

IMPACT OF MACROECONOMIC INDICATORS THE ON PUBLIC DEBT DYNAMICS

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Abstract: *The paper examines the determinants of public debt in EU Member States, including the United Kingdom, from 2005 to 2019. The research's aim is to estimate the correlation of each macroeconomic indicator, as current account balance, real effective exchange rate, export market share, nominal unit labour cost index, unemployment rate to public debt, using a multiple regression on panel data, the contribution that the United Kingdom has had in the whole mechanism of the Union. Also, among the objectives is the capture of some proposals for a better limitation of the increasing levels of the member countries' debts, taking into account the impact of Covid 19, which at this date cannot be estimated accurately. The results, in this sense, seem to indicate an acceleration of the level of debt that tends to increase in most member countries to limit and stabilize some severely affected economies. The main contribution of the paper is providing a viable solution for recovery and constant economic growth in order to reduce the public debt at the level of the member countries of the European Union.*

Keywords: *euro area, multiple regression, public debt*

JEL classification: E44, E60

Introduction

In any field of economic development of a country, of a community, there is the problem of public debt and implicitly of the risk it implies, having consequences that cannot always be foreseen or anticipated in terms of circumstances. The issue associated with public debt in contemporary society is a result of the fact that we actually live in a dynamic civilization in a continuous change. In the end, human history has imposed a continuous development, a development that comes bundled with risks associated with public debt and even if in recent decades we have become more aware and began to look at these things from a scientific perspective, they have an economic and financial impact and some differences from country to country.

In the conditions of globalization, we can no longer speak of an analysis of public debt at the level of a country but as a whole, it being influenced by the action of other more or less developed economies of this entity composed of EU Member States, including the United Kingdom. considering that in the analyzed period (2005 - 2019) it was a member of the EU. The problem of public debt was analyzed even after the Second World War, when it is observed that it registered rapid growth rates (between 9.85% and 22.45%) for developing countries, and (between 3, 60% and 10.45%) for industrialized countries.

Thus, political decisions, but especially economic ones on public debt, should express a more responsible, much more coherent cohesion policy, based on a strategic vision that takes into account several aspects, such as: fiscal consolidation, reduction of social spending (without endangering the security and needs of citizens, taking into account the COVID 19 pandemic), supporting an

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economic environment conducive to economic development as a whole and, last but not least, the sustainability of public debt.

A detailed knowledge of this field will for a long time bring new points of view that will improve and contribute to support for economic and financial policy makers, as well as for academia in developing strategies with a positive impact on the economic development of European Union member countries.

The paper examines the determinants of public debt in EU Member States, including the United Kingdom, from 2005 to 2019. The research's aim is to examine the contribution of each indicator to public debt, using a **multiple regression** on panel data, the contribution that the United Kingdom has had in the whole mechanism of the Union. Also, among the objectives is the capture of some proposals for a better limitation of the increasing levels of the member countries' debts, taking into account the impact of Covid 19, which at this date cannot be estimated accurately. The results, in this sense, seem to indicate an acceleration of the level of debt that tends to increase in most member countries to limit and stabilize some severely affected economies.

The motivation of the chosen theme consists in the paradoxical character that defines the process of globalization considering the fact that although, most of the times, it can be beneficial it can result at the same time, with the assumption of excessive risks from the countries, in terms of public debt.

Another motivational aspect that defines the choice of theme is found in the vulnerability of the economic sector and implicitly, of the economic development of some states that are not members of the Schengen Area, O.E.C.D. (Examples: Romania, Bulgaria, Croatia). Moreover, the devastating effects of the financial crisis fuel the curiosity to analyze, in detail, possible causes and solutions to ensure the balance of the economy, having as main element the public debt.

The countries of the European Union and, implicitly, Romania also need liquidity, and some of them that borrow abroad create the false impression that this "foreign capital brought through loans involves making investments to increase production and jobs²." Practice has shown that countries indebted above a limit of 60% of gross domestic product (GDP), they serve as a negative example for ending the support of such a crisis, noting on the one hand a slowdown in economic progress and on the other hand a worsening of trade imbalances.

The purpose of the research is to estimate the correlation of each macroeconomic indicator, as current account balance, real effective exchange rate, export market share, nominal unit labour cost index, unemployment rate to public debt, using a multiple regression on panel data, the contribution that the United Kingdom has had in the whole mechanism of the Union.

The objective of the research is to analyze the level of public debt by estimating correlations between significant factors at the level of EU member states, in the economic context, in the reference period (2005 - 2019) and implicitly providing a viable solution of recovery and constant economic growth in order of diminishing it at the level of the member countries of the European Union. Also, among the objectives, I try to capture some proposals for a better limitation of the increasing levels of the member countries' debts, taking into account the impact of Covid 19, which at this date cannot be estimated accurately.

Through this paper, I would like to contribute to the literature, with **added value**, in the description of the determining indicators for the dynamics of public debt.

The paper's structure is as follows: part 2 contains the scientific context, respectively the literature review, followed by the methodology and the estimated results. The paper concludes by presenting the conclusions.

² Călin Magdalena - **Datoria publică**. Editura Didactică și Pedagogică R.A. București 2008.

Literature review

Regarding the scientific context, there are studies³ that describe the inadvertence of the debt policy (debt policy) in Romania, in the period 1990-2011 and the decisions regarding the dynamics of public debt (public debt decisions). The authors captured the dynamics of public debt, based on the indicators⁴: government debt, expressed in billion RON, government debt expressed as a percentage of GDP and real GDP growth rates, expressed as a percentage, compared to the following year, concluding that debt policy was not a coherent one, due to the transition period in which Romania is, being accentuated by the more ad-hoc decisions taken.

The general conclusion of the study is that the strategic elements of public indebtedness had only a formal character during the analysis, the ad-hoc decisions being taken under short-term pressures even after 2007. The strategy was developed, with a medium-term vision and so it is necessary to connect this strategic document to socio-economic realities, taking into account the lessons learned from the transition and the current crisis.

Another study, regarding the public debt at the level of the U.E. member countries. "Public debt sustainability and the participation of the new member states in the euro area⁵", made on a panel of 10 U.E. member countries, in which the author aims to capture the influence of the most significant indicators on the evolution of public debt, but concludes that the results fail to provide concrete evidence on the sustainability of public debt due to data limits and their stationarity (average and variance are constant).

The financial and economic crisis has pushed the ratio of public debt to GDP in a number of industrialized countries to unprecedented levels. This phenomenon has been particularly marked in the peripheral countries of the euro area, which has once again questioned the adequacy of the institutional framework of the economy and monetary union, including the Maastricht criteria on public finances.

As regards the Treaty of Maastricht, it has been one of the most profound changes to the Treaties since the establishment of the European Community. It was signed on February 7, 1992, and its main objective is the creation of Economic and Monetary Union.

The convergence criteria established are meant to ensure the stability of the single currency, the euro and in order for a country to participate in the Monetary Union must meet them, they predict among others a low inflation rate, a budget deficit below 3% of GDP, public debt to or at most 60% of GDP national legislation to be compatible with the ESCB etc.

Although some Member States of the European Union cannot respect them, due to the socio-economic environment existing in their countries, they may require the consideration of certain relevant factors, such as: structural reforms, research support programs, budgetary policies etc.

Other authors⁶ (Czech and Tusińska) capture the link between economic growth, public debt and social spending, the latter being considered a proxy for state spending on welfare in the context of the 2008 crisis, including in advanced capitalist economies.

Based on an analysis of 21 developed countries (OECD) in the period 1991-2014, the authors investigate whether social spending can be considered a source of current tax problems, as well as prosperity, concluding that they can be a cause of reducing the dynamics of the economic growth indicator, but not for all countries (usually the Mediterranean, not necessarily the Nordic ones).

The issue of public debt and its effect on economic activity in the European Union is also addressed by the authors Mencinger and Aristovnik⁷. They seek to empirically explore the

³ Florin Oprea, Irina Bilan, Ovidiu Stoica - Public Debt in Romania over the past two decades: did we have a coherent debt policy? - 8th International Strategic Management Conference. Procedia - Social and Behavioral Sciences 58 - 2012.

⁴ furnizați de Ministerul Finanțelor Publice și a Institutului Național de Statistică.

⁵ Piotr Stanek -Public Debt sustainability and the participation of the new member states in the euro area - Vol. IV, Nr. 4Poznan Universityofeconomics review - 2014.

⁶ Sławomir Czech, Magdalena Tusińska - Economic growth, public debt and social spending. Should welfare state take the blame?- Czech S., Tusińska M., Economic growth, public debt and social spending. Should welfare state take the blame?, „Ekonomia i Prawo. Economics and Law”, Polzakiewicz B., Boehlke J. (ed.), Vol. 15, No. 1 / 2016.

transmission mechanism regarding the short-term impact of public debt on economic growth. In order to take into account the impact of the debt-to-GDP ratio on the real GDP growth rate, a panel regression model is used to capture an inverse causal relationship between economic growth and the level of public debt rates, some methodological issues, such as issues of heterogeneity and endogeneity.

The problem of reverse causation stems from the possibility that lower economic growth will lead to higher debt growth, for reasons that are not necessarily related to debt⁸.

Thus, the direct effect of a high level of indebtedness on economic growth for 25 countries of the European Union in a sovereign debt crisis is assessed, also taking into account some methodological aspects, such as the problems of heterogeneity and endogeneity. The sample of EU countries covers the period 1995-2010.

The calculated debt-to-GDP break-even point, where the positive effect of accumulated public debt turns into a negative effect, is around 80% to 94% for the 'old' Member States. However, for the "new" Member States, the debt-to-GDP break-even point is lower, at between 53% and 54%. The results of the study indicate a statistically significant impact of public debt rates on annual GDP growth rates per capital, and the threshold value for the "new" Member States is lower than for the "old" Member States.

The focus on the debt-to-GDP ratio can be found in another study⁹, which assesses the response of this indicator to the fiscal consolidation efforts set out in the 2013 *Stability and Convergence Programs (PCS)*, presented by EU members under various assumptions about fiscal multipliers. The effects of fiscal consolidation are assessed in relation to a counterfactual scenario without consolidation, conducted in 2012. Results of the study show that large tax multipliers lead to temporary increases in debt, after consolidation, compared to the basic non-consolidation.

Another study¹⁰ analyzes the sustainability of public debt in the member countries of Economic and Monetary Union, focusing on the sustainability of fiscal and budgetary policies. At EU level, the issue of public debt sustainability has become a matter of public interest since the introduction of the single currency. The results of the study, conducted by a comparative analysis between countries, reveal the importance of ensuring debt sustainability through a mix of fiscal and budgetary policies, aimed at reducing budget deficits and increasing monetary policy measures to ensure financial stability.

Moreover, according to another study¹¹, it analyzes the determinants of public debt in the new Member States of the European Union. The aim is to examine the fiscal position of these countries as well as to make proposals for limiting debt growth. The authors aim to answer the key question: fiscal consolidation (numerator) or economic growth (denominator) have a stronger impact in determining the debt-to-GDP ratio.

Based on a panel analysis, they chose as a dependent variable the debt-to-GDP indicator and as independent variables the real GDP growth rate and fiscal consolidation, approximated by the

⁷Mencinger, Jernej; Aristovnik, Aleksander; Verbic, Miroslav (2014)The Impact of Growing Public Debt on Economic Growth in the European Union. *Amfiteatru Economic Journal*, vol. 16, issue 35, pp.: 403-414, ISSN: 2247-9104 – 2014. The Impact of Public Debt on Growth: A Comparative Analysis of Old and New EU Member States, Jernej MENCINGER, Aleksander ARISTOVNIK

⁸ Kumar, M. S. and Woo, J. (2010). *Public Debt and Growth* (IMF Working Paper 10/174). Washington, D.C.: IMF. Retrieved September 5, 2012, from <http://www.imf.org/external/pubs/cat/longres.cfm?sk=24080.0> Pattillo, C., Poirson, H., & Ricci, L. (2004). *What are the Channels through Which External Debt Affects Growth?* (IMF Working Paper 04/15). Washington, D.C.: IMF. Retrieved January 20, 2013, from <http://www.imf.org/external/pubs/cat/longres.cfm?sk=17021.0>

⁹ Katia Berti, Francisco de Castro, Matteo de Salto - *Effects of fiscal consolidation envisaged in the 2013 Stability and Convergence Programmes on public debt dynamics in EU Member States*, Publications: B-1049 Brussels Belgium - 2013.

¹⁰ Teică, Ramona Andreea - *Analysis of the public debt sustainability in the Economic and Monetary Union*. *Procedia Economics and Finance* 3 (1081 - 1087) - 2012,

¹¹ Tomislav Globan, Marina Matosec - *Public Debt-to-GDP Ratio in new EU member States: Cut the numerator or Increase the Denominator?* *Romanian Journal of Economic Forecasting* – XIX (3) – 2016.

primary budget balance, as a share in GDP. The results of the study showed that by achieving a more balanced government budget, public debt decreases, but the effect is quite small.

Regarding Romania, as a member country of the European Union since 2007, it had a public debt of approx. 13% of GDP at a value of over 52 billion RON (2008). Before Romania, at that time were: Estonia with 3.4%, Luxembourg with 6.8% and Latvia with 9.7%.

In other words, the transition from a generalized plan-based and state-owned economy to a free, competitive market economy based on predominantly private property is a complex, time-consuming and difficult process for countries with a less well-off economy from the European Union. This requires, on the one hand, the transformation of the economic mechanism from one directed to one regulated by the supply-demand mechanism, characterized by privatization, encouraging the formation and development of private property, decentralization of decisions, liberalization of prices, convertibility of national currency, reorganization of credit the establishment of bodies specific to the competitive economy (stock exchange, competition supervisory bodies, etc.), and, on the other hand, the restructuring of state companies by adapting to new conditions for awarding orders, resources and last but not least the sales markets.

The latter includes modernization, refurbishment, re-profiling of enterprises, and at the macroeconomic level by correcting the structure of branches of the economy, in order to better connect the economy of less developed countries to the economy of highly industrialized countries in the European Union. While the first requirement has been somewhat implemented by most Member States, the second requires a longer period of applicability.

Research in the field has shown that ensuring a competitive climate involves the demonopolization of the economy, through privatization and stimulating the creation of new privately owned enterprises, gradually reducing the protectionism applied to domestic products, improving the legal and institutional framework for promoting competition, all contributing to the well-being of the economy of the Member States of the European Union in terms of reducing the need to accumulate debt.

Method and Results

The research is carried out on a sample of panel data, with an annual frequency, capturing the period 2005-2019 for the 28 EU Member States¹²: Austria, Belgium, Bulgaria, Czech Republic, Cyprus, Croatia, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Hungary, Great Britain. The data (stationary) were taken from specialized sites, such as EUROSTAT, the Central Bank of Europe, the International Monetary Fund, etc., and multiple regression was used as a research tool.

The econometric model is described using the following formula, using public debt, as dependent variable and five independent variables:

$$y=f(x_1,x_2,\dots)+\varepsilon$$

$$y=\beta_0 +\beta_1x_1+\beta_2x_2+\dots + \varepsilon,$$

where:

y = effect variable (dependent)

y = public debt - % of GDP

x_{1,2,...} = cause variables (independent)

x₁= Current account balance (% of GDP)

x₂ = Real effective exchange rate - 42 trading partners (3 year % change)

x₃ = Export market share (% of world exports)

x₄ = Nominal unit labour cost index (2010=100) (3 year % change)

x₅ = Unemployment rate (3 year average)

¹² Great Britain until 2019.

In order to obtain conclusive results and eliminate redundancy, insignificant indicators were eliminated, as: *Nominal unit labour cost index*, and also, I used panel cointegration tests. For all next estimations, I used 420 observation and four independent variables. The final correlation matrix has the following form:

Table no. 1 Correlation matrix

| | Current account balance | Export market share | Real effective exchange rate | Unemployment rate |
|------------------------------|--------------------------------|----------------------------|-------------------------------------|--------------------------|
| Current account balance | 1 | -0.3199 | -0.2810 | -0.1425 |
| Export market share | -0.3199 | 1 | 0.4169 | -0.0793 |
| Real effective exchange rate | -0.2810 | 0.4169 | 1 | -0.0930 |
| Unemployment rate | -0.1425 | -0.0793 | -0.0930 | 1 |

Source: own estimations, using EViews 8

The recorded values belong to the range (-0.5; 0.5) and, therefore, we can substantiate our ideas based on the indicators used in the model.

In order to choose the right model, the probability associated with the Hausman test was considered.

**Table no. 2 Hausman Test
Correlated Random Effects - Hausman Test**

| Test cross-section random effects | | | |
|-----------------------------------|-------------------|--------------|---------------|
| Test Summary | Chi-Sq. Statistic | Chi-Sq. d.f. | Prob. |
| Cross-section random | 28.193637 | 5 | 0.0000 |

Source: own estimations, using EViews 8

As can be seen in the table above, the probability associated with the test registers a percentage below the 5% threshold, which is why the optimal model for estimation is the one with fixed effects.

After estimating the indicators, we obtained the following results:

Table no. 3 Indicators estimation - Fixed effects

Dependent Variable: Public debt

Method: Panel Least Squares

Sample: 2005 2019

Periods included: 15

Cross-sections included: 28

Total panel (balanced) observations: 420

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|-------------------------|-------------|------------|-------------|--------|
| Current account balance | 0.95244 | 0.142458 | 6.685748 | 0.0000 |
| Export market share | -0.049452 | 0.035688 | -1.38567 | 0.1666 |
| Real exchange rate | -0.239247 | 0.102 | -2.345562 | 0.0195 |

| | | | | |
|---------------------------------------|----------|-----------------------|-----------|--------|
| Unemployment rate | 2.928211 | 0.208344 | 14.05467 | 0.0000 |
| C | 0.366437 | 0.019396 | 18.89245 | 0.0000 |
| Effects Specification | | | | |
| Cross-section fixed (dummy variables) | | | | |
| R-squared | 0.912233 | Mean dependent var | 0.612957 | |
| Adjusted R-squared | 0.905221 | S.D. dependent var | 0.356057 | |
| S.E. of regression | 0.109616 | Akaike info criterion | -1.510531 | |
| Sum squared resid | 4.662098 | Schwarz criterion | -1.202702 | |
| Log likelihood | 349.2116 | Hannan-Quinn criter. | -1.388863 | |
| F-statistic | 130.0909 | Durbin-Watson stat | 0.590985 | |
| Prob(F-statistic) | 0.0000 | | | |

Source: own estimations, using EViews 8

$$\text{public debt} = 0,366437 + 0,95244* \text{current account balance} - 0,049452* \text{export market share} - 0,239247* \text{real exchange rate} + 2.928211* \text{unemployment rate}$$

It is observed that each independent variable is statistically significant, considering a significance threshold of 5%. Also, they prove to be relevant from an economic point of view, as there is an inverse link between public debt and export market share and the real exchange rate and a positive influence between the dependent variable and the current account balance, respectively the unemployment rate.

The current account balance has a positive impact on public debt, which can be explained by the share of investments in the capital and financial account and by the price of volatile financial assets on the market. The positive influence is also found in relation to the unemployment rate, so that a high cost of labor shortage, generates expenses on the part of social assistance.

The real exchange rate measures the cost of a country's competitiveness in relation to its competitors on international markets. The negative influence on the public debt translates in terms of investments expressed in foreign exchange, given the unfavorable situation induced by the financial crisis, a fact highlighted by the export market share (negative impact).

The F-statistical test strengthens the validity of the model by its statistical significance. Thus, it is established whether there is at least one explanatory variable in the linear regression model to justify the behavior of the variable Y. For F-statistic, Prob = 0.000000 < 0.05 → the H1 hypothesis is observed. So, with a probability of 95%, that the model is valid. In other words, there is at least one independent variable that can explain the variation of the dependent variable; that is, the evolution of public debt, for the period 2005-2019, was influenced by exogenous variables such as current account balance, export market share, real exchange rate, respectively unemployment rate. This model verifies that the regression model is correctly specified.

Another relevant indicator is represented by the **Determination Report**. According to the data from the estimation of the variables, the determination ratio, expressed with the help of R-squared, is 0.912233, and the value of Adjusted R-squared is 0.905221. The value of R-squared is more relevant than the value of Adjusted R-squared and shows that 91.2233% of the percentage change in public debt dynamics is explained by the percentage changes in the current account balance, export market share, real exchange rate, unemployment rate.

Autocorrelation hypothesis testing - Durbin-Watson test

The value of the test statistic DW is included in the range [0,4]. DW less than 2 indicates a positive autocorrelation, and DW greater than 2 indicates a negative autocorrelation. If the errors are not correlated, then the value of DW will be around 2.

The estimated value with the help of the DW test is equal to 0.590985, so we reject the null hypothesis and say that there is a linear and positive correlation, and the errors are not independent, but are correlated.

Verification of residual normality - Jarque - Bera test

The Jarque-Bera test considers both the asymmetry and the flattening coefficient and verifies to what extent the empirical distribution can be approximated with a normal distribution. The series created Residuals includes all the errors of the estimated variable - *the public debt*.

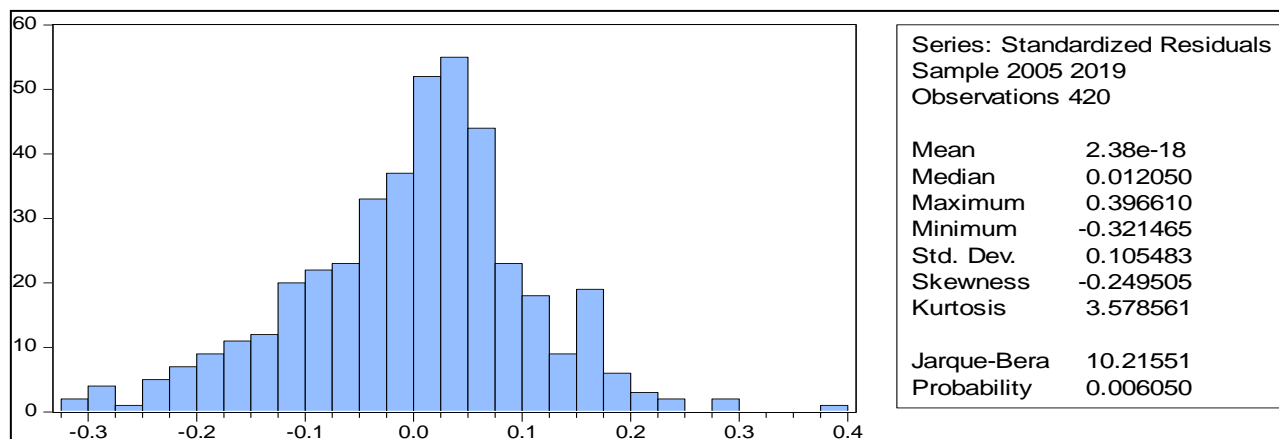


Fig. no. 1 Verification of residual normality - Jarque - Bera test

Source: own estimations, using EViews 8

The probability associated with the Jarque-Bera test is 0.006050 < 0.05, which indicates that we reject the null hypothesis and can approximate the distribution of the model as not being a normal distribution (errors are not normally distributed). The average of the errors has a very small value, which means that we can base our analysis on the estimated model.

Conclusions

The paper aims at analyzing the significant factors, with a pronounced impact in order to estimate and predict sustainability, with implications on the economic development of EU member states.

The research concludes that there is an inverse link between public debt and export market share and the real exchange rate and a positive influence between the dependent variable and the current account balance, respectively the unemployment rate. Also, I find that the current account balance has a positive impact on public debt. A possible explanation is the share of investments in the capital and financial account and by the price of volatile financial assets on the market. The positive influence is also found in relation to the unemployment rate, so that a high cost of labor shortage, generates expenses on the part of social assistance. The negative influence of the real exchange rate on the public debt translates in terms of investments expressed in foreign exchange, given the unfavorable situation induced by the financial crisis.

The financial reports of the IMF, the ECB, the OECD (2020-2021) show that macroeconomic variables indicate a good "health" of the financial system. The results capture the dynamics of public debt, and the research aims to value ideas both within academia and at the level of decision-making authorities.

The issue captures the aspects necessary for contracting loans and, implicitly, the increase of public debt, as well as its impact on the economy, with direct effects on the population and the business environment. Thus, any decision related to the development of an international loan must also take into account this variable - public debt.

The limits of research refer to the related uncertainties generated by the UK's exit from the European Union, and future research directions involve the introduction of data on future developments for this region as well.

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