論　説

Debt Sustainability in the Developing Countries: Case Study of the Kyrgyz Republic

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Abstract:

The main objective of this paper is to investigate the impact of external debt on economic growth. This study is based on panel data for 117 developing countries for the period 1981–2015 using OLS and fixed effect methods. The results reveal a nonlinear relationship between external debt and economic growth. The marginal impact of debt on economic growth, which can maximize growth, is 61.3 percent of GDP for total external debt and 30 percent of GDP for public and publicly guaranteed external debt. In the long term, the marginal impact of debt on growth is lower, namely 23.6 percent of GDP. The result implies that exceeding the external debt of the above-mentioned levels leads to an economic slowdown or reduction in growth rate in developing countries.

Keywords: external debt, debt threshold levels, economic growth.

1．Introduction

The challenges of external debt sustainability has become highly relevant after the financial crisis, the consequences of which resulted in a significant increase in external debt. In this situation, developing countries are particularly vulnerable, whose economic and financial potential is lower relative to developed economies. Therefore, the preservation of debt sustainability and the effective debt management in developing countries remain relevant issues.

As many empirical studies reveal, external debt can have both positive and negative impacts on economic growth, depending on its volume, application and certain conditions in the country. The general theoretical assumption of public debt is that a reasonable level of public debt has a positive effect on economic growth, and its further accumulation and

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Figure 1 Optimum level of public external debt
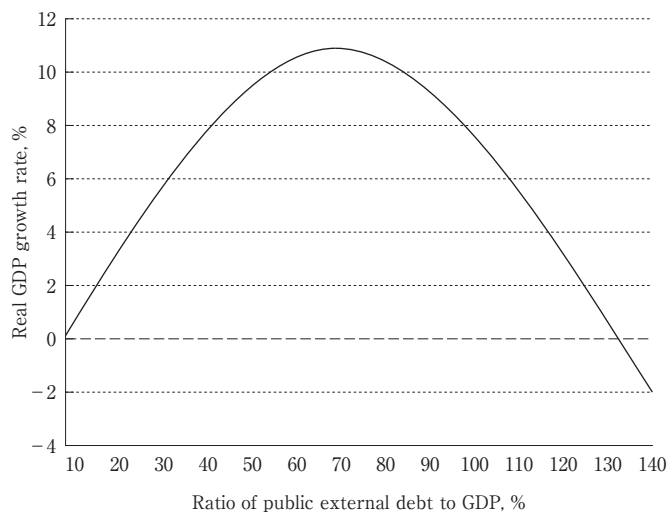
growth has an adverse effect (Pattillo, Poirson and Ricci, 2002). This assumption suggests that the impact of debt on economic growth can be described as an inverted U-shaped curve, as shown in Figure 1, and assumes that the debt becomes unsustainable when it exceeds a certain point (Afonso and Alves, 2015).

According to the definition of the International Monetary Fund "*debt sustainability as a situation in which a borrower is expected to be able to continue servicing its debts without an unrealistically large future correction to the balance of income and expenditure*"[1] (IMF, 2002). Based on the foregoing, the basic idea of the state of sustainability is the ability and capacity of the country to serve debt without any difficulties over time and any delays. The debt sustainability of countries is usually measured by debt and debt service indicators scaled by relevant measures of repayment capacity (GDP, exports, revenues), whose evolution over a certain projection horizon is calculated by the debt dynamics (World Bank, 2016). These indicators reflect the solvency of the country and the ability to timely fulfill all obligations from its own resources and are key elements of debt sustainability analysis.

Thus, the objective of this paper is to investigate the impact of external debt on economic growth and to assess the ability of developing countries to manage debt for economic development. As a main debt indictor, we examine the ratio of external public debt to GDP, since a stable debt-to-GDP ratio usually manifests improving the government's ability to service its debt and measures the burden on the economy.

This study addresses answers to the following two research questions: Is there a nonlinear relationship between external debt and economic growth? What is the marginal impact of external debt on economic growth, above which the economic slowdown begins?

Accordingly, this study hypothesizes that there is a nonlinear relationship between

external debt and economic growth, and an excessive level of external debt begins to negatively affect growth.

The structure of the paper is organized as follows. The next section is devoted to the description of the current situation of debt sustainability in developing countries and the Kyrgyz Republic. The third section reviews the previous literature. The fourth section describes the methodology and data. The fifth section contains the main findings and their interpretations. Then the conclusions are presented in the final section.

## 2．Debt sustainability in the developing countries

Public debt is an important element of the market mechanism, through which savings are transformed into investments, stimulates economic growth and improves the welfare of the people. That is why attracting external loans to support the economy is a common phenomenon in the international capital market, and sometimes a necessity for many countries in the world. However, in countries with a weak and backward economy, public debt from a factor that should stimulate the development of production turns into a factor that oppresses and impedes the recovery of the economy. Without an effective debt management policy and adequate control measures, an excessive level of a country's public debt may well become a potential threat to national economic security.

As can be seen from Figure 2, the external public debt of developing countries and countries with economies in transition in nominal terms has been increasing. Over the past 10 years, the total external debt stock has more than doubled, and since 2010, there has been an increase in the indicator of external debt to GDP ratio. The main challenge for many countries in the post-crisis period of 2007–2009 became a problem of high accumulation of external debt. Total external debt stock of developing countries and countries with economies in transition reached $6.8 trillion in 2015, or 25.5% of GDP and 100.1% of their exports of goods and services. Debt service payments in 2015 amounted to $782 billion, or about 11.5% of debt service to exports of goods and services（United Nations, 2016）.

The average level of external debt-to-GDP ratio（25.5%）indicates an acceptable level of external debt burden for developing countries, but this indicator is highly differentiated between countries.

The most commonly mentioned threshold value of the debt indicator is the criterion established by the Maastricht Treaty in 1992, according to which the level of public debt for the European Union（EU）countries should not exceed 60% of GDP. According to Debt Sustainability Analysis for Market-Access Countries（MACs）, the required threshold level of debt to GDP ratio is 60 percent for advanced economies and 50 percent for emerging economies（IMF, 2013）.

**Figure 2** Dynamics of external debt in developing countries
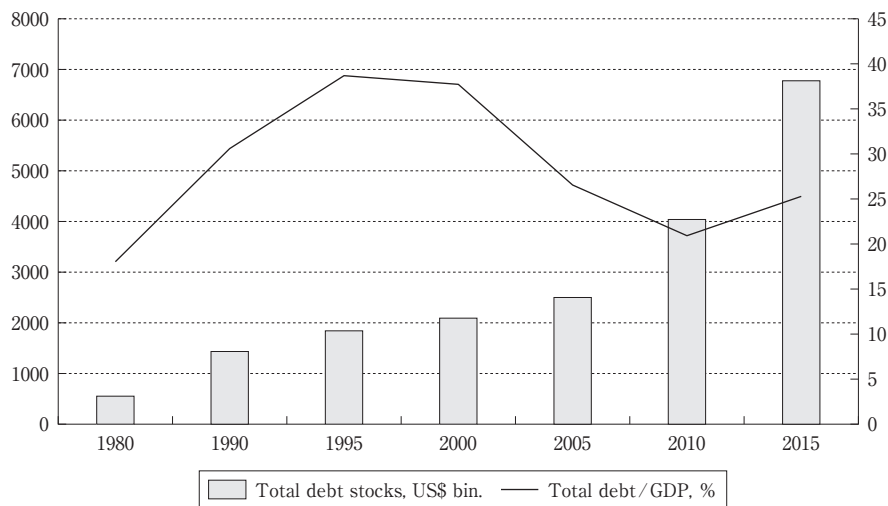
Although the nominal amount of debt is generally lower in developing countries than in developed ones, its growth rate is a serious concern for international financial organizations. Developing countries are more often faced with irregularities in payment schedules, debt restructuring and debt crises. The World Bank and the International Monetary Fund use a special tool, such as Debt Sustainability Analysis (DSA), to assess the debt situation in low-and middle-income countries for countries themselves and donors. The DSA considers various indicators of the debt burden (the present value of debt and debt service). According to DSA, each country is classified in accordance to its risk of debt crisis through the quality of its policies and institutions.

As a case study the rest of this research describes the debt situation in the Kyrgyz Republic. The Kyrgyz Republic is assessed as a country with a moderate risk of a debt crisis (IMF, 2016). The Kyrgyz economy in recent years has suffered from the economic slowdown. The situation caused a significant rise in public external debt and identified problems of debt sustainability.

The history of the accumulation of external debt in the Kyrgyz Republic began in the early 90s since the independence. At that time, the Kyrgyz Republic had just begun to develop legal, administrative and institutional standards for external borrowing. For the Kyrgyz Republic, the first priority was to mobilize the resources from any sources to support the critical level of imports, to prevent a decline in production and to finance the budget deficit. The ratio of the public external debt to GDP ratio increased sharply in 1999 due to a fall in the exchange rate after the Russian crisis (Figure 3). While economic growth in the country was stable, the deterioration in the nominal exchange rate of the som (the national currency of the Kyrgyz Republic) to the US dollar in 1998-2000 led to a

Figure 3 Public external debt to GDP ratio
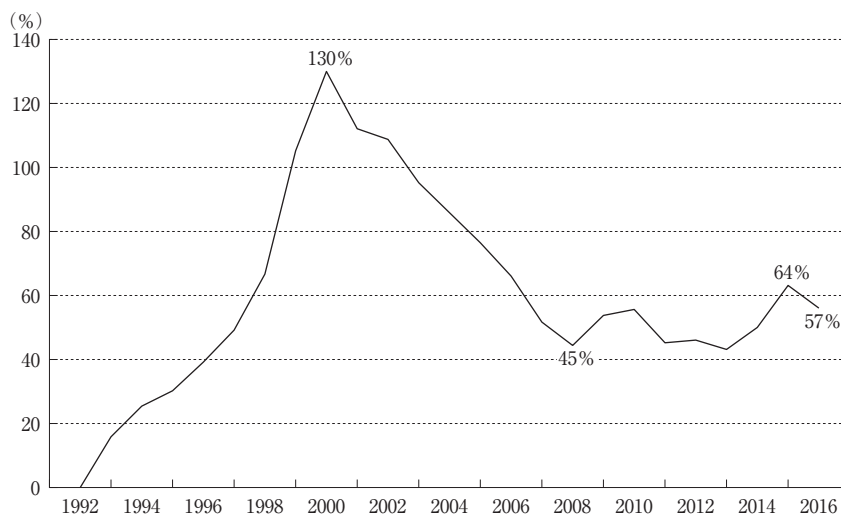
sharp increase in foreign debt expressed in national currency. The situation was exacerbated by the lack of experience in external borrowing, management and a reliable system of the monitoring of public external debt. Liquidity problems led to the restructuring of public external debt in 2002 and 2005 within the framework of the Paris Club, which helped alleviate the burden of external debt and reduce external debt from 109 percent to GDP in 2002 to 45 percent in 2008. In 2001-2008, the introduction of a debt tracing system and debt reporting system significantly improved the accounting and monitoring of public external debt. However, the national budget worsened from 0.83 percent of the surplus in 2008 to minus 5 percent of the deficit in 2010, and at that time there was also an increase in the external public debt to GDP. A sharp increase in the debt indicator can be explained by the consequences of the global economic crisis and internal political instability in the country, which led to an increase in government spending.

The public external debt accounted for US$3.7 billion or 56.6 percent of GDP in 2016. The share of multilateral loans was 41 percent, and bilateral was 59 percent.

To date, for the Kyrgyz Republic, external borrowing remains the main source of funding for priority measures: financing of the budget deficit, implementing structural reforms in the economic sectors, and financing investment projects that contribute to the revival of the economy.

3. Literature review

A large amount of literature is devoted to the issues of external debt sustainability, in

which the authors use different methodologies to evaluate it. Since the issue of external debt sustainability is a broad concept and includes a large number of indicators, the topic of debt sustainability can be interpreted differently in each paper. It depends on the author's approach and specific research questions.

In most studies, issues of debt sustainability are considered along with economic growth. The authors try to determine the positive or negative impact of external debt. The most popular assumption in such studies is the existence of a linear negative relationship between external debt and economic growth in developing countries. This is confirmed by the study of Zouhaier and Fatma (2014), who established that external debt negatively affects growth in 19 developing countries over the period 1999–2011. In addition, they found the same negative interaction between external debt and investment.

Some researchers support the existence of a nonlinear relationship between external debt and economic growth, according to which a reasonable level of debt contributes to economic growth, and its further increase hinders (reduces) economic growth. Nonetheless, there are still ongoing discussions on external debt levels that maximize growth.

Pattillo, Poirson and Ricci (2002) investigated the nonlinear impact of external debt on economic growth by using panel data of 93 developing countries during 1969–1998. The main findings of this paper are that the average impact of debt on GDP growth becomes negative above 160–170 percent of exports and 35–40 percent of GDP. The marginal impact of debt becomes negative with much lower levels of debt, which is half of the average values.

Demchuk (2003) reviewed the impact of external debt on economic growth in the 21 transition countries during the period of 1994–1999. He found an inverted U-shaped relationship between debt and growth; the optimal level of debt, which maximizes economic growth, is from 11 to 18 percent of GDP; the negative average impact of debt on growth belongs to the range of 16–35 percent of GDP.

In connection with the expansion and availability of data on public debt (central government debt), Reinhart and Rogoff (2010) conducted a study on 44 advanced and emerging economies covering about 200 years. Their results show that economic growth worsens when the level of external debt exceeds 60 percent of GDP, and when the level of external debt exceeds 90 percent, the growth rate is sharply reduced. This corresponds to the fact that more than half of all defaults on external debt in emerging markets since 1970 happened at debt levels that would meet the Maastricht criteria of 60 percent.

Other studies of the IMF on debt issues, conducted by Clements, Bhattacharya and Nguyen (2003, 2005), analyzed the relationship between debt and growth for 55 low-income countries for the period 1970–1999. As a result, they found that the negative impact of debt begins after the face value of external debt reaches more than 50 percent of GDP, or the net present value of external debt is more then 20–25 percent of GDP.

The following authors considered a nonlinear assumption in relation to public debt. Thus, Jacobo and Jalile (2017) found a significant nonlinear relationship between government debt and economic growth in 16 Latin American countries from 1960 to 2015. They believe that public debt adversely affects economic growth when it reaches 64–71 percent of GDP, while institutional variable (the democratic government) promotes economic growth.

Mencinger, Aristovnik and Verbic (2015) examined and evaluated the impact of public debt on economic growth using panel data of 36 countries covering the period 1980–2010 for developed countries and 1995–2010 for emerging economies. They found that the debt-to-GDP turning point, when the debt variable begins to have a negative impact on growth, is 90–94 percent for developed economies and 44–45 percent for emerging economies.

In contrast to the above results, the following authors do not find evidence of a nonlinear and an inverted U-shaped relationship between public or external debt and economic growth. For instance, Presbitero (2005) mentioned that there are various theoretical hypotheses about the influence of the debt stock and flow on investment and economic growth, but they find no firm conclusion. They examine the relationship between external debt, economic growth, and investment in 152 developing countries for the period 1977–2002. The authors find the following: the relationship between debt and growth is linear and negative, and there is no evidence of an inverted U-curve; debt service does not directly affect growth; high level of debt does not significantly reduce level of investment, but reduces its quality and efficiency; the impact of high debt in the poorest countries is greater due to weak institutional quality and policies there.

Daud and Podivinsky (2012) analyse the impact of external debt on the economic growth of 31 developing countries for 36 years. They do not find any evidence of an inverted U-shape relationship in the debt growth model, so they tend to believe that the negative relationship of debt with economic growth is robust.

Soydan and Bedir (2015) support the previous studies that state the linear relationship between external debt and GDP growth. Their study cover the period 1985–2013 for 13 middle-income countries using common correlated effects (CCE). They indicated that external debt adversely affects growth through the debt stock rather than debt servicing.

4. Data and methodology

In accordance with the research questions, the empirical study is carried out in two stages. To answer the first research question, this study follows Patillo et al. (2002), who used a quadratic specification in order to find a nonlinear relationship between debt and growth. The regression model is as follows:

$$GDP_{it}=\beta_0+\beta_1 lnINGDP_{it}+\beta_2 InDEBT_{it}+\beta_3 lnDEBT^2{}_{it}+\beta_4 EDUC_{it}$$
$$+\beta_5 CPI_{it}+\beta_6 OPEN_{it}+\beta_7 FDI_{it}+\varepsilon_{it}, \tag{1}$$

Where:

GDP_{it} ― GDP per capita growth;

$lnINGDP_{it}$ ― Initial per capita GDP, measured in natural logs;

$InDEBT_{it}$ ― External debt to GDP ratio, measured in natural logs;

$lnDEBT^2{}_{it}$ ― External debt to GDP ratio in square, measured in natural logs;

$EDUC_{it}$ ― Mean years of schooling;

CPI_{it} ― Growth rate of consumer price index;

$OPEN_{it}$ ― Openness indicator (export＋import as a share of GDP);

FDI_{it} ― Foreign direct investment as a share of GDP.

Coefficients β_i, ($i=0, \cdots\cdots, 7$)‒parameters of the model to be evaluated by the available set of values of the variables, ε_{it}‒is an error term.

The next step is to get an answer to the second research question. What is the marginal impact of the external debt indicator on economic growth?

If we get confirmation of the nonlinear relationship between external debt and economic growth, we can calculate the peak of the quadratic function that determines the marginal impact of the external debt indicator, above which the impact of external debt on growth begins to be negative. The partial derivative of equation (1) is calculated with respect to external debt to GDP ratio:

$$\frac{d(GDP_{it})}{dlnDEBT_{it}}=\beta_1+2\beta_2 lnDEBT_{it}=0 \tag{2}$$

Then solving equation (2) for the turning point of the external debt indicator, we get the following equation:

$$lnDEBT^*=-\frac{\beta_1}{2\beta_2} \tag{3}$$

This study is based on panel data for 117 developing and emerging economies for the period 1981‒2015. The data were calculated at five-year averages to avoid the impact of annual short-term fluctuations. Mean years of schooling indicator were collected from the Barro and Lee Dataset and the UNESCO Institute for Statistics, all other data are available in the World Development Indicators database of the World Bank.

In order to investigate the impact of various forms of external debt stocks, we used two types of disbursed and outstanding debt (DOD): total external debt stock and public and publicly guaranteed external debt stock. Public and publicly guaranteed external debt includes only the debts of the national government, political subdivisions, autonomous

Table 1　Summary statistics of model variables

Variable	Obs	Mean	Std. Dev.	Min	Max
GDP per capita growth （%）	759	.079	.202	−1.263	1.242
Initial GDP per capita （$）	745	7,400	1,020	4,811	9,540
External debt to GDP （%）	742	3.841	.832	−.239	7.191
Education （indicator）	718	5.761	2.821	.3	12.18
CPI （%）	666	.150	.364	−.107	5.672
Openness （% of GDP）	716	74.4	35.6	.198	266.6
FDI （% of GDP）	724	3.5	4.8	−3.9	45.9

Table 2　Correlation matrix of model variables

	GDP per capita growth	Initial GDP per capita	External debt to GDP	Education	CPI	Openness	FDI
GDP per capita growth	1						
Initial GDP per capita	0.0436	1					
External debt to GDP	**−0.0928***	−0.230***	1				
Education	0.186***	0.673***	−0.124**	1			
CPI	−0.394***	0.0451	0.0114	−0.0002	1		
Openness	0.112**	0.280***	0.191***	0.379***	−0.152***	1	
FDI	0.226***	0.0827*	0.121**	0.249***	−0.113**	0.461***	1

*p$<$0.05,　**p$<$0.01,　***p$<$0.001

public bodies and private debts guaranteed by public entity.

The descriptive statistics for each variable are given in Table 1.

According to the correlation matrix （Table 2）, the correlation coefficients are rather low, and the correlation between the external debt and economic growth coefficients is significant and negative （correlation coefficient is −0.093）.

5．Estimated results

Several regression models, such as OLS, a fixed effect and a random effect, were evaluated in order to establish relationship between debt and growth. The Hausman specification test is applied to determine between a fixed effect and a random effect that showed a preference of a fixed effect model.

The result of Table 3 is based on a fixed effect model with a time specific effect for total external debt as a percentage of GDP. This result based on available data and calculations, shows a nonlinear relationship between external debt and economic growth. It is confirmed that an acceptable level of external debt has a positive effect, and its further growth （excessive debt level） has a negative effect on GDP growth.

Table 3 Estimated results of effect of external debt on economic growth
(for the total external debt stock as a share of GDP)

Dependent variables: GDP per capita growth

Independent variables	Model 1	Model 2	Model 3	Model 4	Model 5
Initial GDP	-0.306^{***} (0.0294)	-0.275^{***} (0.0283)	-0.146^{***} (0.0261)	-0.152^{***} (0.0262)	-0.144^{***} (0.0258)
External debt-to-GDP	0.182^{***} (0.0462)	0.350^{***} (0.0513)	0.176^{***} (0.0488)	0.183^{***} (0.0494)	0.163^{***} (0.0501)
External debt-to-GDP^2	-0.0230^{***} (0.00626)	-0.0411^{***} (0.00669)	-0.0223^{***} (0.00645)	-0.0234^{***} (0.00658)	-0.0198^{***} (0.00665)
Education		-0.00611 (0.0159)	-0.00331 (0.0128)	-0.00190 (0.0129)	-0.00581 (0.0126)
CPI			-0.188^{***} (0.0192)	-0.189^{***} (0.0191)	-0.186^{***} (0.0187)
OPEN				0.00130^{***} (0.000338)	0.000864^{**} (0.000341)
FDI					0.00764^{***} (0.00174)
Constant	1.892^{***} (0.225)	1.313^{***} (0.230)	0.788^{***} (0.219)	0.735^{***} (0.220)	0.718^{***} (0.217)
year FE	yes	yes	yes	yes	yes
Observations	729	664	595	573	568
R-squared	0.279	0.329	0.378	0.399	0.434
Number of Countries	117	116	110	109	109

Standard errors in parentheses
***p$<$0.01, **p$<$0.05, *p$<$0.1

Almost all control variables are statistically significant at 1 percent level and in the expected sign, with the exception of the education coefficient. This coefficient is supposed to be significant and positive. On the contrary, the result shows the estimated coefficient is insignificant and negative. Pattillo et al. (2002) also found the ambiguous impact of education in their regressions, but in the fixed-effect estimations they received a negative and insignificant education coefficient (school enrollment rates). Our result can be explained by the fact that the indicator of mean years of schooling does not change and remains on the same level for a long period of time and is quite low in low-income countries.

The CPI and trade openness represent a macroeconomic condition. As expected, the result shows that an increase in the coefficient of CPI by 1 percent leads to a drop in GDP per capita by 0.19 percent. It is obvious that a constant increase in the level of inflation creates uncertainty in the market and leads to a reduction in investment by economic agents, thus adversely affects economic growth. Trade is statistically significant at 1 percent level, but the coefficient is low. Pattillo et al. (2002) also confirm a positive and significant coefficient of openness indicator in most specifications with a fixed effect.

The coefficient of FDI shows it contributes to economic growth. The coefficient is positive and significant at 1 percent level. Different authors use different types of invest-

Table 4 Estimated results of effect of external debt on economic growth
(for public and publicly guaranteed external debt stock as a share of GDP)

Dependent variables: GDP per capita growth

Independent variables	Model 1	Model 2	Model 3	Model 4	Model 5
Initial GDP	−0.296*** (0.0296)	−0.258*** (0.0293)	−0.142*** (0.0265)	−0.148*** (0.0267)	−0.138*** (0.0263)
PPG external debt-to-GDP	0.0635* (0.0357)	0.133*** (0.0376)	0.0680** (0.0304)	0.0705** (0.0308)	0.0577* (0.0306)
PPG external debt-to-GDP^2	−0.0110** (0.00541)	−0.0181*** (0.00551)	−0.0114** (0.00458)	−0.0117** (0.00466)	−0.00852* (0.00463)
Education		−0.00996 (0.0165)	−0.00570 (0.0129)	−0.00448 (0.0130)	−0.00791 (0.0127)
CPI			−0.199*** (0.0189)	−0.200*** (0.0189)	−0.197*** (0.0184)
OPEN				0.00129*** (0.000341)	0.000858** (0.000343)
FDI					0.00814*** (0.00174)
Constant	2.079*** (0.227)	1.685*** (0.237)	1.017*** (0.213)	0.969*** (0.215)	0.919*** (0.211)
year FE	yes	yes	yes	yes	yes
Observations	728	664	595	573	568
R-squared	0.266	0.283	0.369	0.389	0.424
Number of Countries	117	116	110	109	109

Standard errors in parentheses
***p<0.01, **p<0.05, *p<0.1

ment (private and public) in growth models that generally support economic growth.

Due to missing data in some variables, the sample size has been reduced to 568 (with 109 countries) from the original number.

Table 4 shows the assessment of public and publicly guaranteed external debt stock as a share of GDP and growth using a fixed effect model with a time effect.

As in the first regression, the result confirms the nonlinear debt-growth relationship. All coefficients have the same sign as in the previous regression with the significance of time effects. The result indicates that an increase in the debt indicator, trade openness and FDI leads to an increase in GDP growth, and an increase in the debt indicator in square and CPI result in a decrease of economic growth.

The presence of a nonlinear relationship between external debt and growth makes it possible to calculate the marginal impact of external debt (turning point), when the growth is maximized. Thus, the marginal impact of the ratio of external debt to GDP, when growth is maximized and above which GDP growth slows down, is estimated as 61.3 percent of GDP for the total external debt, and 30 percent of GDP for public and publicly guaranteed external debt. This means that after these turning points, the impact of the external debt indicators begins to negatively affect growth in developing countries.

Our obtained level exceeds the estimated result of Pattillo et al. (2002) on which this

Table 5 Estimated results of effect of external debt on economic growth
(for the total external debt stock as a share of GDP)

Dependent variables: GDP per capita growth

Independent variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Initial GDP	-0.00387^{**} (0.00187)	-0.0102^{***} (0.00249)	-0.00966^{***} (0.00274)	-0.0104^{***} (0.00275)	-0.0104^{***} (0.00279)	-0.0101^{***} (0.00281)
External debt-to-GDP	0.00108 (0.0169)	0.000567 (0.0158)	0.0853^{***} (0.0309)	0.0864^{***} (0.0305)	0.0873^{***} (0.0311)	0.0778^{**} (0.0305)
External debt-to-GDP^2	-0.00187 (0.00206)	-0.00164 (0.00191)	-0.0134^{***} (0.00432)	-0.0137^{***} (0.00428)	-0.0138^{***} (0.00435)	-0.0122^{***} (0.00426)
Education		0.00348^{***} (0.000979)	0.00390^{***} (0.00110)	0.00319^{**} (0.00119)	0.00326^{**} (0.00125)	0.00214^{*} (0.00125)
CPI			0.00750 (0.0142)	0.0220 (0.0171)	0.0220 (0.0172)	0.0251 (0.0165)
OPEN				0.000114 (7.63e$-$05)	0.000120 (8.09e$-$05)	0.000154^{*} (7.76e$-$05)
FDI					-0.000221 (0.000944)	8.04e$-$05 (0.000963)
eastasiapac						-0.00580 (0.00621)
latincarrib						-0.00746 (0.00566)
subsahafr						-0.0148^{***} (0.00471)
Constant	0.0693^{*} (0.0388)	0.0939^{**} (0.0368)	-0.0634 (0.0578)	-0.0628 (0.0571)	-0.0642 (0.0579)	-0.0420 (0.0582)
Observations	79	79	58	58	58	58
R-squared	0.292	0.395	0.355	0.382	0.382	0.492

Standard errors in parentheses
$^{***}p<0.01$, $^{**}p<0.05$, $^{*}p<0.1$

study is based. The difference in the turning points can be explained by the difference in the number of countries, control variables in the regression and the changes in the structure of developing countries since then. At the same time Pattillo et al. (2002) note that "*it is very difficult to accurately estimate the turning point because of the limited variation in the data between the growth experiences of countries with low indebtedness and those with low-to-moderate indebtedness*"[2].

To assess the long-term effect of external debt on economic growth, we applied the cross-country regression analysis with the same control variables, which is presented in Table 5.

This method also confirms the existence of a nonlinear relationship between external debt and economic growth. The coefficients are statistically significant, external debt to GDP is at 5 percent level and external debt to GDP in square is at 1 percent level.

The marginal impact of external debt on economic growth in this regression is much lower, namely, 23.6 percent of GDP. This means that in the very long term we should expect a decline in economic growth already when the external debt to GDP reaches more than 20 percent of GDP.

However, as the literature review shows, it is rather difficult to determine the threshold levels of external debt indicators because there are different points of view among the authors regarding the threshold values at which external debt will be sustainable and support economic growth. This task is especially challenging for developing countries, which have sharply different levels of GDP development between economies, an unstable economic system, weakly developed institutions, and political and social instability.

In the end, in order to better understand the relationship between variables in the context of debt, this study considers the conditional effect of debt and economic growth using a fixed effect model. According to the results, the interaction between debt and openness indicator is statistically significant and negative in relation to GDP. This means that trade openness might increase the effect of debt to reduce GDP growth. In turn, interaction between debt, education and CPI is statistically significant and positive. This means that education and the CPI decrease the effect of debt to increase GDP growth. If everything is clear with trade openness and education, then the positive interaction of debt and the CPI may be due to the fact that inflation reduces the purchasing power of money and thereby reduces the burden of debt on the economy. In other words, inflation allows the government to repay a debt with foreign currency（in most cases, dollars）that has less purchasing power than those that were originally received.

Taking into account the socio-economic conditions, our results show that developing countries can steadily develop at the level of total external debt of just over half of the country's GDP.

6．Conclusion

Despite the existence of various hypothesis of debt-growth relation, according to our results, this study supports the nonlinear relationship between external debt and economic growth. In particular, we found that this relationship is robust in terms of different quadratic model specifications for developing countries.

The marginal impact of the external debt on economic growth, which can maximize economic growth, is 61.3 percent of GDP for total external debt, and 30 percent of GDP for public and publicly guaranteed external debt. In the long term, the marginal impact of total external debt on growth is 23.6 percent of GDP. This means that if the external debt exceeds the above-mentioned levels of GDP, this leads to an economic slowdown and reduction in growth rate.

In addition, this study found that price stability and a favorable trade policy regime are important macroeconomic conditions for short and medium term economic growth. All this contributes to the creation of an enabling environment for investment and economic

growth, and increases the capacity for debt servicing. The investments presented by FDI in the models also support economic growth as an alternative fund of resources that do not create debt, but they are not sufficient for long-term growth. The cross-country regression results confirm that it is necessary to invest in education, since it is positively associated with the growth rate in the long-term period.

At the same time, as the experience of different countries shows, a failure with proper management of external debt can arise at any debt levels. This confirms that the sustainable level of external debt is individual for each country, depending on many factors and socio-economic conditions.

As for the Kyrgyz Republic, in 2017 its public external debt was 53.9 percent of the country's GDP. Theoretically, according to our results, the country exceeds the critical value of the debt indicator. However, the country will not be able to abandon external loans, as it lacks domestic funds to finance large-scale investment projects, as well as many developing countries. In this situation, the country needs to develop a reliable debt policy for effective debt management in order to avoid a strong debt burden on the economy.

Thus, the sustainability of external debt depends not so much on the level of debt indicators as on the effective debt management taking into account the socio-economic situation in the country. In addition to the empirical results of this thesis, the following comments could be addressed for effective debt management.

・Constant monitoring of the accumulation of external debt in order to ensure the sustainability of debt is indispensable. It is necessary to monitor the system of indicators in general for a comprehensive assessment of the debt situation in the country;

・The threshold level of external debt should be perceived as a signal for the application of appropriate policy measures to avoid a strong burden on the economy in the short run as well as in the long run;

・Debt growth rates and external debt indicators should be specified on an annual basis and regulated by law within acceptable safe limits, taking into account the socio-economic situation in the country;

・External borrowing should be used productively and efficiently to make a profit for full and timely servicing of external debt.

Despite the fact that the study has reached its aim, it is necessary to note some limitations. First, some data on the sample countries are not available, thus, the results have suffered from missing data. Second, the study covers all developing countries, but there is no division into debt levels of countries, also debt crisis in countries are not taken into account, which can affect the results. The third limitation of this study is the lack of necessary data for the Kyrgyz Republic and get individual results.

This topic requires further study to confirm and refine the results as over time additional statistical information will be obtained, and structural changes will take place in

the economies of developing countries.

Notes

1) IMF Assessing Sustainability（2002, p. 4）
2) Pattillo C., Poirson H. and Ricci L.（2002）p. 19

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