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Non-linear Effect of Debt on the Economic Performance of Trans-Pacific Partnership Countries

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ABSTRACT

Objective – The formation of the Trans-Pacific Partnership (TPP) without the United States has raised many concerns in terms of the possibility of its success. The economic growth of the remaining 11 partner countries is important for the success of the formation of the TPP. Although economic performance depends on certain crucial indicators including debt, the effect of debt on the economic performance among the TPP partner countries remains ambiguous.
Methodology/Technique – As a result, this study investigates the nonlinear effect of debt on the economic performance of these partner countries (excluding Brunei and Vietnam) as a whole. In addition, the optimal level of debt is proposed as a means to control the level of debt for sustainable economic growth. Unbalanced panel data of the annual public debt-to-Gross Domestic Product ratio (measured as a percentage of GDP) and real GDP per capita from 1984 to 2015 was collected. Through panel analysis, this study reports an inverted U-shaped relationship between debt and economic performance.
Findings –The threshold debt level was identified at 58.02% of GDP. This non-linear relationship means that increasing debt has a positive impact on economic performance before reaching 58.02% of GDP, and an inverse impact on economic performance occurs after this threshold debt level. However, the average debt reveals that the partnership as a whole experiences the reverse effect of debt on growth during this period.
Novelty – This study highlights the need for prudent indebtedness policies to ensure continuing trade integration.
Type of Paper: Empirical.

Keywords: Debt; Growth; Nonlinear; Threshold; TPP Countries.

JEL Classification: G10, G11, G19.

1. Introduction

The Trans-Pacific Partnership Agreement was signed by twelve countries with the primary goal of deepening economic ties through reduced tariffs. These partner countries each have different levels of

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economic development and include both developed and developing countries (World Economic Situation and Prospects, 2014). The member countries include Australia, Brunei, Canada, Chile, Japan, Malaysia, Mexico, New Zealand, Peru, Singapore, Vietnam, and the United States. The withdrawal of the United States resulted in a revision of the agreement, which saw it renamed to Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP). The success of the CPTPP is dependent on the continuing economic growth among these partners, while debt has been found to have a significant effect on economic growth. Some of these partner countries – Japan, Singapore, and Canada – are ranked among the top 30 countries in the world with the highest public debt-to-GDP ratio (The World Factbook, 2018). As the accumulation of public debt will have an adverse effect on long-term economic growth (Barro, 1991), which may hinder further trade integration, this study examines the negative impact of debt on the economic performance of the TPP countries. Furthermore, this study is inspired by the findings of Reinhart and Rogoff (2010a, 2010b) who identified a non-linear relationship in the debt-growth nexus. This explains that the adverse effect of debt is only observed after a certain threshold debt level. With the identification of the threshold debt level, governments may control their debt below this threshold to ensure continuous economic growth.

The rest of this paper is organized as follows: section 2 discusses the relevant theoretical and empirical literature. The data and methodology adopted is explained in section 3. Section 4 reports the findings from this study and is followed by the discussion. The last section includes the concluding remarks of this study.

2. Literature Review

Policymakers have experienced increasing concern in terms of the impact of debt on economic growth, particularly following the European sovereign debt crisis. Aizenman et al. (2007) stresses that it is not wise for governments to finance their public expenditure to increase productivity as the accumulation of debt will ultimately result in a reduction in welfare and economic growth. Debt was found to generate a positive impact on growth in the short-term (Baum et al., 2012). However, in the long-term, debt may hamper economic growth, thereby implying that countries with high public debt will observe lower growth rates (Saint-Paul, 1992; Aizenman et al., 2007; Panizza & Presbitero, 2014).

In addition, with the evidence reported by Reinhart and Rogoff (2010a, 2010b), there is doubt concerning the possibility of non-linearities in debt-growth. They examine the relationship of debt and the long-term growth rate among emerging and advanced economies. Although no evidence of correlation was detected before the threshold level of 90% of GDP, debt above 90% of GDP was found to yield a negative impact on economic growth. Following that, researchers began to analyse the debt-growth nexus taking into account the possibility of a non-linear relationship in different sample countries. Kumar and Woo (2010), who examine emerging and advanced economies, identified an inverted U-shaped relationship between debt and growth. That study also reveals a threshold debt level of 90% of GDP. Similar findings were reported in a study examining 12 European countries with an optimum debt point of 90% - 100% of GDP (Checherita-Westphal & Rother, 2012). However, Cecchetti et al. (2012) identifies a lower public debt threshold at 84% of GDP for the 18 OECD countries under investigation. Meanwhile, Caner et al. (2010) reports the threshold debt at 77% of GDP for the full sample of developing and developed countries, and 64% of GDP for the sub-sample of developing countries.

On the other hand, other researchers have identified a slightly different kind of non-linear relationship between debt and growth. Presbitero (2012) detected a negative debt-growth relationship before the threshold of 90% of GDP among low- and middle-income countries. The effect became insignificant after the threshold debt level. Meanwhile, Minea and Parent (2012) reveal a negative debt-growth relationship for debt between 90% and 115% of GDP, while debt over 115% had a positive impact on growth.

In summary, evidence of non-linearities in the debt-growth relationship is documented, although no specific kind of non-linear relationship has been identified in the empirical studies. Furthermore, the

threshold level of debt, which may be detrimental to economic growth, was found to be different across the samples.

3. Research Methodology

The aim of this study is to examine the presence of linear and non-linear relationships between debt and economic performance among TPP countries. However, the insufficient sample size for TPP countries prevents this study from performing advanced estimation techniques such as dynamic panel analysis. Hence, a basic estimation technique using the panel fixed effect model corrected for heteroscedasticity and autocorrelation was performed for this purpose. The link between debt-growth was examined using the following linear growth equation:

$$y_{it} = \alpha + \beta_1 \mathrm{DEBT}_{\mathrm{it}} + \beta_2 X_{it} + \varepsilon_{it} \quad (1)$$

Where y_{it} is the logarithm of real gross domestic product (GDP) per capita. Our analysis defines economic growth using economic performance in income per capita. DEBT is measured by the public debt-to-GDP ratio (as a percentage of GDP), while X is a vector of the standard control variables that affect economic growth/performance including financial development, inflation, human capital and trade openness. Lastly, the error term is captured by ε_{it}. A significant β_1 in model (1) with a negative value implies the adverse impact of debt on economic performance.

Our second model examines the presence of non-linearity in the debt-growth relationship. Therefore, the squared term of debt (DEBT2) is included in the model specification. The significance of both DEBT and DEBT2 indicates either a U-shaped or inverted U-shaped relationship between debt and economic performance. The second model is as follows:

$$y_{it} = \alpha + \beta_1 \mathrm{DEBT}_{\mathrm{it}} + \beta_2 \mathrm{DEBT}_{it}^2 + \beta_3 X_{it} + \varepsilon_{it} \quad (2)$$

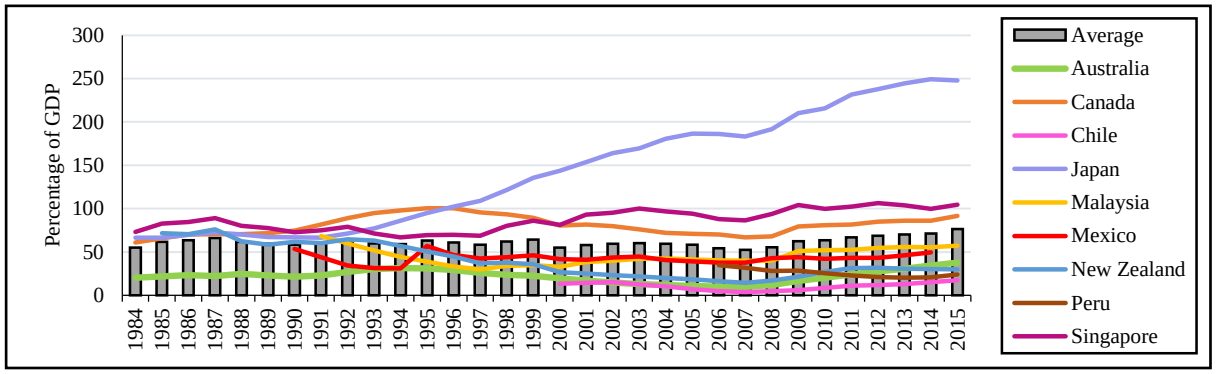
If β_1 is significantly negative and β_2 is significantly positive, this indicates a U-shaped relationship. An inverted U-shaped relationship is observed if both β_1 and β_2 are significant with positive and negative signs, respectively. A threshold level of debt can be determined if a non-linear relationship is identified in the study. The test for non-linearity is further verified with the U-test proposed by Lind and Mehlum (2010). Instead of relying purely on the significance of both β_1 and β_2 in the regression model, this test examines the alternative hypothesis of an inverse U-shape against the null of monotone or U-shape. In addition, the 95% Fieller interval (Fieller, 1954) for the threshold level is constructed.

In order to analyse the debt-performance link among TPP countries, unbalanced panel data between 1984 and 2015 was collected. Brunei and Vietnam were excluded in this study due to the unavailability of data (to be referred as TPP-9 thereafter). The annual data of the public debt-to-GDP ratio (measured as a percentage of GDP) was collected from the IMF database, while the real GDP per capita in US$ (measured at the constant price of 2010) along with the control variables was collected from the World Bank database. The market capitalization of listed domestic companies (as a percentage of GDP) was adopted as the proxy for the financial development of the country. Human capital was measured by the life expectancy in years while trade openness was measured by trade (as a percentage of GDP). To ensure robustness, two proxies were used to measure inflation, namely, the GDP deflator and the consumer prices, both as an annual percentage.

All of the variables were transformed into logarithm form except for the proxy for inflation due to the possible negative values in the sample data.

4. Results and Discussion

The overview of public debt held by the TPP-9 countries is presented in Figure 1. Japan held the biggest ratio of debt over their GDP compared to the other countries. In addition, Japan's debt continuously increased over time, reaching a total of 249.11% in 2014. Other partner countries had debt below 100% of their GDP. The average debt was 61.48%.



Source: IMF database

Figure 1. Debt-to-GDP ratio of TPP-9 Countries

The results of the fixed effect model using linear specifications and the model including the non-linear specifications are reported in Table 1. The models use different proxies for inflation and the insignificant impact of debt on real income per capita was revealed in the model with a linear specification. However, in the model with a non-linear specification, both debt and the squared term of debt were significant with positive and negative signs, respectively. These findings were further supported by the Lind-Mehlum U-test, which reported an inverted U-shaped relationship between debt and economic performance among the TPP-9 countries. These results are consistent with the studies conducted by Checherita-Westphal and Rother (2012).

Table 1. Results of the fixed effect model for both linear and nonlinear specifications

Variables	Inflation – GDP Deflator		Inflation – Consumer Price	
	Model 1 (a)	**Model 1 (b)**	**Model 2 (a)**	**Model 2 (b)**
Debt	0.1691	1.5173 ***	0.1651	1.5096 ***
	(0.1540)	(0.3615)	(0.1516)	(0.3456)
Debt 2	-	– 0.4285 **	-	– 0.4280 **
		(0.1337)		(0.1283)
Capital	0.0708	0.1294	0.0871	0.1457
	(0.1437)	(0.1342)	(0.1425)	(0.1330)
Inflation	0.0027	0.0039	0.0054	0.0063
	(0.0038)	(0.0040)	(0.0051)	(0.0054)
Life Expectancy	14.6711 ***	16.5462 ***	14.8917 ***	16.7012 ***

	(2.2215)	(2.2377)	(2.1140)	(2.1666)
Trade Openness	– 0.0443	– 0.0729	– 0.0441	– 0.0737
	(0.1036)	(0.0995)	(0.1002)	(0.0968)
Constants	– 23.7137 ***	– 28.3255 ***	– 24.1638 ***	– 28.6441 ***
	(4.2348)	(4.3437)	(4.0014)	(4.1964)
R-Squared	0.7334	0.7673	0.7363	0.7703
Lind-Mehlum U-test statistics	-	1.82 *	-	1.91 *
Threshold Debt	-	58.93%	-	58.02%
Lower boundary of 95% Fieller Interval on threshold debt	-	34.02%	-	34.02%

Note: Model (a) refers to the model with a linear specification. Model (b) refers to the model with a nonlinear specification by including the square term of debt into the model. The dependent variable is the logarithm of real GDP per capita while the other independent variables are in logarithmic form except for GDP deflator and consumer prices. The results show the estimated coefficients and the level of significance (*10%, **5%, ***1%). Standard errors are reported in parentheses.

Both models in this study identified a similar turning point of 58.93% and 58.02% among the TPP-9 countries. This implies that debt has a positive impact on the economic performance among the TPP-9 countries before reaching 58.02% of GDP in debt. This also means that their economic performance can be harmed if their average debt-to-GDP ratio surpasses this level. The threshold level adopted in this study is much lower compared to the findings reported by Checherita-Westphal and Rother (2012) for European countries and other studies in advanced countries. The higher threshold debt level for these advanced countries can be explained by the hypothesis of debt sustainability, where it is claimed that debt management capacity increases with income. Caner et al. (2010) reveals a much lower threshold level of 64% of GDP for developing countries. Therefore, the present sample of TPP-9 countries, which consists of more developing than developed countries, is expected to yield a lower threshold debt level. In addition, the lower boundary of the 95% Fieller interval in this study reveals that the inverse relationship between debt and performance may begin when debt exceeds 34.02%. As the average debt is found to have surpassed this identified threshold, this means that the negative effect was realized within the TPP-9 partnership.

5. Conclusion

This study examines the impact of public debt on economic performance (proxy for economic growth) among TPP-9 countries to ensure the viability of the CPTPP. A non-linear relationship was detected indicating that the economic growth within this partnership would not be harmed if the average debt-to-GDP ratio falls below 58% of the GDP. However, the statistics reveal that the TPP-9 partnership has experienced the adverse impact of debt on growth already. Therefore, prudent indebtedness policies should be implemented to prevent debt overhang, which can hinder further trade integration among the TPP partnership countries. A new and effective supervising body may be the solution to ensure effective fiscal consolidation which may lead to better debt management.

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