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An investigation of nonlinear effects of debt on growth

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ABSTRACT

The existence of threshold effects in public debt-growth relationship has been intensively discussed since Reinhart and Rogoff (2010). Using various country groups, a number of studies pointed out different turning points for public debt beyond which economic growth sharply slows down. This study investigates the threshold effects in debt-growth link for different types of debt employing a Panel Smooth Transition Regression framework. We basically find that nonlinearity of the relationship between debt and growth depend mostly on debt's structure. For a large panel data set which covers both developing and industrial countries, our results show that the direction of the effect of public debt on growth changes smoothly from positive to negative depending on the level of indebtedness. Furthermore, we find that debt threshold is lower for developing countries implying that public debt can hurt growth at lower levels of debt for those economies relative to advanced countries. We also find that short-term external debt and public long-term external debt generate more pronounced and strong negative impact on growth for high levels of indebtedness.

1. Introduction

Rising public debt and fiscal sustainability have been one of the major concerns of economic policy. The recent global financial crisis and the subsequent sovereign debt crisis in the euro area have reignited the debate about the economic impacts of public debt. While the ratio of public debt to GDP has risen considerably over the past 3 decades for most of the economies, this upward trend in government indebtedness is more pronounced in industrial countries. As seen from Fig. 1, public debt to GDP ratio has nearly tripled in advanced economies increasing from 30% in 1970 to 86% in 2012. On the other hand, developing countries have significantly declined their public debt ratio over the past 15 years after the sharp debt buildup pattern in 1980s and 1990s which has reached to 120% levels. However, the rise in public indebtedness has remained at relatively moderate rates in emerging economies.¹

Regarding the growth effect of public debt, conventional view argues that public debt positively affects economic growth in the short run by stimulating the aggregate demand (see for instance, [Elmendorf & Mankiw, 1999](#)). However, theoretical literature mostly points to a negative debt-growth link in the long run through different channels. Public debt can crowd out private investments and deteriorate economic growth via higher long term interest rates ([Gale & Orszag, 2003](#); [Kumar & Baldacci, 2010](#)), higher inflation ([Barro, 1995](#); [Cochrane, 2011](#)), and higher future distortionary taxation ([Barro, 1979](#); [Dotsey, 1994](#)). Since the ability to implement countercyclical fiscal policy is reduced in the case of high public debt, this can lead to higher volatility and lower growth ([Aghion & Kharroubi, 2007](#); [Woo, 2009](#)). There also exists a vast empirical literature which provide evidence that public debt is detrimental to economic growth (see, among others, [Gale & Orszag, 2003](#); [Kumar & Baldacci, 2010](#); [Bräuning, 2005](#); [Futagami, Hori, & Ohdoi, 2010](#)).

Theoretical arguments also point to a nonlinear impact of debt on growth suggesting that low or “reasonable” levels of debt is likely

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¹ The list of advanced, emerging and other developing countries are given in [Appendix](#).

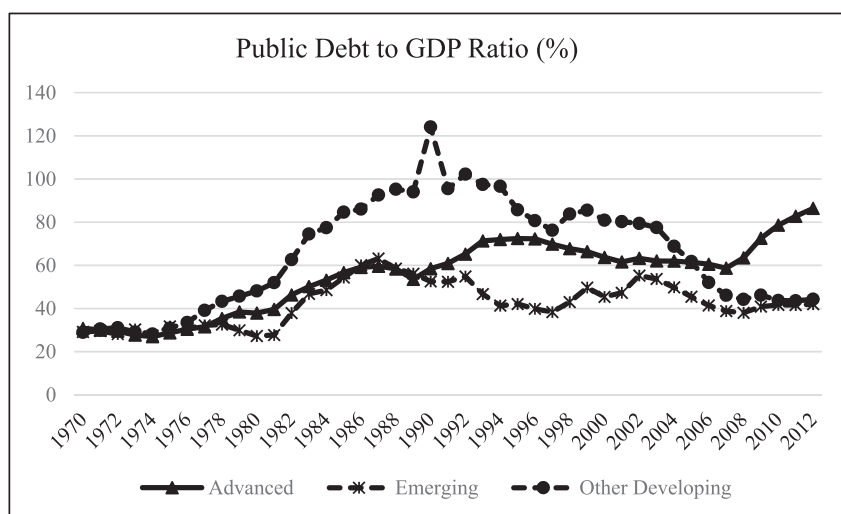


Fig. 1. Public debt ratios of advanced, emerging and other developing countries over 1970–2012.

Source: Abbas et al. (2010).

to enhance economic growth while high levels of debt is detrimental for the stability and growth of the economy. First of all, countries need borrowing at their early stages of development to benefit from investment opportunities with high rates of return. Therefore, these countries' growth can increase using borrowed funds at productive investments as long as they make timely debt repayments. On the other side, borrowing allows individuals to smooth consumption, corporations to smooth investments and production, and governments to smooth taxes in the face of their variable income, sales and expenditures, respectively. However, the accumulation of debt involves several risks. As debt levels increase, borrowers' ability to repay becomes progressively more sensitive to drops in income and sales as well as increases in interest rates (Cecchetti, Mohanty, & Zampolli, 2011). In the case of a negative shock, higher debt increases the probability of default and decline in economic activity. Therefore, high levels of debt lead to real volatility, financial fragility and reduces average growth. On the other hand, "debt overhang" theory implies that high debt leads to investors' expectation of high future distortionary taxes discouraging new domestic and foreign investments, which, in turn, slows down capital accumulation (Krugman, 1988; Sachs, 1989). This argument is represented in the "debt Laffer curve", which posits that larger debt stocks tend to be associated with lower probabilities of debt repayment. Other considerations argue that high debt levels can also reduce growth by lowering total factor productivity. High stocks of debt are likely to hinder governments' incentives to engage in difficult and costly policy reforms, to improve technology and use resources efficiently (Poirson, Ricci, & Pattillo, 2004). Misallocated resources and less efficient investment projects could then contribute to slower productivity growth. Therefore, theoretical arguments also suggest that nonlinear growth effects of debt are likely to occur through capital accumulation and total factor productivity channels. Empirically analyzing the impact of debt on countries' capital accumulation and total factor productivity, Pattillo, Poirson, and Ricci (2002), Schlarek (2004) and Checherita-Westphal and Rother (2012) are among the studies that show nonlinear effects of debt on growth operate through both of these two channels.

Since the influential study of Rogoff and Reinhart (2010), recent empirical literature has been focusing on the non-linear feature of debt-growth link. A large number of studies argue that the growth effect of debt largely depends on the level of debt and the relationship between debt and growth is characterized by the presence of a threshold above which debt have a negative effect on economic growth. Using simple descriptive statistics, Rogoff and Reinhart (2010) show that economic growth slows down considerably if public debt to GDP ratio exceeds 90%.

The simplest and the most common way of testing for non-linearities consists of including a quadratic term in the growth regression. Using this approach for a panel data sample of 12 European economies, Checherita-Westphal and Rother (2012) show that the effect of debt on growth becomes negative when debt to GDP ratio is above 90–100%. Similarly, using a spline regression analysis for a sample consisting advanced and developing countries, Kumar and Woo (2010) find the turning point of public debt to GDP ratio as 90%.

The linear specifications augmented with quadratic interaction effects generally suffer from the exogenous determination of thresholds. Instead, rather than fixing the thresholds at arbitrary values, one can determine the threshold level of debt with a data-driven approach by using non-linear panel data methodologies. In this context, a number of studies apply Panel Threshold Regression methodology of Hansen (1999) to debt-growth nexus. Among them, Cecchetti et al. (2011) estimate a threshold level of 95% for government debt to GDP ratio for a sample of 18 OECD countries. For a panel data set of 25 developed and 74 developing economies, Caner et al. (2010) find the threshold level as 77% beyond which public debt hampers growth. They also show that this nonlinear impact is more pronounced and the threshold is lower (64%) for developing countries. While Égert (2015) cannot find a robust nonlinear relationship between public debt and growth for Rogoff and Reinhart (2010)'s dataset, he finds the negative nonlinear correlation at very low levels of public debt (between 20% and 60% of GDP). Focusing on 12 euro area countries, Baum, Checherita-Westphal, and Rother (2013) show that short-run impact of public debt on growth is significantly positive while the impact declines to zero and

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