



2528-9705

Örgütsel Davranış Araştırmaları Dergisi

Journal Of Organizational Behavior Research

Cilt / Vol.: 8, Sayı / Is.: 1, Yıl/Year: 2023, Sayfa/Pages: 74-91

<https://doi.org/10.51847/tw5g65dco8>



PUBLIC DEBT AND PROSPERITY NEXUS IN ASIAN COUNTRIES: NONLINEARITY AND THRESHOLD ANALYSIS

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ABSTRACT

The purpose of this research is to examine the relationship between public debt and the prosperity of Asian countries over the period between 2009 and 2019. By performing a panel threshold technique and using the data from 37 countries in the Asian area, this study provides new evidence on the threshold value of the ratio of public debt to prosperity. Our results show that public debt may promote economic growth. We further find that debt has a negative and statistically significant impact on prosperity at a low level of public debt but is insignificant at a high level of public debt. Therefore, our study suggests that policymakers in Asian countries must consider the level of public debt to avoid negative impacts on the prosperity of countries. In addition, the most crucial issue that governments need to pay attention to is the effective use of public debt, especially those with high public debt to GDP ratio.

Keywords: Public debt, Prosperity, Threshold, Asian countries.

INTRODUCTION

The effect of sovereign debt on national prosperity is one of the primary concerns of nations around the world. On the one hand, Keynesian economists believe that when public debt induced by the deficit-financed fiscal policy is increased, economic growth or prosperity can be improved thanks to the climb in income, the transaction demand for money, and prices. On the other hand, in the long run, the burden of public debt could be transferred to taxpayers, ultimately causing some negative effects on prosperity. Alternatively, this kind of debt probably has a linear impact on prosperity, but many researchers have indicated a nonlinearity in this relationship. In short, the effect of sovereign debt is always an arguable issue. In recent decades, finding an accurate answer to this problem is more necessary because the matter of national prosperity has become increasingly complicated. Our literature review reveals three research gaps that we use for our contributions.

First, which indicators should be chosen to measure prosperity? Since its development in the 1930s, GDP is often used by numerous people. Prioritizing the GDP indicator is explained by “the tendency to equate increasing GDP with improved wellbeing and a better quality of life” (Jackson et al., 2010; Butkus & Seputiene, 2018; Loncke *et al.*, 2019; Moscoso & Salgado, 2021).

Geliş tarihi/Received: 10.09.2022 – Kabul tarihi/Accepted: 21.01.2023 – Yayın tarihi/Published: 30.03.2023

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However, prosperity has to be examined in various aspects like the economy, society, and politics, which requires more comprehensive indicators. Among many well-researched and developed prosperity indicators, the Legatum prosperity index (LPI) is preferred by many people. In this study, we use both GDP and LPI to compare regression results. This result could indicate differences in evaluating the impact of sovereign debt when only the country's economic aspect is accounted for and when the various national dimensions are examined.

Second, there are a few studies on the public debt and the prosperity relationship between Asian countries. Researchers have been more interested in European countries because of recent years' notorious sovereign debt crisis in this area. Dimitrios Asteriou *et al.* (2021) publicate their study that examines the impact of public debt on economic growth based on the data from 14 selected Asian countries from 1980 to 2012. They found the inverse impact of public debt on economic growth in the short and long run. Meanwhile, abusing public debt is also a headache for many Asian Governments. Moreover, from 2009 to 2019, the average global LPI fluctuated between 54 and 56. In this period, the number of countries in our sample reached the average global level and did not change significantly. Therefore, the issue of the prosperity of Asian countries needs to receive more attention. Alternatively, the effect of public debt on Asian national prosperity does not seem to have received sufficient attention from scientists, and there are no studies on these countries' sovereign debt threshold effect yet. Meanwhile, **Figure 1** shows a nonlinear relationship between the explanatory variable (Public debt) and response variable (GDP growth rate ratio, LPI). This study uses panel threshold regression to look for the tipping points at which the effect of public debt on the country's prosperity has changed.

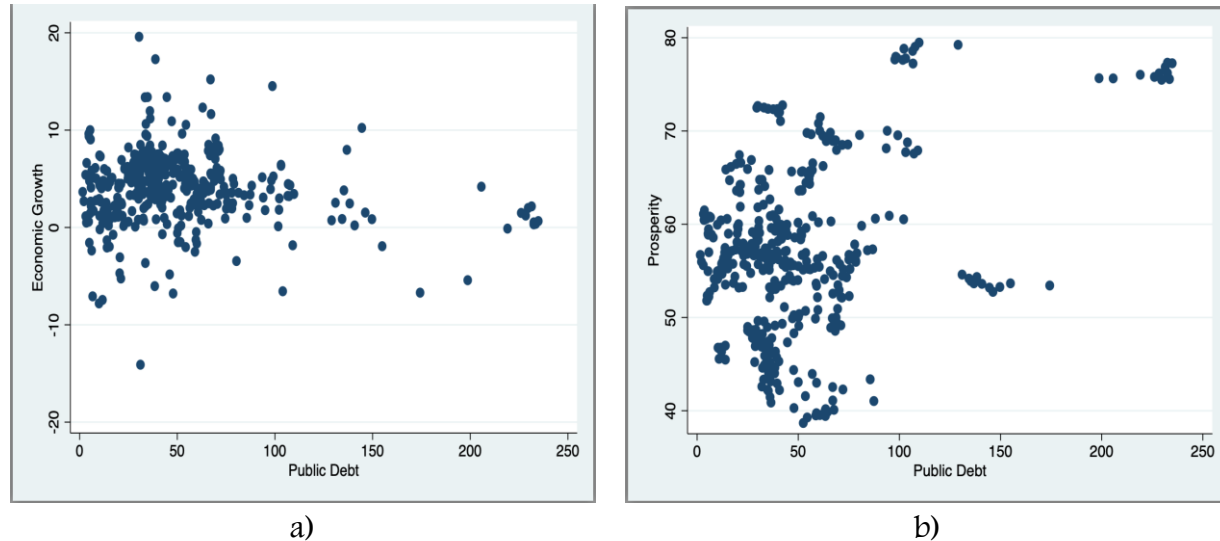


Figure 1. The relationship between the public debt-to-GDP ratio and the prosperity of 37 Asian countries from 2009 to 2019

Third, previous research study period often includes special events, such as the global financial crisis and the European sovereign debt crisis. This could distort the regression results because the determination of factors influencing the country's prosperity with the existence of abnormal circumstances could become complex. In our paper, we choose the study period from 2009 to



2019 when there were no significantly abnormal phenomena, which helps us to have a more objective and accurate conclusion on the effect of public debt on prosperity.

Literature Review

The literature review in our research is divided into two parts in order to answer the following questions: First, which indicators could be used to evaluate the prosperity of a country? Second, how does sovereign debt affect national prosperity with taking into account the threshold effect?

Measuring Prosperity

In this paper, we focus on two indicators: gross domestic product (GDP) and the Legatum prosperity index (LPI). Analyzing the regression results of these two values helps us to give some comments about effective measures of prosperity and the true level of impact of using public debt.

Gross Domestic Products (GDP)

Since its development in the 1930s, GDP is often the favorite measure of numerous people. The credibility of GDP comes from its simple way of calculating and its ability to deliver information about national wealth. The formula of GDP makes it implicit the invaluable metrics about the performance of an economy. Based on GDP, some other indicators, such as the growth rate of GDP, and GDP per capita, have been developed and used.

It is clear that GDP has a strict relationship with economic growth, while the ultimate purpose is to measure the national prosperity that requires the evaluation of the level of development in a range of aspects like the economy, society, and politics. It means that there are some parts of prosperity issues that GDP cannot reflect. However, it is not easy to cope with this matter because of the difficulties that high-level policy decisions-makers face, especially when complex, large-scale systems become increasingly challenging to tackle. Moreover, when international trade and attachment between the countries in the world significantly climb, finding out a comprehensive indicator is more complicated. In this context, allowing extensive and detailed information to be condensed into a concise and simple format is accepted. Jackson's (2010) point of view, "One of the reasons for this is the tendency to equate increasing GDP with improved wellbeing and a better quality of life. Rising GDP traditionally symbolizes a thriving economy, more spending power, increased family security, greater choice, richer and fuller lives, more public spending, and better public services" (Jackson, 2010). As a consequence, indicators calculated from GDP are widely accepted in the world in measuring the country's prosperity. However, as the size and growth rate of economies around the world have increased significantly, the use of GDP to measure national prosperity has revealed more of its weaknesses. To specify, we calculated it by capturing the cost and benefits of economic activity in the market. This characteristic leads to some problems relating to omitting the diverse cost (or "negative externalities"), failing to incorporate the benefits to society of goods and services that are supplied outside the market (Kubiszewski *et al.*, 2013; Ranger & Wolgast, 2019; Schweizer & Troche, 2019; Sagi *et al.*, 2021), having difficulties in distinguishing between the intermediary and final goods. All the above points could distort the conclusion about the true prosperity of a country. Therefore, in recent years, many economists have made an effort to build indicators that can help them have a more comprehensive evaluation of national prosperity.



The Prosperity Index

There are many well-researched and developed prosperity indicators in the world, but many people prefer the LPI. LPI is an indicator that can reflect both economic and social wellbeing. Its advantage is the capacity to capture the richness of a truly prosperous life, which makes it better than traditional macroeconomic measurements of a nation's prosperity, such as GDP per capita and GDP growth rate. It is considered an authoritative measure of human progress. Through examining the changes in different aspects of a country for a certain time, LPI gives a unique insight into how to form and change prosperity across nearly all countries worldwide. LPI consists of 12 pillars of prosperity (Safety and security, Personal freedom, government pillar, Social capital, Investment environment, Enterprise conditions, Market access and infrastructure, Economic quality, Living conditions, Health, Education, and Natural environment). They have been divided into 66 discrete policy-focused elements and grouped into three domains essential to prosperity (Inclusive Societies, Open Economies, and Empowered People)¹. LPI is one of the most used prosperity indicators in the world for some reasons. Firstly, it is the result of the hard work of "more than 100 academics and experts around the world with particular expertise in each of the pillars of prosperity", consolidating its reliability in the academic aspect. Secondly, to calculate this index, 294 different indicators from more than 80 reliable data sources are used, ensuring its accuracy. As a result, this index can offer an overview of national prosperity, becoming a favorite indicator of a wide range of users, including political leaders, policymakers, investors, business leaders, philanthropists, journalists, and researchers.

The Effect of Public Debt on the National Prosperity

The effect of sovereign debt has always been the subject of the attention of many researchers. However, until now, economists have often focused on its influence on the economic sector. Therefore, there have been a lot of studies examining the public debt and economic growth nexus. If the increase in economic growth can be equated with an improvement in prosperity, these studies have brought along certain perspectives about the relationship between sovereign debt and national prosperity. In fact, there is no agreement among economists about this matter yet.

From the point of view of classical economists (like Smith (1776), Ricardo (1821), and Mill (1845)), using public debt could have a detrimental impact on the country's economy. They explained that the loans put pressure on the country to repay, and in subsequent periods, when the Government has to fulfill its debt repayment obligation, it is the increase in taxes is often chosen measure. As a result, taxpayers are forced to decrease their own accounts because of sovereign debt, negatively affecting the country's prosperity. By contrast, many people support the view of the Keynesian economists who argued that when the public debt induced by the deficit-financed fiscal policy is increased, economic growth can be improved thanks to the climb in the level of income, the transaction demand for money, and prices.

In the previous period, many researchers thought that sovereign debt had a linear effect on economic growth. This effect can be negative or positive, but it does not change in the long run. However, Pattillo *et al.* (2002) show that if public debt is at a suitable level, it will have a positive effect, but high indebtedness can be detrimental to growth. It means that there probably is a

¹ <https://www.prosperity.com/>



tipping point for debt, and when sovereign debt crosses this point, its impact on economic growth will change. Recent studies have consolidated this point of view. One of the most well-known research on the threshold of public debt is implemented by Reinhart and Rogoff (2010). They used data from 20 advanced countries over the period 1946–2009 and 24 emerging market economies for the periods 1946–2009 and 1900–2009 to examine the impact of indebtedness on a country's growth. They found evidence of a nonlinear effect of this independent variable, and they also indicated a weak link between low public debt levels and growth, but when the debt-to-GDP ratio exceeds 90%, it negatively affects the growth. The nonlinear impact of debt on growth probably partly comes from a nonlinear response of market interest rates when the debt tolerance limits of a country are reached. To specify, when debt levels rise significantly compared to the increased speed of GDP, creditors would require higher interest rates to limit the risk of default, which would increase the cost of financing, constraining investment (Greenlaw *et al.*, 2013). Alternatively, a too-high debt could directly distort investment, as investors believe that their profit gained from any new project will be taxed away to service the pre-existing debt (Krugman, 1988; Aguiar *et al.*, 2009). Because of the complex and hardly predictable effect of public debt, this matter has become a subject of attention of many researchers in recent years. As a result, a range of theoretical or/and empirical studies have been carried out. While some authors do not find out evidence of any particular debt threshold (such as Pescatori, M. A *et al.* (2014), Eberhardt, M. *et al.*, (2015), and Chudik *et al.* (2017), some other researchers prove the existence of a threshold of public debt. That probably results from the differences in the choice of sample, response, and explanatory variables. Some main studies on this issue are listed detailedly in the **Table 1**.

Table 1. The threshold point of public debt

| No | Author(s) and year of publication | Variables | | | Findings |
|----|---|--------------------------|---|---|---|
| | | Response variable (s) | Explanatory variables | Data | |
| 1 | Baum <i>et al.</i> (2013) | GDP growth rate | Trade openness measure; The ratio of gross capital formation to GDP; Signals the EMU membership; The debt-to-GDP series | 12 euro area countries - Period: 1990-2010 | In the short run, the debt statistically positively impacts GDP growth, but at the level of public debt-to-GDP, around 67% and above, this effect decreases significantly. For high debt-to-GDP ratios (above 95%), increasing debt has a negative impact on economic activity. |

| | | | | | |
|---|--|--|---|--|--|
| 2 | Afonso and Jalles, (2013) | The real aggregated output; Total Factor Productivity | Labour force or population; Capital (physical and human); Debt-related variable of interest | - 155 countries (advanced, emerging, and developing) - Period: 1970-2008 | - For countries with debt ratios above (below) 90% (30%), the growth impact of a 10% increase in the debt ratio is -0.2% (0.1%) - An endogenous debt ratio threshold of 59% can be derived. |
| 3 | Checherita-Westphal <i>et al.</i> (2014) | - Output growth rates | Labour; Private capital; Public capital | - 14 EU countries (EU-14) and 11 euro area countries (EA-11). - Period: 1960-2010 | - Targeting debt levels of around 50% of GDP is beneficial to the euro area if member states have common targets. |
| 4 | Woo and Kumar, (2015) | Real GDP per capita | The initial level of real GDP per capita; Human capital, Initial government size; Initial trade openness; Initial financial market depth; Initial inflation; Terms of trade growth rates; Banking crisis incidence; Fiscal deficit; The initial government debt | - 79 countries (advanced, emerging, and developing) - Period: 1970-2008 | - The effect of public debt starts to change from levels of debt above 90% of GDP, but it probably is not easy to pinpoint a single threshold. |
| 5 | Checherita-Westphal and Rother, (2012) | The growth rate of GDP per capita | - The initial level of GDP per capita - Gross government debt as a share of GDP - Saving or investment (gross capital formation) as a share of GDP | - Twelve euro area countries - Period: 1970-2011 | - A nonlinear impact of debt on growth starts as a turning point when the debt reaches about 90-100% of GDP. |
| 6 | Caner <i>et al.</i> (2010) | The long-run average real growth rate | The long-run average public debt-to-GDP ratio, Openness; Inflation; Initial GDP; 1 represents an indicator function that takes the value of one when the event inside happens, otherwise zero. | - 101 countries - Period: 1980-2008 | - For the total sample, the threshold point of debt is 77% - In emerging markets, the threshold is 64 percent debt-to-GDP ratio. |



| | | | | | |
|----|---------------------------------|---|--|---|--|
| 7 | Cecchetti <i>et al.</i> (2011) | Real per capita GDP | Gross saving (public and private) as a share of GDP; Population growth; Human capital; Population structure and aging; Openness to trade; Inflation; The ratio of liquid liabilities to GDP; A control for banking crises taking the value of zero if in the subsequent five years; An indicator variable that takes the value of 1 if the debt is below a given threshold, and zero otherwise | - 18 OECD countries - Period: 1980-2010 | For government debt, starting from the threshold at around 85% of GDP, debt is not beneficial to the growth |
| 8 | Ahlborn and Schweickert, (2018) | GDP per capita growth rate | Initial income; Investment; Foreign direct investment; Openness; Democratic governance; Inflation rate; The financial crisis variable; Government activity; Public debt | - 111 countries (Liberal, Continental, and Nordic) - Period: 1971-2010 | - For Nordic countries, there is a nonlinear relationship between public debt and economic growth at the level of debt around 60% of GDP. |
| 9 | Ahlborn and Schweickert, (2018) | The real per capita GDP | The growth rate of the population; Inflation rate; openness; Government size | - 152 countries - Period: 1996-2016 - Unbalanced data | - The debt-growth nexus is inverted U-shaped with clear debt turning point dependence on government effectiveness. - Institutional quality seems to be a less important factor than trade balance, on which threshold level depends |
| 10 | Liu and Lyu, (2021) | Average per capita GDP growth rate of 5 years | General government debt; Real GDP per capita; Initial share of government consumption; Initial proportion of total import and export of GDP; Age dependency ratio; the Growth rate of the population; The quadratic term of public debt | - 102 countries (advanced, emerging, and developing countries) - Period: 1980-2016 | - There is a nonlinear nexus between public debt and economic growth. - There are no uniquenesses and determinacy about the thresholds of public debt for different types of countries |

MATERIALS AND METHODS

Empirical Model and Variables

The threshold model has been constructed as follows:

$$Y_{it} = \mu_i + X_{it}(q_{it} < \gamma)\lambda_1 + X_{it}(q_{it} \geq \gamma)\lambda_2 + \varepsilon_{it} \quad (1)$$

Where: Y_{it} is the dependent variable; q_{it} is the threshold variable; γ is the threshold parameter that divides the equation into two regimes with coefficients λ_1 and λ_2 ; X is a vector of controls

The measurement of dependent variables and independent variables is detailed in the following table.

Table 2. Measurement of variables

| Types of variable | Variable | Formula |
|-------------------|-----------------------|--|
| Dependent | Prosperity | Legatum Prosperity index |
| | Economic growth | GDP growth annual (%) |
| Threshold | Public Debt | National public debt/GDP |
| | Inflation | Consumer prices (annual %) |
| Control | Financial development | Domestic credit to the private sector (% of GDP) |
| | Initial income | GDP per capita (current US\$) |
| | Population growth | Population growth (annual %) |
| | Trade openness | exports and imports of goods and services as a percentage of GDP |
| | Capital stock | outlays on additions to the fixed assets of the economy plus net changes in the level of inventories |



Prosperity, debt, capital stock, financial development, and trade openness variables are in the natural logarithm.

Research Method

In this study, we use the static panel threshold regression method proposed by Hansen (1999) as follows:

$$Y_{it} = \begin{cases} \mu_i + \lambda_1 q_{it} + \alpha X_{it} + \varepsilon_{it} & \text{if } q_{it} \leq \gamma \\ \mu_i + \lambda_2 q_{it} + \alpha X_{it} + \varepsilon_{it} & \text{if } q_{it} > \gamma \end{cases} \quad (2)$$

In short, the models are distinguished by the threshold value (γ) and different regression slopes, which are denoted by λ_1 and λ_2 . To test the effect of the threshold variables on the dependent variables, a pair of hypotheses were conducted as follows:

$$\begin{aligned} H_0: \lambda_1 &= \lambda_2 \\ H_1: \lambda_1 &\neq \lambda_2 \end{aligned} \quad (3)$$

If hypothesis H_0 is accepted, it means that the effects of different debt thresholds are the same, and it can be concluded that no evidence has been found for the existence of the threshold variable affecting the dependent. On the contrary, if hypothesis H_1 is accepted, it means that

there is a threshold variable that affects the dependent variable. According to Hansen (1999), using F and Sub-Wald tests is recommended to test the above hypothesis. If two debt thresholds exist, the new model will be represented as follows:

$$Y_{it} = \begin{cases} \mu_i + \lambda_1 q_{it} + \alpha X_{it} + \varepsilon_{it} & \text{if } q_{it} \leq \gamma_1 \\ \mu_i + \lambda_2 q_{it} + \alpha X_{it} + \varepsilon_{it} & \text{if } \gamma_1 < q_{it} \leq \gamma_2 \\ \mu_i + \lambda_3 q_{it} + \alpha X_{it} + \varepsilon_{it} & \text{if } q_{it} > \gamma_2 \end{cases} \quad (4)$$

This model is fully scalable for cases of more than two thresholds with threshold values of ($\gamma_1, \gamma_2, \dots$)

Data

This study uses panel data on 37 Asian countries from 2009 to 2019. The data on LPI are obtained from the Legatum Institute Foundation. The economic growth of countries is collected from the World bank's database. The national public debt to GDP is collected from the website <https://countryeconomy.com>. The data for the control variables—initial income, population growth, financial development, inflation, and trade openness—are collected from the database of the World Bank. Financial development, inflation, initial income, trade openness, national public debt, and prosperity variables are in logarithmic terms to reduce variations in the data.

RESULTS AND DISCUSSION

Descriptive Statistics

Table 3. Summary of descriptive statistics

| Variables | Unit of measurement | Mean | Standard Deviation | Minimum | Maximum |
|-----------------------|---------------------|----------|--------------------|---------|----------|
| Economic growth | Annual % | 4.1563 | 3.7025 | -14.1 | 19.59 |
| Prosperity | Score | 56.8177 | 8.9554 | 38.69 | 79.48 |
| National public debt | %/GDP | 50.4257 | 41.0142 | 1.56 | 234.86 |
| Initial income | Current US\$ | 14013.03 | 17179.39 | 478.17 | 85076.14 |
| Capital stock | % of GDP | 27.4325 | 7.7452 | 11.2988 | 58.1507 |
| Population growth | Annual % | 1.7264 | 1.7665 | -0.8881 | 14.1446 |
| Financial development | % of GDP | 69.2202 | 48.3618 | 3.47218 | 253.262 |
| Inflation | Annual % | 4.4253 | 4.6846 | -4.8632 | 39.9073 |
| Trade openness | % of GDP | 90.4643 | 57.9390 | 24.4908 | 379.0986 |

As can be seen from the table of descriptive statistics, the economic growth variable has a mean value of 4.1563%. The standard deviation of this ratio is quite high at 3.7025%, showing a large difference in economic growth between countries in the region. While the maximum value of this variable is 19.59% (Qatar in 2010), its minimum value is -14.1% (Armenia in 2009). The Prosperity variable has a mean value of 56.8177 and a standard deviation of 8.9554. Thus, the average prosperity index of this region is at a low level compared to the other regions of the

world. Besides, there is a large gap in the prosperity index between countries, with values ranging from 38.69 to 79.48 in the period 2009-2019. While Singapore and Japan belong to the group of countries with the highest prosperity index in the world, some countries, such as Afghanistan, Iraq, and Pakistan, are among the lowest ones in the world. It is clear that different indicators could give different estimations of national prosperity. Therefore, comparing the regression result to them might help us make meaningful conclusions about the public debt and prosperity nexus.

The public debt variable has a rather high average value (50.4257% of GDP). The significant standard deviation shows the huge difference in public debt between countries in Asia. The minimum and maximum values of national public debt are 1.56% (Saudi Arabia in 2014) and 234.86% (Japan in 2019), respectively.

The standard deviation values of other variables (initial income, capital stock variable, population growth variable, Financial development, Inflation, Trade openness) are quite high, showing the various real socio-economic situations across countries.

Correlation Analysis

Table 4. Correlation matrix (Dependent variable: Prosperity)

| | Prosperity | Trade openness | Inflation | Financial development | Population growth | Capital stock | Initial income | Public debt |
|-----------------------|------------|----------------|-----------|-----------------------|-------------------|---------------|----------------|-------------|
| Prosperity | 1.0000 | | | | | | | |
| Trade openness | 0.4780 | 1.0000 | | | | | | |
| Inflation | -0.4537 | -0.2424 | 1.0000 | | | | | |
| Financial development | 0.6679 | 0.3154 | -0.3254 | 1.0000 | | | | |
| Population growth | 0.0016 | 0.1289 | -0.1461 | -0.1856 | 1.0000 | | | |
| Capital stock | -0.0687 | -0.1031 | 0.2747 | -0.0145 | -0.0442 | 1.0000 | | |
| Initial income | 0.7423 | 0.4096 | -0.3556 | 0.3763 | 0.3500 | -0.0907 | 1.0000 | |
| Public debt | 0.3681 | 0.0809 | -0.2316 | 0.4357 | -0.1438 | -0.1409 | 0.2201 | 1.0000 |



As can be seen from **Table 4**, the prosperity variable has a statistically significant correlation with the variable trade openness, financial development, initial income public debt, and inflation variable.

Table 5. Correlation matrix (Dependent variable: Economic growth)

| | Economic growth | Trade openness | Inflation | Financial development | Population growth | Capital stock | Initial income | Public debt |
|-----------------|-----------------|----------------|-----------|-----------------------|-------------------|---------------|----------------|-------------|
| Economic growth | 1.0000 | | | | | | | |

| | | | | | | | |
|-----------------------|---------|---------|---------|---------|---------|---------|---------------|
| Trade openness | -0.0019 | 1.0000 | | | | | |
| Inflation | -0.0496 | -0.2424 | 1.0000 | | | | |
| Financial development | -0.2050 | 0.3154 | -0.3254 | 1.0000 | | | |
| Population growth | 0.0897 | 0.1289 | -0.1461 | -0.1856 | 1.0000 | | |
| Capital stock | 0.2379 | -0.1031 | 0.2747 | -0.0145 | -0.0442 | 1.0000 | |
| Initial income | -0.1385 | 0.4096 | -0.3556 | 0.3763 | 0.3500 | -0.0907 | 1.0000 |
| National public debt | -0.1388 | 0.0809 | -0.2316 | 0.4357 | -0.1438 | -0.1409 | 0.2201 1.0000 |

The results in **Table 5** show that the economic growth variable correlates statistically with the capital stock financial development, initial income, and national public debt variable.

Result of the Static Panel Threshold Models

The results of the stationarity test show that all the research variables are stationary. Hence, these variables can be included in the threshold regression model. Ramsey test that the dataset has a nonlinear relation between the threshold and the dependent variables.

Table 6. Results of static panel threshold estimations.

| | Model 1 (Dependent variable: Prosperity) | Model 2 (Dependent variable: Economic growth) |
|------------------------------|---|--|
| Threshold estimates | | |
| γ_1 | 2.7173 | 3.7932 |
| γ_2 | | 3.7989 |
| 95% confidence interval | | |
| Impact of threshold variable | | |
| λ_1 | -.0147214** (0.0065536) | -0.1499022 (0.5957197) |
| λ_2 | -0.0015373 (0.0046039) | 1.659954** (0.7887876) |
| λ_3 | | -0.4320425 (0.5395519) |
| Impact of covariates | | |
| Ln initial income | 0.0545135*** (0.0083044) | 4.158716*** (0.9253509) |
| Ln capital stock | -0.0042695 (0.0080968) | 2.834492** (1.110075) |
| Ln financial development | 0.0489674*** (0.0121976) | -3.85145*** (0.8574) |
| Ln trade openness | -0.0057406 (0.0159135) | 5.087187*** (1.41869) |



| | | |
|-------------------|----------------------------|------------------------------|
| Population growth | -0.0006199 (0.0014101) | 0.36661** (0.1446555) |
| Inflation | -0.000513 (0.0003608) | -0.1654738*** (0.0528424) |
| μ_i | 3.405227*** (0.1133099) | -47.3214*** (10.86545) |
| Observation | 407 | 407 |
| N | 37 | 37 |

Sample Countries: 37 Asian countries (Threshold variable: National public debt)
Standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 6 shows the results from estimating equation (1) using national public debt as a threshold variable and different control variables. The upper part of the table displays the estimated national public debt-to-GDP threshold and the confidence level of 95%. The middle part of the table shows the marginal effects of national public debt on GDP prosperity and economic growth. λ_1 and λ_2 denote the coefficients of the public debt-to-GDP ratio on prosperity and economic growth in the low and high debt regimes, respectively. The coefficients of the control variables are presented at the bottom of the table.

In model 1, the results of the threshold effect test show that there exists one threshold with a confidence level of 95%. The estimated national public debt threshold value is 15.14%, with a corresponding 95% confidence interval. The influence of public debt on the prosperity of countries is assessed by the statistical significance of two coefficients, λ_1 and λ_2 . The results show that only the lower regime-dependent coefficient ($\lambda_1 = -0.0147214$) of debt is significant at the 5% level, while the upper regime-dependent coefficient ($\lambda_2 = -0.0015373$) is insignificant. This indicates that when public debt is less than 15.14%, it has a negative impact on the prosperity variable in the sample of Asian countries. The value of λ_1 means that when public debt is less than 15.14%, each additional percentage point of public debt reduces prosperity by 0.0147214 percent annually.

In terms of control variables, initial income and financial development are statistically significant at 0%, while the variables capital stock, trade openness, population growth, and inflation are not statistically significant. Specifically, initial income has a positive relationship with the prosperity score. Thus, when GDP per capita income increases, people's living conditions are improved. Consequently, the prosperity index of the country also increases. Financial development has a positive relationship with the prosperity variable. Therefore, the higher the domestic credit to the private sector is, the higher the country's prosperity index is, and vice versa. The research result is consistent with Demircuc-Kunt (2006), Goldsmith (1969), Levine (1997), McKinnon (1973), and Schumpeter (1911). They thought that finance development affects growth by influencing saving, investment, and technological innovations. As a result, investment environment and infrastructure – two out of ten pillars of the prosperity index are raised.

In model 2, two thresholds were found with estimated threshold values of 44.4% and 44.65%, respectively, with a confidence level of 95%. To see how public debt affects countries' economic



growth, we evaluate the statistical significance of the coefficients λ_1 , λ_2 , and λ_3 . We find that there is only the coefficient ($\lambda_2=1.659954$) of debt is significant at the 5% level, while the coefficient ($\lambda_1 = -0.1499022$) and the coefficient ($\lambda_3 = -0.4320425$) are not significant. This indicates that when public debt is between 44.4% and 44.65%, there is a positive effect on economic growth in the sample of Asian countries. The significance of $\lambda_2=1.659954$ means that when public debt is between 44.4% and 44.65%, each additional percentage point of national public debt will boost economic growth by 1.659954% annually. This means that higher public debt can stimulate aggregate demand and have a positive growth effect (Elmendorf & Mankiw, 1999). The estimated threshold value is different from the existing threshold in the literature: 90 percent in developed countries (Reinhart & Rogoff, 2010), 77 percent in developed and developing countries, and 64 percent in emerging countries (Caner *et al.*, 2010). The finding of a 51.65 percent debt threshold level is found by Egert (2015) and Siong Hook Law (2021). The different threshold levels might be due to the different sample countries, periods, and different control variables used in the previous studies.

Regarding control variables, initial income, financial development, trade openness, inflation, capital stock, and population growth are all statistically significant at the 0% to 5% level.

Specifically, initial income has a positive relationship with economic growth; in other words, when GDP per capita increases, economic growth also increases.

Capital stock has a positive relationship with economic growth. Therefore, the higher the capital stock of a country is, the higher the economic growth of that country is. The research results are consistent with Cook and Munnell (1990) and Garcia-Mila *et al.* (1992). These authors suggested that investment in infrastructure on aggregate output, labor, and capital formation can increase private productivity and therefore enhance economic growth.

Financial development has a negative relationship with economic growth. Thus, it can be understood that the higher the domestic credit to the private GDP is, the lower the GDP growth is. In line with this, some authors provided some arguments and evidence for an inverse relationship between financial sector development and economic growth. From their point of view, financial development may lead to high systemic risk (Allen & Carletti, 2006; Gai *et al.*, 2008; Gennaioli *et al.*, 2012), suboptimal low savings (Jappelli & Pagano, 1994), suboptimal high allocation of labor to the financial sector (Philippon, 2007; Bolton *et al.*, 2016), overheated economic capacity, or the exertion of inefficiently high cost on the economy (Zeira, 1998).

The trade openness variable has a positive relationship with economic growth. This result shows that trade openness can potentially enhance economic growth by providing access to goods and services, achieving efficiency in the allocation of resources, and improving total factor productivity through technology diffusion and knowledge dissemination (Rivera-Batiz & Romer, 1991; Barro & Sala-i-Martin, 1997). It is thought that countries with more trade openness will have higher economic growth than those with less openness.

Population growth has a positive relationship with economic growth. Therefore, the increase in population also promotes the country's economic growth. It can be seen that if population growth and per capita GDP growth are completely independent, higher population growth rates will lead to higher economic growth rates. However, according to Piketty (2014), only the growth in per capita GDP would give rise to improvements in economic wellbeing. On the other hand, population growth affects per capita output growth depending on the nature of its effects



on per capita GDP. With this result, we can conclude that, for the Asian region, over the period 2009 to 2019, higher population growth would contribute to higher economic growth.

Inflation has a negative relationship with economic growth. In other words, when the inflation rate increases, it negatively affects the development of the economy. The results of this study are consistent with the results of some authors such as Barro (1996), Judson and Orphanides (1999), Bruno and Easterly (1998), and Ghosh and Philips (1998). In this case, inflation can reduce investment-source activities and inputs of the economy. Besides, uncertainty in the volatility of inflation is the main cause of investment decline in the long run Fischer (1993). Additionally, Azariadas and Smith (1996) thought that if high inflation exists, it will reduce the real interest rate borrowers have to pay lenders, even negatively. Consequently, more people want to be borrowers than savers, thus creating an imbalance in capital and credit markets. As a result, economic growth is negatively affected.

In short, when debt is used as the threshold variable in 2 models 1 and 2, it shows the different effects of debt on the prosperity and economic growth of countries in Asia. While public debt harms prosperity, it positively impacts economic growth. In addition, in model 2, all control variables show a statistically significant relationship with economic growth, while only two variables, initial income, and financial development, have a statistically significant relationship with prosperity. On the other hand, the financial development variable positively affects the prosperity variable in model 1 but harms economic growth in model 2. The difference could be due to the difference in the dependent variable. While economic growth is only based on annual GDP growth, the prosperity index is comprehensively calculated based on many aspects of the economy. Economic growth is one of the 12 pillars of the prosperity index.



CONCLUSION

This study examines the relationship between public debt and prosperity using data from 37 Asian countries from 2009 to 2019. The empirical results demonstrate that the threshold value of the public debt-to-GDP ratio is 15.14%. This finding shows that the threshold of public debt to GDP in the model (1) (the dependent variable is Prosperity) is lower than the threshold of public debt found in model (2) (the dependent variable is economic growth). Moreover, public debt may promote economic growth, but it negatively affects national prosperity. When national public debt is below a threshold, there is a negative and significant effect on prosperity. However, there is an insignificant effect above that threshold. These findings suggest that higher public debt harms prosperity in Asian countries. Therefore, policymakers in these countries must consider the level of public debt to avoid negative impacts on the prosperity of nations. Additionally, the most important issue that countries need to pay attention to is the effective use of public debt, especially those with a high public debt-to-GDP ratio.

ACKNOWLEDGMENTS: The author would like to thank the anonymous reviewers for their time and suggestions, which were most helpful in improving this article.

CONFLICT OF INTEREST: None

FINANCIAL SUPPORT: None

ETHICS STATEMENT: We certify that the study is conducted in an honest manner and does not contain plagiarism.

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