Public Debt and Economic Growth in LAC

Thomas Rauzi

May 5, 2020

Abstract: The purpose of this paper is to determine the causal relationship between public debt and economic growth, and it contributes to the literature by applying Toda and Yamamoto (1995) VAR method to 29 LAC countries from 1982 to 2015 while controlling for capital, import, and government revenue data. Data is collected from the World Development Indicators (WDI) and International Monetary Fund (IMF). Public debt and economic growth have a bidirectional relationship for 12 countries. Debt causes growth for 14 countries while growth causes debt in 20 countries. Increasing debt causes growth to decrease for seven countries, and it increases growth for three countries. An increase in economic growth decreases public debt for 14 countries.

1. Introduction

Economic growth and public debt are important considerations for any country because economic growth provides increased welfare while debt can be used to finance programs to enhance growth. Although debt can be used to increase growth, debt has risks such as default and interest payments. Due to the advantages and disadvantages of debt, it is important to understand the relationship between growth and debt. Figure 1 shows external debt as a percentage of GDP and GDP growth rates for six regions (emerging and developing Asia, emerging and developing Europe, European area, Latin America and the Caribbean, Middle East and Central Asia, and Sub-Sahara Africa). For debt, figure 1(a) suggests Latin America and the Caribbean (LAC) has the largest variation in debt with a peak near 100 percent of GDP in the late 1980's and a low near 25 percent in the late 2000's. From figure 1(b), growth rate for LAC compared to the other regions indicates a narrower range. Although wide variation in debt with a narrow variation in economic growth may suggest a relationship does not exist, Figure 2 shows a downward trend in growth in the early 1980's with an upward trend in debt around the same time period, which illustrates a potential negative relationship between debt and growth. LAC is worth further analysis due to the wide variation in debt and apparent negative relationship with growth. The purpose of this paper is to determine causality between debt and economic growth for LAC.

The potential relationship between debt and growth shown in figure 2 may be due to growth causing debt, or debt causing growth. When the economy enters a recession, governments often increase expenditures to spur economic growth. Figure 2 shows the downturn in the economy due to the great recession is followed by an increase in debt; therefore, governments may use deficit spending to counter the recession. Debt may impact economic growth through crowding out or Ricardian principle. Crowding out occurs when the government increases expenditures, interest rates increases, which crowds out private investment. With less investment, there is less future output. The Ricardian principle says individuals assume an increase in government spending will be met with an increase in future taxes. To prepare for the potential tax increase, individuals decrease their current expenditures; thus, current private savings increase. With an increase in private savings and a decrease in government savings, economic growth can increase, decrease, or remain the same. If the increase in private savings equals the decrease in government savings, there will be no impact on economic output. When the increases in private savings is less than the decrease in government savings, economic

growth decreases due to crowding out. Finally, if private savings increases more than government savings, interest rates fall, which increase investment. More investment leads to higher output, so economic growth increases.

This paper uses Toda and Yamamoto's (1995) vector autoregressive (VAR) method, which allows Granger causality test to be performed even with possible integrated variables. Traditionally, VAR must be stationary to test Granger causality, which means VAR variables must be all stationary, or the variables must have the same order of integration. When the variables have the same order of integration, they can be differenced until they are stationary. However, Toda and Yamamoto (1995) method can be employed with variables of different orders of integration. To apply the method, this paper uses data from the World Bank's World Development Indicators (WDI) and International Monetary Fund (IMF) for 29 LAC countries from 1982 to 2015. Figure one and two show a wide variation in the data for each country. Wide variation suggest heterogeneity may be an issue, so each country is treated as an individual time series.

For the 29 countries, 22 countries show a causal relationship between growth and debt. Results for Paraguay and Peru are consistent for this paper and Butts (2009). Growth causes debt for Paraguay, and Peru has a bidirectional relationship. Seven countries in this paper versus four in Butts (2009) have no relationship. With this paper, 12 countries exhibited a bidirectional relationship while Butts (2009) only three countries have bidirectional relationships. Two countries in the current paper show debt causing growth while three countries have the same relationship in Butts (2009). Finally, growth causes debt for eight countries in both papers.

This paper contributes to literature by extending Butts (2009) by applying Toda and Yamamoto's (1995) VAR method and controlling for capital, imports, and government revenue. Butts (2009) conducted analysis for 18 out of 27 countries because debt and growth have different orders of integration for the nine excluded countries. Since Toda and Yamamoto's (1995) method allows for variables to have different orders of integration, analysis is conducted on all countries. Additionally, Butts (2009) only account for debt and growth, which they suggest may result in omitted variable bias. Capital and trade are important variables when analyzing the relationship between debt and growth Capital (e.g., Checherita-Westphal and Rother, 2012 and Onafowora and Owoye, 2019). Therefore, I control for capital, import, and government revenue.

2. Literature Review

Previous studies use ordinary least squares (OLS), Pooled OLS, instrumental variables (IV), error correction models, autoregressive distributed lags (ARDL), vector autoregression (VAR), and vector error correction (VEC) to investigate the relationship between public debt and economic growth. To address the impact of debt on economic growth, Geiger (1990) and Lin and Sosin (2001) performed OLS using panel data. Using data on nine South American countries, Geiger (1990) performs OLS with distributed lags on each country separately, and he finds a statistically significant negative relationship between debt and economic growth. Lin and Sosin (2001) utilize pooled OLS on 18 Latin American countries, and they do not find a statistically significant relationship between growth and debt. The inconsistent results between the two papers is likely due to omitted fixed country effects in Lin and Sosin (2001). Each country has country specific effects that are not controlled with pooled OLS, so the effects are left in the error term, which causes omitted variable bias.

To correct for omitted country specific effects, Checherita-Westphal and Rother (2012) and Kumar and Woo (2010) estimate their models using fixed effects (FE). Checherita-Westphal and Rother (2012) study the impact of debt on economic growth in the European area from 1970 to 2010, and they determine debt has an inverted U-shaped relationship with growth while capital and openness positively impact growth in 12 European area countries. Kumar and Woo (2010) determine initial debt negatively influences growth for 79 advanced, emerging, and developing countries from 1970 to 2008. When Kumar and Woo (2010) use only the emerging and developing countries, initial debt has an insignificant impact on subsequent growth, which suggests level of development is an important factor. Although FE corrects for omitted time invariant variable bias, it does not correct for reverse causality. If the goal is to determine the causal impact of debt on growth, reverse causality occurs when growth actually causes debt.

Instrumental variables[1] (IV) is one way to address reverse causality. A common instrument is lagged debt (Schclarek and Ramon-Ballester, 2005; Kumar and Woo, 2010; Checherita-Westphal and Rother, 2012; and Megersa and Cassimon, 2015). Schclarek and Ramon-Ballester (2005) study 20 LAC countries using data from 1970 to 2002, and they determine an increase in external debt causes economic growth to decrease. When using IV, Kumar and Woo (2010) still find initial debt negatively causes growth; however, unlike their FE

[1] Generalized method of moments (GMM) uses lagged variables as instrumental variables, so for this paper GMM is being treated as IV.

results, their IV estimation results are consistent for emerging and developing countries. Checherita-Westphal and Rother (2012) find an inverse U-shaped relationship between debt and growth with a turning point at 93.1% for 12 European countries from 1970 to 2010. Megersa and Cassimon (2015) determine debt decreases economic growth; however, the negative impact of debt is mitigated by increasing quality of public sector management. Although the results are consistent for IV with lagged debt, lagged variables often violate the exclusion requirement for IV. Exclusion requirement means the instrument should only impact growth through the contemporaneous debt. However, since macroeconomic variables are persistent, previous periods debt likely have a causal impact on contemporaneous economic growth.

To mitigate the downside of lagged debt, Checherita-Westphal and Rother (2012) and Panizza and Presbitero (2014) use alternative instruments. Checherita-Westphal and Rother (2012) construct an instrument for a country by averaging the debt of the remaining 11 countries in the sample. With the average debt instrument, Checherita-Westphal and Rother (2012) find debt has an inverted U-shaped relationship with growth that has a turning point of 81.2%. Using debt weighted exchange rates, Panizza and Presbitero (2014) find debt has an insignificant impact on economic growth for OECD countries from 1980 to 2010. There is no reason to assume one country's debt will influence the growth of different countries', so the instrument satisfies the exclusion requirement. Debt weighted exchange rates are correlated with exchange rates, which impacts trade. Since trade has been associated with economic growth (Checherita-Westphal and Rother, 2012 and Calderón and Fuentes, 2013), Panizza and Presbitero's instrument likely affects growth through additional channels, which violates the exclusion principle. When the exclusion or relevance principles is violated, the results are inconsistent. Finally, IV only analyzes the impact of debt on economic growth, so it does not account for economic growth's potential impact on debt.

Error correction (EC) and autoregressive distributed lag (ARDL) are other methods to analyze a unidirectional causal relationship between debt and economic growth. Balassone, Francese, and Pace (2011) use EC for Italy from 1861 to 2010, and they find in both the short and long run debt and capital impact growth negatively and positively, respectively. Égert (2015) estimate an EC for OECD countries from 1790 to 2009, and they find a negative non-linear relationship between debt and growth; however, since Égert does not test for cointegration, EC may not be appropriate. By using ARDL, Onafowora and Owoye (2019) determine there is a

negative long-run relationship between debt and growth for five Caribbean countries from 1975 to 2015 with coefficients ranging from -.02 to -.06.

Although EC and ARDL estimates causality, it does not test for bidirectional relationships. Vector autoregression (VAR) and vector error correction (VEC) test for bidirectional effects. Butts (2009) is the only paper covering Latin American and Caribbean (LAC) countries that investigates the relationship between public dept and economic growth using VAR/VEC framework. Since only countries where debt and growth have the same order of integration can be analyzed with VAR/VEC, Butts (2009) only analyzed 18 out of 27 LAC countries from 1970 to 2003. He finds four, three, three, and eight countries have no relationship, bidirectional, debt causes growth, and growth causes debt, respectively. Although Butts (2009) estimates bidirectional relationships, his paper only uses GDP growth and short-term external debt (STED). Since capital and trade are correlated with debt and growth (e.g., Checherita-Westphal and Rother, 2012 and Onafowora and Owoye, 2019), his paper likely suffers from omitted variable bias.

This paper contributes to the literature by estimating a VAR model for LAC using Toda and Yamamoto (1995) method for testing Granger causality between public debt and economic growth, and it reduces omitted variable bias by controlling for capital, imports, and government revenue. Toda and Yamamoto (1995) method allows VAR to be estimated even when variables do not have the same order of integration, so the method can be applied to all countries. Additionally, since the data are in levels, they do not lose a year of data by first differencing. Butts (2009) is the only study using VAR approach to analyze the relationship between growth and debt in LAC, but it likely suffers from omitted variable. Due to these deficiencies, this paper includes capital, imports, and government revenue.

3. Theoretical Concept

This section looks at the mechanism in which debt impacts economic growth, and how economic growth impacts debt. Public debt influences economic growth through government spending and government revenues. Current public debt is equal to previous period debt plus the current budget deficit. Since previous period of debt is considered fixed in the present, the only way to increase current debt is to increase the budget deficit. Thus, an increase in debt is equivalent to an increase in the budget deficit. Budget deficit is equal to government revenues minus government expenditures. Therefore, an increase in debt necessitates an increase in

government spending, decrease in government revenue, or a change in both such that expenditures exceeds revenue.[2] Government spending influences economic growth by impacting capital formation or by increasing output. Finally, economic growth impacts debt through government spending and government revenues.

Government expenditures influence capital formation through crowding out and Ricardian principle. Crowding out occurs when an increase in government spending decreases national savings. With less savings, there is more desired investment than savings, so the interest rate increases. Higher interest rates make some investment projects un-profitable, which reduces desired investments. Lower level of investments decreases the amount of capital created.[3] Since capital formation is one key component in long term per capita growth, less capital means there is less economic growth. However, if the Ricardian principle holds, individuals realize an increase in government revenue will require higher future tax rate. In anticipation of the increase in taxes, they reduce current consumption. With a reduction in consumption, private savings increases. When both private savings increases and public savings decreases, the net effect on national savings depends on the relative changes. For instance, if private savings increases by the same amount as the decrease in public savings, there is no change in national savings, which means no change in capital; thus, no change in economic growth. Finally, if private savings increases more than public savings, national savings increases, which reduces interest rates. Lower interest rates result in higher investment, so economic growth increases.

The previous analysis assumes increasing the budget deficit through increased government expenditures has no impact on output, so government expenditures do not increase income.[4] Governments purchase already produced items, so government spending often does not increase output. According to Aizenman, Kletzer, and Pinto (2007) and Aschauer, D. A. (2000), increasing debt by increasing spending on health and education may increase output through increased productivity. Therefore, increasing debt will increase, decrease, or have no impact on economic growth.

[2] If a country runs a budget surplus, increasing government expenditure without an increase in government revenue will decrease the budget deficit. This possibility is ignored because most LAC run budget deficits.

[3] Investment is gross private investment, and gross private investment is used to create additional capital or replace worn-out capital. For simplicity, I ignore depreciation, so gross investment is equal to capital formation.

[4] Output has to equal income because when an item is produced individuals receive income for producing the item, so an increase in output equals the increase in income.

When debt increases because of a decrease in government revenues, economic growth may increase, decrease, or stay the same. If the government reduces revenues by decreasing the tax rate, individuals will have a larger disposable income. With a larger disposable income, individuals can save some of the additional income, which would increase private savings. If government spending remains constant, the increase in private savings should increase national savings, which increases capital. An increase in capital, leads to higher economic growth. However, if the Ricardian principle holds, consumption will not be affected, so savings, capital, and growth remain unaffected.

Economic growth impacts debt through reduced budget deficit or counter cyclical spending. As output increases, tax income increases if the tax rate remains constant. With additional tax revenue, the budget deficit decreases if government spending remains unchanged. Thus, an increase in income may decreases debt. Counter cyclical spending occurs when governments use fiscal policy to counter a recession. When economic growth is declining, governments will sometimes increase expenditures to spur growth, and they usually borrow money to finance the counter cyclical spending, which increases debt. Thus, economic growth and debt have an inverse relationship when conducting counter cyclical operations.

4. Empirical Strategy

$$Y_{c,t} = \beta_{0,c} + \beta_{c,2}Y_{c,t-1} + \cdots + \beta_{c,p+1}Y_{c,t-p} + \cdots + \beta_{c,p+1+q}Y_{c,t-p-q} + \varepsilon_{c,t}$$

$$Y_{c,t} = \begin{bmatrix} log(gdp_{c,t}) \\ log(debt_{c,t}) \\ log(k_{c,t}) \\ log(im_{c,t}) \\ log(gr_{c,t}) \end{bmatrix}$$

$gdp_{c,t}$, $debt_{c,t}$, $k_{c,t}$, $im_{c,t}$, and $gr_{c,t}$ are real GDP per capita, debt to GDP ratio, gross capital formation, imports as a percentage of GDP, and government revenue as a percentage of GDP for country c at time t, respectively. Natural log of the variables is used because the goal is to identify the relationship between debt and growth, so using logs allows for estimating elasticities.

To avoid omitted variable bias, imports must be included in the estimation because imports are correlated with economic growth and public debt. Imports are correlated with

domestic output because imports can be substitutes or complements for domestic goods. If imports are substitutes for domestic goods, an increase in imports will decrease output, or if imports are complements, increasing imports increases output. Therefore, imports are correlated with economic growth. Economic growth is correlated with debt through government spending and revenues, which is shown in the theoretical section.

An empirical issue with identifying the relationship between public debt and economic growth is reverse causality and simultaneous bias. Although the two concepts are related, they are not the same thing. Reverse causality occurs when it is thought debt causes economic growth, but economic growth causes debt. If reverse causality occurs, there may be a significant relationship between debt and economic growth, but the significance is due to economic growth causing debt. Simultaneous bias occurs when debt and growth cause each other. Thus, simultaneous bias implies reverse causality, but reverse causality does not imply simultaneous bias. The issue with simultaneous bias is addressed in the literature review.

To address reverse causality and simultaneous bias, previous literature uses IV, EC, VAR, and VEC. IV and EC[5] can estimate the unidirectional relationship, so they cannot determine the impact of growth on debt. VAR and VEC address reverse causality by using lagged GDP and debt to estimate GDP. Since current growth cannot cause past debt, estimates of debt will catch only the impact debt has on growth. Additionally, VAR/VEC captures the effects of debt on growth and the effects of growth on debt by estimating each equation separately.

VAR and VEC have their limitations. VEC is limited because it requires all variables to be cointegrated, which means all variables must have the same order of integration. VAR estimate each equation separately using OLS. Since OLS for time series requires the data to be stationary[6], VAR can only be used if all variables are stationary. Since not all variables are stationary or the same order of integration, it is not possible to estimate a VEC or VAR in levels for each country. Therefore, variables will be differenced until they are stationary. Differencing data loses data points, which may contain important information.

[5] ECM usually only estimate unidirectional causality; however, Onafowora and Owoye (2019) use generalized forecast error variance decomposition (GFEVD) along with ECM to test for directional causality.

[6] OLS for time series is unbiased if the data is strictly exogenous; however, past values of growth likely influence current levels of debt, so the data is only contemporaneously exogenous, which requires the data to be stationary and weakly dependent.

To address the limitations of standard VAR, this paper uses Toda and Yamamoto's (1995) Granger causality method. Toda and Yamamoto's (1995) method allows a VAR to be estimated in levels even when some of the variables are integrated of different orders. Since all variables are not required to have the same order of integration, a VAR for all countries can be estimated. To employ this method, first determine the order of integration for each variable. The highest order of integration is called q. Next, using information criteria such as AIC determine the appropriate number of lags. After selecting the number of lags, test for autocorrelation, and if there is serial correlation, adjust the number of lags until serial correlation has been removed. Call the number of lags p. Next, estimate a VAR with p+q lags. Finally, test for Granger causality using only the first p lags.

A draw back to Granger causality is that it does not test for the sign of the relationship. Granger causality tests against the null hypothesis that all parameters are jointly zero; therefore, it does not test if the net effect is negative or positive. It is possible to test if all the parameters are positive or negative; however, that does not account for when some of the lags or positive while others are negative. In the case of mixed signs, the net effect could be positive or negative. Impulse response functions are used to determine the sign of the relationship.

5. Data

The data is collected from the World Bank's World Development Indicators (WDI), International Monetary Fund (IMF), and U.S. Federal Reserve Bank of Saint Louis Federal Reserve Economic Data (FRED), and it ranges from 1970 to 2015. GDP per capita is collected from WDI, and it is converted into real values using the GDP deflator from FRED. U.S. GDP deflator is used because GDP per capita is reported in U.S. dollars. Gross capital formation as percentage of GDP, imports as a percentage of GDP, and government revenue excluding grants as a percentage of GDP are collected from WDI. Debt as a percentage of GDP is collected from the IMF.[7] Finally, the natural log of each variable is taken. Data is collected for 34 LAC countries. Although the data is collected as panel data, each country will be treated as an independent time series

Initially, the data set consisted of 34 LAC countries from 1970 to 2015. five countries are removed; four countries are removed because they lack data for the entire time period (British

[7] WDI reports debt as a ratio of GNI, but due to the large number of missing data points, debt to GDP from IMF is used.

Virgin Islands, Cuba, Suriname, and Turks and Caicos). British Virgin Islands is missing growth, debt, capital, and import data for the entire period. Cuba and Suriname are missing debt data while Turks and Caicos is missing debt, capital, and import data for the whole period. Finally, Puerto Rico is dropped because it only has 10 years of data, which is insufficient to estimate a VAR.

To determine the impact of eliminating countries from the sample, I first look at the effect on island countries then on non-island countries. Island economies are likely to differ from non-island countries because islands have limited land and may depend on tourism more than non-island areas. Initially there are 14 island countries in the sample and 20 non-island countries. Four out of the five countries removed are island countries (British Virgin Islands, Cuba, Puerto Rico, and Turks and Caicos).

Differences between countries in and out of the sample are shown in figure 3 in the appendix. Figures 3(a) and 3(b) indicates the average economic output is similar between the countries included and those excluded from the study. From figures 3(c) and 3(d) gross capital formation as a percentage of GDP is lower for the countries excluded from the sample.[8] Average imports as a percentage of GDP between the groups is similar, which is shown by figures 3(e) and 3(f). With similar imports, there is little difference between the groups, which suggest imports have the same impact on output for both groups. GDP for those countries in the sample and those out of the sample are the same while capital is higher for countries in the sample, which suggests those excluded countries may have more efficient economies. Excluded countries may be more efficient because they can produce the same amount of output with less inputs; therefore, the results for included countries may not apply to those excluded countries.

Suriname is the only non-island country removed from the sample. Figure 4(a) and 4(b) in the appendix show Suriname exhibits lower economic output than the included countries. Therefore, those countries removed from the sample may be less efficient than those left in the sample. For both island and non-island countries, figures one and two show there is a large variation in the data for each country, which suggests treating the data as panel data would likely suffer from heterogeneity. Therefore, this paper will treat each country has a separate time series.

[8] Debt is not discussed because the countries excluded from the sample do not have debt data except for Puerto Rico. Since Puerto Rico only has ten years of debt data, it is not appropriate to compare Puerto Rican debt to the rest of the countries.

Furthermore, although both island and non-island excluded countries may be more efficient, conducting the analysis country by county will lessen this impact.

Although five countries are removed because they lack data, there are ten countries whose limited data may impact the results (Antigua, Dominica, Ecuador, Grenada, Guyana, Haiti, Panama, Saint Vincent, Trinidad and Tobago, and Venezuela). Antigua, Dominica, and Grenada are missing capital data over the whole time period; furthermore, Antigua only has debt data from 1998 to 2015. Trinidad and Tobago is missing capital and import data for all 34 years. If a country is missing data for the entire time period for a variable, the variable will be excluded from the model, which will limit the results. Ecuador, Guyana, Haiti, and Panama lack government revenue data. Saint Vincent and Grenadines has capital data for only three years. Since Saint Vincent have only a limited number of years, any extrapolation technique is likely to be inaccurate. Extrapolation tends to be less effective when trying to extrapolate more year than data. For example, when extrapolating data for St. Vincent, I will be using 3 years to predict 31 years. Venezuela is missing data from 1992 to 1997.[9]

Since certain global economic events such as the great recession impact all countries nearly at the same time, it is important to analyze countries using a common time frame. Due to data limitations, 1982 to 2015 is the best time frame because all 29 countries have the most data available during this period. From 1970 to 2015, growth and debt data vary widely. For example, Argentina has 45 years of debt data while Brazil only has 38 years of debt data. Reducing the time frame to 1982 to 2015, provides more consistent data availability. Although removing data before 1982 improves data availability, it may show a stronger negative relationship between debt and economic growth. The Latin American debt crisis, which is known as the lost decade, started in 1982 when Mexico could not support its debt, and sixteen other countries restructured or delayed debt payments. Debt default causes higher interest rates because lenders must be compensated for increased risk. Higher interest rates may slow economic activity through decreased consumption and investment, which hampers economic growth. Since debt default is

[9] Venezuela is likely missing data from 1992 to 1997 due to the two failed coupes by Hugo Chavez in 1992 and the impeachment of President Perez in 1993 to 1995. Hugo Chavez is elected President in 1998. During his presidency, Chavez nationalizes telecommunication and oil companies, devalues currency, implements price controls, and limits freedom of press. Following Chavez's death in 2013, Nicolas Maduro becomes president through a disputed election. Maduro's presidency has violent protests, and in 2018 Juan Guaido declares himself interim president. Restructuring the Venezuelan economy through the nationalization of certain industries, price controls, and civil unrest makes it very difficult to establish economic relationships after 1992.

the most negative action a country can take with debt, starting the period with wide range of debt default will likely emphasize the negative impact of debt.

All 29 countries have growth data for all 34 years. Descriptive statistics for the 29 countries from 1982 to 2015 are reported in table one in the appendix. The natural log of real per capital GDP represents a small change in output. Majority of countries have an average change of seven to eight dollars. However, Barbados has the highest change with 9.5, and Haiti has the lowest change with 6.4.

From the 29 countries, there are 23 that do not lack data. 16 countries have debt data for all 34 years while the remaining seven countries have missing debt data. Argentina is missing data for 1989. Jamaica is missing data from 1995 while Columbia is missing data for 1996. Chile, Costa Rica, and Guatemala are missing debt data from 1999. Peru is missing data for 2005. Average change is three or four dollars; however, Guyana has an average change of 5.4. Chile has the lowest with 3.2. Since debt data is a primary variable of interest, the missing data will not be extrapolated, so the missing year will be drop for the analysis. Missing only one year of data is likely to have a negligible effect on the results.

Haiti is missing capital formation and import data while Belize is missing import data. Haiti is missing data from 1982 to 1987, and Belize is missing import data from 1991. Average change for capital and imports is 3 and 3.6 percent, respectively. Since capital and import data are not the main variables, the missing data will be extrapolated. To calculate the missing values, it is assumed there is a constant annual growth rate for the variables. For Haiti, the annual growth rate is calculated for the period of 1988 to 2015, and the growth rate is then applied to years of 1982 to 1987. Since Belize is missing one year, the growth rate is calculated from 1990 to 1992 and applied to 1991.

16 countries are missing government revenue data. Argentina, Belize, Bolivia, Guatemala, Jamaica, Mexico, Nicaragua, and St. Vincent are missing no more than 11 years of data. El Salvador has 18 years of data while St. Lucia has 16 years of data. Trinidad and Tobago has 15 years of data, and Barbados and Honduras have only 13 years of revenue data. Colombia has 12 years of data while Paraguay has 11 years of data.

6. Results

The results section is organized by the steps of Toda and Yamamoto's (1995) Granger causality method. First, the maximum order of integration is found using a unit root test. Next,

information criteria is used to determine the lag length. After the appropriate number of lags are selected, Granger causality is tested. Additionally, impulse response functions are created to investigate the direction of the relationships, and variables are dropped to investigate the robustness of the results.

6.1 Unit Root Tests

To test for unit roots, augmented Dicky-Fuller (ADF) unit test is utilized where the null hypothesis is there is a unit root. AIC is used to determine the appropriate number of lags. A summary of the ADF unit root test is reported in table 2a in the appendix.[10] For all but six countries (Bolivia, Colombia, El Salvador, Guatemala, Guyana, and St. Vincent), all variables are integrated of order one, so maximum order of integration is one for 23 countries. Debt is stationary for Bolivia, Guatemala, and Guyana. Maximum order of integration is two for El Salvador because output growth is integrated order two. Government revenue is integrated of order two for Colombia. Capital is stationary for St. Vincent. Countries highlighted in red are the six countries that are missing data mentioned in the Data section.

6.2 Lag Selection

The number of lags used in the base VAR, which is selected with the smallest AIC, is reported in the AIC lags column of table 3 in the appendix. In other words, AIC values determines p. Once p is selected, Johansen (1995) Lagrange Multiplier test for VAR is used to test for auto correlation.[11] If autocorrelation is detected, additional lags are added until autocorrelation is removed.

6.3 Tests for Granger Causality

Table 4a includes the results of Granger causality tests and the direction of the relationship, which is determined by impulse response functions. A ten percent significance level is used to determine if Granger causality exits.[12] Since the purpose of this paper is to investigate the relationship between debt and economic growth, Granger causality and impulse response

[10] ADF unit root test statistics and statistical significance are reported in table 2b in the appendix. The critical values for each test depend on the number of lags used for the test, so only the significance of the test statistic is indicated and not the critical value.

[11] Lagrange multiplier test has a null hypothesis of no autocorrelation. Under the null, the test statistic is distributed Chi-square with K^2 degrees of freedom where k is the number of variables in the VAR.

[12] Table 4b in the appendix presents the Wald statistic and p-values for the Granger causality tests. Additionally, table 4b reports maximum order of integration, VAR lag length, and lag length for Toda and Yamamoto (1995) method.

functions are only reported for debt and growth. Countries highlighted in red are the countries that are mentioned in the data section, which have data limitations.

Results for Paraguay and Peru are consistent between this paper and Butts (2009. For Paraguay, growth causes debt, and Peru has a bidirectional relationship. Since the two studies involve different number of countries, the studies will be compared with percentages. The two papers are similar in the quantity of countries with no relationship, and most countries show growth causing debt. Growth causes debt in 69% of countries and 61% in this study and Butts (2009), respectively while debt causes growth 48% and 34% in this paper and Butts (2009), respectively. Therefore, both studies conclude it is more likely for growth to cause debt in a LAC than for debt to cause growth or no relationship.

Although both papers agree it is more likely for a country to have growth causing debt, this paper finds a smaller proportion of countries have a relationship between debt and growth than Butts (2009). 24% of countries in this study exhibit no relationship versus 22% in Butts (2009). Therefore, debt and growth have a relationship in 76% of countries in the current study compared to 78% in Butts (2009). Butts (2009) finds more relationships than the current study, but this paper has a larger percentage in both categories, which is seen in the previous paragraph. This apparent contradiction is explained by the large difference in bidirectional relationships. When the relationship is broken down into bidirectional and unidirectional relationships, 7%, 28%, and 41% of countries have debt causing growth, growth causing debt, and bidirectional, respectively while Butts (2009) have 17%, 44%, and 17 show debt causing growth, growth causing debt, and bidirectional relationships, respectively. If debt and growth have a relationship, it is more likely it is a bidirectional relationship in the current study. However, Butts (2009) determined it is more likely only growth causes debt.

Differences between the two papers may be due to time frame and variables. Butts (2009) uses data from 1970 to 2003 while this paper uses data from 1982 to 2015. The relationship between debt and growth may depend on the underlying economic structure such as government's attitude towards debt, and attitudes change over time. Since the two papers cover different time periods, they may capture a different relationship. Additionally, Butts (2009) likely suffers from omitted variable bias because he only controls for growth and debt. By controlling for growth, debt, capital, imports, and government revenue, this paper is less likely to have biased results, which could explain the difference between the two papers. It is unlikely the

different methods used by the two papers contributed to the different results because both methods are designed to detect Granger causality.

6.4 Impulse Response Functions

Unlike Butts (2009) this paper uses impulse response functions (IRF) to determine the direction of the relationship, and the IRF graphs and tables[13] are reported in figures 5a through 5w in the appendix.[14] IRF are only computed for variables where Granger causality exists because Toda and Yamamoto (1995) method ensures Granger causality results are correct. From the 14 countries where debt causes growth, 7 countries (Barbados, Ecuador*, Guatemala, Haiti*, Mexico, Nicaragua, and Venezuela*) have debt negatively causing growth, so an increase in debt leads to a decrease in growth. Debt has a positive causal relationship with growth in Brazil, St. Lucia, and Trinidad and Tobago*. Only growth and debt are available for Trinidad, so omitted variable bias may explain the positive results in Trinidad and Tobago. Finally, IRF for Chile, Jamaica, Peru, and St. Vincent* did not determine a directional relationship. Although St. Vincent's IRF results may be due to data corruption from extrapolating 31 years of capital data from only three years, the remaining three countries do not suffer from any data issue; therefore, the lack of direction may be a result of the limitation of Toda and Yamamoto's (1995) method to estimate IRF.[15]

When the potential problem countries are removed, four, two, and three countries show a negative, positive, and no relationship, respectively. 50%, 21%, and 29% of countries where debt causes growth have a negative, positive, and no relationship, respectively. Once the countries with potential data issue are removed, 44%, 22%, and 34% of countries have negative, positive, and no relationship. Thus, there is little change in the percentage of relationships, which suggests potential data issues have little effect on the overall relationship, and most countries where debt causes growth to experience a negative relationship.

[13] IRF tables are reported for Chile, Dominican Republic, Haiti, Jamaica, and Nicaragua because the graphs do not easily show the statistically significant relationships that are shown by the tables.

[14] Impulse response functions (IRF) are based on the underlying VAR without the additional lag from the maximum order of integration. In other words, it is based on VAR(p). Since the additional lag is not used when computing testing for Granger causality, it did not seem appropriate to include it in the IRF. Toda and Yamamoto (1995) method determines Granger causality even when some of the variables are integrated. It is not designed for IRF; therefore, the non-stationarity of the VAR(p) likely biases the IRF.

*Results may be biased due to insufficient data.

[15] The fact Granger causality exits implies a relationship does exits; thus, debt must have a positive or negative impact on growth.

*Results may be biased due to autocorrelation in the VAR or insufficient data.

There are 20 countries where growth Granger causes debt. 14 (Argentina, Brazil, Costa Rica, El Salvador, Guatemala, Haiti*, Jamaica, Mexico, Nicaragua, Panama*, Paraguay, Peru, St. Lucia, and Uruguay) countries show growth negatively causes debt, which is consistent with the idea governments run deficits during recessions and surpluses during economic expansion. IRF for Barbados, Belize, Chile, Guyana*, and St. Vincent* do not show any directional relationship, which may be due to Toda and Yamamoto's (1995) method is not designed to compute IRF. Finally, Ecuador* shows growth initially negatively causes debt and then positively causes debt; however, since Ecuador is missing government revenue data, the mixed results may be due to omitted variable bias. Once the countries with data issues are removed, 12 and three countries have negative and positive, respectively. Thus, for most countries where growth causes debt, increasing growth decreases debt.

The bidirectional relationships are classified as stable, unstable, or indeterminate. For simplicity, only the nine countries with bidirectional relationships and without data limitations are discussed. Barbados, Chile, Jamaica, and Peru have indeterminate relationships, which means the direction of debt causing growth or growth causing debt cannot be determined. Stable relationships imply when debt increases, economic growth tends to return to the same level before the debt increase. Brazil and St. Lucia are the only countries with a stable relationship. Debt and economic growth have a positive causal relationship in Brazil and St. Lucia, which may be due to borrowing money to fund health or education investments. By investing in health and education, productivity may increase, which would increase economic growth. Thus, increasing debt causes an increase in economic growth. An increase in economic growth causes a decrease in debt, which causes a decrease in economic growth. The increase in economic growth likely decreases debt because governments receive more tax income, so the government needs to borrow less. Therefore, economic forces pull growth near its initial levels.

Guatemala, Mexico, and Nicaragua exhibit an unstable relationship where debt could cause growth to continue to decrease. Debt and growth have a negative causal relationship in Guatemala, Mexico, and Nicaragua, so an increase in debt causes a decrease in economic growth. An increase in debt due to an increase in government spending on public capital may explain the negative relationship. Since the government borrows funds from the public, there is less money for private investment, but with more public investment, total investment stays the same. However, if public capital is less productive than private capital, growth may decrease.

This decrease in economic growth causes an increase in debt. With an increase in debt, economic growth decreases further. There is no stabilizing component in this feedback loop; thus, it is possible for the cycle to continue.

6.5 Robustness Tests

To determine the importance of controlling for other variables, I rerun the analysis with only debt and growth. If controlling for other variables is important, there should be a large difference in the results. Table 5a in the appendix shows the results of using Toda and Yamamoto (1995) method on the natural log of real GDP per capita and log of debt as a percentage of GDP for 1982 to 2015. When using only growth and debt data, 14, nine, and nine countries have no relationship, debt causing growth, and growth causing debt, respectively. Not controlling for capital, imports, and government revenue, doubled the number of countries with no relationship between growth and debt. Furthermore, there is a 75% decrease in the number of bidirectional relationships by not controlling for other variables. The results suggest it is important to control for capital, imports, and government revenue.

Finally, I rerun the analysis without government revenue to determine the importance of controlling for government revenue, which is shown in table 5b in the appendix. Including debt, growth, capital, and imports results in five, seven, five, and 12 no relationships, debt only causing growth, growth only causing debt, and bidirectional relationships, respectively. Not controlling for government revenue does not change the number of bidirectional relationships; however, it does decrease the number of no relationships, increases the number of unidirectional relationships where debt causes growth, and decreases the number of unidirectional relationship where growth causes debt. When controlling for all variables, growth causing debt is more prominent compared to any of the other groups of variables; therefore, controlling for government revenue is important to understanding the true relationship between debt and growth.

Conclusion

This paper investigates the causal relationship between economic growth and public debt in LAC. The relationship between economic growth and debt may be a result of economic growth causing debt, or debt causing economic growth. Increasing debt may increase, decrease, or have no impact on economic growth. If public debt is used to finance health and education, productivity may increase. An increase in productively would increase output; thus, economic

growth would increase. Borrowing funds to finance other goods likely decreases national savings, which increase interest rates. Private investment is crowed-out by the rise in interest rates. Finally, if the Ricardian principle holds, an increase in government spending will be met by a decrease in consumption. With a decrease in consumption, private savings increases, and if the increase in private savings matches the decrease in government savings, national savings remain constant. Therefore, there is no impact on economic growth. Economic growth likely has a negative impact on debt. With an increase in economic growth, tax revenue is likely to increase, which reduces the need to borrow funds. Furthermore, governments may borrow money to increase government expenditures to combat recessionary effects when economic growth is decreasing.

Using Toda and Yamamoto's (1995) VAR method, this paper analyzes 29 LAC countries. Due to the wide variation in data for LAC countries, each country is treated as a separate time series. The variables analyzed are real GDP per capita, debt as a percentage of GDP, gross capital formation as a percentage of GDP, imports as a percentage of GDP, and government revenue as a percentage of GDP. The data is from the WDI and IMF. Granger causality indicates there is a causal relationship between debt and economic growth for most countries. Out of the 29 countries analyzed, only seven countries show no relationship. From the 22 countries with a causal relationship, 12, two, and eight are bidirectional, debt causing growth, and growth causing debt, respectively. An increase in debt causes a decrease in economic growth in seven countries while an increase in debt leads to an increase in growth for three countries. Increasing growth decreases debt for 14 countries.

The main limitations of this paper are political structure and the IRF. LAC has a volatile political history that likely impacts the economic system. For example, the military ruled over Bolivia from 1964 to 1982. In 1985, the Bolivian president introduced austerity measures to help reduce hyper-inflation. Drastic changes in the economy such as nationalizing firms, price controls, and austerity measures likely cause a structural change in the economy. When there is a structural break in the data, traditional unit root tests such as ADF are often inaccurate. Since the maximum order of integration plays an import role in the Toda and Yamamoto (1995) method, the potential break may influence the results. Furthermore, political decisions such as government spending impacts economic growth as well as debt. Since government spending is not included, the results may be biased. IRF are meant to be used with stationary or cointegrated

variables. All the countries in this study are non-stationary, so computing the IRF in levels likely leads to in accurate results; therefore, the IRF results are meant to get a general idea of the directional relationship.

Table 4a: Results					
number	**Country**	**Debt causes GDP**		**GDP causes debt**	
		Granger Causality	**relationship**	**Granger Causality**	**relationship**
1	**Antigua and Barbuda**	No	NA	No	NA
2	**Argentina**	No	NA	Yes	Negative
3	**Barbados**	Yes	Negative	Yes	None
4	**Belize**	No	NA	Yes	None
5	**Bolivia**	No	NA	No	NA
6	**Brazil**	Yes	Positive	Yes	Negative
7	**Chile**	Yes	None	Yes	None
8	**Colombia**	No	NA	No	NA
9	**Costa Rica**	No	NA	Yes	Negative
10	**Dominica**	No	NA	No	NA
11	**Dominican Republic**	No	NA	No	NA

Table 4a: Results					
number	**Country**	**Debt causes GDP**		**GDP causes debt**	
		Granger Causality	**relationship**	**Granger Causality**	**relationship**
12	**Ecuador**	Yes	Negative	Yes	Negative Positive
13	**El Salvador**	No	NA	Yes	Negative
14	**Grenada**	No	NA	No	NA
15	**Guatemala**	Yes	Negative	Yes	Negative
16	**Guyana**	No	NA	Yes	None
17	**Haiti**	Yes	Negative	Yes	Negative
18	**Honduras**	No	NA	No	NA
19	**Jamaica**	Yes	None	Yes	Negative
20	**Mexico**	Yes	Negative	Yes	Negative
21	**Nicaragua**	Yes	Negative	Yes	Negative
22	**Panama**	No	NA	Yes	Negative
23	**Paraguay**	No	NA	Yes	Negative
24	**Peru**	Yes	None	Yes	Negative

Table 4a: Results					
number	**Country**	**Debt causes GDP**		**GDP causes debt**	
		Granger Causality	**relationship**	**Granger Causality**	**relationship**
25	**St. Lucia**	Yes	Positive	Yes	Negative
26	**St. Vincent and the Grenadines**	Yes	None	Yes	None
27	**Trinidad and Tobago**	Yes	Positive	No	NA
28	**Uruguay**	No	NA	Yes	Negative
29	**Venezuela**	Yes	Negative	No	NA

References

Aizenman, J., Kletzer, K., & Pinto, B. (2007). Economic growth with constraints on tax revenues and public debt: implications for fiscal policy and cross-country differences (No. w12750). National Bureau of Economic Research.

Aschauer, D. A. (2000). Do states optimize? Public capital and economic growth. The annals of regional science, 34(3), 343-363.

Balassone, F., Francese, M., & Pace, A. (2011). Public debt and economic growth in Italy. Bank of Italy Economic History Working Paper, (11).

Butts, H. C. (2009). Short term external debt and economic growth—Granger causality: evidence from Latin America and the Caribbean. *The Review of Black political economy*, 36(2), 93-111.

Calderón, C., & Fuentes, J. R. (2013). Government debt and economic growth (No. IDB-WP-424). IDB Working Paper Series.

Checherita-Westphal, C., & Rother, P. (2012). The impact of high government debt on economic growth and its channels: An empirical investigation for the euro area. *European economic review*, 56(7), 1392-1405.

Égert, B. (2015). Public debt, economic growth and nonlinear effects: Myth or reality?. *Journal of Macroeconomics*, 43, 226-238.

Geiger, L. T. (1990). Debt and economic development in Latin America. *The Journal of Developing Areas*, 24(2), 181-194.

Johansen, S. (1995). Likelihood-based inference in cointegrated vector autoregressive models. Oxford University Press on Demand.

Kumar, M., & Woo, J. (2010). Public debt and growth. IMF working papers, 1-47.

Lin, S., & Sosin, K. (2001). Foreign debt and economic growth. *Economics of Transition*, 9(3), 635-655.

Megersa, K., & Cassimon, D. (2015). Public debt, economic growth, and public sector management in developing countries: Is there a link?. *Public Administration and Development*, 35(5), 329-346.

Onafowora, O., & Owoye, O. (2019). Public debt, foreign direct investment and economic growth dynamics. *International Journal of Emerging Markets*.

Panizza, U., & Presbitero, A. F. (2014). Public debt and economic growth: is there a causal effect?. *Journal of Macroeconomics*, 41, 21-41.

Schclarek, A., & Ramon-Ballester, F. (2005). External Debt and Economic Growth in Latin America. Paper not yet published. Download at http://www. cbaeconomia. com/Debt-latin. pdf.

Toda, H. Y., & Yamamoto, T. (1995). Statistical inference in vector autoregressions with possibly integrated processes. *Journal of econometrics*, 66(1-2), 225-250.

Appendix

Figure 1: Regional Debt and Economic Growth

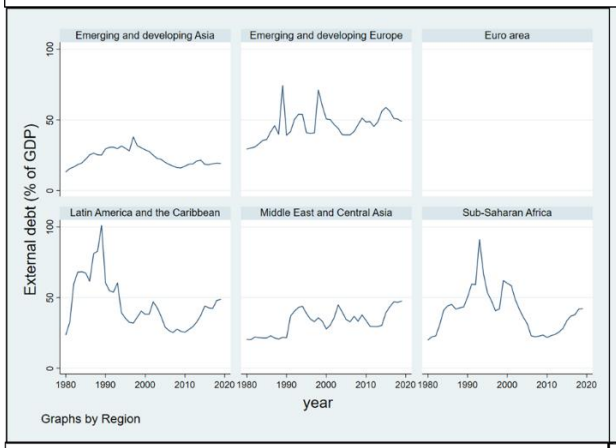


Figure 1(a): Regional Debt

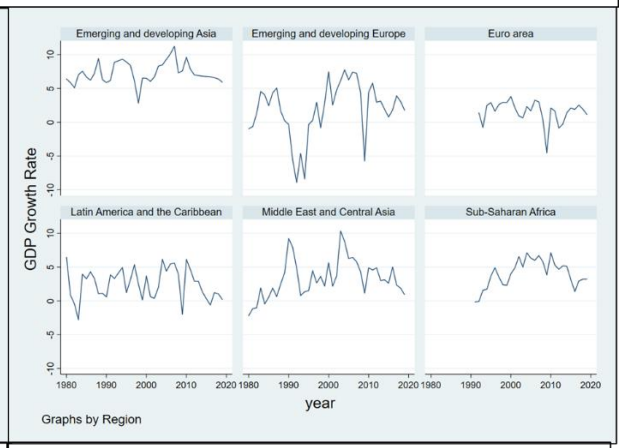


Figure 1(b): Regional Economic Growth

Figure 2: External Debt and Economic Growth in LAC

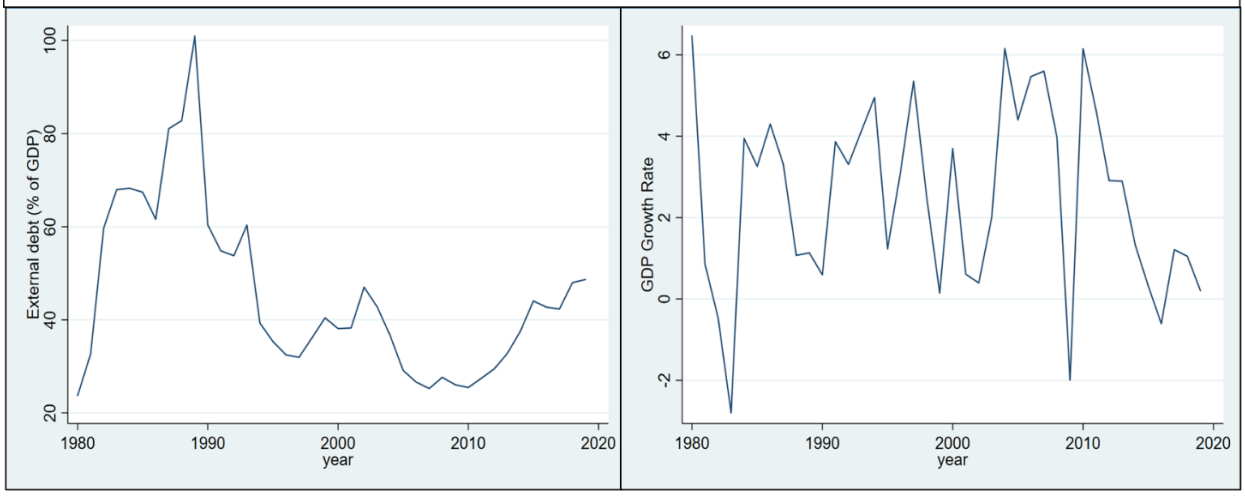


Figure 3: Caribbean Island Countries

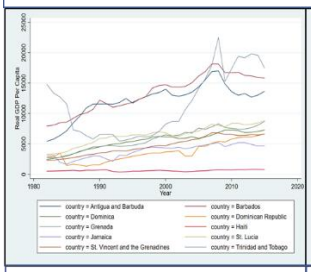


Figure 3(a): Included in Sample

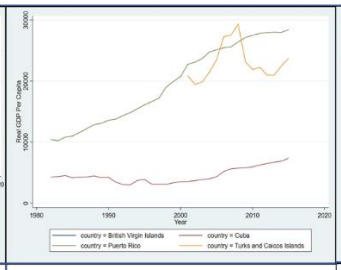


Figure 3(b): Excluded from Sample

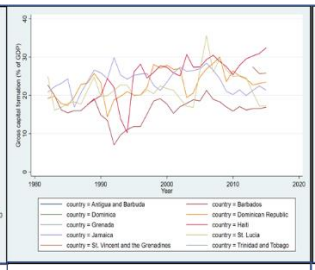


Figure 3(c): Included in Sample

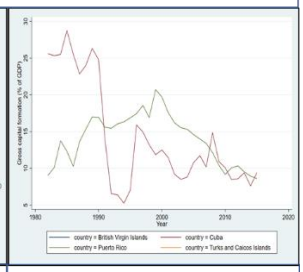


Figure 3(d): Excluded in Sample

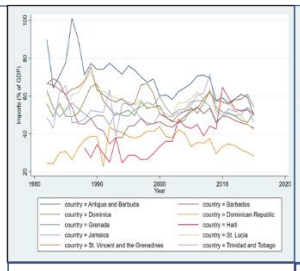


Figure 3(e): Included in Sample

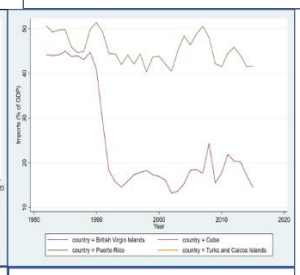


Figure 3(f): Excluded in Sample

Figure 4: Non-island Countries

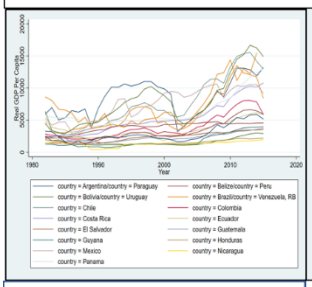


Figure 4(a): Included in Sample

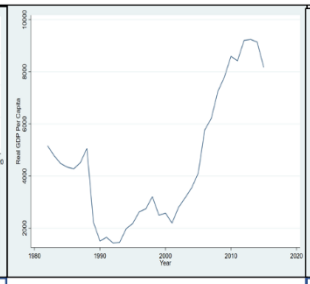


Figure 4(b): Excluded from Sample

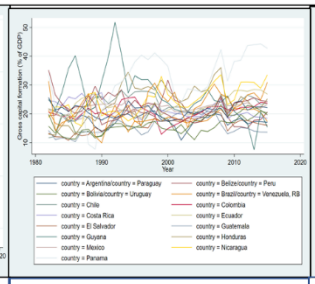


Figure 4(c): Included in Sample

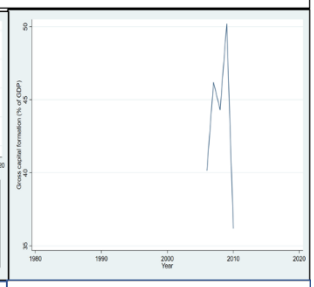


Figure 4(d): Excluded from Sample

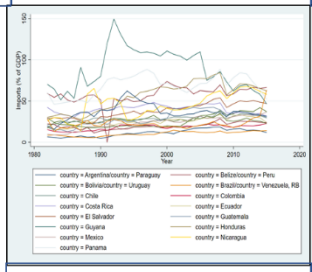


Figure 4(e): Included in Sample

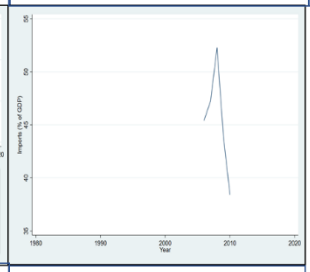


Figure 4(f): Excluded from Sample

Table 1: Descriptive Statistics

Country	Statistics	Ln Growth	Ln Debt	Ln Capital	Ln Imports	Ln Revenue
Antigua	Observation	18	18	0	18	0
	Mean	9.54	4.61	NA	4.13	NA
	SD	.089	.151	NA	.093	NA
Argentina	Observation	33	33	33	33	33
	Mean	9.01	3.90	2.88	2.37	2.66
	SD	.361	.384	.142	.417	.304
Barbados	Observation	34	34	34	34	34
	Mean	9.47	3.99	2.77	3.87	3.33
	SD	.247	.289	.231	.152	.046
Belize	Observation	34	34	34	34	34
	Mean	8.25	4.18	3.06	4.07	3.18
	SD	.224	.323	.179	.115	.093
Bolivia	Observation	34	34	34	34	34
	Mean	7.31	4.26	2.78	3.37	2.88
	SD	.317	.532	.179	.169	.363

Table 1: Descriptive Statistics						
Country	**Statistics**	**Ln Growth**	**Ln Debt**	**Ln Capital**	**Ln Imports**	**Ln Revenue**
Brazil	Observation	34	34	34	34	34
	Mean	8.64	4.10	2.97	2.30	3.17
	SD	.452	.257	.117	.286	.141
Chile	Observation	33	33	33	33	33
	Mean	8.79	3.23	3.11	3.35	3.09
	SD	.550	1.10	.205	.129	.111
Colombia	Observation	33	33	33	33	33
	Mean	8.16	3.52	3.02	2.87	3.23
	SD	.444	.233	.148	.194	.289
Costa Rica	Observation	33	33	33	33	33
	Mean	8.46	3.83	3.06	3.68	3.10
	SD	.474	.447	.128	.128	.087
Dominica	Observation	34	34	0	34	0
	Mean	8.56	4.17	NA	3.96	NA
	SD	.313	.220	NA	.092	NA

Table 1: Descriptive Statistics						
Country	**Statistics**	**Ln Growth**	**Ln Debt**	**Ln Capital**	**Ln Imports**	**Ln Revenue**
Dominican Republic	Observation	34	34	34	34	34
	Mean	8.09	3.46	3.12	3.55	2.58
	SD	.479	.376	.168	.174	.147
Ecuador	Observation	34	34	34	34	0
	Mean	8.11	3.89	3.14	3.19	NA
	SD	.331	.558	.134	.214	NA
El Salvador	Observation	34	34	34	34	34
	Mean	7.70	3.86	2.79	3.62	2.75
	SD	.344	.401	.178	.238	.265
Grenada	Observation	34	34	0	34	0
	Mean	8.60	4.16	NA	3.96	NA
	SD	.348	.334	NA	.072	NA
Guatemala	Observation	33	33	33	33	33
	Mean	7.69	3.40	2.72	3.32	2.27
	SD	.284	.347	.199	.346	.199

Table 1: Descriptive Statistics						
Country	**Statistics**	**Ln Growth**	**Ln Debt**	**Ln Capital**	**Ln Imports**	**Ln Revenue**
Guyana	Observation	34	34	34	34	0
	Mean	7.30	5.38	3.23	4.44	NA
	SD	.541	1.00	.340	.297	NA
Haiti	Observation	34	34	34	34	0
	Mean	6.377264	3.893238	3.14	3.59	NA
	SD	.2078806	.6799103	.283	.264	NA
Honduras	Observation	34	34	34	34	34
	Mean	7.43	4.08	3.15	3.97	2.94
	SD	.229	.429	.287	.344	.117
Jamaica	Observation	33	33	33	33	33
	Mean	8.20	4.749833	3.16	3.95	3.30
	SD	.327	.2648079	.122	.127	.088
Mexico	Observation	34	34	34	34	34
	Mean	8.86	3.84	3.09	3.08	2.75
	SD	.373	.220	.078	.408	.197

Table 1: Descriptive Statistics						
Country	**Statistics**	**Ln Growth**	**Ln Debt**	**Ln Capital**	**Ln Imports**	**Ln Revenue**
Nicaragua	Observation	34	34	34	34	34
	Mean	7.10	4.97	3.19	3.74	2.86
	SD	.414	1.14	.205	.391	.438
Panama	Observation	34	34	34	34	0
	Mean	8.69	4.11	3.37	4.21	NA
	SD	.322	.316	.403	.197	NA
Paraguay	Observation	34	34	34	34	34
	Mean	7.90	3.32	3.04	3.57	2.56
	SD	.394	.391	.100	.268	.155
Peru	Observation	33	33	33	33	33
	Mean	7.96	3.600885	3.09	2.96	2.81
	SD	.473	.3029176	.166	.204	.226
St. Lucia	Observation	34	34	34	34	34
	Mean	8.73	3.64	3.06	4.03	3.06
	SD	.281	.494	.181	.109	.026

Table 1: Descriptive Statistics						
Country	**Statistics**	**Ln Growth**	**Ln Debt**	**Ln Capital**	**Ln Imports**	**Ln Revenue**
St. Vincent	Observation	34	34	34	34	34
	Mean	8.396854	3.950362	3.81	4.073722	3.15
	SD	.3496318	.2734032	.357	.1055108	.090
Trinidad and Tobago	Observation	33	33	0	0	33
	Mean	9.25	3.63	NA	NA	3.24
	SD	.471	.509	NA	NA	.213
Uruguay	Observation	34	34	34	34	34
	Mean	8.86	4.06	2.79	3.10	3.26
	SD	.496	.379	.205	.195	.111
Venezuela	Observation	17	17	17	17	0
	Mean	9.00	3.64	3.20	3.05	NA
	SD	.4487137	.3745418	.164902	.1753577	NA

Table 2a: Unit Root Summary						
number	**Country**	**Log Real GDP per capita**	**Log debt per GDP**	**Log Capital Formation**	**Log Imports**	**Ln Gov. Revenue**
1	**Antigua**	I(1)	I(1)	I(1)	I(1)	NA
2	**Argentina**	I(1)	I(1)	I(1)	I(1)	I(1)
3	**Barbados**	I(1)	I(1)	I(1)	I(1)	I(1)
4	**Belize**	I(1)	I(1)	I(1)	I(1)	I(1)
5	**Bolivia**	I(1)	I(0)	I(1)	I(1)	I(1)
6	**Brazil**	I(1)	I(1)	I(1)	I(1)	I(1)
7	**Chile**	I(1)	I(1)	I(1)	I(1)	I(1)
8	**Colombia**	I(1)	I(1)	I(1)	I(1)	I(2)
9	**Costa Rica**	I(1)	I(1)	I(1)	I(1)	I(1)
10	**Dominica**	I(1)	I(1)	NA	I(1)	NA
11	**Dominican Republic**	I(1)	I(1)	I(1)	I(1)	I(1)
12	**Ecuador**	I(1)	I(1)	I(1)	I(1)	NA
13	**El Salvador**	I(2)	I(1)	I(1)	I(1)	I(1)

Table 2a: Unit Root Summary						
number	**Country**	**Log Real GDP per capita**	**Log debt per GDP**	**Log Capital Formation**	**Log Imports**	**Ln Gov. Revenue**
14	**Grenada**	I(1)	I(1)	NA	I(1)	NA
15	**Guatemala**	I(1)	I(0)	I(1)	I(1)	I(1)
16	**Guyana**	I(1)	I(0)	I(1)	I(1)	NA
17	**Haiti**	I(1)	I(1)	I(1)	I(1)	NA
18	**Honduras**	I(1)	I(1)	I(1)	I(1)	I(1)
19	**Jamaica**	I(1)	I(1)	I(1)	I(1)	I(1)
20	**Mexico**	I(1)	I(1)	I(1)	I(1)	I(1)
21	**Nicaragua**	I(1)	I(1)	I(1)	I(1)	I(1)
22	**Panama**	I(1)	I(1)	I(1)	I(1)	NA
23	**Paraguay**	I(1)	I(1)	I(1)	I(1)	I(1)
24	**Peru**	I(1)	I(1)	I(1)	I(1)	I(1)
25	**St. Lucia**	I(1)	I(1)	I(1)	I(1)	I(1)
26	**St. Vincent**	I(1)	I(1)	I(0)	I(1)	I(1)

Table 2a: Unit Root Summary						
number	**Country**	**Log Real GDP per capita**	**Log debt per GDP**	**Log Capital Formation**	**Log Imports**	**Ln Gov. Revenue**
27	**Trinidad and Tobago**	I(1)	I(1)	NA	NA	I(1)
28	**Uruguay**	I(1)	I(1)	I(1)	I(1)	I(1)
29	**Venezuela**	I(1)	I(1)	I(1)	I(1)	NA

Table 2b: ADF Unit Root Test						
Significance level: (1%)*, (5%)**, and (10%)***						
		GDP	**Debt**	**Capital**	**Imports**	**Gov. Revenue**
Antigua	**Levels**	**0.933**	**-0.013**	**NA**	**-0.999**	**NA**
	First Difference	**-2.563****	**-3.862*****	**NA**	**-4.685*****	**NA**
Argentina	**Levels**	**0.439**	**0.078**	**-0.383**	**0.404**	**2.73**
	First Difference	**-6.221*****	**-5.385*****	**-5.021*****	**-6.032*****	**-4.23*****

Table 2b: ADF Unit Root Test						
Significance level: (1%)***, (5%)**, and (10%)*						
		GDP	Debt	Capital	Imports	Gov. Revenue
Barbados	Levels	2.645	0.863	-0.496	-0.871	-2.23**
	First Difference	-3.527***	-3.331***	-5.639***	-5.727	NA
Belize	Levels	2.476	0.199	-0.064	0.191	0.512
	First Difference	-3.724***	-4.887***	-6.285***	-6.834***	-6.33***
Bolivia	Levels	0.822	-1.995**	0.120	0.370	3.83
	First Difference	-3.740***	NA	-6.592***	-7.897***	-4.14***
Brazil	Levels	0.503	0.502	-0.028	0.841	0.156
	First Difference	-4.733***	-4.746***	-6.941***	-4.907***	-10.3***
Chile	Levels	1.380	0.271	0.728	1.282	-0.803
	First Difference	-3.455***	-1.824*	-5.919***	-6.861***	-5.16***
Colombia	Levels	1.099	0.592	0.154	0.746	NA

Table 2b: ADF Unit Root Test						
Significance level: (1%)***, (5%)**, and (10%)*						
		GDP	Debt	Capital	Imports	Gov. Revenue
	First Difference	-3.405***	-2.903***	-5.411***	-5.594***	NA
Costa Rica	Levels	5.147	-0.291	-0.566	-0.661	0.782
	First Difference	-3.257***	-2.918***	-5.631***	-5.716***	-6.35***
Dominica	Levels	4.636	0.716	NA	0.017	NA
	First Difference	-2.215**	-3.968***	NA	-4.501***	NA
Dominican Republic	Levels	0.717	-0.113	0.099	-0.008	0.797
	First Difference	-6.670***	-7.364***	-6.239***	-4.251***	-6.09***
Ecuador	Levels	0.476	-0.673	0.323	0.360	NA
	First Difference	-3.755***	-5.245***	-6.008***	-6.296***	NA
El Salvador	Levels	2.404	-0.167	0.133	1.270	2.10

Table 2b: ADF Unit Root Test						
Significance level: (1%)***, (5%)**, and (10%)*						
		GDP	Debt	Capital	Imports	Gov. Revenue
	First Difference	-1.573	-2.993***	-6.824***	-5.959***	-4.66***
	Second Difference	-6.755***	NA	NA	NA	NA
Grenada	Levels	3.986	0.113	NA	-0.250	NA
	First Difference	-2.349**	-5.593***	NA	-6.350***	NA
Guatemala	Levels	0.932	-1.696*	-0.176	0.467	0.685
	First Difference	-4.650***	NA	-5.705***	-6.186***	-5.90***
Guyana	Levels	1.479	-2.441**	-0.512	-0.471	NA
	First Difference	-4.845***	NA	-5.338***	-6.697***	NA
Haiti	Levels	0.339	-0.483	0.903	0.925	NA
	First Difference	-4.707***	-4.088***	-6.682***	-9.590***	NA

Table 2b: ADF Unit Root Test						
Significance level: (1%)***, (5%)**, and (10%)*						
		GDP	Debt	Capital	Imports	Gov. Revenue
Honduras	Levels	-0.053	-0.317	0.765	1.12	2.83
	First Difference	-3.52***	-4.24***	-6.49***	-5.19***	-4.60***
Jamaica	Levels	0.496	-1.04	-0.062	-0.510	-0.268
	First Difference	-5.193***	-3.652***	-6.515***	-8.260***	-6.33***
Mexico	Levels	0.577	0.020	0.140	1.764	0.407
	First Difference	-5.446***	-5.684***	-6.494***	-5.150***	-5.20***
Nicaragua	Levels	0.032	-0.969	0.652	0.207	-1.133
	First Difference	-4.741***	-7.950	-6.335***	-6.388***	-5.42***
Panama	Levels	1.341	-1.107	0.165	-0.279	NA
	First Difference	-2.269**	-3.291***	-5.588***	-5.205***	NA
Paraguay	Levels	1.346	-0.590	-0.365	0.398	2.194

Table 2b: ADF Unit Root Test						
Significance level: (1%)***, (5%)**, and (10%)*						
		GDP	Debt	Capital	Imports	Gov. Revenue
	First Difference	-3.674***	-5.234***	-7.566***	-5.594***	-2.08**
Peru	Levels	1.090	-0.387	-0.664	0.138	-0.088
	First Difference	-6.312***	-4.139***	-5.835***	-9.162***	-3.59***
St. Lucia	Levels	3.660	3.073	-0.049	-0.856	-0.063
	First Difference	-3.100***	-4.126***	-6.248***	-7.517***	-5.19***
St. Vincent	Levels	5.362	1.354	-10.474***	-0.487	1.296
	First Difference	-2.75***	-4.92***	NA	-4.70***	-8.20***
Trinidad and Tobago	Levels	0.160	-0.424	NA	NA	NA
	First Difference	-4.95	-4.37***	NA	NA	NA
Uruguay	Levels	1.51	-0.64	-0.13	0.33	1.00

Table 2b: ADF Unit Root Test						
Significance level: (1%)***, (5%)**, and (10%)*						
		GDP	Debt	Capital	Imports	Gov. Revenue
	First Difference	-4.85***	-5.75***	-5.35***	-7.16***	-5.86***
Venezuela	Levels	1.48	0.390	-0.174	0.619	NA
	First Difference	-2.90***	-2.73***	-3.97***	-3.00***	NA

Table 3: Lag Selection Criteria						
Country	AIC Lags	LM Autocorrelation Test				Adj Lags
		Lag Order	Test Statistic	df	P-value	
Antigua	4	AR 1	5.994	9	0.7406	2
		AR 2	14.62	9	0.1020	
Argentina	3	AR 1	12.19	16	0.7309	3
		AR 2	23.71	16	0.0961	
Barbados	4	AR 1	26.62	25	0.375	3

Table 3: Lag Selection Criteria						
Country	**AIC Lags**	**LM Autocorrelation Test**				**Adj Lags**
		Lag Order	**Test Statistic**	**df**	**P-value**	
		AR 2	**30.61**	**25**	**0.2023**	
Belize	**4**	**AR 1**	**11.39**	**25**	**0.9908**	**2**
		AR 2	**28.44**	**25**	**0.2863**	
Bolivia	**4**	**AR 1**	**26.19**	**25**	**0.3977**	**2**
		AR 2	**17.62**	**25**	**0.8579**	
Brazil	**4**	**AR 1**	**28.74**	**25**	**0.2750**	**3**
		AR 2	**27.24**	**25**	**0.3440**	
Chile	**4**	**AR 1**	**33.48**	**25**	**0.1195**	**2**
		AR 2	**27.42**	**25**	**0.3353**	
Colombia	**3**	**AR 1**	**29.87**	**25**	**0.2292**	**2**
		AR 2	**16.15**	**25**	**0.9104**	
Costa Rica	**4**	**AR 1**	**25.93**	**25**	**0.4114**	**3**
		AR 2	**35.88**	**25**	**0.0734**	
Dominica	**2**	**AR 1**	**6.419**	**9**	**0.6973**	**2**

Table 3: Lag Selection Criteria						
Country	**AIC Lags**	**LM Autocorrelation Test**				**Adj Lags**
		Lag Order	**Test Statistic**	**df**	**P-value**	
		AR 2	**5.209**	**9**	**0.8157**	
Dominican Republic	**4**	**AR 1**	**31.84**	**25**	**0.1628**	**1**
		AR 2	**31.48**	**25**	**0.1736**	
Ecuador	**3**	**AR 1**	**14.59**	**16**	**0.5546**	**3**
		AR 2	**9.700**	**16**	**0.8818**	
El Salvador	**4**	**AR 1**	**24.95**	**25**	**0.4650**	**2**
		AR 2	**32.57**	**25**	**0.1421**	
Grenada	**1**	**AR 1**	**8.967**	**9**	**0.4403**	**1**
		AR 2	**7.733**	**9**	**0.5613**	
Guatemala	**3**	**AR 1**	**35.96**	**25**	**0.0722**	**3**
		AR 2	**29.06**	**25**	**0.2614**	
Guyana	**1**	**AR 1**	**10.17**	**16**	**0.8574**	**1**
		AR 2	**9.466**	**16**	**0.8930**	
Haiti	**4**	**AR 1**	**11.65**	**16**	**0.7677**	**4**

Table 3: Lag Selection Criteria						
Country	**AIC Lags**	**LM Autocorrelation Test**				**Adj Lags**
		Lag Order	**Test Statistic**	**df**	**P-value**	
		AR 2	**10.2190**	**16**	**0.85495**	
Honduras	**4**	**AR 1**	**31.68**	**25**	**0.1675**	**2**
		AR 2	**26.62**	**25**	**0.3750**	
Jamaica	**4**	**AR 1**	**26.30**	**25**	**0.3916**	**2**
		AR 2	**33.38**	**25**	**0.1218**	
Mexico	**4**	**AR 1**	**16.23**	**25**	**0.9077**	**3**
		AR 2	**21.66**	**25**	**0.6556**	
Nicaragua	**4**	**AR 1**	**28.19**	**25**	**0.2990**	**1**
		AR 2	**26.62**	**25**	**0.3749**	
Panama	**1**	**AR 1**	**20.79**	**16**	**0.1866**	**1**
		AR 2	**9.367**	**16**	**0.8975**	
Paraguay	**4**	**AR 1**	**20.35**	**25**	**0.7284**	**3**
		AR 2	**24.4**	**25**	**0.4940**	
Peru	**3**	**AR 1**	**18.50**		**0.8203**	**3**

Table 3: Lag Selection Criteria						
Country	**AIC Lags**	**LM Autocorrelation Test**				**Adj Lags**
		Lag Order	**Test Statistic**	**df**	**P-value**	
		AR 2	**37.27**	**25**	**0.0544**	
St. Lucia	**4**	**AR 1**	**22.09**	**25**	**0.6307**	**3**
		AR 2	**24.57**	**25**	**0.4867**	
St. Vincent	**4**	**AR 1**	**21.47**	**25**	**0.6659**	**2**
		AR 2	**16.58**	**25**	**0.8963**	
Trinidad and Tobago	**4**	**AR 1**	**4.696**	**9**	**0.8600**	**4**
		AR 2	**10.50**	**9**	**0.3117**	
Uruguay	**4**	**AR 1**	**24.03**	**25**	**0.5174**	**3**
		AR 2	**30.33**		**0.2121**	
Venezuela	**2**	**AR 1**	**28.78**	**16**	**0.025**	**1**
		AR 2	**17.29**	**16**	**0.3669**	

Table 4b: Toda Yamamoto (1995) Granger Causality							
Country	**VAR Lags**	**Max Order**	**Granger Lags (p+q)**	**Debt Causes Growth**		**Growth Causes Debt**	
				Statistic	**P-value**	**Statistic**	**P-value**
Antigua	2	1	3	0.70	0.7058	0.07	0.9676
Argentina	3	1	4	2.61	0.4560	10.77	0.0130
Barbados	3	1	4	12.05	0.0072	16.67	0.0008
Belize	2	1	3	1.32	0.5176	7.00	0.0302
Bolivia	2	1	3	10.63	0.0049	0.83	0.6608
Brazil	3	1	4	28.29	0.0000	16.53	0.0009
Chile	2	1	3	9.39	0.0091	13.53	0.0012
Colombia	2	2	4	0.46	0.7936	1.33	0.5149
Costa Rica	3	1	4	3.48	0.3236	23.38	0.0000
Dominica	2	1	3	1.80	0.4073	0.30	0.8594
Dominican Republic	1	1	2	0.60	0.4397	0.78	0.3774
Ecuador	3	1	4	22.75	0.0000	8.64	0.0344
El Salvador	2	2	4	3.41	0.1818	9.75	0.0076

Table 4b: Toda Yamamoto (1995) Granger Causality							
Country	**VAR Lags**	**Max Order**	**Granger Lags (p+q)**	**Debt Causes Growth**		**Growth Causes Debt**	
				Statistic	**P-value**	**Statistic**	**P-value**
Grenada	1	1	2	1.17	0.2785	0.25	0.6184
Guatemala	3	1	4	45.29	0.0000	13.32	0.0040
Guyana	1	1	2	0.30	0.5815	6.80	0.0091
Haiti	4	1	5	12.64	0.0132	16.61	0.0023
Honduras	2	1	3	2.41	0.3001	2.78	0.2497
Jamaica	2	1	3	11.47	0.0032	5.40	0.0670
Mexico	3	1	4	32.07	0.0000	14.35	0.0025
Nicaragua	1	1	2	4.49	0.0342	5.31	0.0212
Panama	1	1	2	0.08	0.7826	8.12	0.0044
Paraguay	3	1	4	3.00	0.3915	8.79	0.0323
Peru	3	1	4	17.19	0.0006	33.02	0.0000
St. Lucia	3	1	4	16.91	0.0007	12.92	0.0048
St. Vincent	2	1	3	6.03	0.0491	8.38	0.0151

Table 4b: Toda Yamamoto (1995) Granger Causality							
Country	**VAR Lags**	**Max Order**	**Granger Lags (p+q)**	**Debt Causes Growth**		**Growth Causes Debt**	
				Statistic	**P-value**	**Statistic**	**P-value**
Trinidad and Tobago	4	1	5	14.85	0.0050	6.28	0.1789
Uruguay	3	1	4	2.73	0.4346	13.13	0.0044
Venezuela	1	1	2	5.32	0.0211	0.16	0.6853

Table 5a: Results with only Growth and Debt				
number	**Country**	**Debt causes GDP**	**GDP causes debt**	**Relationship**
1	**Antigua**	Yes	No	Debt-GDP
2	**Argentina**	No	No	None
3	**Barbados**	Yes	No	Debt-GDP
4	**Belize**	No	No	None
5	**Bolivia**	Yes	No	Debt-GDP
6	**Brazil**	Yes	No	Debt-GDP
7	**Chile**	Yes	Yes	Bidirectional

Table 5a: Results with only Growth and Debt				
number	**Country**	**Debt causes GDP**	**GDP causes debt**	**Relationship**
8	**Colombia**	No	Yes	GDP-Debt
9	**Costa Rica**	No	No	None
10	**Dominica**	No	No	None
11	**Dominican Republic**	No	No	None
12	**Ecuador**	No	No	None
13	**El Salvador**	No	Yes	GDP-Debt
14	**Grenada**	No	No	None
15	**Guatemala**	Yes	Yes	Bidirectional
16	**Guyana**	No	Yes	GDP-Debt
17	**Haiti**	No	Yes	GDP-Debt
18	**Honduras**	No	No	None
19	**Jamaica**	Yes	No	Debt-GDP
20	**Mexico**	No	No	None
21	**Nicaragua**	Yes	No	Debt-GDP
22	**Panama**	No	No	None

Table 5a: Results with only Growth and Debt				
number	**Country**	**Debt causes GDP**	**GDP causes debt**	**Relationship**
23	**Paraguay**	No	Yes	GDP-Debt
24	**Peru**	Yes	Yes	Bidirectional
25	**St. Lucia**	No	No	None
26	**St. Vincent**	No	No	None
27	**Trinidad and Tobago**	No	No	None
28	**Uruguay**	No	No	None
29	**Venezuela**	No	Yes	GDP-Debt

Table 5b: Results with Capital and Imports				
number	**Country**	**Debt causes GDP**	**GDP causes debt**	**Relationship**
1	**Antigua**	No	No	None
2	**Argentina**	Yes	Yes	Bidirectional
3	**Barbados**	Yes	Yes	Bidirectional
4	**Belize**	Yes	Yes	Bidirectional

Table 5b: Results with Capital and Imports				
number	**Country**	**Debt causes GDP**	**GDP causes debt**	**Relationship**
5	**Bolivia**	Yes	No	Debt-GDP
6	**Brazil**	Yes	Yes	Bidirectional
7	**Chile**	No	Yes	GDP-Debt
8	**Colombia**	Yes	No	Debt-GDP
9	**Costa Rica**	No	No	None
10	**Dominica**	Yes	Yes	Bidirectional
11	**Dominican Republic**	Yes	Yes	Bidirectional
12	**Ecuador**	Yes	No	Debt-GDP
13	**El Salvador**	Yes	Yes	Bidirectional
14	**Grenada**	No	No	None
15	**Guatemala**	Yes	No	Debt-GDP
16	**Guyana**	No	Yes	GDP-Debt
17	**Haiti**	Yes	Yes	Bidirectional
18	**Honduras**	No	No	None

Table 5b: Results with Capital and Imports				
number	**Country**	**Debt causes GDP**	**GDP causes debt**	**Relationship**
19	**Jamaica**	Yes	Yes	Bidirectional
20	**Mexico**	Yes	Yes	Bidirectional
21	**Nicaragua**	Yes	Yes	Bidirectional
22	**Panama**	No	Yes	GDP-Debt
23	**Paraguay**	No	Yes	GDP-Debt
24	**Peru**	Yes	Yes	Bidirectional
25	**St. Lucia**	No	No	None
26	**St. Vincent and the Grenadines**	Yes	No	Debt-GDP
27	**Trinidad and Tobago**	Yes	No	Debt-GDP
28	**Uruguay**	No	Yes	GDP-Debt
29	**Venezuela**	Yes	No	Debt-GDP

Figure 5a: Argentina IRF

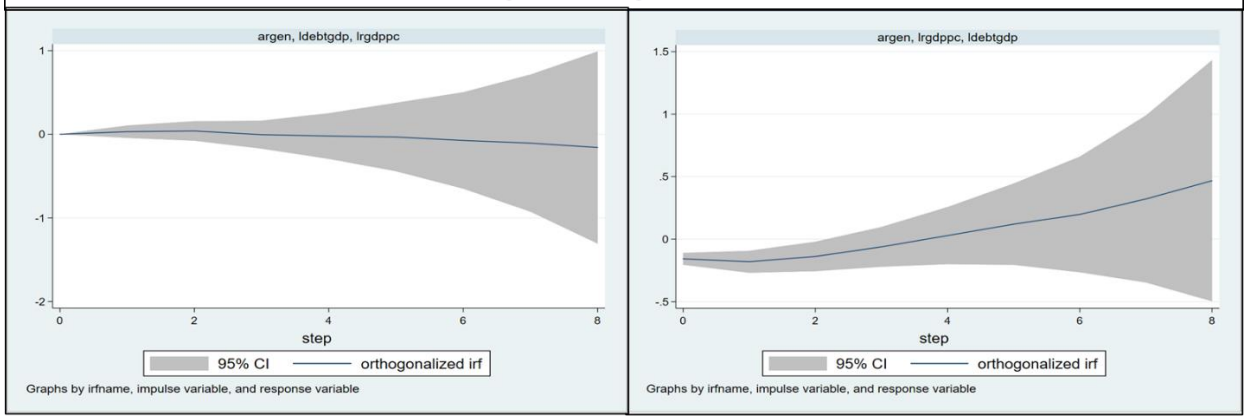


Figure 5b: Barbados IRF

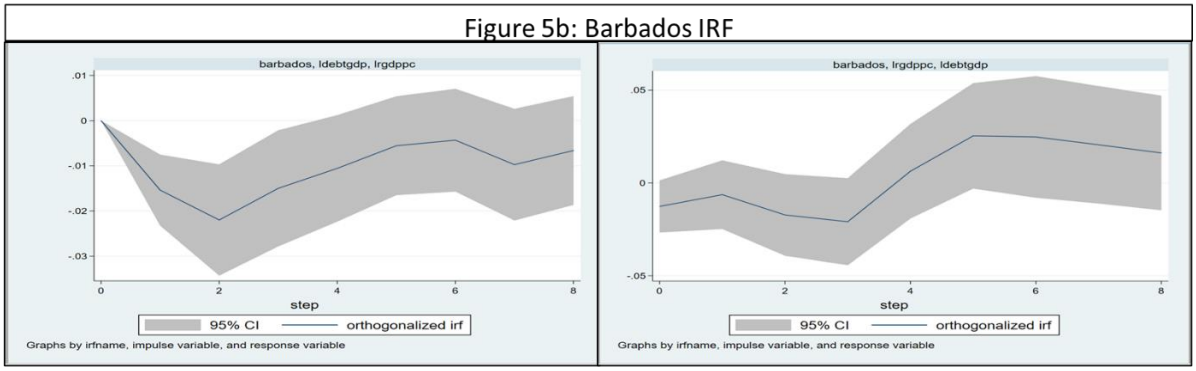


Figure 5c: Belize IRF

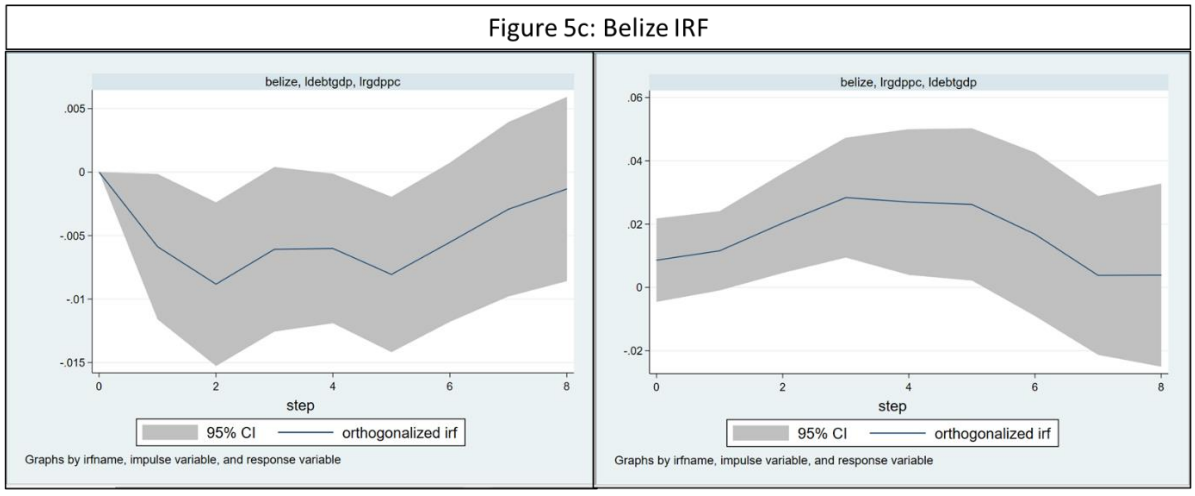


Figure 5d: Bolivia IRF

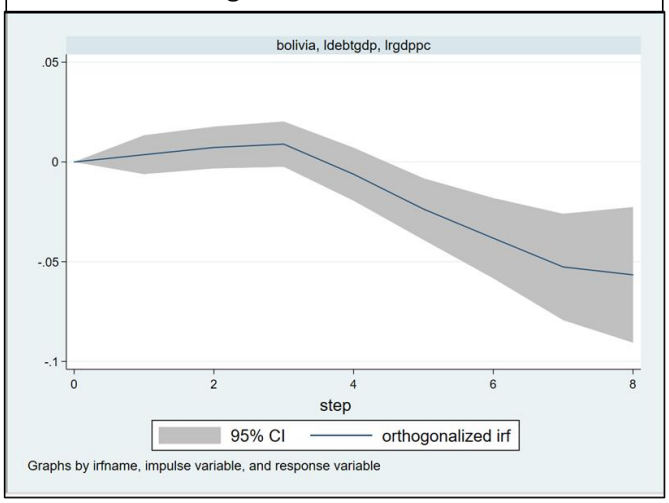


Figure 5e: Brazil IRF

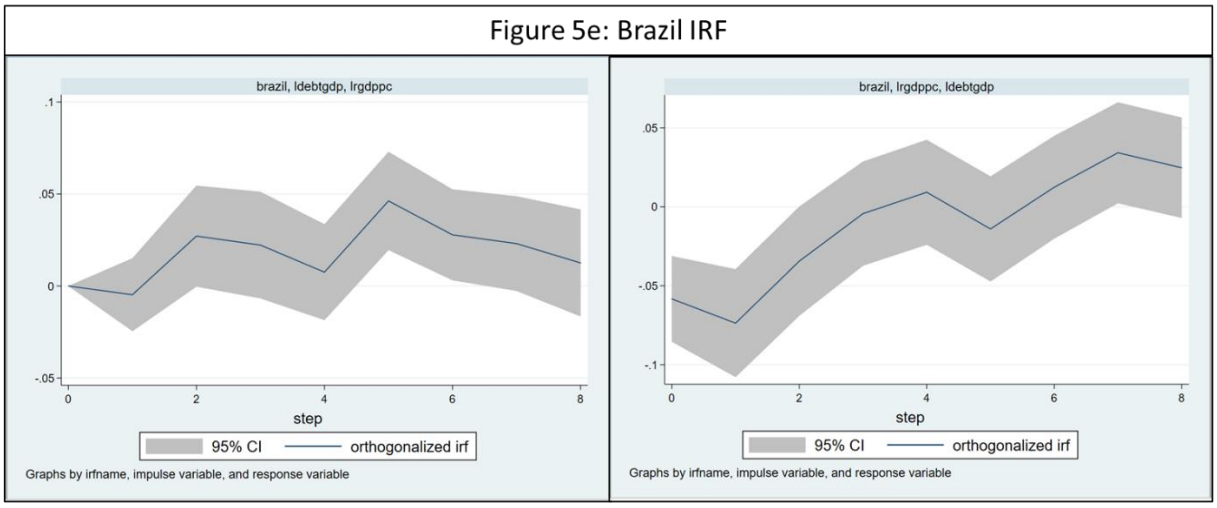
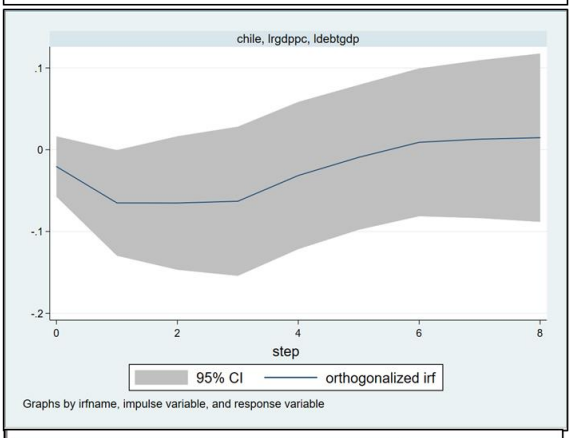


Figure 5f: Chile IRF



step	(1) oirf	(1) Lower	(1) Upper
0	-.020595	-.057464	.016274
1	-.065055	-.129553	-.000557
2	-.065161	-.146732	.016411
3	-.063006	-.154133	.02812
4	-.03153	-.121474	.058414
5	-.009288	-.097803	.079228
6	.009091	-.081248	.09943
7	.012895	-.083575	.109364
8	.014727	-.088153	.117606

95% lower and upper bounds reported
(1) irfname = chile, impulse = lrgdppc, and response = ldebtgdp

Figure 5g: Colombia IRF

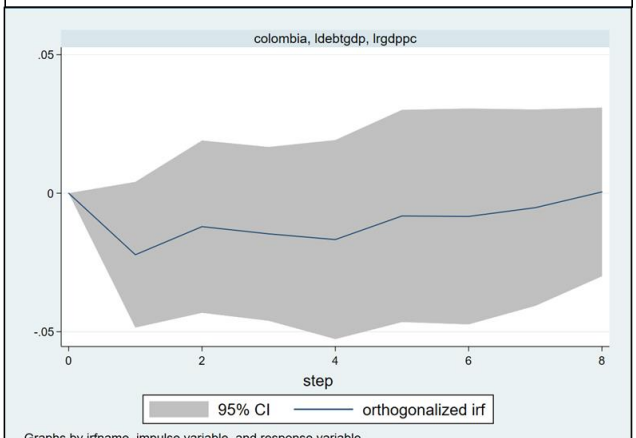
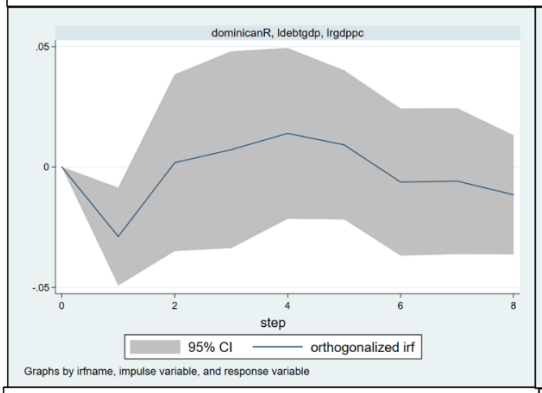
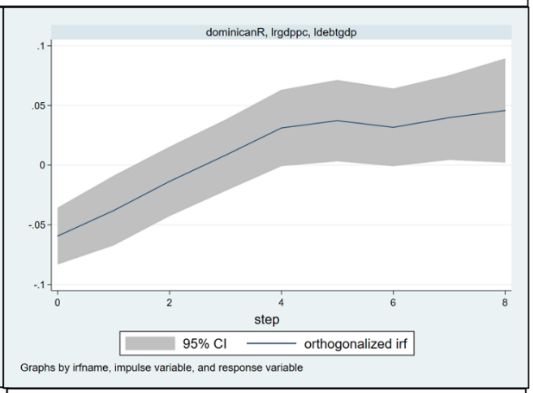


Figure 5h: Dominican Republic IRF



step	(1) oirf	(1) Lower	(1) Upper
0	0	0	0
1	-.028884	-.049184	-.008584
2	.001781	-.034886	.038447
3	.007187	-.033662	.048037
4	.013949	-.021492	.049389
5	.009187	-.021739	.040113
6	-.006285	-.036805	.024236
7	-.005863	-.036129	.024402
8	-.011553	-.036272	.013167

95% lower and upper bounds reported
(1) irfname = dominicanR, impulse = ldebtgdp, and response = lrgdppc



step	(1) oirf	(1) Lower	(1) Upper
0	-.059445	-.083227	-.035663
1	-.038101	-.067285	-.008918
2	-.013649	-.042678	.015381
3	.008279	-.021553	.038111
4	.031134	-.000848	.063115
5	.037274	.003222	.071327
6	.031635	-.00089	.064159
7	.039806	.004381	.07523
8	.045763	.002171	.089356

95% lower and upper bounds reported
(1) irfname = dominicanR, impulse = lrgdppc, and response = ldebtgdp

Figure 5i: Ecuador IRF

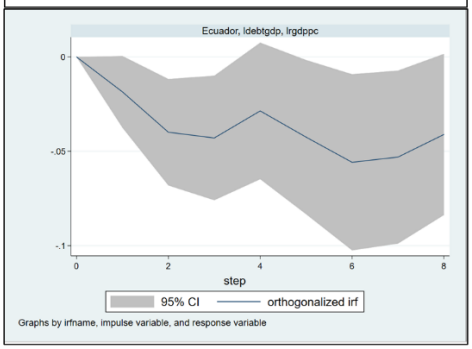


Figure 5j: El Salvador IRF

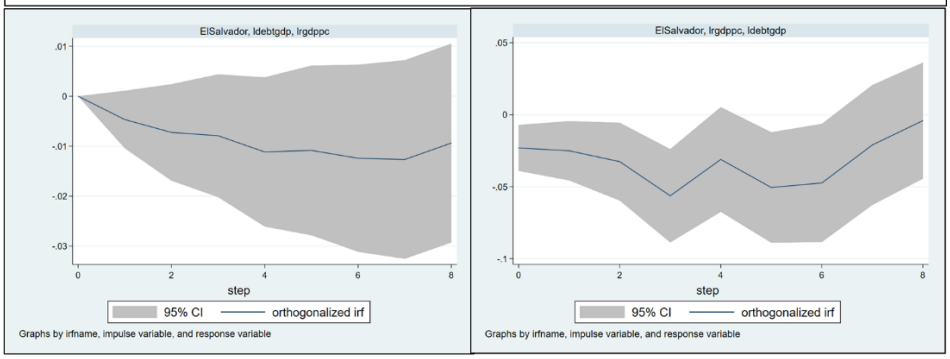


Figure 5k: Guatemala IRF

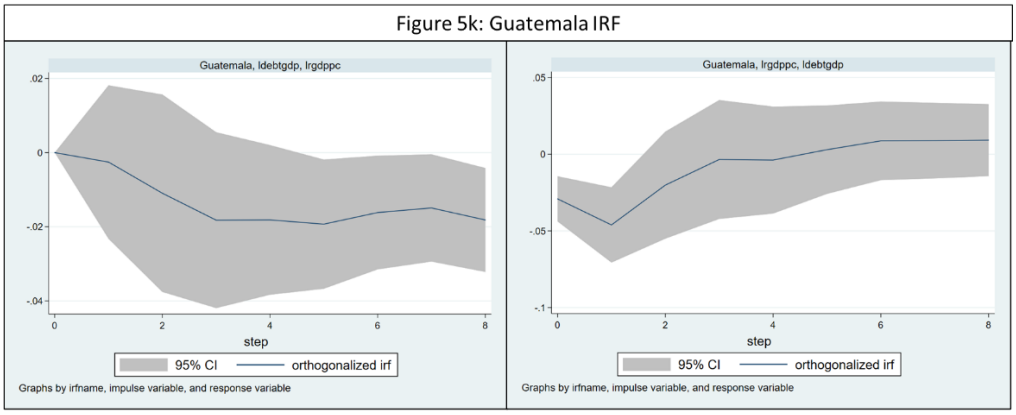


Figure 5l: Guyana IRF

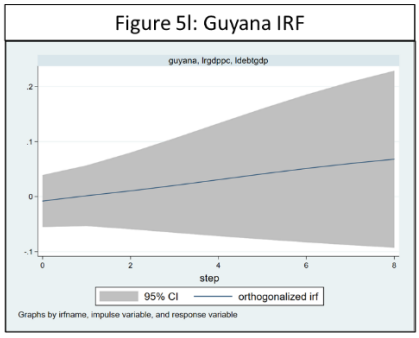
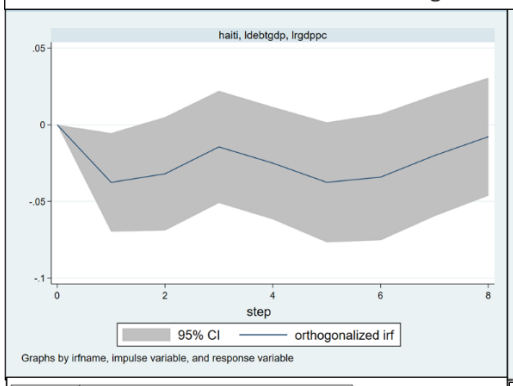
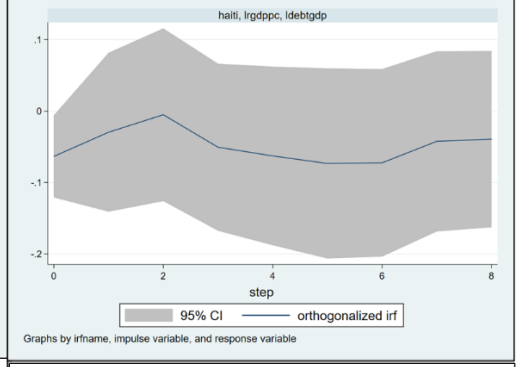


Figure 5m: Haiti IRF





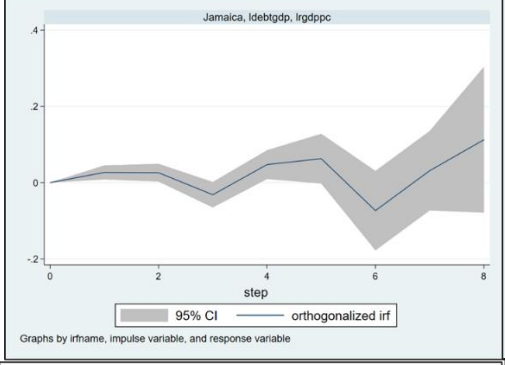
step	(1) oirf	(1) Lower	(1) Upper
0	0	0	0
1	-.037577	-.069727	-.005427
2	-.031984	-.068964	.004997
3	-.014439	-.051025	.022148
4	-.025006	-.061666	.011655
5	-.037549	-.076683	.001585
6	-.034159	-.075373	.007054
7	-.020072	-.059635	.019491
8	-.007762	-.046223	.030699

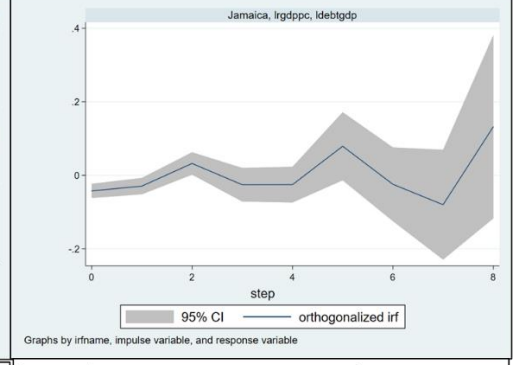
95% lower and upper bounds reported
(1) irfname = haiti, impulse = ldebtgdp, and response = lrgdppc

step	(1) oirf	(1) Lower	(1) Upper
0	-.063389	-.120873	-.005905
1	-.029564	-.140759	.08163
2	-.005077	-.125927	.115772
3	-.050582	-.167491	.066327
4	-.062759	-.18776	.062242
5	-.073308	-.206326	.059711
6	-.072411	-.203598	.058776
7	-.042293	-.168449	.083864
8	-.039258	-.162658	.084143

95% lower and upper bounds reported
(1) irfname = haiti, impulse = lrgdppc, and response = ldebtgdp

Figure 5n: Jamaica IRF





step	(1) oirf	(1) Lower	(1) Upper
0	0	0	0
1	.02673	.008339	.045121
2	.025888	.002654	.049122
3	-.031809	-.06511	.001492
4	.04718	.009455	.084905
5	.062832	-.002326	.12799
6	-.073525	-.177604	.030554
7	.031111	-.072964	.135186
8	.112266	-.078814	.303347

95% lower and upper bounds reported
(1) irfname = Jamaica, impulse = ldebtgdp, and response = lrgdppc

step	(1) oirf	(1) Lower	(1) Upper
0	-.042556	-.061854	-.023259
1	-.029518	-.051777	-.00726
2	.032144	.001735	.062553
3	-.02576	-.071481	.01996
4	-.025566	-.074047	.022916
5	.079021	-.013646	.171688
6	-.024502	-.124875	.075871
7	-.080075	-.229493	.069342
8	.131996	-.117332	.381323

95% lower and upper bounds reported
(1) irfname = Jamaica, impulse = lrgdppc, and response = ldebtgdp

Figure 5o: Mexico IRF

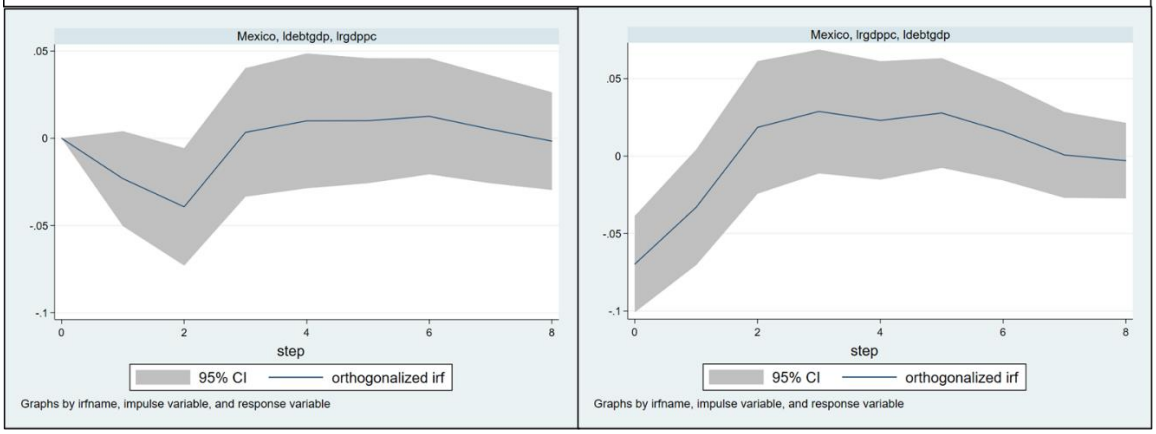
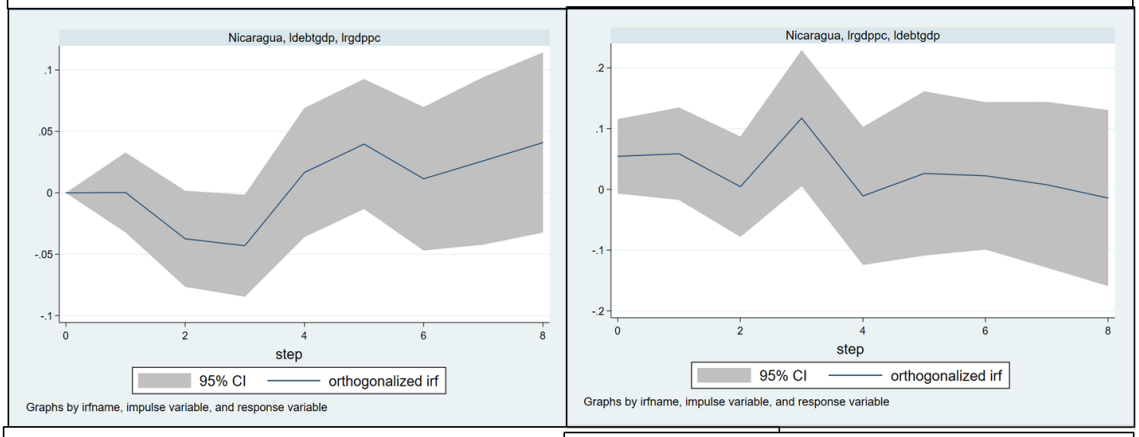


Figure 5p: Nicaragua IRF



step	(1) oirf	(1) Lower	(1) Upper
0	0	0	0
1	.000289	-.032208	.032785
2	-.037417	-.076486	.001652
3	-.043092	-.084539	-.001644
4	.016572	-.035959	.069103
5	.039718	-.013171	.092607
6	.011437	-.046904	.069777
7	.026018	-.042147	.094184
8	.040912	-.032324	.114148

95% lower and upper bounds reported
(1) irfname = Nicaragua, impulse = ldebtgdp, and

step	(1) oirf	(1) Lower	(1) Upper
0	.054467	-.00672	.115653
1	.058661	-.017392	.134715
2	.004386	-.078111	.086883
3	.117324	.005518	.229129
4	-.010821	-.124314	.102673
5	.026203	-.108904	.16131
6	.022383	-.098804	.143571
7	.007634	-.128772	.144039
8	-.014222	-.159007	.130564

95% lower and upper bounds reported
(1) irfname = Nicaragua, impulse = lrgdppc, and response = ldebtgdp

Figure 5q: Panama IRF

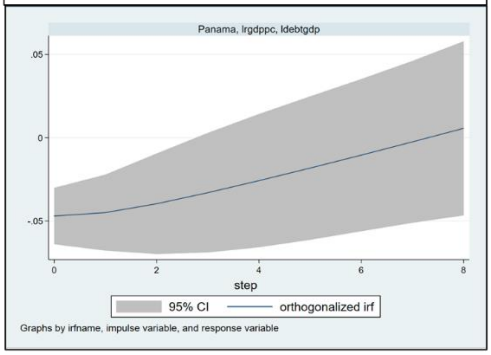


Figure 5r: Paraguay IRF

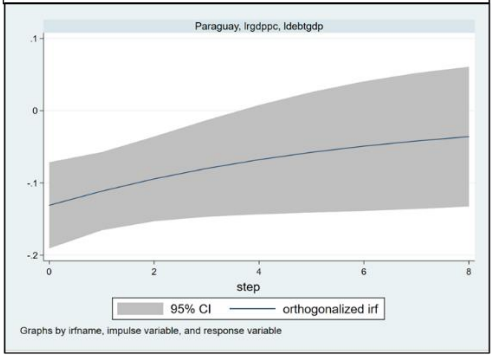
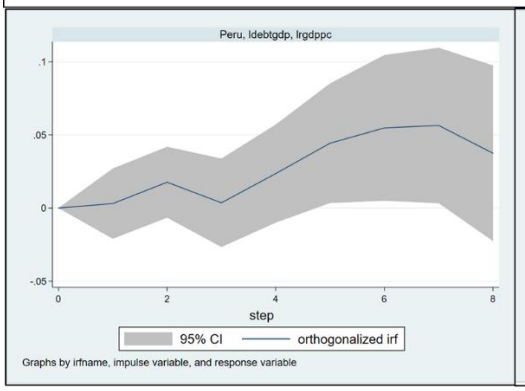


Figure 5s: Peru IRF



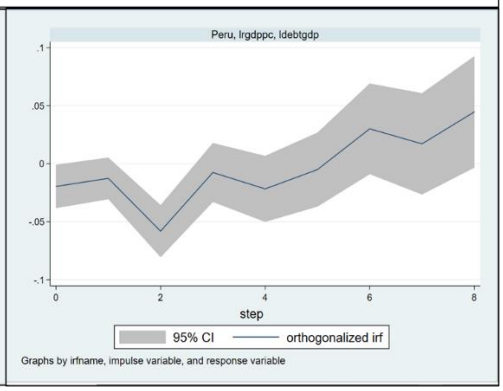


Figure 5t: St. Vincent IRF

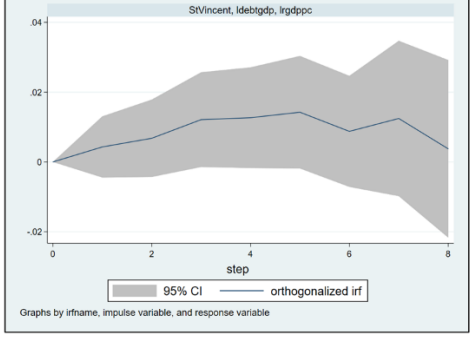


Figure 5u: Trinidad and Tobago IRF

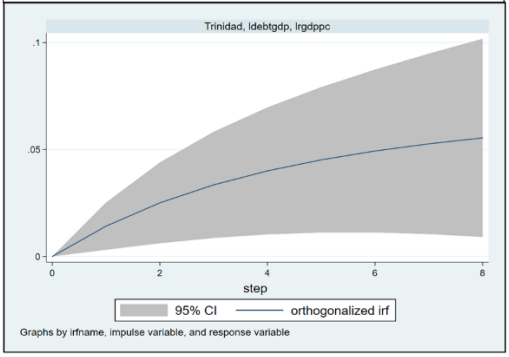


Figure 5v: Uruguay IRF

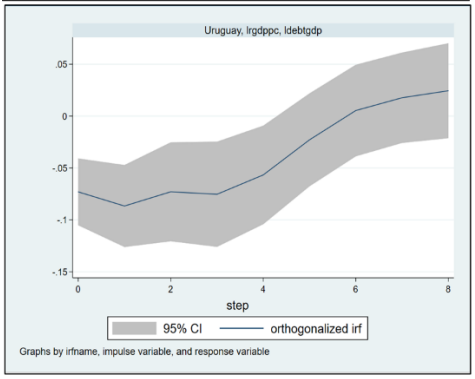


Figure 5w: Venezuela IRF