Government Consumption, Government Debt and Economic Growth*

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Abstract

This paper compares the effects of government consumption and government debt on economic growth by using data from 83 countries, including both developed and developing markets, over the period between 1960 and 2014. Linear regressions reveal that the negative effects of government consumption are relatively higher than the negative effects of government debt. A nonlinear investigation further suggests that the restrictions on government expenditure to prevent negative growth are shown to be more important for countries with lower trade openness, lower inflation, or higher financial depth, whereas the restrictions on government debt are shown to be more important for countries with higher trade openness, lower inflation or higher financial depth.

JEL Classification: H50, H63, O23, O47

Key Words: Government Consumption; Government Debt; Economic Growth; Thresholds; Cross-Country Analysis

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1 Introduction

The Great Recession of 2007-2009 has resulted in many governments bailing out their financial institutions and even providing finance for the real sector using government resources. Combined with the necessity of an expansionary fiscal policy due to the restricted monetary policy at the zero lower bound, many governments around the world started having problems regarding their budgets, and they eventually employed austerity measures, potentially at the cost of their economic growth. Influential studies such as by Rogoff and Reinhart (2010) have ignited the debate based on such budget problems and their impact on growth from a policy perspective by showing a negative correlation between government debt and growth for countries with debt above 90% of their gross domestic product (GDP) for the post–World War II era.

Within this picture, though, the effects of government consumption/expenditure on growth have not been investigated and compared enough with those of government debt. While government debt can affect growth through the reductions in public saving (e.g., as in Elmendorf and Mankiw (1999)), government consumption affect growth through factor accumulation or influences on technical progress such as public research and development (as discussed in Gemmell et al. (2001)), the reductions in company profits and private investment (as in Alesina, Ardagna, Perotti, and Schiantarelli (2002)), or organized interest groups attempting to gain benefits for themselves in the form of legislation or transfers (as in Olson (2008)). Such a comparison between government consumption and government debt is also important from the policy perspective; e.g., Carlo Cottarelli, former Director of the Fiscal Affairs Department, IMF, has written in 2012:[1]

> *"Government debt remains very high in many advanced economies, and fiscal adjustment to bring debt down over the medium term is essential. Nearly all advanced economies plan to reduce their deficits this year. But if growth slows more than expected, some may feel inclined to preserve their short-term plans through additional tightening, even if hurts growth more. My bottom line for them: unless you have to, you shouldn't."*

[1] See http://voxeu.org/article/fiscal-adjustment-too-much-good-thing

where he also emphasizes the importance of country-specific fiscal policies due to the economic characteristics of the countries. Accordingly, the debate is not only about the government debt itself but also about the short- and medium-term adjustments of fiscal policies which can be measured by government consumption/expenditure and/or tax revenues.

Based on the discussion so far, in this paper, we compare the effects of government consumption versus government debt on growth by using data from 83 countries over the period between 1960 and 2014, including both developed and developing markets.[2] In order to connect our results to the existing studies, we first consider linear regressions that are supported by statistical tests regarding the potential issue of endogeneity. Such a linear investigation results in government consumption having a bigger reducing impact on growth compared to the negative effects of government debt. This result contradicts with the argument in studies such as by Elmendorf and Mankiw (1999) who show that government consumption may boost aggregate demand due to the Keynesian view, but government debt may lead into a reduction in output and income by reducing investment and the capital stock. We further investigate this contradiction by considering nonlinear/threshold effects of government fiscal policies on growth as advocated in studies such as by Kumar and Woo (2010), Rogoff and Reinhart (2010), Cecchetti, Mohanty, and Zampolli (2011), Checherita-Westphal and Rother (2012), Panizza and Presbitero (2014), Baum, Checherita-Westphal, and Rother (2013), Pescatori, Sandri, and Simon (2014). Such nonlinear analyses show that the effects of both government consumption and government debt on growth are highly affected by the economic characteristics of the countries investigated. It is implied that certain countries should pay more attention to their government expenditure, while certain others should pay more attention to their government debt, if they would like to prevent having negative economic growth.

Overall, this paper contributes to the literature by (i) comparing the effects of government expenditure versus government debt, (ii) using a rich data set with much more countries and time coverage compared to the existing studies, (iii) considering nonlinearities in the relationship between growth and government expenditure/debt that are essential in the

[2] Another important consideration is the accompanying levels of taxes and/or government deficits (as a stock variable), which is not the focus of this paper.

determination of country-specific policies. The rest of the paper is organized as follows. The next section covers the theoretical background of our investigation and shows the contribution of this paper with respect to the existing empirical evidence. Section 3 introduces the data set and the empirical methodology. Section 4 depicts the results based on a linear investigation, while Section 5 shows the results when nonlinearities/thresholds are considered in the economic characteristics of the countries investigated. Section 6 concludes.

2 Literature Review

Government policies can affect growth through alternative channels in the theoretical literature. According to neoclassical models, government policies only have short-run rather than long-run effects, since they only affect savings or labor force participation in the short-run. According to endogenous-growth models, government policies can have long-run effects depending on the type of government expenditure; e.g., the positive effects of education expenditure on human capital and thus economic growth. Government policies may also facilitate growth through the quality of institutions that can be measured by items such as transparent rules, rule of law and well-defined property rights.[3]

Within this theoretical picture, there is no clear-cut implication on the effects of government consumption/expenditure on economic growth.[4] Nevertheless, studies such as by Alesina, Ardagna, Perotti, and Schiantarelli (2002) have shown that increases in government spending can hit company profits and thus lead to a reduction in private investment and economic growth. From an alternative perspective, political economy studies such as by Olson (2008) have shown that organized interest groups may attempt to gain benefits for themselves in the form of legislation or transfers which in turn may retard the growth of the private sector. Since the scope for such interest group action is potentially larger in countries

[3] See Barro and Sala-i Martin (2004); Bergh and Henrekson (2011).

[4] For sure, in the short-run, according to the standard textbook approach, fiscal expansion may boost aggregate demand and lead to an economic expansion due to the Keynesian view, but this does not imply anything for the long-run, except for the indirect implications through accumulated government debt leading into a reduction in output and income by reducing investment and the capital stock (as we discuss, below); e.g., see Elmendorf and Mankiw (1999).

with bigger governments, and since higher-income countries have bigger governments, there is a negative expected relationship between government size and growth in higher-income countries. Therefore, the relationship between government consumption/expenditure and growth may depend on economic characteristics of countries. It is implied that one should take into account such heterogeneity across countries while investigating the effects of government consumption/expenditure on growth, as we achieve in this paper using nonlinear analyses.

The empirical literature on the effects of government consumption/expenditure on growth is also mixed. In particular, earlier studies such as by Kormendi and Meguire (1985), Ram (1986), Lin (1994) and Zagler and Dürnecker (2003) have all found a positive relationship between government consumption and growth. Nevertheless, recent studies such as by Fölster and Henrekson (2001), Dar and AmirKhalkhali (2002), Romero-Avila and Strauch (2008), Afonso and Furceri (2010), and Bergh and Karlsson (2010) have all found negative and significant effects of government size (defined as either total taxes or total expenditure) on growth (defined as the growth of real GDP per capita as in this paper) by using data on higher-income (e.g., European Union or OECD) countries.[5] Therefore, the results highly depend on the countries and periods included in the empirical investigation. Accordingly, compared to these mentioned studies, this paper considers a large data set based on both low-income and high-income countries for the longest possible sample period available, so that we can observe how the relationship between government size and growth is affected by the heterogeneity across countries regarding their economic characteristics.

On the other hand, the conventional view of public debt (e.g., as in Elmendorf and Mankiw (1999)) implies a positive effect of government consumption/expenditure on the demand-determined short-run output and a negative effect of government debt on the economic growth due to lower public savings (brought by higher budget deficits) which in turn would reduce

[5] The study by Colombier (2009) is an exception finding a small but positive effect of government size and growth, although this result has been rebutted by a study by Bergh and Öhrn (2011).

total investment and thus growth.[6] According to Cochrane (2011a) and Cochrane (2011b), such negative effects of government debt on growth could be much higher due to uncertainty and expectations of future confiscation through inflation or financial repression. Moreover, recent theoretical models have also shown that there may be a tipping point above which public debt becomes unsustainable.[7] High-levels of government debt may also restrict a country's ability to conduct countercyclical policies and thus reduce growth (e.g., see Ramey and Ramey (1995)), although such restrictions may depend on the composition (rather than the level) of public debt as advocated by Hausmann and Panizza (2011) and De Grauwe (2011). Therefore, the effects of government debt on growth may change with respect to the economic characteristics of the countries investigated as well, which implies nonlinearities in this relationship.

The empirical literature also supports the view of nonlinearities; one influential paper is by Rogoff and Reinhart (2010) who have shown a negative correlation between government debt and growth for countries with debt above 90% (of GDP). Similarly, Minea and Parent (2012) find that public debt is negatively correlated with growth when government debt is between 90% and 115% (of GDP), although the correlation turns out to be positive for countries with government debt above 115% (of GDP). According to Checherita-Westphal and Rother (2012), the range of government debt which has negative effects on growth is between 90% and 105% (of GDP). Using a much smaller data set, Baum, Checherita-Westphal, and Rother (2013) find a positive correlation between debt and growth when government debt is below 67%, no significant correlation when it is between 67% and 95%, and a negative correlation when it is above 95% (of GDP). Nevertheless, Égert (2015) has found that the negative nonlinear correlation between government debt and growth kicks in at much lower levels of public debt (between 20% and 60% of GDP). There are also other empirical studies such as by Kourtellos, Stengos, and Tan (2013) who suggest that the relationship between government debt and growth is statistically insignificant for advanced

[6] See Afonso and Jalles (2014) for the mixed empirical evidence on the relationship between government expenditure and growth (that depends on fiscal decomposition) and Afonso and Jalles (2013) for evidence on the negative relationship between government debt and growth.

[7] For example, see Ghosh, Kim, Mendoza, Ostry, and Qureshi (2013).

economies; accordingly, they advocate for other threshold variables besides government debt itself, such as trade openness, inflation, and other country-fixed effects such as language, institutions, and geographical variables, as we also achieve in this paper.

3 Data and Empirical Methodology

We are interested in the effects of government final consumption expenditure and government debt on economic growth. In terms of methodology, the growth regressions used in this paper closely follow studies such as by Barro (1991) and Levine and Renelt (1992) by considering a set of explanatory variables, where data are averaged over 5-year (non-overlapping) periods in order to smooth out any cyclical effect. Specifically, the dependent variable is real per capita income growth (annual rate), whereas government consumption (% of GDP) or government debt (% of GDP) is the explanatory variable, with variables such as log of initial GDP per capita, initial secondary school enrollment rate, private credit, inflation rate and trade openness considered as control variables (as they are standard in the literature). In the regressions, we also include country fixed effects in order to control for any country-specific factor that is constant over time and time fixed effects in order to control for any time-specific factor that affects the global economy during our sample period.

The log of initial per capita GDP has an expected negative effect on growth, since lower income countries are expected to grow faster in order to catch up. The effects of human capital are captured by log initial school enrollment; it has an expected positive effect on growth. Domestic credit to private sector (private credit) is used as a proxy for financial depth; although financial depth has an expected positive effect on growth, the expected effects of private credit need a detailed discussion, as we achieve below. Inflation rate (defined as the annual growth rate of consumer price index, CPI) is considered to examine the effect of prices on growth; it has an expected negative effect on growth. Trade openness (defined as the sum of imports and exports divided by GDP) is used to capture the effect of international openness; it has an expected positive effect on growth.

3.1 Data

The annual data set is constructed by using three sources. Data for per capita income growth (constant 2005 US$), government consumption (% of GDP), log initial GDP (constant 2005 US$), trade openness (% of GDP), inflation (based on consumer price index) and private credit (% of GDP) are obtained from the World Development Indicators (WDI) as of 2015. Data for government debt are obtained from the updated version of the data used in Abbas, Belhocine, El-Ganainy, and Horton (2011). Data for initial secondary school enrollment rate are obtained from the Barro-Lee data set (http://www.barrolee.com/). The final annual data set covers 83 countries for the period between 1960 and 2014, where all series are averaged over 5-year periods.

The corresponding descriptive statistics are given in Table 1, where, across countries and years, per capita income growth rate is ranging between -6.78% to 13.25%, with an average of 2.01% and a standard deviation (SD) of 2.49. Government consumption (% of GDP) ranges between 4.08 and 36.31, with an average of 14.74 and a SD of 5.40, whereas government debt (% of GDP) ranges between zero and 227.39, with an average of 49.40 and a SD of 34.12. Also based on the control variables, it is evident that there are significant differences across country characteristics which may affect the way that government consumption or government debt affects economic growth. Correlation between these variables are also indicated in Table 1, where both government consumption and government debt have negative correlation coefficients with per capita income growth.

3.2 Empirical Methodology

We consider economic growth regressions based on both linear and nonlinear frameworks for robustness. Regarding the linear investigation, as has been well documented, growth regressions may be subject to the important drawback of potential endogeneity, especially when 5-year averages are used for an investigation. Moreover, in the context of government-growth nexus, according to Wagner's law: "as the economy develops over time, the activities and functions of the government increase," so not only government consumption and government

debt have impacts on economic growth, but growth may also cause government to expand as well, leading the regression analysis facing another endogeneity problem. To address these issues, we use two-stage least square (2SLS) methodology in our regressions, where the 5-year averages of the explanatory variables are instrumented by their initial levels; e.g., for the 5-year average taken between 2010 and 2014, the instrument used is the initial value of 2010 and so on.

We further support the linear 2SLS regressions with statistical tests regarding issues of under-identification, weak identification, and weak-instrument-robust inference, which are standard and essential tests for the robustness of a typical 2SLS regression. In particular, following Baum, Schaffer, Stillman, et al. (2007), we use the Kleibergen-Paap rk LM test and the Kleibergen-Paap rk Wald test regarding under-identification, the Kleibergen-Paap F-test regarding weak-identification, and the Anderson-Rubin Wald test and the Stock-Wright LM S statistic regarding weak-instrument-robust inference.[8]

Although linear 2SLS regressions would provide evidence on the effects of government consumption and government debt on economic growth, they would be silent regarding how such effects would change based on country characteristics such as initial income, initial human capital, financial development, trade openness or inflation. The corresponding literature has also advocated for having nonlinear effects of government consumption/debt on growth; e.g., see studies such as by Kumar and Woo (2010), Rogoff and Reinhart (2010), Cecchetti, Mohanty, and Zampolli (2011), Checherita-Westphal and Rother (2012), Panizza and Presbitero (2014), Baum, Checherita-Westphal, and Rother (2013), Pescatori, Sandri, and Simon (2014). Accordingly, in order to capture such nonlinear effects of government consumption and government debt on economic growth, following earlier studies such as by Rousseau and Wachtel (2002) or Yilmazkuday (2011), we also consider a continuous threshold analysis based on rolling-window two-stage least squares regressions with a constant window size of

[8] Stata package called "ivreg2" is used to obtain such statistics. Hansen tests cannot be used, since we have the same number of instruments as endogenous variables (i.e., exact identification), although we still consider tests for under-identification for which exact identification is a necessary but not a sufficient condition.

100, after ordering the data according to a threshold variable.[9] For instance, if the financial development thresholds are of interest, all the observations (i.e., the pooled sample of 5-year average data from all the countries) are sorted in the order of the lowest to the highest private credit; the first regression is run with the first 100 observations of the sorted data set, the second regression by moving the 100 window toward higher private credit values by one observation, and so on. The selection of a constant window size is important for comparison of coefficient estimates across windows, while the selection of a window size of 100 is important to ensure a fair distribution across the power of regressions and the degree of nonlinearity.

4 Linear Empirical Results

This section reveals the empirical results based on linear 2SLS regressions, where we distinguish between the effects of government consumption and government debt on economic growth. Before moving to the presentation of the empirical results, we test the validity of the instruments used in our regressions using various statistical tests. We run these tests for the case in which all control variables are included in our regressions.

4.1 Results of Statistical Tests based on the Validity of Instruments

Regarding under-identification, we use the Kleibergen-Paap rk LM test and the Kleibergen-Paap rk Wald test; both have the null hypothesis that the estimated equation is under-identified, while the alternative hypothesis is that the estimated equation is identified. The corresponding results are given in Table 2. As is evident, the null hypothesis of under-identification is rejected at the 10% significance level, independent of the statistic considered.

Regarding weak-identification, we use the Kleibergen-Paap F-test, which has the null hypothesis that the estimated equation is weakly identified. The corresponding test statistic

[9] Compared to other threshold methodologies such as sample-splitting, which imply a linear relationship between the marginal effects of regressors and the threshold variable, the main advantage of using rolling-window regressions is that the data are allowed to speak in a more flexible way that is essential to capture any nonlinearities.

is based on the rejection rate r (10%, 20%, etc.) that we would like to tolerate if the true rejection rate should be the standard 5%; in this context, weak instruments are defined as instruments that will lead to a rejection rate of r when the true rejection rate is 5%. The results are given in Table 2, which we compare with the critical value table in Stock and Yogo (2005). It is implied that our estimated equations do not suffer from weak identification problem, either, based on the rejection rate r of 20% (with a critical value of 6.66) at the 5% significance level.

Regarding weak-instrument-robust inference, we employ the Anderson-Rubin Wald test and the Stock-Wright LM S statistic that test whether the estimated coefficients of the endogenous variables are compatible with the data used, independent of the strength of instruments used. The corresponding null hypothesis is that the estimated coefficients of the endogenous variables are jointly equal to zero. The results given in Table 2 reject the null hypothesis at the 5% significance level, independent of the statistic considered. Therefore, our estimated coefficients are compatible with the data used, independent of the strength of instruments used. We move to the presentation of these estimated coefficients next.

4.2 Effects of Government Consumption

The empirical results regarding the effects of government consumption on growth are given in Table 3, where all regressions include country and time fixed effects (for each 5-year period). As is evident, independent of the control variables considered, there are negative and significant effects of government consumption on economic growth. When the full set of control variables is considered in the last column of Table 3, 1% of an increase in government consumption (% of GDP) leads to about -0.1% of a drop in economic growth, on average across countries. Compared to the existing literature, this result is consistent with relatively recent empirical studies such as by Landau (1983), Grier and Tullock (1989), Engen and Skinner (1992), Dar and AmirKhalkhali (2002), and Afonso and Furceri (2010) who find a negative relationship between government consumption and growth, while they are against the relatively older empirical results in studies such as by Kormendi and Meguire (1985), Ram

(1986) and Lin (1994) who find a positive relationship between government consumption and growth. Regarding the magnitude of the coefficient estimates, our results are also in line with the recent survey of empirical studies by Bergh and Henrekson (2011) who have shown that an increase in government size by 10% is associated with a 0.5% to 1% lower annual growth rate.

Regarding the control variables, their estimated coefficients are significant, except for inflation and initial secondary school enrollment when the full set of control variables is considered. Consistent with earlier studies such as by Checherita-Westphal and Rother (2012) and Presbitero (2012), the coefficient of private credit is negative and significant. The definition of private credit might help us understand the reason for this negative sign. In particular, domestic credit to private sector refers to financial resources provided to the private sector by financial corporations. One might interpret that as expanding government size leaving fewer sources assigned to the private sector for saving and investment purposes. Also, it is argued that the fast expansion of private credit does not necessarily represent an improvement in the financial sector, if this expansion leads to an increase in risk at the microeconomic and macroeconomic levels (e.g., see Honohan (2004) and Arcand, Berkes, and Panizza (2015)). Hence, one can expect a negative sign for private credit in growth regressions, showing a negative effect on growth. High adjusted R-squared values further support these regression results.

4.3 Effects of Government Debt

The results regarding the effects of government debt on growth are given in Table 4, where, again, all regressions include country and time fixed effects. As is evident, the effects of government debt are negative and significant, independent of the control variables considered. Compared to the existing literature, the significant and negative effects of government debt on growth are consistent with recent empirical studies such as by Schclarek et al. (2004) and Afonso and Jalles (2012).

Regarding the magnitude of the effects of government debt on growth, the estimated coefficient is about -0.01 when the full set of control variables is considered. It is implied that 1% of an increase in government debt (% of GDP) would result in about 0.01% of a reduction in growth. Such estimated values are consistent with the existing literature, where Presbitero (2012), Égert (2015), and Woo and Kumar (2015) all have a similar coefficient of around -0.01, although the coefficient by the latter has been insignificant. Many other studies have considered thresholds in the relationship between government debt and growth; these include studies such as by Kumar and Woo (2010), Rogoff and Reinhart (2010), Cecchetti, Mohanty, and Zampolli (2011), Checherita-Westphal and Rother (2012), Panizza and Presbitero (2014), Baum, Checherita-Westphal, and Rother (2013), Pescatori, Sandri, and Simon (2014) who have mostly found that there is a threshold of government debt (% of GDP) above which there is a negative relationship between government debt and growth. We will further investigate such nonlinear effects below.

4.4 Government Consumption versus Government Debt

Regarding the magnitude of the effects of government debt (% of GDP) on growth, the estimated coefficients are about -0.01 in Table 4, which are significantly lower than the estimates regarding the effects of government consumption (% of GDP) on growth that are about -0.1 in Table 3. In order to have a proper comparison of these coefficients, though, we need to consider the corresponding magnitude of their standard deviations (across countries and time) given in Table 1, where data on government consumption and government debt have alternative scales. In particular, government consumption (% of GDP) has a standard deviation of about 5.40, whereas government debt (% of GDP) has a standard deviation of about 34.12. Therefore, one standard deviation of an increase in government consumption (% of GDP) results in 0.52% of a reduction in growth, whereas one standard deviation of an increase in government debt (% of GDP) results in 0.33% of a reduction in growth.

It is implied that government consumption has a bigger reducing impact on economic growth compared to government debt. This is against the argument by Elmendorf and

Mankiw (1999) who shows that government consumption may boost aggregate demand due to the Keynesian view, but government debt may lead into a reduction in output and income by reducing investment and the capital stock. Nevertheless, this contradiction may be due to nonlinear/threshold effects of government debt on growth as advocated by studies such as by Kumar and Woo (2010), Rogoff and Reinhart (2010), Cecchetti, Mohanty, and Zampolli (2011), Checherita-Westphal and Rother (2012), Panizza and Presbitero (2014), Baum, Checherita-Westphal, and Rother (2013), Pescatori, Sandri, and Simon (2014). We investigate such nonlinear effects next.

5 Nonlinear Empirical Results

As discussed above, the effects of government consumption and government debt on economic growth may highly depend on the country characteristics such as their initial income, initial human capital, financial development, trade openness or inflation. Accordingly, this section depicts the results of 2SLS rolling-regressions, where each regression corresponds to a particular country characteristic.

Following earlier studies such as by Rousseau and Wachtel (2002) or Yilmazkuday (2011), 2SLS rolling-regressions are achieved by ordering the data with respect to a threshold variable (that represents country characteristics), where the dependent variable is the per capita income growth as in Tables 3-4. Using the ordered data, each rolling regression considers a window length of 100 observations to have enough power in 2SLS regressions. The median value (across 100 observations) of the threshold variable is considered as the country characteristic that is further used as the horizontal axis of the figures presented. The corresponding coefficients of government consumption or government debt are depicted in the vertical axis of these figures.

We start with investigating the effects of government consumption on growth. This is achieved by considering the very same variables (and observations) as in column (8) of Table 3, although we only focus on the coefficient of government consumption. The corresponding results are given in Figure 1, where threshold variables of trade openness, inflation, private

credit, initial school enrollment, initial GDP per capita, and government consumption are considered. As is evident, there is evidence for negative and significant effects of government consumption on growth when trade openness is below about 50%, inflation is below about 7%, and private credit is above about 60% (of GDP). It is implied that the effect of government consumption on growth in fact depend on certain country characteristics.

The effects of government debt on growth are given in Figure 2, where the very same variables (and observations) as in column (8) of Table 4 have been used. As is evident, for extremely open countries with trade openness of more than about 85% (of GDP), for those with inflation below 4%, or for those with private credit measures above 60%, the effects of government debt on growth are negative and significant. It is implied that the effect of government debt on growth also depend on certain country characteristics.

Overall, there is a good amount of evidence for the negative and significant effects of both government consumption and government debt on growth, although the thresholds representing country characteristics (above or below which growth is affected negatively) highly differ between these variables.

6 Concluding Remarks and Policy Implications

The debate on fiscal policy of governments has been ignited by their budgetary problems during the Great Recession, when they had to take several steps to rescue their financial institutions and/or private sectors around the globe. Since such policies are associated with economic growth through public and private saving/investment decisions, many studies have started focusing on the relationship between fiscal health and growth. Much of this debate has been achieved through the effects of government debt on growth, although several empirical studies have found that such effects are either weak or nonexistent.

In this paper, we show that both government consumption and government debt have negative and significant effects on economic growth, independent of the control variables used. When these significant effects are compared, one standard deviation of an increase in government consumption (% of GDP) results in about 0.52% of a reduction in growth,

whereas one standard deviation of an increase in government debt (% of GDP) results in about 0.33% of a reduction in growth.

In terms of policy suggestions, it is implied that restrictions on government expenditure, rather than government debt, are relatively more important for faster growth. Based on nonlinear analyses, the restrictions on government expenditure (to prevent negative growth) are shown to be more important for countries with lower trade openness, lower inflation, or higher financial depth, whereas the restrictions on government debt are shown to be more important for countries with higher trade openness, lower inflation or higher financial depth. Therefore, certain countries should pay more attention to their government expenditure, while certain others should pay more attention to their government debt, if they would like to prevent having negative economic growth.

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Table 1. Descriptive Statistics

Variables	Per capita income growth	Government consumption	Government debt	Log of initial GDP	School enrolment	Trade	Inflation	Private Credit
Mean	2.018	14.743	49.400	7.957	63.817	64.152	10.324	42.083
Standard deviation	2.491	5.395	34.122	1.611	33.013	37.010	14.758	37.791
Minimum	-6.784	4.080	0.000	4.928	1.294	8.423	-3.016	0.938
Maximum	13.248	36.314	227.392	11.029	154.050	207.741	147.142	195.081
Income growth	1							
Government consumption	-0.1122	1						
Government debt	-0.2058	0.2556	1					
Log of initial GDP	0.0209	0.4151	0.0214	1				
School enrolment	0.067	0.3846	0.1218	0.8489	1			
Trade	0.0984	0.3326	0.1129	0.1472	0.1974	1		
Inflation	-0.1397	-0.0978	-0.0236	-0.1552	-0.2081	-0.2148	1	
Private Credit	-0.0415	0.3038	0.1289	0.7047	0.6629	0.1968	-0.3163	1

Notes: The list of 83 countries covering the years 1960-2014 is as follows: Argentina, Australia, Austria, Bangladesh, Barbados, Belgium, Bolivia, Brazil, Cameroon, Canada, Central African Republic, Chile, Colombia, Costa Rica, Cote d'Ivoire, Denmark, Dominican Republic, Ecuador, Egypt, Arab Rep., El Salvador, Fiji, Finland, France, Gambia, The, Ghana, Greece, Guatemala, Guyana, Haiti, Honduras, Iceland, India, Indonesia, Iran, Islamic Rep., Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kenya, Korea, Rep., Lesotho, Luxembourg, Malawi, Malaysia, Malta, Mauritius, Mexico, Morocco, Nepal, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Norway, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Portugal, Rwanda, Senegal, Sierra Leone, South Africa, Spain, Sri Lanka, Sudan, Sweden, Switzerland, Syrian Arab Republic, Thailand, Togo, Trinidad and Tobago, Turkey, United Kingdom, United States, Uruguay, Venezuela, RB, Zimbabwe.

Table 2. Validity of Instruments

	Column (8) of Table 3	Column (8) of Table 4
Under-identification tests		
Kleibergen-Paap rk LM statistic	Chi-sq(1)=11.17 [0.0008]	Chi-sq(1)=3.28 [0.0699]
Kleibergen-Paap rk Wald statistic	Chi-sq(1)=119.76 [0.0000]	Chi-sq(1)=36.53 [0.0000]
Weak identification test		
Kleibergen-Paap Wald rk F statistic	28.90	8.53
Weak-instrument-robust inference		
Anderson-Rubin Wald test	F(4,51)=4.08 [0.0061]	F(4,25)=12.96 [0.0000]
Anderson-Rubin Wald test	Chi-sq(4)=16.90 [0.0020]	Chi-sq(4)=55.47 [0.0000]
Stock-Wright LM S statistic	Chi-sq(4)=14.80 [0.0051]	Chi-sq(4)=14.97 [0.0048]

Notes: p values are in brackets. Under-identification tests, Ho: matrix of reduced form coefficients has rank=K1-1 (under-identified); Ha: matrix has rank=K1 (identified). Weak identification test, Ho: equation is weakly identified. Weak-instrument-robust inference, Tests of joint significance of endogenous regressors B1 in main equation, Ho: B1=0 and over-identifying restrictions are valid.

Table 3. The Effects of Government Consumption on Growth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Government Consumption	-0.148***	-0.154***	-0.131***	-0.133***	-0.139***	-0.148***	-0.0882**	-0.0969**
	(-5.26)	(-5.47)	(-4.14)	(-4.61)	(-4.40)	(-5.16)	(-2.66)	(-2.93)
Log of initial GDP	-1.550***	-1.938***	-2.185***	-1.025**	-2.639***	-1.302***	-1.348**	-1.676***
	(-4.93)	(-5.90)	(-5.83)	(-2.86)	(-6.74)	(-3.59)	(-3.20)	(-3.92)
School enrolment	-0.00185	-0.00837	0.00771	0.00491	0.000549	0.000302	0.0104	0.00304
	(-0.18)	(-0.82)	(0.72)	(0.48)	(0.05)	(0.03)	(0.95)	(0.28)
Trade		0.0249***			0.0267***	0.0315***		0.0294***
		(3.73)			(3.74)	(4.67)		(4.05)
Inflation			-0.0157		-0.0189		-0.0137	-0.0169
			(-1.54)		(-1.89)		(-1.35)	(-1.70)
Private credit				-0.0220***		-0.0266***	-0.0272***	-0.0315***
				(-4.56)		(-5.46)	(-5.24)	(-6.01)
Constant	16.31***	19.26***	20.41***	11.69***	23.67***	13.76***	13.01**	15.15***
	(6.20)	(7.05)	(5.35)	(3.94)	(6.12)	(4.60)	(3.11)	(3.64)
N	775	758	634	731	622	717	614	602
R^2	0.329	0.349	0.404	0.389	0.422	0.416	0.420	0.442
adj. R^2	0.237	0.257	0.304	0.298	0.322	0.326	0.318	0.340

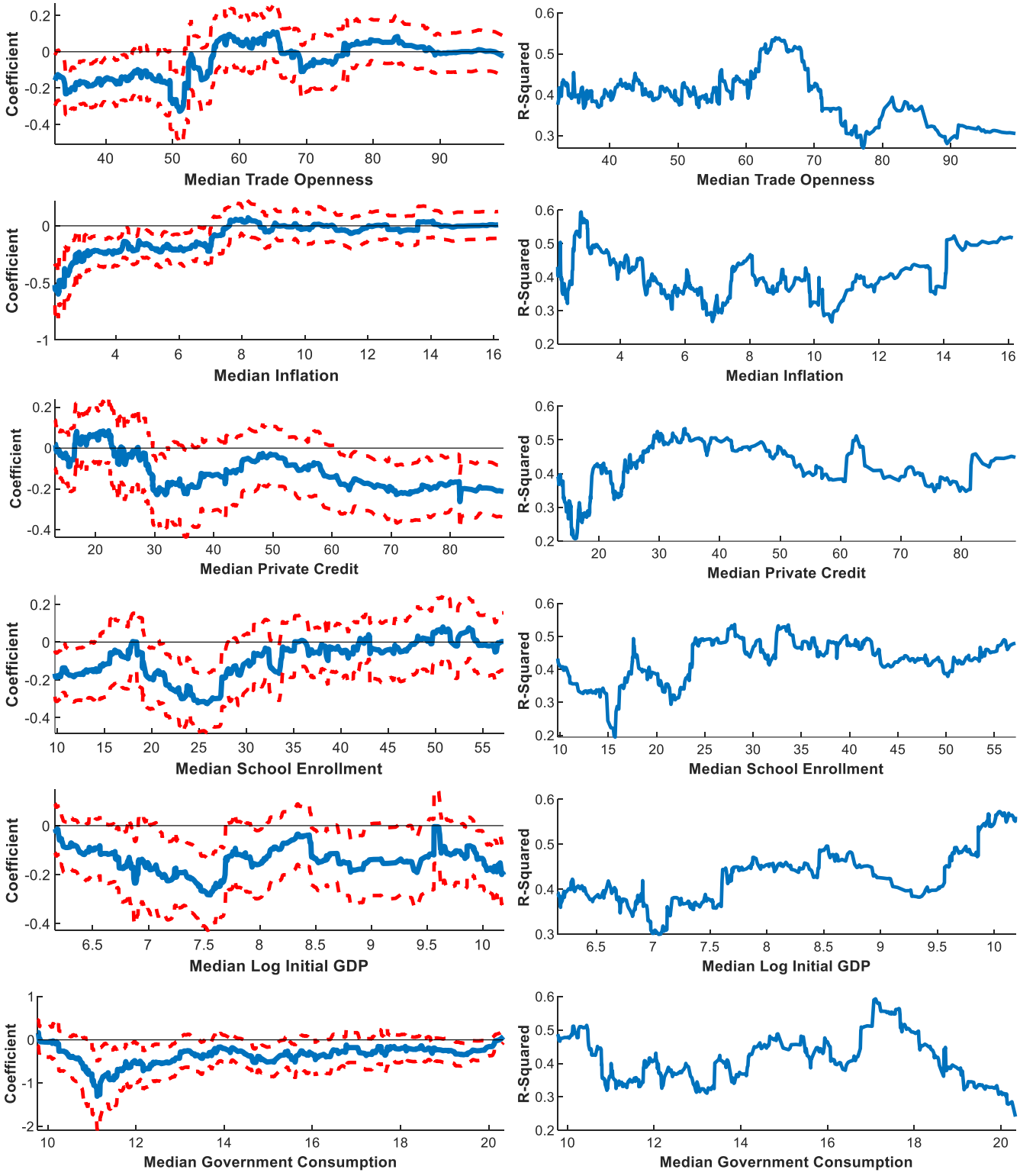
Notes: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. t-statistics are in parentheses. The initial values of government consumption, trade, inflation and private credit in each 5-year period are used as instruments for the corresponding 5-year average. All equations include country and time fixed effects. The list of 83 countries is as follows: Argentina, Australia, Austria, Bangladesh, Barbados, Belgium, Bolivia, Brazil, Cameroon, Canada, Central African Republic, Chile, Colombia, Costa Rica, Cote d'Ivoire, Denmark, Dominican Republic, Ecuador, Egypt, Arab Rep., El Salvador, Fiji, Finland, France, Gambia, The, Ghana, Greece, Guatemala, Guyana, Haiti, Honduras, Iceland, India, Indonesia, Iran, Islamic Rep., Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kenya, Korea, Rep., Lesotho, Luxembourg, Malawi, Malaysia, Malta, Mauritius, Mexico, Morocco, Nepal, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Norway, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Portugal, Rwanda, Senegal, Sierra Leone, South Africa, Spain, Sri Lanka, Sudan, Sweden, Switzerland, Syrian Arab Republic, Thailand, Togo, Trinidad and Tobago, Turkey, United Kingdom, United States, Uruguay, Venezuela, RB, Zimbabwe.

Table 4. The Effects of Government Debt on Growth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Government Debt	-0.0151***	-0.0154***	-0.0117**	-0.0154***	-0.0111**	-0.0156***	-0.00956*	-0.00963*
	(-4.18)	(-4.36)	(-2.79)	(-4.36)	(-2.70)	(-4.51)	(-2.27)	(-2.34)
Log of initial GDP	-2.321***	-2.738***	-2.834***	-1.499***	-3.187***	-1.710***	-1.840***	-2.071***
	(-7.00)	(-8.06)	(-7.10)	(-3.96)	(-7.74)	(-4.52)	(-4.19)	(-4.74)
School enrolment	0.00154	-0.00348	0.00521	0.00365	0.000180	0.000401	0.00716	0.00211
	(0.15)	(-0.34)	(0.45)	(0.36)	(0.02)	(0.04)	(0.62)	(0.19)
Trade		0.0282***			0.0266***	0.0302***		0.0293***
		(4.38)			(3.88)	(4.68)		(4.26)
Inflation			-0.0184		-0.0227*		-0.0172	-0.0211
			(-1.57)		(-1.98)		(-1.50)	(-1.89)
Private credit				-0.0249***		-0.0289***	-0.0275***	-0.0314***
				(-5.49)		(-6.41)	(-5.50)	(-6.34)
Constant	20.57***	23.62***	25.22***	13.68***	27.39***	15.08***	16.96***	18.04***
	(7.64)	(8.63)	(6.33)	(4.47)	(6.86)	(4.96)	(3.98)	(4.32)
N	681	663	581	656	567	640	564	550
R^2	0.425	0.454	0.440	0.465	0.466	0.493	0.469	0.502
adj. R^2	0.331	0.361	0.333	0.373	0.360	0.403	0.362	0.398

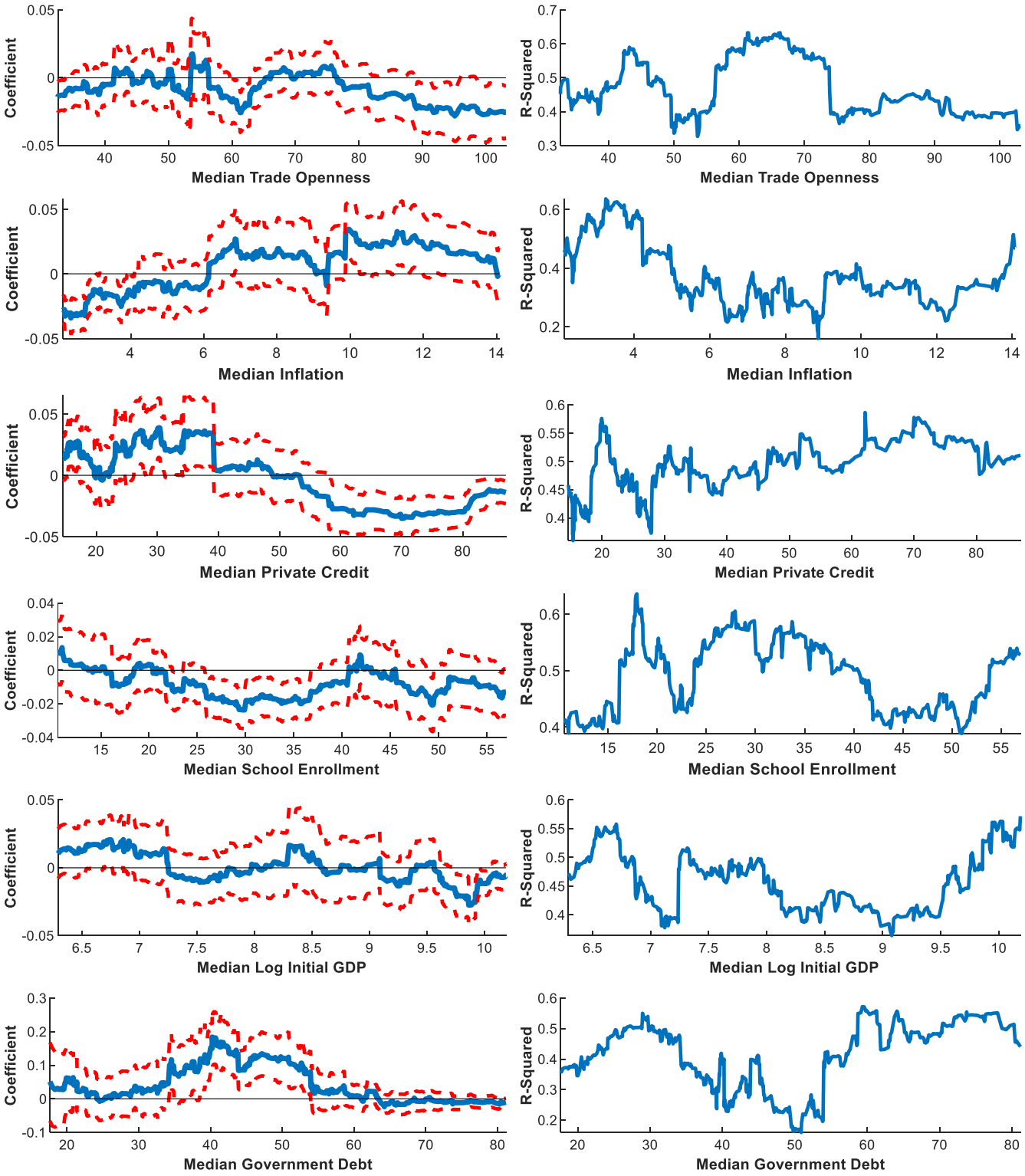
Notes: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. t-statistics are in parentheses. The initial values of government debt, trade, inflation and private credit in each 5-year period are used as instruments for the corresponding 5-year average. All equations include country and time fixed effects. The list of 83 countries is as follows: Argentina, Australia, Austria, Bangladesh, Barbados, Belgium, Bolivia, Brazil, Cameroon, Canada, Central African Republic, Chile, Colombia, Costa Rica, Cote d'Ivoire, Denmark, Dominican Republic, Ecuador, Egypt, Arab Rep., El Salvador, Fiji, Finland, France, Gambia, The, Ghana, Greece, Guatemala, Guyana, Haiti, Honduras, Iceland, India, Indonesia, Iran, Islamic Rep., Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kenya, Korea, Rep., Lesotho, Luxembourg, Malawi, Malaysia, Malta, Mauritius, Mexico, Morocco, Nepal, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Norway, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Portugal, Rwanda, Senegal, Sierra Leone, South Africa, Spain, Sri Lanka, Sudan, Sweden, Switzerland, Syrian Arab Republic, Thailand, Togo, Trinidad and Tobago, Turkey, United Kingdom, United States, Uruguay, Venezuela, RB, Zimbabwe

Figure 1. Thresholds for Government Consumption



Notes: The results for rolling regression using column (8) in Table 3. Solid (blue) lines in the left panel show the estimated coefficient of government consumption, while dashed (red) lines show the corresponding 90% confidence intervals. The figure in the right panel show the corresponding R-bar squared values. The initial values of government consumption, trade, inflation and private credit in each 5-year period are used as instruments for the corresponding 5-year averages. All rolling regressions include country and time fixed effects.

Figure 2. Thresholds for Government Debt



Note: The results for rolling regression using column (8) in Table 4. Solid (blue) lines in the left panel show the estimated coefficient of government debt, while dashed (red) lines show the corresponding 90% confidence intervals. The figure in the right panel show the corresponding R-bar squared values. The initial values of government debt, trade, inflation and private credit in each 5-year period are used as instruments for the corresponding 5-year averages. All rolling regressions include country and time fixed effects.