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# Assessment of Factors Determining the Level of Private Credit in European Union Countries

This paper aims to evaluate the factors determining countries' private credit level as well as to identify the differences of their effect during the periods when the levels of country private credit exceeded 100 percent of GDP or were below. The research methodology relies on two modifications of the multiple regression model with log differences of variables. Research results showed a negative impact of economic growth and a positive impact of consumer prices and housing prices on the level of private credit. It has also been found that in the first period when the level of private credit to GDP exceeds the 100 per cent threshold households tend to borrow more than in other periods. In the second model distinguishing between periods when the level of country's private credit was below 100 per cent of GDP and when this level was reached or exceeded the research showed that the effects of economic growth do not differ between periods of high and low indebtedness, but the difference becomes apparent when assessing the impact of household income and expenditure, thus confirming the impact of the marginal financial depth.

**Keywords:** level of private credit, high indebtedness, household income/expenditure, threshold.

Šiame straipsnyje siekiama įvertinti veiksnius, lemiančius šalies privačių paskolų lygį, taip pat jų poveikio skirtumus laikotarpiais, kai šalies privačių paskolų lygis viršijo 100 proc. BVP ir kai šis dar nebuvo pasiektas. Tyrimo metodika remiasi dviem daugialypės regresijos modelio modifikacijomis su logaritmuotų kintamųjų reikšmių pokyčiais. Tyrimo metu nustatytas neigiamas ekonomikos augimo poveikis ir teigiamas vartojimo kainų lygio bei nekilnojamojo turto kainų poveikis privačių paskolų lygiui. Taip pat buvo nustatyta, kad pirmuoju laikotarpiu, kai privačių paskolų santykis su BVP viršija 100 proc. ribą, namų ūkiai linkę skolintis daugiau nei kitais laikotarpiais. Antrajame modelyje atskyrus laikotarpius, kuomet šalies privačių paskolų lygis nesiekė 100 proc. BVP ir kai šis lygis buvo pasiektas ar viršytas, nustatyta, kad ekonomikos augimo poveikis nesiskiria aukšto ir žemo įsiskolinimo lygio laikotarpiais, tačiau šis skirtumas išryškėja vertinant namų ūkių pajamų ir išlaidų poveikį, taip patvirtinant ribinio finansinio gylio poveikį.

**Raktiniai žodžiai:** privačių paskolų lygis, aukštas įsiskolinimo lygis, namų ūkių pajamos / išlaidos, ribinis lygis.

## Introduction

Deepening processes of internationalization and globalization attract the significant interest of researchers, policymakers, and practitioners to examine the causes of financial instability, banking and thrift collapse, and the nature of

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the economic cycle. The phenomenon of the recent financial crisis led to economic instability and difficult recovery in many parts of the world, so there is a need to assess the processes taking place not only in one country but also in groups of countries. It becomes relevant to assess the factors that cause level of private credit, as these levels in countries are quite sensitive to economic fluctuations and often exceed GDP.

Most previous studies examine the determinants of credit growth in a country (Tan, 2012; Shijaku & Kalluci, 2013; Akinlo & Oni, 2015; Shingjergji & Hyseni, 2015; Ivanovic, 2016; Boako et al., 2017; Bambulovic & Valdec, 2018; Matuka, 2019). However, rising lending in one country or in groups of countries can become a threat to other countries and their economies. For this reason, it is important to study not only the situation of individual countries, but also the situation of their groups and the factors that determine it. Previous studies reveal the positive impact of economic growth on credit demand (Guo & Stepamyan, 2011; Said & Tumin, 2011; Shijaku & Kalluci, 2013; Karimzadeh et al., 2013; Hassan & Qayym, 2013; Moyi, 2019); however, the impact of inflation (Sharma & Gounder, 2012; Chowdhury, 2012; Wagner & Winkler, 2013; Hassan & Qayym, 2013; Kiyak & Paulionienė, 2014; Chaibi & Ftiti, 2015) and unemployment (Bolt et al., 2012; Castro & Kubota, 2013; Zampara et al., 2017) on credit growth is negative. Low housing prices (Goodhart & Hofmann, 2008) and interest rates (Maddaloni & Peydró, 2011) boost the demand for private credits. In addition, it is important to consider the level of private credit ratio: if it reaches 80–100% of GDP, this can become a risky economic situation for the country's development in the future. This research complements the limited evidence on assessing the level of private loans taking into account periods of high indebtedness. The impact of high percentage of private loans was confirmed in previous studies by W. Easterly et al. (2000), S. G. Cecchetti et al. (2011), S. G. Cecchetti and E. Kharroubi (2012), M. F. Arsene and D. D. Guy-Paulin (2013), E. Dabla-Norris and N. Srivisal (2013), and S. H. Law and N. Singh (2014), J. L. Arcand et al. (2015), B. Cournede and O. Denk (2015), L. Ductor and D. Grehyna (2015), J. L. Ruiz (2018). It could be stated that there are not many studies that evaluate the determinants of private credit volumes taking into account as well the level of private loans, and this implies the importance of analysing the direction and strength of the determinant impact. **The paper aims** to evaluate the factors determining countries' private credit level. **The problem of the research** is related to determining the factors of the countries' private credit level, evaluating the direction and strength of the determined factors and assessing whether the effects of these factors differ during periods of high and low private indebtedness.

The paper is organized as follows. The second section presents the literature review on factors determining the level of private credit. The third section describes the methodology and estimation strategy. The next sections provide estimation results and discussion. The last section concludes the paper.

## Review of the literature on factors determining country private credits

Summarizing previous empirical research, it was found that the level of private loans is affected by macroeconomic (economic growth, unemployment rate, loan interest rates, real estate prices, and inflation) and internal bank factors (amount of risky loans in the bank, bank size, and deposits). As our goal is to evaluate the impact of macroeconomic factors, we will discuss the results of previous research analysing macroeconomic determinants determining the level of private credit.

Higher GDP growth leads to higher demand for credit and hence higher credit growth (Guo & Stepamyan, 2011). According to G. Shijaku and I. Kalluci (2013), the improving economic situation increases the confidence of economic entities that they can afford to repay credits. M. Karimzadeh et al. (2013) and R. M. Said and M. H. Tumin (2011) argue that GDP growth has a positive effect on both bank and customer expectations, as not only the demand for new credits is increasing, but also banks are more willing to increase the supply of credit.

The amount of credits granted by banks also depends on the economic cycle. During the periods of economic growth, banks provide more credits as manufacturing firms begin to utilize their productive capacity. This leads to a greater need for investment, which is why company executives decide to borrow capital from banks. According to F. Hassan and A. Qayym (2013), rapid economic growth increases firms' expectations for higher profits and future income, leading firms to increase demand for credit to expand and initiate new projects to reap future benefits. E. D. Moyi (2019) argues that during the economic upturn, banks are willing to lend to entrepreneurs and individuals by lowering interest rates and easing lending stan-dards, as production growth guarantees higher incomes for entities, increasing the likelihood that loans will be repaid. However, when there is an economic downturn in a country, banks reduce the issuance of private credits (Gambacorta & Ibanez, 2011; Brei & Schclarek, 2013), as the unfavorable domestic macroeconomic situation leads to a deteriorating situation of borrowers. During the economic downturn, business and personal incomes are declining, unemployment is rising, corporate losses are increasing, the number of bankruptcies is growing, and expectations for the future are changing. For these reasons, there are problems with credit execution, with an increase in credit defaults and a modest increase in private credits (Moyi, 2019).

According to D. Kiyak and L. Paulionienė (2014), the behavior of consumers largely depends on the level of inflation they expect in the future. If consumers expect inflation to fall and their real income to rise, it is likely that consumers will tend to take out fewer loans and give up expensive purchases. The real value of a credit usually falls when faced with high inflation (Wagner & Winkler, 2013). The consumer will then give priority to the purchase of goods when taking out a credit, as the credit installments will be repaid in cash that has already been depreciated. N. Klein (2013) argues that the rate of inflation by reducing the real value of debt, which facilitates the ability to repay the

outstanding amount, is debatable because real income is also affected by inflation. A study by P. Sharma and N. Gounder (2012) found that inflation has a significant negative impact on credits. According to Chaibi and Z. Ftiti (2015), this happens because high inflation reduces real income and deteriorates borrowers' access to credit. An increase in inflation is associated with project risk, as it has an impact on costs and revenues, and high inflation rates are likely to lead to less investment by firms (Hassan & Qayym, 2013). Y. Taner (2000) investigated that unexpected inflation raises interest rates, leading to a decline in the volume of loans due to reduced demand for loans. K. E. Chowdhury (2012) argues that as inflation increases, banks raise interest rates to adjust to changes in inflation.

Thus, unemployment is one of the most important factors affecting the financial situation of households. Increasing unemployment rates negatively affect household cash flows and increase the debt burden (Bolt et al., 2012; Castro & Kubota, 2013; Zampara et al., 2017). According to S. Pašič and A. Omerbegovič-Arapovič (2016), increased unemployment leads to job losses for bank customers and they may result in default. According to A. S. Messai and F. Jouini (2013), the increase in non-performing loans due to the increased unemployment rate has a negative impact on banks' profitability, as banks incur additional costs, leading to a decision to tighten lending conditions, thus reducing the supply of loans.

Housing prices influence the demand for credits through the impact of assets on consumption and investment, and pledged properties also affect the supply of loans (Goodhart & Hofmann, 2008). When low real estate prices prevail, households are willing to borrow from banks to buy housing because housing is more affordable. In addition to this property effect, house prices also have an additional effect since houses are used as collateral for loans because they are immobile and therefore cannot be easily removed from the assets of borrowers. However, higher housing prices not only encourage homeowners to spend and borrow more, but also enable them to do so by increasing borrowing opportunities (Arestis & Gonzalez, 2014). Increasing housing prices reduce the availability of housing, which is reducing the demand for household credits, as the debt service burden is rising as mortgage prices rise.

Low interest rates foster private credit growth as it boosts the demand for private credits. A. Maddaloni and J. L. Peydró (2011), examining improvements in borrowers' creditworthiness due to cheaper credit, argue that low short-term interest rates ease lending standards for both businesses and households, especially if interest rates remain too low for too long. On the contrary, if the interest rate increases, the demand for households and businesses decreases as the price of the credit increases.

Having regard to the level of financial development, it can be seen that private credit, when it reaches a level above GDP, becomes an obstacle to economic growth. Countries with a high percentage of private credit to GDP have more developed economies (Cecchetti & Kharroubi, 2012). However, when lending to the economy is insufficient, it causes a problem of slow economic growth. And when credit to the private sector is too high

for the economy, it increases inflation, which turns the country into a problem of high inflation (Arsene & Guy-Paulin, 2013). Despite the lack of consensus on the turning point in the impact of private sector credit on the economy, most authors set it at close to 100% of GDP. J. L. Arcand et al. (2015) found that the marginal effect becomes negative when the level of private sector lending reaches 80–100% of GDP; B. Cournede and O. Denk (2015), W. Easterly et al. (2000), S. G. Cecchetti et al. (2011) confirm it when the private credit ratio to GDP is 100%. This is confirmed by L. Ductor and D. Grehyna (2015) that exceeding the 100% of GDP threshold for credits has a negative effect, but they have also found a positive effect in the short run. S. G. Cecchetti et al. (2011) also point to marginal levels of credits to households and non-financial corporations to 85% and 90% of GDP, respectively, which have a negative impact on economic growth. E. Dabla-Norris and N. Srivisal (2013) found that the positive impact of private sector loans on the economy becomes statistically insignificant when this indicator reaches 105% of GDP. S. G. Cecchetti and E. Kharroubi (2012) and Law and Singh (2014) state that the turning point for private sector lending is 90% of GDP. They emphasize that the faster the financial sector grows, the slower the economy as a whole grows. As the financial sector competes with the rest of the economy for limited resources, financial booms are not conducive to growth. This shows that if private sector lending increases, it does not stimulate economic growth, but actually hinders growth. However, J. L. Ruiz (2018) believes the opposite, he argues that the growth of developing countries that do not reach the financial threshold is slower, and that countries which exceed economy are growing faster.

Summarizing the results of previous studies, it can be stated that inflation and GDP growth rate are negatively correlated with higher risky bank loans (Škarica, 2014; Beck et al., 2015). Furthermore, higher unemployment is associated with higher risk loans because high unemployment reduces the ability to repay credits (Nkusu, 2011; Klein, 2013). B. Škarica (2014) emphasises the negative impact of the economic slowdown. Rising interest rates increase the cost of repayable credits (Louzis et al., 2012; Beck et al., 2015), which negatively affects credit repayments. It is also important to pay attention to the level of private sector credit, as excessive credit growth can be an important factor in the formation of economic imbalances, and rapidly growing borrowing can lead to an increase in the current account deficit and a decline in credit risk premia.

## Research design, data and methodology

The research is conducted using a multiple regression model with panel data covering all countries of the European Union (28 countries) in the period 1999-2018. According to the authors, it is expedient to focus on a longer period of time to assess the factors determining the volume of private credit, as it is possible to include more variables explaining private credit in the model and to identify the main trends more accurately.

Data for all model variables were taken from the World Bank database.

The model uses the logarithmic differences in the share of private credit in GDP (ld*privatecredi*t) as a dependent variable. The indicator reflects private credit to households from banks, leasing and insurance companies, and pension funds.

The volume of private credit in a country can be determined by different factors and their effects are different. Gross domestic product, and in particular its growth, can be considered as one of the main factors that can determine the general economic situation of a country, and at the same time promote or inhibit the growth of private credit. Increased GDP may boost incomes, expectations, banks' confidence in borrowers' ability to pay their debts and households' borrowing.

The gross domestic product indicator is quite general, it describes the general situation of the country and its sectors. As the study assesses the level of private credit, in order to assess whether the level of private credit is affected by the economic situation of one of the sectors of the economy, households, household income is included in the model. The inclusion of this factor allows for a more accurate assessment. Income reflects the consumption potential of households. Households are likely to tend to consume less as income reduces, so they are less likely to use credit. As incomes rise for some time, household spending also rises, which encourages households to consume more or buy real estate, using credit.

However, it may be that when incomes fall consumers tend to consume as much as before, only the perpetuation of incomes encourages the use of credit to cover their consumption costs. This aspect may be reflected in the household expenditure indicator. The higher the cost, the potentially greater the need for households to borrow more or new loans can be used to repay loans already taken. The impact of revenue and expenditure will be assessed separately in the study, including these indicators in the different modifications of the model.

The model also assesses the impact of the price level on the level of private credit. Inflation, as measured by the consumer price index, reflects the annual percentage change in the prices of the average consumer for the purchase of a basket of goods and services. It does not cover all goods on the market, but their quantity is sufficient to reflect changes in prices throughout the market. Rapid increases or decreases in inflation can affect both the demand and supply of private loans, so it is important to include this indicator in the model.

The impact of housing prices is also assessed in the research. The need to buy housing is one of the main reasons for household borrowing. With lower house prices, housing is likely to become more affordable for households, making households more inclined to buy housing through loans. Rising prices in the housing market increase the credit burden, so potential consumers are reluctant to borrow, due to lack of funds and uncertainty about the future.

Unemployment can also affect private debt as its growth affects household incomes, the decline of which may have the effect of reducing private lending, as households reduce their needs and, from a bank perspective, banks' mistrust of customers increases. Decreases in customer income and solvency, as well as

defaults, can lead to losses for banks and, on the other hand, rising unemployment worsens the financial situation, making credit an additional source of financing for consumer spending. This may lead to a higher level of credit.

The model also assesses the impact of interest rates on the level of private credit. This factor reflects the cost of the credit. The higher the interest rate, the less willingness to take out a loan, and vice versa, if the interest rate is low, the willingness to borrow is higher. The interest rate is likely to have a negative impact on the level of private credit.

The dummy variable threshold assesses the impact of the current level of private lending on the change in loans. Empirical studies (Easterly et al., 2000; Cecchetti et al., 2011; Cournede & Denk, 2015) have found that if the level of private lending is less than 100 percent of GDP, it does not slow down a country's economic growth. It is emphasized that the level of private credit below this threshold has a positive effect on the country's economy, but when this level is exceeded, economic growth slows down (Dabla-Norris & Srivisal, 2013). The threshold variable is binary, it is encoded in the model as 1 or 0. A value of 1 encodes only the first period when the 100 percent threshold is exceeded, as the aim is to check whether these changes are relevant to the volume of private credit.

In the first stage of the investigation, a multiple regression model is used with logarithmic differentiated variables is used. Three model modifications are used, replacing one model variable that reflects the incentive of the private sector to borrow: gross domestic product, household income and household expenditure. Table 1 shows the model variables and their measurement.

The first modification of the first model uses the GDP indicator:

$$\mathrm{ld}privatecredit_{it} = \alpha + \theta_t + \beta_1 \mathrm{ld}gdp_{it} + \beta_2 \mathrm{ld}_price_{it} + \beta_3 \mathrm{ld}unempl_{it} + \beta_4 \mathrm{ld}interest_{it} + \beta_5 \mathrm{ld}housingpr_{it} + \beta_6 threshold_{it} + \varepsilon_{it} \quad (1.1)$$

The second modification uses the household income indicator:

$$\mathrm{ld}privatecredit_{it} = \alpha + \theta_t + \beta_1 \mathrm{ld}income_{it} + \beta_2 \mathrm{ld}price_{it} + \beta_3 \mathrm{ld}unempl_{it} + \beta_4 \mathrm{ld}interest_{it} + \beta_5 \mathrm{ld}housingpr_{it} + \beta 6 threshold_{it} + \varepsilon_{it} \quad (1.2)$$

The third modification uses the household expenditure indicator:

$$\mathrm{ld}privatecredit_{it} = \alpha + \theta_t + \beta_1 \mathrm{ld}exp_{it} + \beta_2 \mathrm{ld}price_{it} + \beta_3 \mathrm{ld}unempl_{it} + \beta_4 \mathrm{ld}interest_{it} + \beta_5 \mathrm{ld}housingpr_{it} + \beta_6 threshold_{it} + \varepsilon_{it} \quad (1.3)$$

The second stage of the research distinguishes periods when the level of private credit reaches high level of indebtedness. The model includes an interaction variable which consists from gross domestic product, household income or household expenditure (one in each modification), and a dummy variable of high indebtedness. This dummy variable differs from the one used in the first model because it aims to take into account all periods when the private credit level shows high indebtedness, not only the first. The dummy variable is equal to 1 if the private credit level is equal to, or exceeds 100 percent, or 0 if the private credit level is less than 100 percent. The different modifications of the model allow to determine if the impact of GDP, household income, and household expenditure on changes in household credit depends on the current level

*Table 1.* **Model variables**

| Variable | Indicator | Model variable |
|---|---|---|
| Private credit | Private credit as a percentage of GDP | *privatecredit* |
| Gross domestic product | Real GDP per capita, in euros | *gdp* |
| Household income | Household income as a percentage of GDP | *income* |
| Household expenditure | Household expenditure as a percentage of GDP | *exp* |
| Price level | Consumer price index | *price* |
| Unemployment | Unemployment rate, percent | *unempl* |
| Interest rate | Interest rate, percent | *interest* |
| Housing prices | Housing price index | *housingpr* |
| Threshold | Private credit as a percentage of GDP | *threshold:*1, if this is the first period when private credit exceeds 100 percent of GDP;<br>0 in other cases. |
| High indebtedness | Private credit as a percentage of GDP | *high indebtedness:* 1, if private credit is equal to or exceeds 100 percent of GDP;<br>0 if private credit is less than 100 percent of GDP. |

of credit. The negative value of $\beta_2$ will be interpreted as showing a hindering effect of the growth of GDP, household income, and household expenditure (depending on modification) on private credit when the high level is already exceeded.

The first modification of the second model uses the variable of the interaction of GDP with the high indebtedness:

$$\mathrm{ld}privatecredit_{it} = \alpha + \theta_t + \beta_1 \mathrm{ld}gdp_{it} + \beta_2 \mathrm{ld}gdp_{it} * high\ indebtedness + \beta_3 \mathrm{ld}price_{it} + \beta_4 \mathrm{ld}unempl_{it} + \beta_5 \mathrm{ld}interest_{it} + \beta_6 \mathrm{ld}housingpr_{it} + \varepsilon_{it} \quad (2.1)$$

The second modification uses the variable of the interaction of household income with the high indebtedness:

$$\mathrm{ld}privatecredit_{it} = \alpha + \theta_t + \beta_1 \mathrm{ld}income_{it} + \beta_2 \mathrm{ld}income_{it} * high\ indebtedness + \beta_3 \mathrm{ld}price_{it} + \beta_4 \mathrm{ld}unempl_{it} + \beta_5 \mathrm{ld}interest_{it} + \beta_6 \mathrm{ld}housingpr_{it} + \varepsilon_{it} \quad (2.2)$$

The third modification uses the variable on the interaction of household expenditure with the high indebtedness:

$$\mathrm{ld}privatecredit_{it} = \alpha + \theta_t + \beta_1 \mathrm{ld}exp_{it} + \beta_2 \mathrm{ld}exp_{it} * high\ indebtedness + \beta_3 \mathrm{ld}price_{it} + \beta_4 \mathrm{ld}unempl_{it} + \beta_5 \mathrm{ld}interest_{it} + \beta_6 \mathrm{ld}housingpr_{it} + \varepsilon_{it} \quad (2.3)$$

$\theta_t$ in all modifications is the time-varying effects, modelled by including time-dummies.

## Assessment of factors determining country private credit in European Union countries

The results of the models calculated according to Equations 1.1, 1.2 and 1.3 are presented in Table 2.

The regression analysis showed that the increase in economic growth reduces private credit. This contradicts previous research (Ivanovic, 2016; Shijaku & Kalluci, 2013; Matuka, 2019), which found that as economic growth accelerated and borrowing opportunities improved, private lending increased. However, the result obtained in the study is possible, as rising household incomes due to economic growth may have reduced the need for borrowing, and at the same time the volume of private credit, as shown by the results of S. Kozak's (2014) study.

Our results confirm the significant impact of inflation on private credit what is in line with the research by K. Guo and V. Stepamyan (2011) and A. Matuka (2019) that an increase in inflation determines the growth of private credit. It is likely that due to income depreciation, households are investing more in real estate in an effort to avoid this, which could lead to higher private credit. Rising housing prices have been found to increase private credit what is consistent with L. Tupėnaitė and L. Kanapeckienė (2009) and V. Azbainis (2009) this is due to reason that with rising housing prices, there is likely a need to invest in these assets in the hope that prices will continue to rise in the future. A significant positive effect of the threshold variable on private credit was identified, which assesses the effect of change in its current level of private credit. The first year of the 100% of GDP private credit ceiling overrun is significant and confirms the effect of growing household needs or

*Table 2.* **Results of the first model**

| | | 1.1 model | 1.2 model | 1.3 model |
|---|---|---|---|---|
| *const* | | 0,460*** | 0,422*** | 0,425*** |
| *ld_gdp* | | -1,155*** | - | - |
| *ld_income* | | - | 0,831*** | - |
| *ld_exp* | | - | - | 1,095*** |
| *ld_price* | | 1,620*** | 1,082** | 1,480*** |
| *ld_unempl* | | -0,039 | 0,036 | 0,048 |
| *ld_interest* | | 0,002 | 0,005 | 0,009 |
| *ld_housing_pr* | | 0,216** | 0,078 | 0,102 |
| *Threshold* | | 0,163*** | 0,202*** | 0,184*** |
| Coefficient of Determination ($R^2$) | | 0,49 | 0,48 | 0,49 |

**, *** indicate statistically significant at the 5% and 1% levels, respectively.

*Source:* The authors' estimations based on data from the World Bank database.

domestic demand. Both the unemployment rate and the interest rate are not relevant to private credit, or their effects partially overlap with the effects of significant factors in the model.

The regression analysis of Model 1.2 showed that the growth of household income leads to an increase in private credit. Due to relatively low interest rates and rapid income growth, real estate is becoming more affordable, and access to credit is becoming easier. According to R. Beck et al. (2007), higher incomes allow households to achieve more favorable standards for lending. As in Model 1.1, an increase in inflation leads to an increase in private credit. Based on the results obtained, the interest rate has no significant effect on private credit. The insignificant interest rate result obtained does not correspond to the effect of many empirical studies on private credit (Tan, 2012; Mukuka, 2018; Matuka, 2019), although it is consistent with the results of the empirical study by M. Ivanovic (2016). This model failed to determine the significant effects of housing prices, unemployment rates, and the threshold.

The regression analysis of Model 1.3 showed that the increase in household expenditure has been found to lead to an increase in private credit. With increasing household expenditure, disposable income is likely to be insufficient, so there is a real likely incentive effect on private credit growth. Households are taking out credit to respond to growing consumer demand. The upward effects of inflation and the threshold on private credit also confirm the theory of increasing demand for consumption. The results obtained are confirmed by the results of J. L. Arcand et al. (2015) results showing that the marginal effect of financial depth starts when credit to the private sector reaches 100% of GDP. This model did not determine the significant impact of housing prices, unemployment rates, and interest rates on private credit volumes.

## Assessment of the factors of credit to the private sector in periods of high credit levels

The impact of economic growth on private credit in periods when level of private credit has exceeded 100% of GDP will be further examined. The included interaction indicator will show the impact of specific factors in periods when private credit exceeded the 100 percent of GDP threshold. The first step will be to examine how economic growth affects private credit in periods when private credit exceeds the 100 percent threshold. The results of the models calculated based on Eq. 2.1, 2.2 and 2.3 are presented in Table 3.

Model 2.1 shows that rising economic growth leads to declining private credit. In periods of high-level private credit, economic growth does not affect private credit differently, i.e., no significant effect of interaction variable was found.

The effect of household income on the level of private credit in periods when the level of private credit exceeds the 100% of GDP threshold is further examined (Model 2.2). The presented model shows that, in all periods analyzed, the increase in household income leads to the growth of private credit. However, in periods when the level of private credit exceeds the 100% of GDP threshold, an increase in household income reduces private credit. This suggests that rising household

*Table 3.* **Estimations of the second model**

| Indicators | 2.1 model | 2.2 model | 2.3 model |
|---|---|---|---|
| const | 0,520*** | 0,491*** | 0,471*** |
| *ld_gdp* | -1,271*** | - | - |
| *ld_gdp*high indebtedness* | 0,102 | - | - |
| *ld_income* | - | 1,138*** | - |
| *ld_income*high indebtedness* | - | -1,525*** | - |
| *ld_exp* | - | - | 1,301*** |
| *ld_exp*high indebtedness* | - | - | -1,670*** |
| *ld_price* | 1,767*** | 1,212*** | 1,767*** |
| *ld_unempl* | -0,002 | 0,117 | 0,112** |
| *ld_interest* | 0,006 | 0,004 | 0,013 |
| *ld_housing_pr* | 0,223** | 0,089 | 0,115 |
| Coefficient of Determination ($R^2$) | 0,44 | 0,44 | 0,44 |

**, *** indicate statistically significant at the 5% and 1% levels, respectively.

*Source*: The authors' estimations based on data from the World Bank database.

incomes and the saturation of the economy with credit have a negative impact on private credit growth (Kozak, 2014).

The effect of household expenditure on the volume of private credit in periods when private credit exceeds the 100% of GDP threshold is further examined (Model 2.3). The model presented shows that the growth of household expenditure leads to an increase in private credit in all periods. However, in periods when private credit exceeds the 100% of GDP threshold, the increase in household expenditure reduces the level of private credit.

## Conclusions

Research analysis has found that many authors have examined the determinants of private credit level in one country. Our research complements limited empirical evidence estimating the impact of economic growth on the level of private credit based not on a single country sample but by applying the panel estimation technique and looking at EU-28 countries over a 20-year period (1999-2018) in order to assess the long-term situation. After systematizing the factors used in the empirical research, we chose the following factors: economic growth (GDP per capita, household income, and expenditure), unemployment rate, credit interest rate as well as inflation and housing prices. To determine the effect of the level of private credit, when it exceeds 100 percent from the GDP threshold, a dummy variable of high indebtedness was included.

The results of all three model modifications (1.1, 1.2, and 1.3) showed that the decrease in economic growth, growth of household income, and household

expenditure leads to an increase of private credit level. An increase in inflation determines the growth of private credit level. A significant positive effect of the threshold variable on the level of private credit was identified. Only in Model 1.1, rising housing prices have been found to increase the level of private credit.

An evaluation of the determinants of the level of private credit, including interaction variables, found that economic growth had no significant effect on the groups of high-level credit periods. However, it has been confirmed that the impact of household income and expenditure varies over periods of different private credit levels, which is confirmed by the marginal effect of financial depth (Arcand et al., 2015) and generalized insights into the potential impact of high level on the growth of the private sector and its sector.

It is important to note that the impact of factors on the level of private credit in groups of countries with large and small economies may be different. However, our research didin't investigate the non-linear effect, so it could be investigated. This could become the object of further research directions and allow expanding the performed research.

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## PRIVAČIŲ PASKOLŲ LYGĮ EUROPOS SĄJUNGOS ŠALYSE LEMIANČIŲ VEIKSNIŲ VERTINIMAS

Santrauka

Šiame straipsnyje siekiama įvertinti veiksnius, lemiančius šalies privačių paskolų lygį, taip pat jų poveikio skirtumus žemo ir aukšto įsiskolinimo lygio laikotarpiais. Pirmojoje dalyje aptariama privačių paskolų reikšmė šalies ekonomikai, išskiriami privačių paskolų apimtį lemiantys veiksniai, jų poveikio kanalai remiantis teorinėmis koncepcijomis ir atliktų empirinių tyrimų rezultatais. Pristatant tyrimo metodologiją pateikiamas veiksnių, lemiančių privačių paskolų apimtis, vertinimo modelis, tyrimo imties pasirinkimas, laikotarpių grupavimo poreikio pagrindimas, veiksnių ir juos atspindinčių statistinių rodiklių apibūdinimas, pristatomas sudarytas empirinis modelis, empirinio tyrimo etapai ir taikyti metodai. Tyrimo metu vertinami veiksniai, lemiantys šalies privačių paskolų lygį, taip pat jų poveikio skirtumus laikotarpiais, kai šalies privačių paskolų apimtis nesiekė 100 proc. BVP ir kai šis lygis buvo pasiektas ar viršytas. Tyrimo strategija remiasi dviem daugialypės regresijos modelio modifikacijomis su logaritmuotomis kintamųjų reikšmėmis. Naudojami paneliniai duomenys, apimantys 28 Europos Sąjungos šalis 1999–2018 metų laikotarpiu. Pirmajame modelyje vertinama ekonominio augimo, jį matuojant vienam gyventojui tenkančio BVP rodikliu, namų ūkių pajamų ir išlaidų, vartojimo prekių kainų lygio, nedarbo lygio, palūkanų normos įtaka privačių paskolų lygiui, kartu įvertinant ir pirmojo – ribinio – laikotarpio, kai privačių paskolų apimtis pasiekia 100 proc. BVP ribą, poveikį privataus skolinimosi pokyčiui. Antrajame modelyje vietoje ribinio laikotarpio kintamojo įtraukiamas fiktyvusis aukšto įsiskolinimo lygio, naudojant sąveikos kintamuosius, pirmojoje modifikacijoje vertinant vienam gyventojui tenkančio BVP ir aukšto įsiskolinimo lygio sąveikos poveikį, antrojoje – namų ūkių pajamų santykio su BVP ir aukšto įsiskolinimo lygio sąveikos poveikį, o trečiojoje – namų ūkių išlaidų santykio su BVP ir aukšto įsiskolinimo lygio sąveikos poveikį. Nustatytas neigiamas ekonomikos augimo poveikis ir teigiamas kainų lygio bei nekilnojamo turto kainų poveikis privačių paskolų lygiui. Taip pat buvo nustatyta, kad pirmuoju laikotarpiu, kai privačių paskolų santykis su BVP viršija 100 proc. ribą, namų ūkiai linkę skolintis daugiau nei kitais laikotarpiais. Nenustatytas nedarbo lygio ir palūkanų normos poveikis privačių paskolų lygiui. Antrajame modelyje atskyrus laikotarpius, kai šalies privačių paskolų apimtis nesiekė 100 proc. BVP ir kai šis lygis buvo pasiektas ar viršytas, ekonomikos augimas didino privačių paskolų apimtį, ir šis poveikis nesiskiria aukšto ir žemo įsiskolinimo lygio laikotarpiais. Šis skirtumas išryškėja vertinant namų ūkių pajamų ir išlaidų poveikį, taip patvirtinant ribinio finansinio gylio poveikį. Namų ūkių pajamų ir išlaidų augimas didino privačių paskolų apimtis tik tais laikotarpiais, kai privačių paskolų apimtis nesiekė 100 proc. BVP. Pasiekus aukšto įsiskolinimo lygį namų ūkių pajamų ir išlaidų augimas ima lemti nebe privačių paskolų augimą, o jų mažėjimą.