

An Empirical Evaluation of the Demand-Side Drivers of Household Residential Debt: The Case of Poland

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Abstract: *Purpose* – The paper aims at the identification and empirical evaluation of the demand-side drivers of household residential debt in the emerging economy of Poland.

Design/methodology/approach – The research is based on linear regression and factor analysis (with principal component extraction) of macro-level data on household residential debt, demographic changes, real estate market, labour remuneration and unemployment over the period 1997–2013.

Findings – The results of the research indicate that the demand for household residential debt in Poland is negatively associated with the level of market interest rates, relative prices of dwellings and unemployment rate. Simultaneously it appears to be positively associated with population growth, in particular in the group aged 25–34, and the number of new residential buildings.

Originality/value – The majority of relevant studies in the related literature focus on the identification of various drivers of household indebtedness without a direct empirical assessment of their actual impact on the stock of debt. Additionally, such research is conducted mostly in the context of developed economies. The present study attempts therefore to contribute to the existing literature by evaluating the impact of selected demand-side determinants of household residential debt in the specific setting of the emerging economy of Poland.

Keywords: households; indebtedness; residential debt

Introduction

The last few decades have brought a substantial increase in indebtedness of public and private sectors across many economies around the world. Although the vast majority of economic and political debates, as well as related studies in the relevant literature, discuss primarily the issue of public debt, the last global financial crisis raised serious concerns over the sustainability of private debt, especially that of the household sector.

Such concerns seem to be justified by the fact that the accumulation of household debt causes important macroeconomic consequences, as increased sensitivity of the household sector to changes in market interest rates, incomes, and asset prices, not to mention the possibility of being a direct source of negative shocks to particular national economies (Debelle 2004).

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The surge in household indebtedness was driven above all by housing loans (Finocchiaro et al. 2011). This pattern is not limited to developed economies only but it can also be found in many emerging economies, including the Polish one.

Although many studies in the related literature identify and discuss various determinants of household indebtedness, they seldom attempt to assess their influence empirically. In particular, to date the empirical evidence regarding this issue in the specific context of the emerging economy of Poland remains quite modest. Given the above, the present study is aimed at the evaluation of the actual long-run impact of key demand-side drivers of household indebtedness on the changes in the stock of residential debt in Poland.

The remainder of the paper is composed of four sections. Section one provides a review of the relevant literature on the determinants of household indebtedness. Section two briefly characterises the key features and dynamics of the household residential debt in Poland over the analysed period. The details of the methodological framework of the paper, including the development of the research hypotheses and data selection procedures are presented in Section three. The main findings of the study are discussed in Section four. The paper is closed with a brief summary presenting the key conclusions and suggestions on directions of future research.

1. The demand-side determinants of household indebtedness

The relevant literature points to a number of demand-side determinants of household indebtedness. One line of the study is aimed at the identification and empirical investigation of the impact of macro-economic variables on the amount of household debt. For instance, Barnes and Young (2003) found that the rise of US household debt in the 1990s might be explained by unexpected shocks to income growth and to real interest rates.

Jacobsen (2004) provided evidence that household debt in Norway over the period 1994–2004 was determined by the changes in the real value of housing stock, house prices, number of house sales, the average level of a bank's lending rate, total wage income in the economy, the rate of unemployment, and the share of students in the population (statistically persons with higher education tend to take up higher residential loans).

The results of a study by Dynan and Kohn (2007) suggest that rising household debt in the US was caused primarily by the combination of growing house prices and financial innovation that reduced the cost and increased the availability of housing finance. Furthermore, they argue that household indebtedness was boosted also by the concentration of the “baby boomers” generation in the part of the lifecycle where debt use is highest, increases in educational attainment, declining longer-term interest rates and increases in expected incomes.

According to Bloxham and Kent (2009) the demand for household debt in Australia was driven by the reduction in macroeconomic volatility, in particular falling unemployment, inflation and interest rates, accompanied by an ageing population, as well as changes in taxes

and subsidies that rendered residential loans more attractive. More research on Australian household debt, conducted by Meng, Hoang and Siriwanda (2011), revealed that a key role in its increase was played by the growth of the GDP, followed by rising housing prices and the number of new dwellings. Simultaneously interest rates, unemployment rate and inflation were found to be negatively related to the stock of debt.

In general, most of the aforementioned studies regarding the context of developed economies explain the widespread rise of household debt prior to the last global financial crisis through significantly decreased macroeconomic volatility that reduced the risk aversion amongst both borrowers and lenders, which in turn fuelled the demand for residential loans and led to a sharp rise in house prices.

A few studies of the US market suggest, however, that an important role in stimulating households' demand for debt was played by stagnant real wages and retrenchments in the welfare state accompanied by the increased availability of credit (Barba and Pivetti 2009). According to Leicht (2012) the combination of those factors allowed many US households to substitute insufficient income growth with debt and thus to simulate their social class.

Another study on the demand-side determinants of indebtedness focuses on the key socio-economic characteristics of households based on micro-level data, in particular the age of the head of the household, the number of household members, their educational attainment, current and expected future incomes, or wealth profile. Empirical evidence for a hump-shaped relationship between age and debt in Thailand, consistent with the life cycle model of consumption, was provided by Thaicharoen et al. (2004). The findings indicated that household indebtedness is positively associated with educational attainment, household size, housing tenure and negatively with the changes in the level of interest rates. Furthermore it is argued that less educated persons are more likely to fall into financial distress or become over indebted, which is consistent with the results of an investigation of the US households by Lusardi and Tufano (2009). In turn, Keese (2009) argues that a primary source of household over indebtedness in Germany were residential loans, followed by childbirth and unemployment.

In the study of household indebtedness in Italy, Magri (2007) provides evidence that the demand for bank loans is determined by the age of the head of the household (being highest around the age of 30) while the size of loan is positively associated with the household's net wealth and income profile. Her findings also indicate that higher incomes not only increase the demand for debt but also reduce credit rationing by banks. Correspondingly, a comparative study of UK, German and US markets by Brown and Taylor (2008) demonstrated that indebtedness is stimulated by income and household size.

Finally, a considerable bulk of studies identifies and evaluates numerous psychological drivers of household demand for debt, such as personality, motivations, purposes of action, abilities, personal preferences, perceptions, locus of control (capacity of controlling the events of life), interpersonal factors (reference group, dominant culture, behavioural

patterns, ethic and aesthetic values, modes of communication) or subjective factors (personal needs, aspirations, motivations, cultural level) – see e.g. Cosma and Pattarin (2012).

2. Household residential debt in Poland

Until the first half of the first decade of the 21st century the overall level of household indebtedness in Poland was very low, with total outstanding residential debt below 5% of the country's GDP. The growth of housing loans picked up pace around the time of accession to the European Union in May 2004. Over the period 2004–2013 the value of total outstanding residential loans rose almost tenfold, reaching 345.5 billion PLN (20.8% of the GDP) at the end of 2013 (Fig. 1).

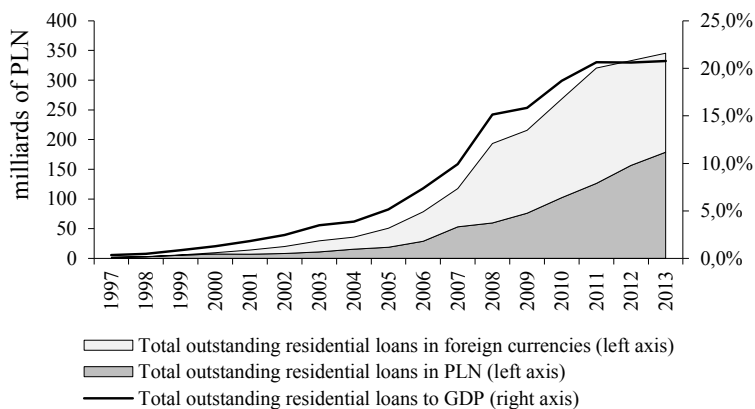


Figure 1. The structure and dynamics of residential loans in Poland over the period 1997–2013

Source: own elaboration based on *Assets and liabilities of monetary financial institutions (monthly data)* (2015), National Bank of Poland, www.nbp.pl/en/statystyka/czasowe_dwn/nalez_zobow_mif_en.zip (7.04.2015).

According to Paczóska (2008) the demand for residential loans was strongly stimulated by increasing demand for dwellings caused by rising household incomes as a result of the improving performance of the Polish economy, as well as the concentration of the 1979–1984 “baby boomers” generation that was gradually reaching the age of the highest activity in the credit market (28–32 years old). Additional factors boosting household debt were falling unemployment, lower inflation and lower interest rates (Szponarowicz 2012).

A recent investigation of the sources of mortgage indebtedness of Polish households by Białowolski (2014) suggests that until 2007 it was driven primarily by the increased availability of residential loans resultant from the transition of the Polish credit market. In turn, since 2007 a key role in this process had been played by rising incomes and new young adults (with families) entering the credit market.

A distinctive feature of the Polish mortgage market is a relatively high share of residential loans denominated in foreign currencies, in particular the Swiss franc. Over the period 2002–2012 they accounted for the majority (from 53% in 2012 up to even 69% in 2008) of the total value of outstanding housing loans. The primary motivation stimulating households' demand for loans denominated in foreign currencies were significantly lower interest rates charged on such loans compared to analogous financing in PLN. Also, since 2004 the Polish zloty began to appreciate gradually towards foreign currencies, which additionally increased the attractiveness of FX loans. In the second half of 2008 this trend was, however, suddenly broken by the announcement of the bankruptcy of the Lehman Brothers, which resulted in a strong depreciation of PLN in response to rapidly growing risk aversion in global financial markets.

Despite the aforementioned surge in household indebtedness, its relation to GDP in Poland remains moderate compared to more advanced European economies (Fig. 2).

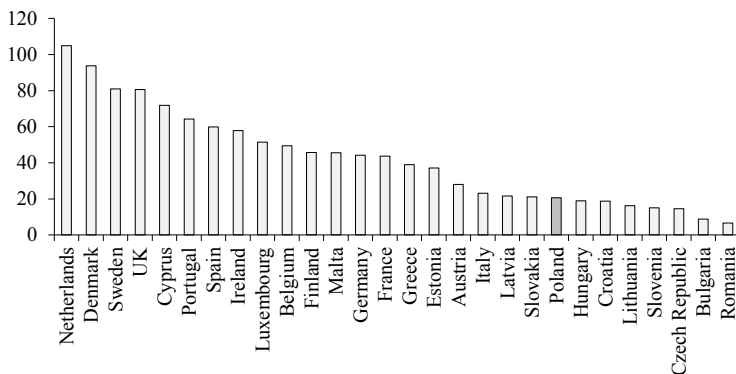


Figure 2. Total outstanding residential loans to GDP in Poland and selected European countries in 2013 (%)

Source: own elaboration based on *HYPOSTAT 2014. A review of Europe's mortgage and housing markets*, European Mortgage Federation, p. 74.

At the end of 2013 the ratio of total outstanding residential loans to GDP reached 20.8%, far below the levels in the Netherlands (104.9%), Denmark (93.8%), Sweden (80.9%) or the United Kingdom (80.6%). On the other hand, the relative size of the Polish mortgage market appears typical for emerging European economies, except Bulgaria and Romania that seem to be lagging behind.

3. Research design

Given the conclusions derived from the prior studies and the availability of macro-level data for the Polish market the following set of hypotheses was developed:

Hypothesis 1: *The demand for household residential debt in Poland is positively associated with:*

- the overall population growth,
- the growth of the population aged 25–34,
- the number of newly built residential dwellings,
- the ratio of the average price of usable floor space of residential buildings to average labour compensation.

Hypothesis 2: *The demand for household residential debt in Poland is negatively associated with:*

- the level of market interest rates,
- the unemployment rate.

To test the above hypotheses, the following linear regression model (hereinafter referred to as Model 1) was constructed:

$$\Delta RD_{FXA_t} = \alpha_0 + \alpha_1 i_t + \alpha_2 \frac{UFSP_t}{AWS_t} + \alpha_3 OPG_t + \alpha_4 PG_{(25-34)_t} + \alpha_5 NB_t + \alpha_6 UR_t + \varepsilon_t,$$

where:

ΔRD_{FXA_t} – the change in the value of total outstanding household residential debt in year t controlled for the impact of the exchange rate between PLN and CHF,
 α_0 – intercept,

$\alpha_1, \dots, \alpha_6$ – regression coefficients,

i_t – weighted average interbank interest rate in year t calculated on the basis of WIBOR 3M and Swiss franc LIBOR 3M with total outstanding household residential debt in domestic currency and foreign currencies as weights (percentages),

$UFSP_t$ – average price of usable floor space of residential buildings in year t (PLN),

AWS_t – average monthly gross wage and salary in the national economy in year t (PLN),

OPG_t – overall population growth in year t (thousands),

$PG_{(25-34)_t}$ – the change in the number of the population aged 25–34 (thousands),

NB_t – the number of newly built residential dwellings started in year t (thousands),

UR_t – average registered unemployment rate in year t (percentages),

ε_t – error term.

In the light of the formulated hypotheses the estimated values of regression coefficients $\alpha_2, \alpha_3, \alpha_4$ and α_5 of Model 1 were expected to be positive, whereas the values of the remaining two (α_1 and α_6) – negative.

In the next stage of the research, to reduce the number of explanatory variables and mitigate the potential multicollinearity issues that might arise from a relatively small number of observations due to the limited availability of data, a factor analysis with principal

components extraction was carried out. The components were extracted using the varimax method with Kaiser normalisation and then linearly regressed against ΔRD_{FXAt} .

The research was based on the macro-level data provided by the National Bank of Poland (NBP), Central Statistical Office of Poland (CSO) and Stooq.pl website. Due to the limited availability of historical data the analysis covers the period 1997–2013. The data on the value and structure of household residential debt were collected from the website of the NBP (*Assets...* 2015). In turn, the data on population growth, unemployment rates, the number of newly built residential dwellings, average monthly wage and salary in the national economy and average prices of a square meter of usable floor space of residential buildings were extracted from the publications and databases of the CSO (*Average...* 2015; *Local...* 2015; *Price...* 2015). Finally, the data on interbank interest rates and the exchange rate between PLN and CHF were collected from the Stooq.pl website (*LIBOR...* 2015; *WIBOR...* 2015; *Swiss...* 2015).

4. Results

Table 1 presents the results of the estimation of Model 1 over the period 1997–2013.

Table 1

Results of the estimation of Model 1

Model: $\Delta RD_{FXAt} = \alpha_0 + \alpha_1 i_t + \alpha_2 \frac{UFSP_t}{AWS_t} + \alpha_3 OPG_t + \alpha_4 PG_{(25-34)_t} + \alpha_5 NB_t + \alpha_6 UR_t + \varepsilon_t$,

Parameter	Estimated value	Standard error	p-value	VIF
α_0	132.467**	58.960	0.048	
α_1	-55.858*	29.054	0.083	3.160
α_2	-73.575**	29.496	0.032	8.670
α_3	0.020	0.011	0.116	1.818
α_4	0.052**	0.251	0.034	1.762
α_5	0.135	0.093	0.180	6.580
α_6	-3.420**	1.282	0.024	11.762
R ²	0.940	4.61854		
Adj. R ²	0.905			
F-statistic	26.320		0.000	
N	17			

** parameter is significant at the 0.05 level; * parameter is significant at the 0.10 level.

Source: own development.

The constructed regression model proved to be statistically significant. The combined variability of the explanatory variables was able to explain over 90% of the variation in the yearly changes of the residential household debt controlled for the impact of the exchange

rate over the analysed period. The values of variance inflation factors (VIF) indicate, however, a potential problem with the multicollinearity of some explanatory variables, in particular the average unemployment rate (UR_t). This issue is likely to be resultant from a relatively small number of observations in the examined time-series due to the limited availability of data.

Consistent with expectations, the estimated values of parameters α_1 and α_6 were negative and statistically significant (the former at the 10% level and the latter at the 5% level). These findings suggest that the dynamics of indebtedness over the analysed period was strongly dependent on the level of interest rates and conditions in the labour market. Falling interest rates and unemployment were therefore important drivers of households' demand for residential debt, which supports the second hypothesis of the present study.

As regards the first hypothesis, the findings are mixed. On the one hand, the values of coefficients α_3 , α_4 , and α_5 were positive, however, only the changes in the number of the population aged 25–34 appeared to have a statistically significant impact on the dependent variable. Additionally, the responsiveness of ΔRD_{FXA} to changes in this particular age group was more than two times higher than the one for the whole population, which suggests the higher activity of persons, aged 25–34 in the mortgage credit market. The responsiveness of the dynamics of residential debt to demographic variables was, however, relatively low compared to other explanatory variables.

On the other hand, contrary to findings of prior international studies, the results of the estimation indicate that the changes in relative house prices (measured with $UFSP_t/AWS_t$ ratio) were significant and negatively associated with the dynamics of residential debt. In other words, during the periods when dwellings were relatively expensive compared to average labour remuneration the demand for residential debt was meaningfully lower.

In the next stage of the research, in order to reduce the number of explanatory variables and mitigate the problems with multicollinearity, a factor analysis was carried out. The results of the extraction of principal components using the varimax method are presented in Table 2.

Table 2

Rotated components matrix

Variable	Component		
	1	2	3
i_t	0.870	0.111	-0.290
$UFSP_t/AWS_t$	0.943	-0.210	0.121
OPG_t	-0.012	-0.086	0.950
$PG_{(24-35)t}$	-0.284	0.605	0.503
NB_t	-0.363	-0.854	0.156
UR_t	-0.497	0.837	-0.049
% of variance	35.099	30.979	21.347
cumulative %	35.099	66.078	87.425

Source: own development.

The factor analysis resulted in the extraction of three principal components being able to explain 87.4% of the variance of the examined explanatory variables. The first component (accounting for 35% of the total variance) is strongly positively associated with the relative price of dwellings and the level of interbank interest rate. Therefore, the higher values of this component correspond to the lower affordability of house purchases, more expensive debt service and the lower creditability of households.

The second component (accounting for about 31% of the total variance) is somewhat harder to interpret, as it is strongly negatively correlated with the number of newly built residential dwellings and positively associated with the unemployment rate. It might therefore be viewed as a proxy of risk involved with long-run investments in the real estate market.

Finally, the last component (accounting for 21% of the total variance) reflects primarily the impact of demographic variables, as it is positively correlated with the changes in both: total population and its fraction aged 25–34.

The extracted components were then employed as explanatory variables in linear regression with ΔRD_{FXA} according to the following formula (hereinafter referred to as Model 2):

$$\Delta RD_{FXA_t} = \beta_0 + \beta_1 PC_{1t} + \beta_2 PC_{2t} + \beta_3 PC_{3t} + \varepsilon_t,$$

where:

- β_0 – intercept,
- β_1, \dots, β_3 – regression coefficients,
- PC_{it} – rotated principal component i in year t .

Given the proposed interpretations of each principal component, one can expect negative values of the estimates of parameters β_1 and β_2 , and a positive value of parameter β_3 .

The results of the estimation of Model 2 are presented in Table 3.

Table 3

Results of the estimation of Model 2

Model: $\Delta RD_{FXA_t} = \beta_0 + \beta_1 PC_{1t} + \beta_2 PC_{2t} + \beta_3 PC_{3t} + \varepsilon_t$				
Parameter	Estimated value	Standard error	p-value	VIF
β_0	17.272***	1.472	0.000	
β_1	-8.837***	1.517	0.000	1.000
β_2	-73.575***	29.496	0.000	1.000
β_3	0.020***	0.011	0.002	1.000
R ²	0.866	6.06950		
Adj. R ²	0.835			
F-statistic	28.077		0,000	

*** parameter is significant at the 0.01 level.

Source: own development.

The use of rotated principal components as explanatory variables allowed to eliminate the multicollinearity ($VIF = 1$ for each predictor) at the expense of losing some predictive power of the model. Although the adjusted R^2 of Model 2 (83.5%) dropped by 7 percentage points compared to the one of Model 1, the regression remained statistically significant.

All of the estimated regression coefficients of Model 2, were statistically significant at the 1% level. Consistent with expectations, the values of coefficients β_1 and β_2 turned out to be negative while the one of β_3 was positive. These findings suggest that the demand for residential debt in Poland over the analysed period increased when:

- the values of the first principal component, reflecting the price/income relationship in the real estate market and the costs of debt service, decreased (corresponding to relatively less expensive dwellings and lower market interest rates),
- the values of the second component, characterising the perception of risk inherent in long-term investments in the real estate market, decreased (corresponding to lower unemployment rates and the higher number of newly built residential dwellings started),
- the values of the third component, representing the demographic changes, increased (corresponding to the higher growth of both the total population and its fraction of the most active credit market customers aged 25–34).

The results of the analysis provide, therefore, only partial support for Hypothesis 1. Although the demand for residential debt in Poland seems positively related to overall population growth, the increase in the number of the population aged 25–34, and the number of newly built residential dwellings; it is also negatively associated with the relative prices of dwellings. Simultaneously, the obtained evidence supports Hypothesis 2, as the demand for residential debt is negatively associated with the level of market interest rates and unemployment.

Conclusions

The analyses conducted in the present study provide empirical evidence on the macro-scale drivers of households' residential debt in the emerging economy of Poland over the period 1997–2013. Consistent with the findings of prior studies in the relevant literature the obtained results suggest that this demand is negatively related to the level of market interest rates and unemployment rate and positively to the population growth, in particular its fraction aged 25–34, and the number of newly built residential dwellings started. Contrary to expectations, however, the demand for residential debt appears to be negatively associated with the ratio of the average prices of dwellings related to average labour remuneration.

The results of the study can be used for analysing the responsiveness of the demand for households' residential debt to changes in selected macroeconomic and demographic variables. Such analyses may be useful for supporting decisions regarding the directions of monetary policy or supervisory regulations. Given the importance of this issue, the future

research might focus on enhancing the framework proposed in the present study, in particular through analysing the impact of other combinations of explanatory variables on the demand for residential debt.

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EMPIRYCZNA OCENA DETERMINANT POPYTU NA KREDYTY NA FINANSOWANIE NIERUCHOMOŚCI W GOSPODARCE WSCHODZĄCEJ – PRZYKŁAD POLSKI

Streszczenie: *Cel* – Celem artykułu jest identyfikacja i weryfikacja empiryczna determinant popytu na kredyty na finansowanie nieruchomości w gospodarce wschodzącej na przykładzie Polski.

Metodologia badania – Badanie zostało przeprowadzone w oparciu o analizę regresji liniowej oraz analizę czynnikową (z wyodrębnieniem składowych głównych) danych makroekonomicznych dotyczących: zadłużenia gospodarstw domowych z tytułu kredytów na finansowanie nieruchomości, zmian demograficznych, rynku nieruchomości, wynagrodzeń oraz bezrobocia w okresie 1997–2013.

Wynik – Rezultaty badania wskazują, że popyt gospodarstw domowych na kredyty finansowanie na nieruchomości w Polsce jest negatywnie skorelowany z poziomem rynkowych stóp procentowych, relatywnymi cenami nieruchomości mieszkaniowych i stopą bezrobocia. Jednocześnie wydaje się on pozytywnie skorelowany z liczebnością populacji, w szczególności w grupie wiekowej 25–34 lata oraz liczbą mieszkań, których budowę rozpoczęto.

Oryginalność/wartość – Większość opracowań w literaturze przedmiotu koncentruje się na identyfikacji różnorodnych determinant zadłużenia gospodarstw domowych, pomijając bezpośrednią ocenę ich faktycznego wpływu na poziom długu. Ponadto, tego typu badania są prowadzone głównie w kontekście gospodarek rozwiniętych. Przedmiotowy artykuł stanowi próbę wzbogacenia istniejącej literatury przedmiotu poprzez oszacowanie wpływu wybranych determinant popytu na kredyty na finansowanie nieruchomości w warunkach wschodzącej gospodarki na przykładzie Polski.

Słowa kluczowe: gospodarstwa domowe, zadłużenie, dług mieszkaniowy

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