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Examination of Indicators Determining the Rate of Government Debt

Comparative Analysis of the V4 and GIPS Countries Using One-step Dynamic Panel Regression

SUMMARY: As a consequence of the crisis of 2008, public debts started to grow throughout the world, causing further economic problems for countries. Several EU Member States have been forced to use the assistance of the troika to alleviate their financing difficulties. The purpose of this paper is to examine the factors influencing public debt. We compared the factors affecting the public debt of GIPS countries, supplemented with data series of the Visegrád Group and Cyprus, using the one-step dynamic panel model. The correlations previously uncovered in literature could be identified in both panels. Deficit, inflation and the deterioration of the current account balance lead to the increase, whereas the growth of the real interest rate and GDP and the improvement of employment lead to the decrease of public debt. Real effective exchange rate, however, proved insignificant in both panels.¹

KEYWORDS: public debt, government debt, one-step dynamic panel model, inflation, GDP growth

JEL CODE: H63

The functioning of today's modern economies is unimaginable without state interventions. The state, on the one hand, facilitates the functioning of market economy by establishing an appropriate legal environment and ensuring that rules are observed and, on the other, corrects existing imperfections. 150 years ago, redistribution amounted to ten percent of GDP in developed economies, whereas today this is well over fifty percent (Benczes – Kutasi, 2010). In order to function, the state needs revenues, the largest portion of which is constituted by levied taxes, from which the

state can finance its own expenses and those of the public sector (Kovács, 2010).

Public debt can be defined in two ways, either as the aggregate amount of the government deficits accumulated in the past, or as the present value of the future fixed obligations of the state. The measure of public debt is compared to GDP, because this way the rate of the debt burden can be correlated to the performance of the economy, and from the growth of the ratio one can infer that future obligations have increased (Czeti – Hoffmann, 2006). Public debt is the consequence of insufficient external and internal equilibrium, the increase of which may result in the

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decrease of employment and the shrinking of the tax base, hence a drop in state revenues.

This paper undertakes to examine the factors affecting public debt, depending on whether the given country is a member of the euro area or has an independent monetary policy. In order to narrow down the topic, we will focus on the Visegrád Group (V4) and South European countries plus Cyprus (hereinafter referring to this group as GIPS in short). We conducted our empirical study in respect of the period from 1996 to 2014. Using the one-step dynamic panel model, we identified the factors affecting the development of the public debt of the V4 and GIPS countries.

Comparison of the V4 and GIPS countries is motivated by the capitalism model of these two groups, which differs from the Continental model (Farkas, 2011), and the adaptation constraints weighing on them, which in the case of the former group means the creation of market economy, then accession to the EU, and in the case of the latter the creation of the euro area and compliance with the rules (e.g. Stability and Growth Pact).

Our preliminary assumption is that the results of the two groups will be different, as we are examining two groups in different economic, financial and cultural situations, which at a closer look cannot be regarded homogeneous at group level either. Of the Visegrád countries, in the autumn of 2008 Hungary sought assistance from the IMF and the European Union, spending the funds largely on covering the budget deficit, purchasing government securities, and financing a bank rescue package. The IMF loan was repaid (IMF, 2013), therefore early in 2016 Hungary returned to bond market financing. With a view to the protection of the banking system and the credit market, in May 2009 the Polish government signed an agreement with IMF for a flexible credit line (FCL), which was last renewed on 18 January 2017 (IMF, 2017). Al-

though for members of the euro area the single currency promises economic stability and growth, a more integrated money market and the elimination of exchange rate risks (European Commission, 2010), certain Mediterranean countries still needed financial support at the time of the crisis. Spain since 2008, Greece since 2010, Portugal since 2011 and Cyprus since 2012 has relied on support from the European Stability Mechanism (ESM²). The other countries covered by the review did not depend on any external support. Based on the current outlook, in order to ensure its stable banking system Italy will have to request external assistance if the government-guaranteed EUR 15 billion bond issue of Banca Monte dei Paschi di Siena (Portfolio, 2016) will be insufficient to restore the bank's liquidity and investor confidence.

As regards the structure of this paper, the literature overview presents the factors affecting public debt and the development of the public debts of the various countries. This is followed by a section describing the methodology, variables and results of empirical research, then the discussion of the topic concludes with a summary.

THEORETICAL MODEL

Examination of the relationship between indebtedness and the economy intensified after the financial crisis of 2008 and the euro crisis of 2010–2011. The studies mostly examined the role of debt in the formation of financial crises, its negative impact on long-term growth and the issue of the sustainability of debt (Barcza, 2015). Our study aims to contribute to this latter topic.

When creating the theoretical model, we seek answers to the following questions: which variables should be included in the research? Is it necessary to incorporate temporal dynam-

ics? Will the individual variables have positive or negative values?

The volume of public debt influences the rate of interest expenses payable on debt. A country that has higher public debt will also have higher interest expenses. Interest rate is affected by risks, expectations as well as risk premiums. Public debt-to-GDP ratio is fundamentally affected by the following variables: the primary balance of the budget, real interest rates, real exchange rate, economic growth (Hoffmann, 2011; Deli – Mosolygó, 2009), as well as inflation and other factors (Czeti – Hoffmann, 2008). *Figure 1* shows the relationship between public debt and the factors affecting it.

High public debt determines subsequent expenditure levels as well, to cover which revenues have to be increased. Higher revenues can be achieved by taxation. Economic growth may ensure that public debt is held within fair limits. If revenues increase and expenses can be kept below the level of growth of revenues, then the primary balance without interest payment would improve through economic growth. All this would be somewhat counteracted by the increase in interest rates. If domestic savings are insufficient, it is necessary to finance indebtedness from abroad, which leads to the deterioration of the balance of payments. The decrease of savings has an increasing effect on real interest rates, which causes private investments to dwindle, decreasing the stocks of capital, potential output and employment (Orbán – Szapáry, 2006). Changes in the real exchange rate, including in particular its devaluation, change not only the value of outstanding debts denominated in foreign currencies, but a higher public debt-to-GDP ratio impacts higher interest rates, potential GDP growth and the deterioration of primary balance, hence it affects fiscal sustainability as well (Martínez Carrera – Vergara, 2012). At the end of this process,

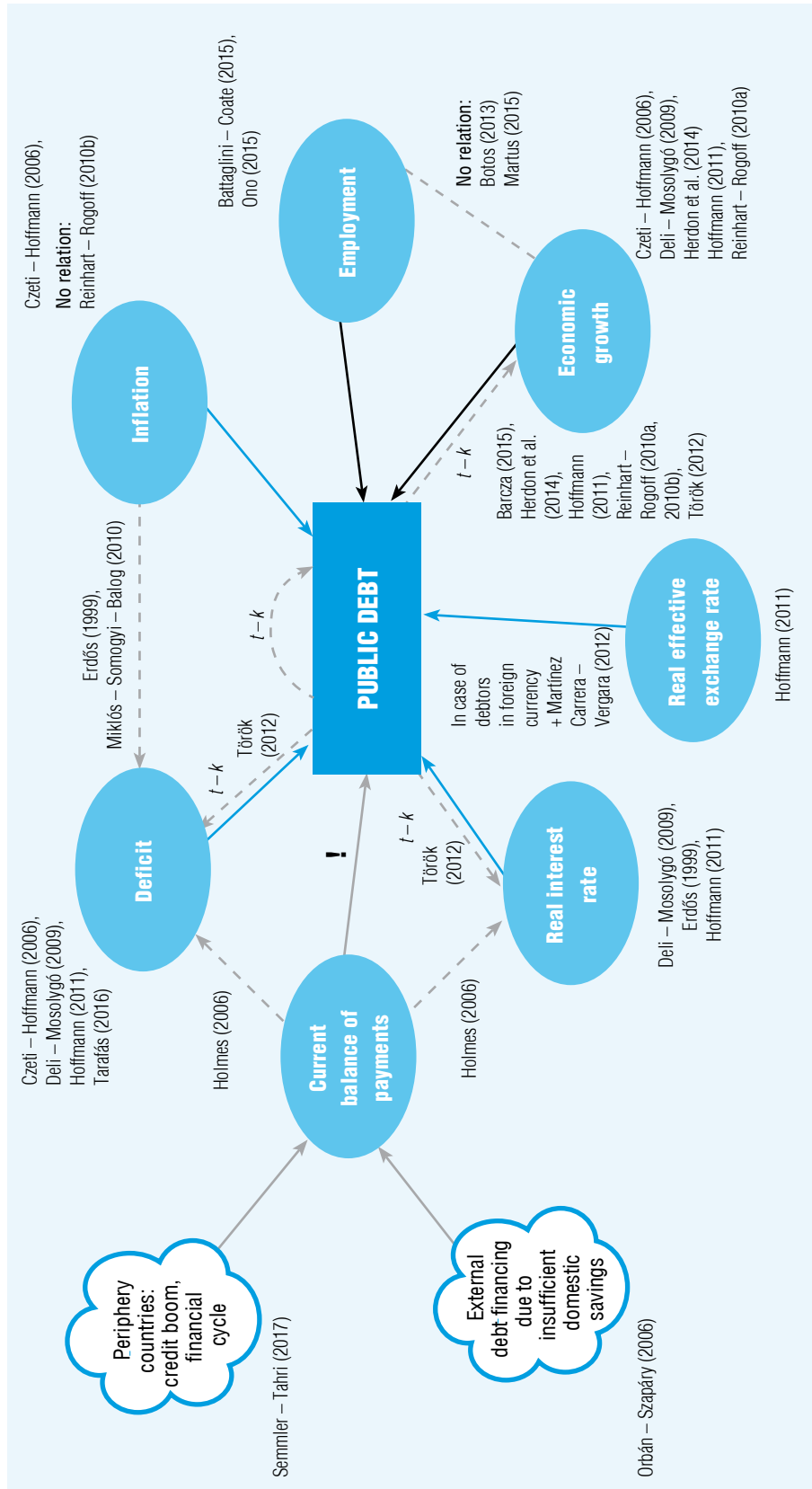
the country may enter into a negative spiral (Török, 2012). The rejection of debt service or the generation of hyperinflation would cause serious damage to the economy, therefore budgetary adjustments, austerity measures and ad hoc reforms³ are needed: cost cuts, the introduction of taxes, reforms in the financing of retirement pension, healthcare and education provide opportunities for restraining public debt (Tarafás, 2016). The costs of debt financing can be moderated with the decrease of risk premium, which can be achieved with the permanent decrease of long-term yields. All this can be implemented with the support of a transparent, prudent and sustainable fiscal policy.

The relationship between GDP growth and public debt was examined by *Reinhart – Rogoff* (2010a), who established that up to a public debt-to-GDP ratio of 90 percent, any increase in the level of debt increases GDP, whereas above this threshold increasing debt has a reducing effect on GDP. *Herndon et al.* (2014)⁴ repeated the tests of Reinhart and Rogoff for the period between 1946 and 2009 in respect of 20 developed countries, and concluded that the authors made selection, coding, weighting and calculation errors. They, furthermore, showed that there is no significant difference between the average and median GDP growth of countries having public debts below or above the threshold. Public debt and GDP growth differed significantly from country to country and from period to period, therefore, they denied Reinhart and Rogoff's assertion that public debt in excess of 90 percent of GDP consistently decreases the country's growth.

The current account balance reflects external debt. In a *Keynesian* framework, with the reduction of competitiveness the deficit of the balance of payments increases, which has a decreasing effect on aggregate demand, therefore, inevitably leads to the increase of

Figure 1

FACTORS AFFECTING PUBLIC DEBT



Notes: green arrows show positive, and gray arrows show negative relationship in the diagram, t-k means feedback of the previous value, and exclamation marks indicate fragility.

Source: own editing

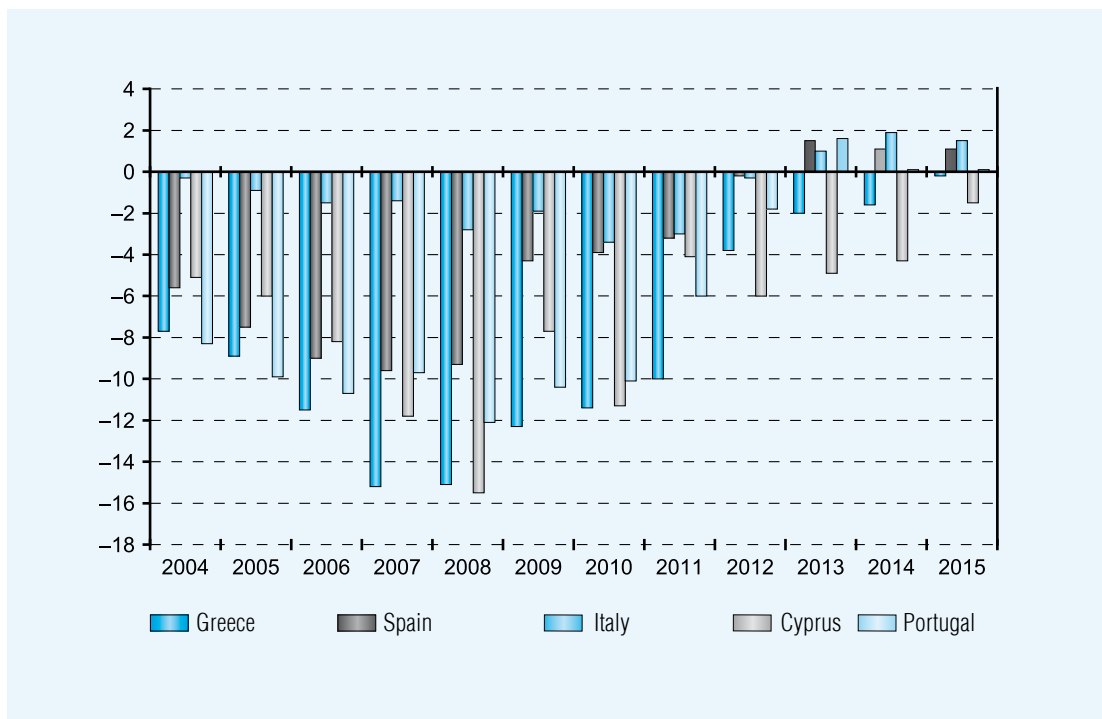
budgetary expenses, public debt and interest rates, which causes the further deterioration of the external balance (Holmes, 2006). In the periphery countries, the increase of the current account deficit is generated by domestic demand, credit boom and the financial cycle, and less by the competitiveness of prices (Semmler – Tahri, 2017). Therefore, it shows the fragility of a country if the current account balance has significant effect on public debt. South European countries (and Ireland) had accumulated significant current account deficit in the years before the crisis (Figure 2), whereas Northern euro area countries had a surplus, and thus became creditors of the system. In the course of the crisis, as a result of the sudden liquidity shock, Southern countries depended on the financial support

of Northern countries, which forced them to adopt severe austerity measures. According to *De Grauwe* (2016), both the debtor and the creditor states are responsible for imbalances. The former should not have taken so much credit, and the latter should not have allowed them do so.

Inflation has a dual effect on the balance of public finances – on the one hand, the government has revenues from inflation tax and on the other, the interest payable on the internal debt of the country should compensate for inflation, which may result in surplus expenditures (Erdős, 1999). Low inflation and balanced public finances contribute to sustainable growth. With the moderation of inflation, lower interest rates and risks can be achieved. The improvement of the budgetary position

Figure 2

CHANGES IN THE CURRENT ACCOUNT BALANCE IN RELATION TO GDP IN SOUTH EUROPEAN COUNTRIES, 2004–2015 (%)



Source: Eurostat database

results in a lower financing burden on public finances. There is no relationship in developed countries between inflation and the level of public debt, whereas the inflation of emerging countries rises sharply upon the growth of public debt (Reinhart– Rogoff, 2010b). Inflation affects internal debt, since the interest paid on internal debt must compensate for inflation as well. In the interest burden of external debt, real interest has predominant weight (Erdős, 1999). Examining the relationship between the state budget and inflation based on a Hungarian data series comprising nine years (1999–2007), *Miklós-Somogyi – Balogh* (2010) found that with the increase of inflation the budget improved, and deteriorated in the opposite case. When examining the effects on revenues and expenditures separately, it was found that the effects counterbalance each other, and all in all inflation has no effect on the budgetary position, with only an indirect effect assumed. As in our research we focused on public debt as a whole, without breaking it down into its constituents, inflation is used in this paper as an explanatory variable.

With the increase of unemployment, the government is forced to spend more on the labour market and (where applicable) retirement pension, which increases public debt (Ono, 2015; Battaglini – Coate, 2015), therefore, the effect of the labour market may also be included among the other factors affecting public debt. However, economic growth may also start without the increase in employment, which is called “jobless growth”. This phenomenon was observed in the US in the periods following the worldwide economic depression of 1929–33, the oil crisis, as well as the shocks of the 1990s and 2000s (Botos, 2013; Martus, 2015). Employment rate is, at the same time, one of the sustainability indicators of the European Union (European Union, 2015), and as such also included in our empirical research.

Our theoretical model, which we tested on empirical data (V4 and GIPS), can be expressed with the following formula:

$$D_t = \omega + D_{t-1} - B_{t-1} + r_{t-1} \pm REER_{t-1} - \Delta GDP_{t-1} \pm CA_{t-1} + \pi_{t-1} + \varepsilon_t \quad (1)$$

Where public debt in the given period is denoted by D_t , public debt in the previous period by D_{t-1} , deficit by B_{t-1} , real interest rate by r_{t-1} , real effective exchange rate by $REER_{t-1}$, GDP by ΔGDP_{t-1} , current account deficit by CA_{t-1} and inflation by π_{t-1} . Constant is ω , and random error is ε_t .

THE SAMPLE

Before the crisis of 2008, monetary policy was focused on achieving stable, low inflation by means of changing the central bank’s key policy rate. Fiscal policy had a rather restricted role at the time, as it was believed that consumption is not determined by current income. The Ricardian equivalence is not true in so far as it is not the same whether the state finances itself from credit or from taxes, and in the long run state intervention has no effect on the vertical aggregate supply curve. Besides economic considerations, there were practical arguments as well against fiscal policy, namely that its implementation is complicated, it has a delayed effect, and it is highly influenced by politics. The outbreak of the crisis called attention to the fact that monetary policy in itself is insufficient, and in the course of crisis management the active use of fiscal policy is also needed (Blanchard et al., 2010).

Countries joining the euro area lose their independent monetary policies, no longer have a national currency of their own, may not use the tools of issuing money or devaluing their currency and must also do without an

independent interest rate policy. In exchange, however, they can enjoy the advantages of a low interest rate environment (Benczes – Kutasi, 2010).

As regards the funding of public finances, the Treaty on the Functioning of the European Union (TFEU) provided that the central banks of the member states cannot purchase government securities directly. Due to the crisis, this rule was cancelled⁵ with the launching of the ECB's "*Outright Monetary Transactions*" (OMT) programme. The basic purpose of the programme is to ensure monetary transmission and a single monetary policy (ECB, 2012). The OMT stopped the rise of bond market yields, thereby improving the funding options of public finances (Lentner, 2015). The central banks of the euro area may effect payments to the central budget from their operating incomes in the form of dividend or tax, with a view to the reduction of the budget deficit. The foundation for this is provided by a low inflation environment. For the majority of the countries, the loss of seigniorage revenues did not result in any decrease of central bank profitability. Non-euro area countries – such as Hungary – are free to use the option of issuing money independently or making foreign exchange transactions. It might occur, however, that the losses of the central bank impair the situation of the budget (Novák – Vámos, 2014). The case of the Czech National Bank – operating between 2002 and 2014 with negative equity⁶ – also belongs here.

The countries covered by the empirical research are members of the European Union (cohesion countries). It is a common feature of the countries of the Visegrád Group⁷ that until 1990, they carried on a socialist economic policy dominated by the Soviet Union. The change of political regimes in these countries was followed by a long transformation process, with liberalisation, stabilisation and

privatisation processes going on simultaneously, as a result of which they developed a peculiar form of the institutional system of capitalism,⁸ evolving into market economies. After this convergence process – which may be called a success – they joined the European Union in 2004. Convergence proved successful up until the eruption of the crisis.

The institutional system of the Visegrád and Mediterranean countries differs significantly from those of the old member states of the European Union, but there are common points as well. Having joined the European Union in the 1980s, Greece, Portugal and Spain were regarded as success stories within the history of the EU, constituting examples to be followed for post-socialist countries until the crisis of 2008. Then it came to light that the low interest rates accompanying euro area membership had led to external and internal imbalances in these countries. Underlying the imbalances were not only structural, but institutional factors as well (Farkas, 2013). From the countries of the Mediterranean, this paper deals only with the GIPS countries⁹ and Cyprus. In these countries, the expectation of country-specific shocks has significant effect on the preferences of institutional investors for domestic markets, resulting in self-fulfilling market sentiments. Currently, it is a common feature of these countries that they are all struggling with grave economic problems. A huge increase of budget deficit and public debt could be seen in all as a result of the crisis, to finance which they had to take different ECB and IMF loan packages (Cornand et al., 2016).

In the following section of this paper, we will examine the development of the public debt of the countries under review (*Figure 3*). From 2000 (as no earlier data are available on EU averages) until 2005, the public debt of the V4 was below the European Union average, and between 2006 and 2011 only the

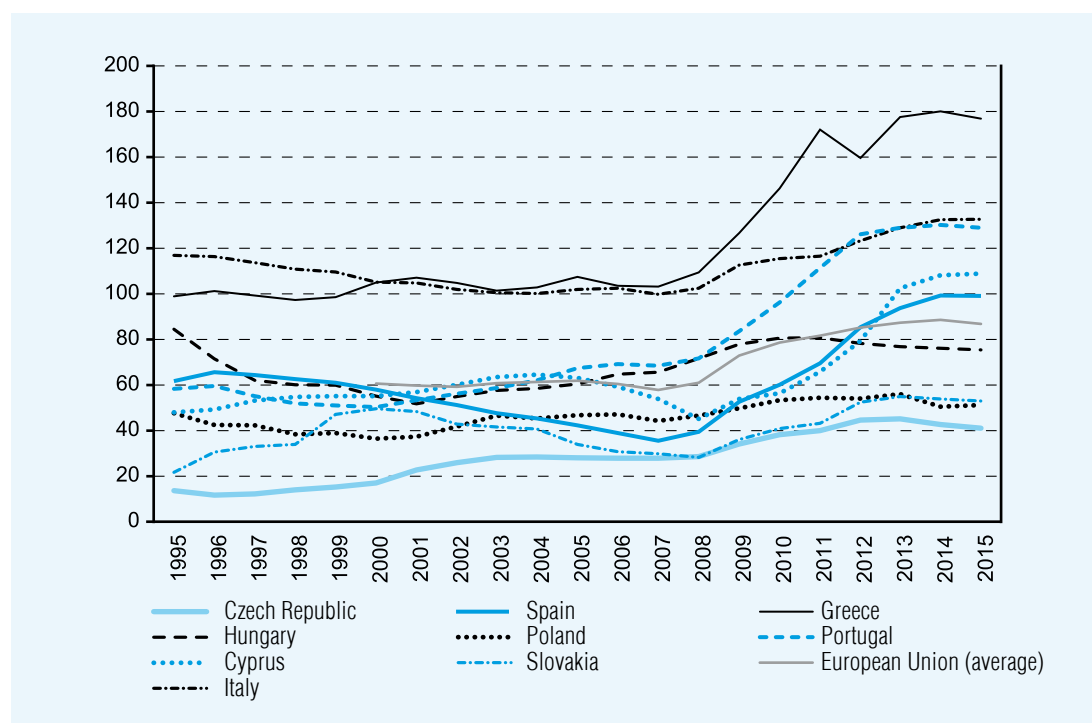
debt of Hungary exceeded this value. As regards the GIPS countries, the data of Greece and Italy exceeded the EU average by about 40 percentage points already before the crisis. Between 1995 and 2001, the debt of Portugal and Spain was at around a similar level, barely exceeding the 60 percent threshold, then in 2002–2008 the Portuguese debt started a slow, then after 2009 a rather robust growth. Spain managed to remain below the EU average until 2012 regarding its public debt, although between 2007 and 2012 the value of debt in relation to GDP more than doubled. It can be said in general that in the recession following the crisis, the huge increase of public debt-to-GDP ratios occurred not only because of the voluminous growth of debt, but on account of the decrease of GDP as well.

As regards the public debt of Cyprus, until 2008 it was at around the EU average, barely exceeding the threshold, but due to the crisis it has been showing significant increase since 2009. The Czech Republic was fortunate in that due to a prudent economic policy, the application of an inflation targeting regime and austerity packages introduced in the course of the crisis, they managed to keep public debt at a low level (Hlédik et al., 2016).

A common feature of the two groups of countries is that the reason they were hit so severely by the crisis is because in addition to a dynamically increasing inflow of foreign capital, they were characterised by a low rate of internal savings, therefore they were struggling with a current account deficit and real exchange rate appreciation. In the course of

Figure 3

DEVELOPMENT OF PUBLIC DEBT-TO-GDP RATIO IN THE COUNTRIES UNDER REVIEW AND IN THE EUROPEAN UNION BETWEEN 1995–2017 (%)



Source: AMECO database

the crisis, confidence was shaken, and capital withdrawals, falling stock prices, CDS premiums and the increase of the yields of government securities were observed (Farkas, 2012).

DATA AND METHODOLOGY

The purpose of the empirical research is to examine the development of the key factors affecting public debt in the two groups of countries. Preparing forecasts is not among the objectives of this paper. As we are working with macroeconomic data, we can assume there is correlation among the variables, and the existence of the autocorrelation of random errors does not affect the unbiasedness of the estimation (Ramanathan, 2003).

The empirical research was carried out with the one-step dynamic panel model, using the Gretl programme. Panel regression can be used in respect of databases in which the attributes of several units (in this case countries) and several periods can be collected. Panel models break down variance according to time and individual dimensions (Kotosz, 2016). If there are more than two periods, the usual estimation procedure is not difference generation – the time average typical of the individual is deducted from all data, but this does not affect interpretation. The advantage of panel regression is that the specific attributes of the individual that are constant over time need not be observable, because constant factors are dropped from the estimated equation (Major, 2013).

If the number of variables is high, the length of the time series is relatively short and the result variable is autocorrelated, the use of the dynamic panel model is accepted. The model is based on an AR(1) process, where the y_{it} result variable is explained with its own delayed values (as a way of managing the endo-

geneity problem) by means of the μ_i variable specific and v_{it} zero mean value uncorrelated random errors (accepted for fixed effect panel regressions) (Blundell – Bond, 1998; Arellano – Bond, 1991):

$$y_{it} = \alpha y_{it-1} + \mu_i + v_{it}, \quad i=1, \dots, n, \quad t=1, \dots, T_i \quad (2)$$

This is complemented with the incorporation of the x_{it} explanatory variables in the model:

$$y_{it} = \alpha y_{it-1} + \beta x_{it} + \mu_i + v_{it}, \quad i=1, \dots, n, \quad t=1, \dots, T_i \quad (3)$$

with the following constraints:

$$y_{it} = \beta x_{it} + f_i + \zeta_{it}, \quad \text{where } \zeta_{it} = \alpha \zeta_{it-1} + v_{it} \quad (4)$$

and $\mu_i = (1-\alpha) f_i \quad |\alpha| < 1$

We checked the overidentification of the model with the Sargan test, the result of which showed that the model is not overidentified (the value $p > 0.05$ was received as a result).

The variables used in the course of the research and their sources are shown in *Table 1* below.

For the public debt-to-GDP ratio, consolidated gross government debt¹⁰ was taken into account, for which the Annual Macro-Economic Database of the European Commission (AMECO) uses the European System of Integrated National Accounts (ESA). The consolidated government debt of the central budget is defined as per Article 1 (5) of Council Regulation (EC) No 475/2000 amending Regulation (EC) No 3605/93. “Government debt” means the total gross debt at nominal value outstanding at the end of the year of the sector of “general government” (S.13), with the exception of those liabilities the corresponding financial assets of which are held by the sector of “general government” (S.13). Government debt is constituted by the liabilities of

Table 1

INDICATORS USED IN THE COURSE OF THE RESEARCH

| Indicator name | Unit of measurement | Source |
|--|---------------------|---------------------|
| Public debt-to-GDP ratio | percent | AMECO database |
| Government deficit-to-GDP ratio (deficit in short) | percent | Eurostat database |
| Real interest rate | percent | AMECO database |
| Real effective exchange rate | percent (base 2010) | World Bank database |
| Economic growth | percent | World Bank database |
| Inflation | percent | World Bank database |
| Current account deficit | percent | World Bank database |
| Employment rate | percent | World Bank database |

Source: own editing

general government in the following categories: currency and deposits (AF.2);¹¹ securities other than shares, excluding financial derivatives (AF.33)¹² and loans (AF.4).¹³ Liabilities are taken into account at their nominal value outstanding at the end of the year. Liabilities denominated in a foreign currency and other agreements booked in foreign currencies shall be converted into the national currency on the basis of the representative market exchange rate prevailing on the last working day of each year (AMECO, 2016).

General government deficit data are from Eurostat’s Government Finance Statistics (GFS) database, where the data are calculated in accordance with the methodology used in the course of the excessive deficit procedure (EDP). In the course of the excessive deficit procedure, the aggregation rules of ESA are taken into account. The data are presented in the national currency and in euro, and also as percentages of GDP. In the course of the research, the percentage point value was taken into account. The deficit surplus of the government will match the government’s net creditor/borrower position. According to the definition of the ESA standard, government

debt is the difference of the total revenues and total expenditures of the government (Eurostat, 2016).

The real interest rate ratio denotes the short-term real interest rate, which is calculated with the following formula:

$$Real\ interest\ rate = (nominal\ interest\ rate - GDP\ deflator) \left/ \frac{GDP\ deflator}{100} + 1 \right.$$

where nominal interest rate denotes the (usually 3-month) interbank interest rates of the different countries, and the GDP deflator is the quotient of GDP calculated at market rates and GDP calculated at constant rates, expressed in percentages, in accordance with the ESA 8.89 methodology (AMECO 2016).

Economic growth means the annual percentage growth of GDP, calculated in the national currency, at 2010 rates, which is converted into US dollars. Aggregation is done by annual weighted averages (World Bank, 2016).

Inflation rate is measured by the World Bank with the annual percentage change of the consumer price index, using Laspeyres’

formula; the data are provided by IMF's¹⁴ International Financial Statistics (IFS) and data. Aggregation is done by median calculation (World Bank, 2016).

The current account balance is taken into account in relation to the value of GDP. The World Bank uses the data of the IMF yearbook, where the current account balance is calculated as the sum of the net export of products and services, and net primary and secondary revenues. IMF collects monthly data from the different countries, and aggregates these into annual data for the establishment of the annual current account balance.

The employment data¹⁵ used for the research also come from the World Bank, which calculates annual weighted averages using the statistics of the International Labour Organisation (ILO). The number of the employed is compared with the total population. An employed is someone minimum 15 years of age who is able to work. A high ratio means that a large part of the population is employed. A low ratio can also mean that young people prefer to study (World Bank, 2016).

Real effective exchange rate is a nominal effective exchange rate adjusted with the relative movement of domestic prices or cost indicators, that of a selected group of countries or the euro area. The source of World Bank data is IMF's IFS database, which are calculated for a 2010 base. The real effective exchange rate is the quotient of the nominal effective exchange rate (i.e. the value of the currency relative to the weighted average of some foreign currencies) and the price deflator or cost index (World Bank, 2016).

The time series of the database was planned to range from 1995 to 2015, but as data were missing for several countries for 1995, we applied listwise deletion for this year, as recommended by *Park* (2005) and *Sávai – Kiss* (2016). Public debt data are included in the research for the period from 1997 to 2015,

whereas the time series of explanatory variables are included with a delay of one year, for the period from 1996 to 2014.

Altogether nine countries were included in the research in two groups, one of these being the Visegrád Group, including the Czech Republic, Hungary, Poland and Slovakia. Members of the other panel are Greece, Italy, Portugal, Spain and Cyprus. We also wanted to include Ireland in the research; but in the case of several variables we encountered major data gaps, which would have distorted the results, therefore Ireland, was omitted.

RESULTS

Comparing the results of the panel examination with literature, we found that the signs of the coefficients of the explanatory variables thus received match the expectations. With the exception of real effective exchange rate, our explanatory variables proved significant. All values were provided as percentage points, which for the interpretation of the results means by how many percentage points the value of public debt-to-GDP ratio changes for each change of 1 percentage point of the value of the individual explanatory variables. *Table 2* shows the results of the Visegrád Group. The sign of the deficit and the current account deficit is negative, which means that if the general government deficit or the deficit of the external balance rises, then government debt will also rise, corresponding to the results of *Hoffmann* (2011), *Deli – Mosolygó* (2009), and *Czeti – Hoffmann* (2008). The significant value of the current account deficit shows the fragility of the country. The real interest rate, GDP growth and the rise of employment moderates debt, as established by *Tarafás* (2016), *Ono* (2015) and *Battaglini – Coate* (2015) in their respective studies. Growing inflation leads to increasing public debt,

Table 2

RESULTS OF THE ONE-STEP DYNAMIC PANEL MODEL RUN FOR THE VISEGRÁD GROUP

SSR: 2028,848

Sargan test: Khi-square (59) = 56.1094 [0.5827]

| | Coefficient | Standard error | z | p-value |
|--------------------------------|-------------|----------------|----------|------------|
| Public debt in previous period | 0.4511 | 0.0780 | 5.7825 | <0.0001*** |
| Constant | 1.2139 | 0.1724 | 7.0419 | <0.0001*** |
| Deficit | -0.5012 | 0.1269 | -3.9487 | <0.0001*** |
| Real interest rate | 0.4842 | 0.1754 | 2.7597 | 0.0058*** |
| Real effective exchange rate | -0.0281 | 0.0367 | -0.7659 | 0.4437 |
| GDP growth | -0.3661 | 0.1338 | -2.7372 | 0.0062*** |
| Current account deficit | -0.2350 | 0.0390 | -6.0256 | <0.0001*** |
| Employment | -0.6580 | 0.0534 | -12.3227 | <0.0001*** |
| Inflation | 0.3701 | 0.1340 | 2.7624 | 0.0057*** |

Note: Asterisks denote the significance level.

Source: own calculation

which matches the results of *Miklós-Somogyi – Balogh* (2010).

Besides the GIPS countries, we also included Cyprus in the panel (see Table 3). In the case of this group of countries, the current account deficit also shows fragility, its negative value highlights the effect of external debt on the growth of public debt; moreover, it is indifferent whether the given group of countries is located within or outside the euro area. At the same time, real effective exchange rate did not prove significant in either case, which means that having an independent currency did not have any adverse effect as far as public debt is concerned. Comparing the resulting coefficients, the values of the GIPS and Cyprus group are higher than those of V4 in respect of all variables. The major differences are in the effect of inflation, deficit and employment. The rise of inflation by one percentage point increases public debt by 1.7921 percent in the GIPS+Cyprus group, but only by 0.3701 percent in the V4. This suggests that this group of countries was

not protected by the – de jure – strict rules of the euro area from maintaining a macro environment that inflated government debt. The programmes of the fiscal cooperation that has become closer since 2010 (e.g. European Semester, European Stability Mechanism) are also based on this realisation. From the macro sustainability aspect, euro area membership did not have any added value – given that there were no incentives for the member states before 2010 to join, apart from their own common sense.

SUMMARY

European countries had to face a voluminous increase of public debt in the course of the 2008 crisis. Several countries under review (Greece, Portugal, Hungary) were compelled to take out loan packages due to their financing problems. The purpose of this paper is to identify the factors that affect the development of public debt.

RESULTS OF THE ONE-STEP DYNAMIC PANEL MODEL RUN FOR THE GIPS COUNTRIES AND CYPRUS

SSR: 3720,092

Sargan test: Khi-square (74) = 69.1565 [0.6376]

| | Coefficient | Standard error | z | p-value |
|--------------------------------|-------------|----------------|----------|------------|
| Public debt in previous period | 0.7565 | 0.0577 | 13.1047 | <0.0001*** |
| Constant | 1.1302 | 0.2380 | 4.7493 | <0.0001*** |
| Deficit | -1.1185 | 0.2197 | -5.0906 | <0.0001*** |
| Real interest rate | 0.6296 | 0.1550 | 4.0608 | <0.0001*** |
| Real effective exchange rate | -0.1185 | 0.1638 | -0.7238 | 0.4692 |
| GDP growth | -0.4058 | 0.1419 | -2.8592 | 0.0042*** |
| Current account deficit | -0.3316 | 0.1751 | -1.8938 | 0.0582* |
| Employment | -1.0145 | 0.0556 | -18.2354 | <0.0001*** |
| Inflation | 1.7921 | 0.4691 | 3.8208 | 0.0001*** |

Note: Asterisks denote the significance level.

Source: own calculation

In accordance with literature, public deficit, economic growth and real interest rate have the largest impact on public debt, which may also be influenced by changes in the inflation rate, the real exchange rate, the current account balance and employment. We tried to include as many of the variables mentioned in literature as possible in our empirical study. The subjects of the research were constituted by two groups of European countries whose members were all cohesion countries, and have (had) to suffer to a smaller or larger degree the problems arising from high public debt. One of these groups of countries may enjoy the advantages (and suffer the disadvantages) of issuing their independent currencies, while for the other group interest rate environment is determined externally (by the ECB).

As a result of the one-step dynamic panel model executed for both groups of countries, we found that most indicators defined by us affect public debt significantly. Deficit, inflation, and the deterioration of the current account balance resulted in the increase, where-

as the growth of real interest rate and GDP and the improvement of employment in the decrease of public debt. The size of the coefficients generated for the different variables was smaller in the case of the Visegrád Group. Real effective exchange rate did not have any effect on public debt in either panel. Therefore, it can be concluded that interest rate policy was not decisive with regards to the effect of the use of the euro on public debt, whereas the coefficients of deficit, inflation and employment had a significantly larger effect on the development of public debt than what we saw in the case of the V4 (who carry on an independent monetary policy).

It might be worthwhile in the future to involve even more variables in the research, for example the loan-to-GDP or loans-to-deposits ratio. The latter could inform us about the extent to which government securities are financed from domestic resources, but unfortunately we could not find any information that could be arranged in time series on this. We might also consider examining these countries

in a different arrangement, as the Czech Republic, Italy and Spain are IMF donor countries, therefore it might be relevant to examine them separately. A control group might also

be checked with the involvement of countries that did not rely on financial aid in the course of the crisis, such as Germany, Finland or the Netherlands.

NOTES

- ¹ This paper has been supported by the Pallas Athéné Domus Scientiae Foundation.
- ² The creation and functioning of the mechanism as well as further crisis management measures are described in detail by Micossi et al. (2011) in their paper.
- ³ As regards the soundness of their concepts, these can move freely in a scale between austerity measures and real reforms.
- ⁴ As in our empirical research we would like to investigate the effect not only of economic growth, but of further factors as well, we cannot analyse this debate in more depth. Further analyses are available in the works of Égert (2013), Panizza – Presbitero (2013) and Smith (2013). Barcza (2015) points out that the widely spread conclusion drawn from the article that a public debt ratio in excess of 90 percent leads to an irreversible and unsustainable debt course is erroneous, as the purpose of the article is to examine the relationship between public debt and economic growth (slowdown).
- ⁵ In 2014-ben 35,000 signatures were collected and a complaint was filed against the OMT, as it contradicted the TFEU, therefore the German Constitutional Court referred to the Court of Justice of the European Union for judicial interpretation. On 14 January 2015, the Court of Justice of the European Union issued a press communiqué to the effect that the OMT programme of the ECB is, as a general rule, compatible with the TFEU (Lentner, 2015).
- ⁶ On the basis of data available in the “Czech National Bank ARAD data series system”.
- ⁷ The Visegrád Group consists of four CEE countries (the Czech Republic, Hungary, Poland and Slovakia) that entered into an agreement among themselves in 1991.
- ⁸ As regards state intervention, the Czech Republic, Hungary and Poland were characterised by robust redistribution. In the case of Slovakia, the role of the state diminished and the ratio of public expenditures decreased in the period between 2000–2006 (Csaba, 2009). On the capitalism typology of these countries, a detailed overview is provided in Farkas (2015) and Bohle – Greskovits (2012).
- ⁹ From the initials of Greece, Ireland, Italy, Portugal and Spain, Cornand et al. (2016) used the acronym GIIPS. As Ireland is omitted from the analysis, the acronym GIPS is used in this paper.
- ¹⁰ The models examining fiscal stability define general government balances in different ways. Revenues and expenditures can be measured and aggregated by means of various special variables, thus accordingly the value of the balance may also change. For a detailed overview of the various balance types, see Benczes – Kutasi (2010), IMF (2015) and Kotosz (2016).
- ¹¹ For further information on this category, see paragraph 7.46 of ESA 1995.
- ¹² For further information on this category, see paragraphs 7.47–7.50 of ESA 1995.

- ¹³ For further information on this category, see paragraph 7.51 of ESA 1995.
- ¹⁴ IMF calculates the consumer price index as the weighted average of the price changes of a special consumer basket, at monthly, quarterly and annual level (World Bank, 2016).
- ¹⁵ The employed and the population are defined in different ways by the different countries. The biggest differences are in the definition of working age.

Aggregation methods may also differ due to the different demographic, social, legal and cultural trends and norms. In most countries, individuals of working age who live in domestic households are taken into account, except for those serving in the armed forces, or those serving their sentence, and the patients of mental institutions. In some countries, troops are taken into account for the calculation of the population, but are not included in the calculation of employment rates. Employment data are also calculated separately by gender (World Bank, 2016).

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