Determinants of Public Debt in Lower-Middle Income Countries

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Abstract: This paper aims is to empirically investigate the influence of macro–economic factors on the changes of the public debt in lower middle-income countries. By applying DGMM regression method on the dataset of 40 countries during the 1996-2015, the study provides empirical evidences on the role of macroeconomic factors on changes of public debt in lower middle-income countries, including trade openness, interest rates, budget surplus, inflation, economic growth, foreign direct investment, infrastructure, financial development. However, the unemployment rate does not have any impact whatsoever on debt to GDP ratios over the period. The study also implies that the policy-makers should give more emphasis on launching appropriate macro-economic policies. In particular, the government had better attract foreign direct investment, using of borrowing efficiently to enhance the rate of investment, increase earning and income as the most important sources to reduce public debt level.

Keywords: Economics growth; Public debt; Differenced panel GMM Arellano-Bond estimation; Lower Middle Income Countries.

JEL classifications: E62, F34, H62, H63.

1. Introduction

Most of developing countries all around the world has been financing their operation and development by borrowing. However, the national debt crisis of the European countries lead both academics and policymakers to reconsider when use borrowing as the main

sources finance for growth. Thus, the public debt dynamics has become as the primary issues for socio-economic development. The large-scale of public debt can have a negative impact on capital accumulation as well as labor productivity and economic growth [1]. Therefore, the challenge for policy makers is to obtain the dramatic economics growth with the debt sustainability. In recent years, there have been large amount of empirical researches relating to the determinants of public debt. However, because of using different statistical

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procedures and datasets, different studies produce remarkably inconsistent results.

In the purpose of complementing the scientific contribution to this subject field as well as providing implication for the public finance management policies in lower middle-income countries, this paper focuses to break out the public debt into macroeconomic components attributable to trade openness, interest rates, budget surplus, inflation, economic growth, foreign direct investment, infrastructure, financial development using DGMM regression method. The paper is organized as follows: section 2 review of some recent research; section 3 describes proposes empirical model and data; section 4 presents and discusses the estimated results and, finally, section 5 draws some final implication for policy makers.

2. Literature review

The ever increasing of public debt has been affecting the financial stability of both high and low-income countries for years and is a considerable subject to various authors all around the world. A large amount of literature has examined the decompositions of public debt using an array of econometric techniques such as OLS, Fixed or Random effect model, GMM model on cross-country, time series, and panel data. Some of typical studies relating to the subject are mentioned as below:

The World Bank broke down the change in public debt to GDP ratios of 31 market-accessed countries into factors such as primary fiscal deficits, real GDP growth, real interest rates, the capital gain/loss on foreign currency denominated debt as result of exchange rate changes, and fiscal costs associated with contingent liabilities such as bank bailouts. By ignoring that factors affecting public debt simultaneously determined and influenced each other, the study points out that primary fiscal deficits, real GDP growth has dramatically affected on the change of public debt ratio [2].

Accademico provided evidences that public debt are determined not only by the budget surplus, real GDP growth, and real interest rates, real exchange rate but also by debt relief over time. This research was carried out on the data of 17 low income countries (LICs), including Vietnam over the period 1990-2002 [3].

Forslund et al. expanded the assessment of public debt determinants in developing countries and emerging markets. By applying the fixed-effects model (FEM) on data samples from 95 countries, the study reveals a weak correlation between national inflation history and the size of domestic debt as the result of the control of capital accounts. In contrast, in countries where capital flows are liberalized or neutral, the relationship between inflation and public debt is contradictory [4].

Sinha et al. used 30-year dataset of middle and high income group countries to find out the determinants of public debt. The research shows that the determinants of debt situation are GDP growth rate, central government, education expenditure and current account balance for both high and middle income group countries. However, foreign direct investment and inflation rate have no impact on debt to GDP ratios among high income group countries but are found to be of more relevance when determining debt situation of middle income group countries. The paper also shows that population density and population above 65 years of age do not have any impact whatsoever on debt to GDP ratios of both high and middle income countries [5].

Bittencourt defied the main determinants of government and external debt in 09 countries in Latin America from 1970 to 2007. Except for economic growth, other proposed factors such as inequality, and constraints on the policy do not present clear-cut estimates on debt [6].

Adonia et al. investigated the impact of political factors on external public debt of 36 countries from Sub-Saharan Africa (SSA) over a long period of 1975 to 2012. Using pooled

OLS and fixed effects model, the results indicates the importance of both political institutions and economic factors in explaining the indebtedness of countries in Sub Saharan Africa [7].

Nguyen carried out the empirical study on the relationship between public debt and inflation by applying GMM Arellano Bond model on a sample of 60 developing countries in Asia, Latin America and Africa over the period 1990–2014. The study suggests that public debt of developing countries is significantly impacted by real GDP per capita and government, private investment and trade openness [8].

Globan et al. investigated the public debt determinants in EU new members. Results of the panel data analysis show that public debt growth decreases if the governments can achieve a more balanced government budget. And by stimulating economic growth, the debt crisis should be resolved [9].

Eisl reassessed theory of public debt by examining the main political influence factors accounting for the variation in public debt accumulation on a global scale. Applying different specifications of quantitative models on political stability, law, control of corruption from the indicators the global economy during the period extending from 1996 to 2014, the paper finds out evidences that the two governance indicators of political stability and regulatory quality have consistent effects on public debt accumulation [10].

Thus, previous studies have pointed out the determinants of public debt for a group of countries using different methods. However, there has not any research carried out for lower middle income countries group using DGMM estimation method. This is the research gap. Specially, this paper will: *(i) define which factors have influence and assess the impact of them on the change of public debt of middle-income countries; (ii) provide policy recommendations for these countries.*

3. Empirical model & data

3.1. Empirical model

In order to empirically investigate the determinants of public debt for a sample of 40 lower middle-income countries over the period 1996-2015, this paper proposed the research model equation for dynamic panel data using DGMM model as follows:

$$\Delta PD_{it} = \alpha_{it} + \alpha_0 PD_{it-1} + \alpha_x X_{it} + \eta_i + \xi_{it} \; (*)$$

In which: η_i is an unobserved time-invariant, country-specific effect and ζ_{it} is an observation-specific error term. Dependent variable: ΔPD_{it}, as the first difference of PD, representing the growth rate of public debt. Explanatory variables: A set of explanatory variables which have impacts on the public debt are selected based on a review of previous studies as well as the basis of the research models. In summary, the variables which are used in the empirical model are as follows:

Table 1. Definition of variables

Variable name	Description	Expected
Public debt	Total public debt, %GDP	
Budget surplus	The budget surplus, %GDP	-
The financial development	Broad money, %GDP	-
Foreign direct investment	Foreign direct investment (net inflow), %GDP	-
Economic growth rate	Natural logarithm of GDP per capita, %.	-
Inflation rate	Natural logarithm of (1 + inflation), %.	-
Interest rate	The new official interest rate, %.	+
Infrastructure development	Number of fixed telephone subscribers per 100 population, subscriber/100.	-
Trade openness	Total exports and import to GDP, %GDP.	+
Unemployment	Unemployment rate, %.	+

3.2. Research data

Macro-data of 40 out of 52 lower middle-income countries are extracted to balance panel data over the period 1996 - 2015. Except for the data of public debt, budget surplus and real GDP growth rate are taken from the datasets of The International Monetary Fund (IMF) Data Mapper, the remaining data is collected from The World Development Indicators database provided by the World Bank (WB). Some missing values of the dataset in some countries are fulfilled with annual report and database of the Asian Development Bank (ADB), the African Development Bank (AFDB) and the United Nations (UN). Pursuant to the analytical classification of the world's economies in 2016 based on estimates of gross national income (GNI) per capita, lower middle-income economies are those with a GNI per capita between $1,026 and $4,035. The reason why data is collected for the period from 1996 to 2015 from 40 countries instead of total 52 countries in group is due to some missing data can be collected by the trust data sources. Some countries such as: Timor-Leste, West Bank and Gaza have not provided data over the same period. Some of them don't public full database for the year after 2015 or before 1996. Therefore, after the database adjustment for conducting the empirical research to get the max of observations, some countries will be rejected out of the sample. The final sample includes 40 countries, in which: 20 countries of group Asia-Pacific, 13 from Africa and 7 from Latin-America and Europe: Armenia, Bangladesh, Bhutan, Bolivia, Cabo Verde, Cambodia, Cameroon, Congo Rep., Cote d'Ivoire, Djibouti, Egypt, Arab Rep., El Salvador, Ghana, Guatemala, Honduras, India, Indonesia, Kenya, Kyrgyz Republic, Lao PDR, Moldova, Mongolia, Morocco, Nicaragua, Nigeria, Pakistan, Papua New Guinea, Philippines, Samoa, Solomon Islands, Sri Lanka, Sudan, Swaziland, Tajikistan, Tunisia, Ukraine, Uzbekistan, Vanuatu, Vietnam, Yemen Rep.

Table 2 summarizes the statistical results of all variables used in the model. The statistical results reveal the variance of data between different countries and at different times.

Table 2. Statistics description

Variable	Obs.	Mean	Std. Dev.	Min	Max
Public debt (%GDP)	800	57.82	37.18	7.28	264.44
Budget surplus (%GDP)	800	-2.60	4.30	-18.35	32.83
Ln (Inflation) (%)	800	0.08	0.09	-0.20	0.95
Fixed-phone subscribers (Subs/100)	800	6.14	6.42	0.10	35.20
Ln (GDP per Capita), (%)	800	7.08	0.73	4.94	8.39
Trade openness (%GDP)	800	81.16	32.80	1.58	199.68
Broad money (%GDP)	800	18.24	15.40	-29.25	119.00
Foreign direct investment (%GDP)	800	3.63	4.49	-5.01	43.91
Unemployment rate (%)	800	8.62	6.17	0.10	32.35
Interest rate (%)	800	2.10	1.66	0.00	11.02

3.3. Empirical results

This study firstly used the correlation matrix to find out the relationships between the independent variables that are likely to affect to public debt ratio. The matrix of correlation coefficients for variables is given in Table 3. In general, all correlation coefficients between dependent variable and independent variables are statistically significant low and less than 0.8. The figure suggests that the correlation between the variables is quite low and

eliminates the possibility of collinearity between these variables. In addition, according to the matrix, instead of financial development, inflation, and unemployment are positively correlated to public debt, all the remaining variables consist of budget surplus, infrastructure, economics growth, trade openness, foreign direct investment, interest rate are negatively linked to public debt.

Table 3. Correlation matrix

Variable	PD	BD	INF	SUB	GP	TRD	BMG	FDI	UNE	INT
PD	1									
BD	-0.13	1								
INF	0.19	-0.07	1							
SUB	-0.18	-0.13	-0.03	1						
GP	-0.33	0.05	-0.34	0.38	1					
TRD	-0.04	0.12	0.04	0.19	0.05	1				
BMG	0,08	0.07	0.47	-0.00	-0.39	0.12	1			
FDI	-0.03	0.06	-0.04	0.07	0.16	0.40	0.10	1		
UNE	0,03	0.16	0.03	0.01	0.13	0.10	-0.04	0.02	1	
INT	-0.07	-0.01	0.02	0.12	0.02	-0.10	0.03	-0.12	-0.10	1

Note: PD: Public debt; BD: Budget surplus; INF: Inflation; SUB: Number of fixed-phone subscribers per 100 population; GP: Economics growth; TRD: Trade openness; BMG: Broad money; FDI: Foreign direct investment; UNE: Unemployment; INT: Interest rate.

The presence of the lagged dependent variable gives rise to autocorrelation. It can make OLS inconsistency and estimates bias for short time dimension (small T). Therefore, this paper suggest using the difference GMM estimator (DGMM). The DGMM was designed for dynamic panel data with "small-T & large-N". In the standard GMM procedure, it is essential to distinguish instrumented variables and instruments. Based on previous empirical research, there exist and converse relationship between the public debt ratio and the inflation rate [8]. Thus, inflation is an endogenous variable, the remaining explanatory variables are added to the model as instrument variables. The DGMM results show the sustainability of the regression model when the coefficient of variables has the expected sign and the p-value is statistically significant. In addition, the validity of instruments in GMM estimator is assessed through Sargan statistic and Arellano-Bond statistic. The result shows that both Sargan and AR (2) tests with the p-value greater than 0.1 meaning that the DGMM model is sustainable. The detailed results of the estimation determinants of the public debt as the results of estimating Eq. (*) as below:

Table 4. DGMM regression results

Dependent variable: Δ Public debt

Variable	Coefficient
Public debt (-1)	-0.67 ***
Budget surplus	-1.23 **
Inflation	-103.78 **
Infrastructure	-0.82 *
Economics growth	-8.83 **
Trade openness	0.53 **
Financial development	-0.43 **
Foreign direct investment	-2.07 *
Unemployment	-1.27
Interest rate	1.01 *
Observations	600
AR (2) test	0.91
Sargan test	0.85

*Note: ***, ** and * denote the significance at 1%, 5% and 10% respectively*

The study has shown empirical evidences on the role of macroeconomic factors on the growth of public debt level in lower middle income countries, in which trade openness, interest rate have positive impact on public debt changes whereas other variables such as state budget surplus, inflation, economic growth, foreign direct investment, infrastructure, financial development negatively correlate with public debt.

It is clear that the budget surplus impacts dramatically on public debt growth in all cases. The nature of public debt derives from the deficit of the budget balance. The results indicate that the improvement in budget balance will reduce the level of public debt [9]. Moreover, the results reveal evidences that inflation and economics growth rate, the financial development and foreign direct investment have significantly reduced the debt ratio. Apparenttly, economic growth can be used as one of the most effective tools to reduce public debt [9]. The rapid growth of these economies contributes to the consolidation of revenues and reduces the debt ratio. Besides, inflation can be used as the alternative solution to enrode the value of public debt but need to be considered due to the unanticipated results of increase inflation rate [8]. Among the independent variables, foreign direct investment is crucial factor to diminish the public debt, implying that the rising of inflow investment form others countries contributes to reduce the public debt to GDP ratio.

In addition, the increase of the real interest rate and trade openness generate a positive variation of public debt levels in countries. The increase in interest rates lead to grow up the borrowing costs and increase the size of public debt.

The study uses two social-variables including unemployed rate and infrastructure development to indenfity the influence of them on debt. The empirical results have not shown significant relationship between unemployment rates and public debt scale. However, the development of infrastructure has important

roles on reducing the level of public debt results from producing more opportunities for those countries to generate income and attracting foreign investment.

4. Conclusions

The study has defined determinants of public debt in lower middle income countries, in which trade openness, interest rate have the significantly positive impact on public debt, whereas budget surplus, inflation, economic growth, foreign direct investment, infrastructure, the development of the financial system have negative correlation with public debt. In addition, the estimated result reveals no impact of unemployment on the public debt of those countries. The result emphases the role of foreign direct investment in lower middle income countries in reducing the burden and size of public debt by increasing productivity and attracting capital. The study also recommends the implementation of policies to attract foreign direct investment and use of finance from borrowings efficiently. By attracting foreign direct investments, the government can create more jobs for employees, improve government income, and reduce public. Moreover, with the effectiveness of investment in infrastructure, financial systems, it can spur the growth of economics and reduce the public debt.

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Các nhân tố quyết định đến nợ công của nhóm quốc gia thu nhập trung bình thấp

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Tóm tắt: Mục tiêu của nghiên cứu là xác định sự ảnh hưởng của các nhân tố kinh tế vĩ mô với sự thay đổi của nợ công tại tại các quốc gia thu nhập trung bình thấp. Bằng cách sử dụng mô hình hồi quy DGMM với dữ liệu bảng được thu thập từ 40 quốc gia thu nhập trung bình thấp từ 1996-2015, nghiên cứu chỉ ra bằng chứng thực nghiệm về vai trò của các nhân tố kinh tế vĩ mô đối với sự thay đổi của nợ công tại nhóm quốc gia này, bao gồm độ mở thương mại, lãi suất, thặng dư ngân sách, lạm phát, tăng trưởng kinh tế, cơ sở hạ tầng và sự phát triển tài chính. Riêng tỷ lệ thất nghiệp, nghiên cứu chưa cung cấp được bằng chứng thực nghiệm về việc tác động đến tỷ lệ nợ công trong suốt thời kỳ nghiên cứu. Nghiên cứu cũng đưa ra một số hàm ý chính sách dành cho các quốc gia thu nhập trung bình thấp, trong đó nhấn mạnh vai trò của thu hút đầu tư trực tiếp nước ngoài, sử dụng hiệu quả các nguồn lực để gia tăng tỷ lệ đầu tư, tăng thu nhập như là một công cụ hiệu quả để làm giảm nợ công.

Từ khóa: Tăng trưởng kinh tế, Nợ công, ước lượng GMM sai phân dữ liệu bảng ArellanoBond, các quốc gia thu nhập trung bình thấp.