalment plans at shops | 11.42 | 4.88 |
| Other companies providing loans* | | 6.02 |
| From private persons or in a shop | 4.95 | 4.78 |

* Categories not highlighted in studies in 2009

Source: own calculations based on Social Diagnosis Data (<http://www.diagnoza.com/>)

Indebted households most often had an income in the range of 2,000 to 4,000 (PLN). However, the increase in the share of households with higher incomes is noticeable, which means improvement of the material situation of indebted households. This information confirms the subjective opinions of the respondents regarding the ability of "making ends meet" with the current net income. There is a noticeable decrease in the number of answers "with great difficulty" and "with difficulty" and an increase in the share of households that responded "with some difficulty" and "rather easily". In the short-term perspective, compared to two years earlier, in 2015 most households declared no change in material situation (over 57%).

Table 2. Transition probability matrix for debt level as a monthly income

| Indebtedness | | 2015 | | | | |
|--------------|-------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| | | < 1 mth | (1 mth; 3 mths> | (3 mths; 6 mths> | 6 mths; 12 mths> | > 12 mths |
| 2009 | < 1 mth | 0.3107 (0.0349) | 0.2429 (0.0323) | 0.2034 (0.0303) | 0.1017 (0.0228) | 0.1412 (0.0263) |
| | (1 mth; 3 mths> | 0.2434 (0.0286) | 0.2920 (0.0303) | 0.1770 (0.0254) | 0.1239 (0.0220) | 0.1637 (0.0247) |
| | (3 mths; 6 mths> | 0.1975 (0.0319) | 0.2229 (0.0333) | 0.2611 (0.0352) | 0.1274 (0.0267) | 0.1911 (0.0315) |
| | (6 mths; 12 mths> | 0.1571 (0.0309) | 0.2286 (0.0356) | 0.1571 (0.0309) | 0.1500 (0.0303) | 0.3071 (0.0391) |
| | > 12 mths | 0.0452 (0.0148) | 0.1005 (0.0214) | 0.0905 (0.0204) | 0.1608 (0.0261) | 0.6030 (0.0348) |

Note: The standard error is given in brackets.

Source: own calculations based on Social Diagnosis Data (<http://www.diagnoza.com/>)

In order to specify the changes in the economic situation, the transition matrices were determined (exemplified in Tables 2 and 3) and subsequently the values of mobility

indices were calculated. In Table 2, the values above the diagonal represent the share of households that, in the examined years, has debt levels increased. The largest group (31%) concerned households whose debt increased from 6–12 months' income to the level exceeding annual income. The values below the diagonal represent the opposite situation – the share of households whose debt decreased in the examined period. In this case, the largest percentage (24%) concerned households that recorded a debt reduction (by one debt class) to the level not exceeding monthly income.

Taking into account the income situation of indebted households (Table 3), the values above the diagonal mean the share of households whose income situation improved in the examined years. The largest group (47%) concerned households whose income increased from the lowest level of income to the range of (2,000; 4,000> (PLN). The values below the diagonal mean the share of households whose income situation deteriorated during the examined period. In this case the largest percentage (27%) concerned households that recorded a reduction in income by three classes to the range of 2,000–4,000 (PLN).

Table 3. Transition probability matrix for income level

| Level of income (PLN) | | 2015 | | | | | |
|-----------------------|---------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| | | <=2000 | (2000; 4000> | (4000; 6000> | (6000; 8000> | (8000; 10000> | >10000 |
| 2009 | <=2000 | 0.3756 (0.0244) | 0.4721 (0.0252) | 0.0888 (0.0144) | 0.0203 (0.0071) | 0.0102 (0.0051) | 0.0330 (0.0090) |
| | (2000; 4000> | 0.1088 (0.0150) | 0.4398 (0.0239) | 0.3287 (0.0226) | 0.0671 (0.0121) | 0.0093 (0.0046) | 0.0463 (0.0101) |
| | (4000; 6000> | 0.0411 (0.0165) | 0.2192 (0.0344) | 0.3630 (0.0399) | 0.2123 (0.0340) | 0.0548 (0.0189) | 0.1096 (0.0259) |
| | (6000; 8000> | 0.0294 (0.0294) | 0.0882 (0.0494) | 0.2353 (0.0738) | 0.2647 (0.0768) | 0.1471 (0.0617) | 0.2353 (0.0738) |
| | (8000; 10000> | 0.0667 (0.0667) | 0.2667 (0.1182) | 0.1333 (0.0909) | 0.1333 (0.0909) | 0.0667 (0.0667) | 0.3333 (0.1260) |
| | >10000 | 0.1176 (0.0805) | 0.0588 (0.0588) | 0.0588 (0.0588) | 0.1176 (0.0805) | 0.0000 (0.0000) | 0.6471 (0.1195) |

Note: The standard error is given in brackets.

Source: own calculations based on Social Diagnosis Data (<http://www.diagnoza.com/>)

When analysing the mobility indices (Table 4), the greatest mobility can be observed in the debt situation (0.2967) of households. In this case, households were more inclined to increase debt levels (56.15%). The stability of the debt structure was also the strongest (0.6766). The material situation, which consisted of the income level and the subjective assessment of the economic situation, was characterised by a similar level of mobility. In terms of an objective assessment of the material situation (income level), households moved in the direction of higher income to a greater extent (85.50%) than in terms of a

subjective assessment of their financial situation (63.05%). The structure of subjective assessments of the material situation was more stable as well.

Table 4. Mobility indices for indebted households by selected characteristics

| Specification | Level of income | Economic situation | Indebtedness |
|---------------------|-----------------|--------------------|--------------|
| I_B | 0.2006 | 0.2073 | 0.2967 |
| Proportion of I_A | 85.50% | 63.05% | 56.15% |
| Proportion of I_D | 16.96% | 36.95% | 43.85% |
| I_S | 0.3595 | 0.6185 | 0.6766 |

Source: own calculations based on Social Diagnosis Data (<http://www.diagnoza.com/>)

Table 5. Mobility indices for level of indebtedness by level of income

| Specification | Level of income (PLN) | | | |
|---------------------|-----------------------|--------------|--------------|--------|
| | ≤ 2000 | (2000; 4000> | (4000; 8000> | > 8000 |
| I_B | 0.3015 | 0.3180 | 0.2876 | 0.2196 |
| Proportion of I_A | 63.4% | 49.0% | 59.3% | 63.1% |
| Proportion of I_D | 36.6% | 51.0% | 40.7% | 36.9% |
| I_S | 0.3301 | 0.2959 | 0.3114 | 0.4497 |

Source: own calculations based on Social Diagnosis Data (<http://www.diagnoza.com/>)

When examining the impact of the income level on the debt situation (Table 5), the greatest mobility in terms of debt levels can be observed in households with income of (2,000; 4000> (PLN). In the case of these households, migration is more frequent (51%) towards lower debt levels. For the households with the lowest and those with the highest income levels, there is a greater overall mobility towards a higher debt levels. However, high-income households are characterised by a much greater stability of debt structure (0.4497).

5 Summary

The improvement of the economic situation in the global economy is reflected by the growing debts levels. This is particularly evident in the case of developing countries. Higher household debt does inevitably lead to heavier repayment burdens. This tendency is not dangerous, as more debt is accompanied by a corresponding increasing in income.

The period 2009–2015 saw an increase in income levels of indebted Polish households (in monetary terms); the subjective perceptions of the material situation generally improved as well. Economic prosperity improved the situation of households from the lowest income classes. Better economic situation led to an increase in debt levels (expressed as a multiplicity of monthly income). The calculated mobility indices show that debt dynamics was higher than income dynamics, which confirms that households leveraged the improvement of their economic situation to increase consumption using

external sources of financing. The increase in debt is primarily observed among those least-debt-burdened and those with debt in excess of 12 months' income (mortgage).

Changes in debts levels are rather evolutionary – households gradually increase their debt (moving to the next class). At the same time, the value of the debt structure stability index confirms its stability – indebted households do not change significantly their debt status in response to higher income.

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