Rising public debt-to-GDP can harm economic growth

by Alexander Chudik, Kamiar Mohaddes, M. Hashem Pesaran, and Mehdi Raissi

Abstract: The debt-growth relationship is complex, varying across countries and being affected by global factors. While there is no simple universal threshold above which debt-to-GDP becomes a significant brake on growth, based on data from the last four decades we show that high and rising public debt burdens slow down growth in the long term.

The relationship between public debt expansion and economic growth has attracted a lot of interest in recent years, spurred by the sharp increase in government indebtedness in advanced economies in the aftermath of the global financial crisis and the subsequent euro area sovereign debt crisis.

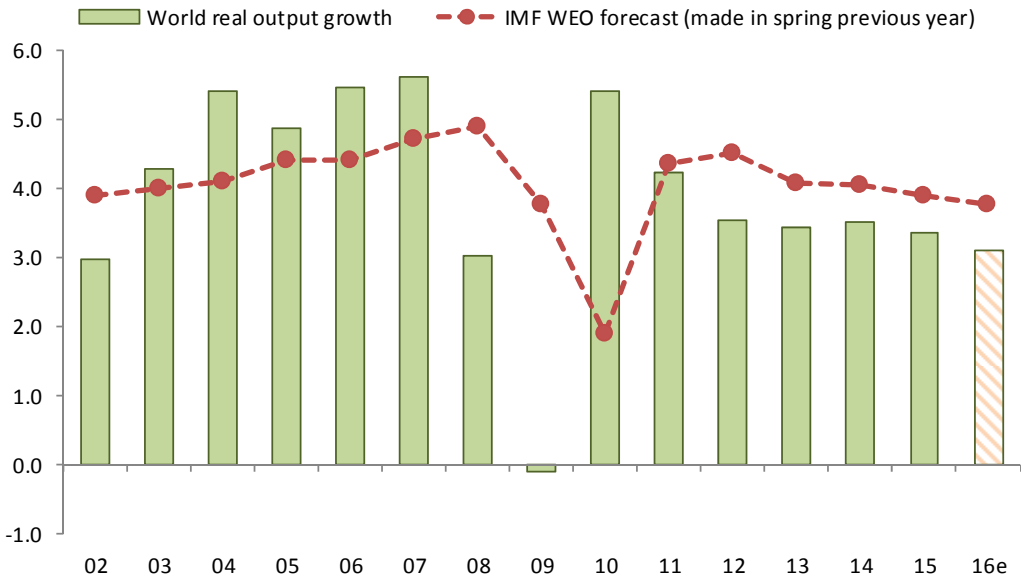
Economists tend to agree that in the *short run* an increase in public debt, arising from fiscal expansion, stimulates aggregate demand, which should help the economy grow; the *longer term* economic impact of public debt accumulation, in contrast, is subject to a more heated debate—where views are not unified. Some argue for a negative long-term relationship between the two; others doubt any long-term association between them for low or moderate levels of public debt; yet others disregard any long-term association between debt and economic growth altogether. A better understanding of the long-term economic consequences of rising public debt is clearly warranted.

A careful empirical examination of this relationship using a panel of 40 advanced and emerging economies and four decades of data uncovers that a persistent *accumulation* of public debt over long periods is associated with a lower level of economic activity. Moreover, there is evidence that debt trajectory can have more important consequences for economic growth than the level of debt-to-GDP itself. There are several channels through which a continuous debt accumulation can harm economic growth, such as “crowding out” of private investment, higher long-term interest rates, more aggressive future taxation, and possibly weaker investor sentiment and greater uncertainty.

Fiscal responses to the global financial crisis

The global financial crisis hit many economies across the globe, shaving more than 5 percentage points off global growth in 2008-09 (**Chart 1**). The subsequent economic recovery has been disappointingly slow. With the exception of 2010, global growth surprised on the downside in each year since crisis. The pace of recovery has been accompanied, amongst other factors, with sovereign debt problems in selected advanced countries and a slowdown in key emerging economies.

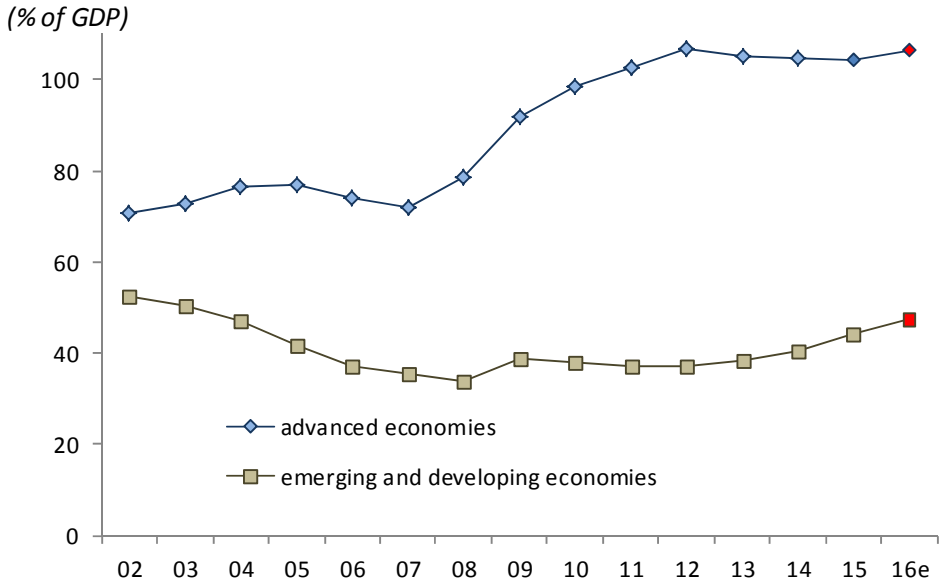
Chart 1: Global economy was hit hard after the global financial crisis



Notes: This chart shows the annual growth rate of the world's real output (green bars). The definition of the world aggregate is taken from the International Monetary Fund's (IMF) World Economic Outlook (WEO) report. The last data point is the estimate reported in the April 2017 update of the WEO report. The dashed line shows IMF WEO projections made in the spring of the previous year.
Sources: International Monetary Fund (World Economic Outlook report) and Haver Analytics.

The large drop in real output growth in 2008-09 and the subsequent disappointing recovery was accompanied by a sizeable fiscal response, especially among the group of advanced economies. Post-crisis fiscal expansion resulted in a considerable government debt build-up in advanced economies from an already elevated level of 71% of GDP in 2007 to 107% of GDP at the end of last year (**Chart 2**). Despite some austerity measures in a number of advanced economies in recent years, the debt-to-GDP ratio has not decreased yet.

Chart 2: Fiscal stimulus in advanced economies led to record levels of public debt



Notes: This chart shows gross public debt as a % of GDP. Gross debt comprises the stock (at year-end) of all government gross liabilities (both to residents and nonresidents). The country classification and the country aggregation are based on the IMF World Economic Outlook report.
Sources: International Monetary Fund (World Economic Outlook report, April 2017) and Haver Analytics.

High levels of public debt and the sovereign-debt problems in the euro area, where policymakers strive to achieve a delicate balance between austerity and pro-growth policies, have fueled the discussion among economists and policymakers on the effects of debt accumulation on economic growth.

Debt-growth relationship

The relationship between public debt accumulation and economic growth is a complex one, and economic theory alone does not provide unambiguous guidance. The main argument for a negative relationship between the two is that of "crowding out" of private investment by government. Another explanation is that of confidence effects: an upward sloping debt trajectory beyond certain levels could lead investors to worry about the country's debt sustainability. Reflecting this risk, economic agents would be willing to hold government securities only at higher borrowing cost. The lower demand and investment due to higher interest rates in turn can have negative consequences for economic growth in the long run. Since the higher cost of government borrowing poses an additional strain on fiscal balances, an increase in government

bond yields could lead to further loss of confidence and become self-fulfilling. In an extreme case, a crisis could occur with negative consequences for economic growth depending on the currency denomination of the public debt and its maturity profile. While it is theoretically possible for governments to inflate the local-currency-denominated debt away by monetizing (printing money), this is impossible for foreign-currency-denominated debt. In the latter case, a public debt crisis could also trigger currency and/or banking crises with more profound consequences for economic growth. High and increasing public debt might also constrain the ability of fiscal authorities to smooth economic cycles. A smaller scope for counter-cyclical fiscal policy can lead to higher volatility and lower output growth. These considerations provide some support for the negative association between growth and debt trajectory in conjunction with a sufficiently high level of debt.

All of the arguments so far abstract from the composition of additional government spending—that gives rise to higher public debt. Such additional government expenditure could be invested in productive public capital (such as infrastructure, education or health) and could be growth enhancing. Consequently, the net effect of debt accumulation on economic growth cannot be established theoretically, and requires a careful analysis of the empirical relationship between debt accumulation and growth.

Estimation of debt-growth relationship

Given the importance of the debt-growth relationship, it deserves a careful empirical investigation. Estimation of such a relationship is, however, no easy task. There are many technical complications that need to be tackled. The first challenge is to take dynamic interactions between debt and growth properly into account. Clearly, the short-run and long-run effects are quite different, and there are feedback effects between the two variables. Second, the long-run relationship between the two could depend on the level of debt itself (threshold effects) as highlighted by the confidence factors discussed earlier. Third, the absence of a sufficient number of historical observations for a reliable individual-country statistical inference on debt-growth relationship means that one should rely on a panel of countries for analysis.

The use of panel data brings two additional technical challenges. First, individual countries are subject to country-specific factors and institutions. Clearly, the degree of financial deepening, track record in meeting past debt obligations, composition and maturity profile of

public debt, and the nature of political systems are all quite heterogeneous across countries, and therefore any estimation and inference should allow for sufficient differences across countries. Second, individual economies are globally interdependent. Such interdependencies arise due to global factors, including world commodity prices and the stance of the global financial cycle, and/or spillover effects from one country to the next that tend to magnify at times of financial crises. Neglecting the global factors could lead to an incorrect statistical inference and false detection of debt threshold effects.

The availability and quality of data pose another challenge. Ideally, one would like to use a large sample of countries spanning a long time period. But data availability is limited. In an effort to obtain comprehensive country coverage, one must rely on "gross government debt," which includes the intra-governmental holdings, as opposed to the net debt held by the public, which would be more appropriate. Taking these into consideration, this economic letter ended up with 40 economies with annual observations for the period 1966-2010.

Table 1 summarizes the results. Individual columns report findings for two estimation methods, labeled as CS-ARDL and CS-DL, both of which are capable of dealing with the technical challenges mentioned above. For each method, we consider different lag orders, and compute two different statistics for testing the significance of the debt-threshold effect (labeled as SupT and AveT). While no evidence is found for a universally applicable threshold effect in the relationship between public debt and economic growth (top panel of **Table 1**), our findings show that countries with *rising* debt-to-GDP ratios beyond 60% tend to have lower real output growth rates (bottom panel of **Table 1**), although the evidence weakens when we consider advanced economies separately from the emerging economies.

Table 1: Statistical evidence of threshold effects is weak

Threshold definition:	*Debt-to-GDP exceeds the threshold level*				
Estimation method:	CS-ARDL		CS-DL		
Maximum lag order:	1	2	0	1	2
Estimated threshold level	40%	30%	40%	40%	40%
Statistical significance of the threshold effect (at 5% or 1% level):					
Based on SupT test statistics	no	no	no	no	no
Based on AveT test statistics	no	no	no	no	no
Threshold definition:	*Debt-to-GDP exceeds the threshold level and is rising*				
Estimated threshold level	60%	60%	60%	60%	60%
Statistical significance of the threshold effect (at 5% or 1% level):					
Based on SupT test statistics	no	no	no	yes: 5%	yes: 5%
Based on AveT test statistics	yes: 1%	yes: 1%	yes: 1%	yes: 1%	yes: 1%

It is important to emphasize that long-run relationships do not provide any indication about direction of causality, but merely provide a statistical association between the variables in the long run. **Table 2** reports the corresponding estimates of (average) long-run impact of public debt accumulation on output growth. All estimates are statistically significant at the 1% level and quite robust across different specifications, estimation methods and country groupings. These estimates are all negative and in the range of -5.7 to -9.4 percent, suggesting that a persistent accumulation in debt-to-GDP ratio at an annual pace of 3% is eventually associated with 0.2 to 0.3 percentage points lower annual GDP growth outcomes, on average.

Table 2: **Estimates of (mean) long-run effects of public debt on output growth are statistically significant**

Estimation method:	CS-ARDL		CS-DL		
Maximum lag order:	1	2	0	1	2
All countries	-0.082	-0.086	-0.085	-0.080	-0.068
	(0.012)	(0.014)	(0.012)	(0.013)	(0.014)
Advanced economies	-0.081	-0.093	-0.094	-0.093	-0.081
	(0.021)	(0.024)	(0.019)	(0.023)	(0.020)
Emerging economies	-0.082	-0.080	-0.077	-0.069	-0.057
	(0.013)	(0.014)	(0.014)	(0.015)	(0.021)

Notes: Standard errors are provided in parentheses. All estimates are statistically significant at the 1% level.

Conclusion

The post-1965 experience of 40 advanced and developing economies shows that there is a statistically robust long-term relationship between persistent accumulation of public debt and economic growth. Moreover, the estimates of the corresponding long-run coefficients are all negative, implying that countries that experienced persistent increases in Debt-to-GDP ratio over long periods also experienced lower output growth. On the other hand, a temporary increase in the debt-to-GDP ratio (for instance to help smooth out business cycle fluctuations), does not play a role in the long-term relationship between economic growth and public debt.

The analysis in this economic letter does not provide any indication about the direction of causality between public debt and growth, and in fact it allows for causality to run both ways. Consequently, it is often difficult to provide a generic policy advice based on estimated relationships using a large set of diverse economies. The mere fact that there is a negative long-term relation between a persistent accumulation of debt and economic growth in the last four decades of available data calls for a better understanding of the economic implications of fiscal policies leading to persistent accumulation of public debt. In our view, the key for prudent debt financing is the reassurance, backed by commitment and action, that the increase in government debt is temporary and will not be a permanent departure from the prevailing norms.

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Notes

This letter is based on "Is There a Debt-threshold Effect on Output Growth?" by A. Chudik, K. Mohaddes, M. H. Pesaran and M. Raissi, 2017, *Review of Economics and Statistics*, 99, pp. 135-150, and on "Long-Run Effects in Large Heterogeneous Panel Data Models with Cross-Sectionally Correlated Errors" by A. Chudik, K. Mohaddes, M. H. Pesaran and M. Raissi, 2016, Advances in Econometrics, 36, Essays in Honor of Aman Ullah, pp. 85-135. The reader is referred to these papers for related literature and full details of the empirical analysis summarized in this letter. The views expressed in this paper are those of the authors and do not necessarily represent those of the Federal Reserve Bank of Dallas, the International Monetary Fund or IMF policy.