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# What determines external debt tipping points?

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ABSTRACT

This paper is interested in the nexus between external debt and export competiveness. Specifically, while we find that once external debt exceeds a certain threshold it is negatively associated with export growth, we are interested in determining whether the tipping points vary based on country characteristics. We test various hypotheses, including extent of exchange rate flexibility, size of foreign exchange reserve holdings, bond market development, degree of banking sector concentration and history of financial crises.



## 1. Introduction

Over the last two decades, the fiscal positions of many economies have deteriorated rather precipitously, leading to ever-growing levels of public debt (in absolute terms and as share of GDP) and mounting concerns about debt sustainability. However, on a global scale, external indebtedness (public plus private) has been rising quite sharply especially since the mid-1990s (Fig. 1).

There is a growing body of literature that has attempted to estimate public debt "tolerance" in the sense that if public debt rises above a certain point it may start to impair economic growth. In a much-cited study, Reinhart and Rogoff (2009, 2010, 2011) highlighted a possible inverted-U relationship between growth and debt. They examined histograms of data from 44 countries over two centuries and found that there appears to be a tipping point at debt-to-GDP ratio of about 90% – growth rates decline significantly beyond the threshold. Many other studies since have revisited this issue using more rigorous threshold econometric techniques with broadly consistent results (see Reinhart et al., 2012 for a succinct summary).[1]

While most of the literature has focused on public debt, the literature on external debt is rather sparse. While some amount of external leverage may be helpful to growth (i.e. overcoming liquidity constraints), once it exceeds a certain

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[1] A central result of Reinhart and Rogoff (2010) was that the average growth rates of countries with debt-to-GDP ratios above the 90% threshold are negative. Herndon et al. (2013), in trying to replicate Reinhart and Rogoff's work have now found that the original Reinhart–Rogoff results were actually driven by coding errors. They find that once the coding errors are rectified, the estimated mean growth rates of these countries are 2% points more than what Reinhart and Rogoff found but still lower than growth rate below the tipping point.

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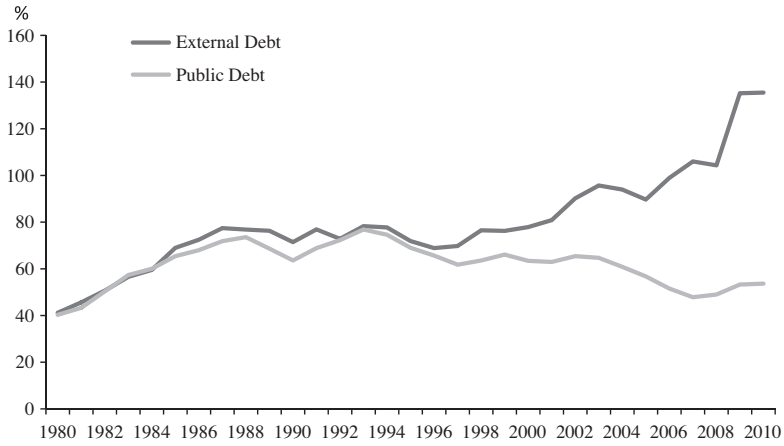


**Fig. 1.** Average public and external debt (over GDP) – sample countries.

threshold it could have deleterious effects by increasing uncertainty (of future tax increases, possible credit ratings concerns), appreciating the real exchange rates, raising risk premia and thus pushing up overall cost of borrowing. There have been a handful of studies that have estimated a threshold for external debt. For instance, Pattillo et al. (2004) use data for a panel of 93 developing countries for the period 1969 and 1998 and found that external debt is associated with negative per capita growth at above 35–40% of GDP and around 160–170% of exports.[2]

This paper builds on the foregoing literature but is more narrowly focused on estimating the possible tipping point for external debt on export growth. More importantly, the paper takes the discussion forward by trying to understand factors that might affect these debt thresholds? We test various hypotheses, including the extent of exchange rate flexibility, size of foreign exchange reserve holdings, bond market development, degree of banking sector concentration, and history of financial crises. The paper is organized as follows: Section 2 discusses the empirical methodology linking export growth with debt thresholds. Section 3 discusses the data, sets out the hypotheses and summarizes main findings. The final section concludes the paper.

## 2. Methodology and data

In exploring the impact of debt, much of the literature focuses on overall growth. The problem here is that there is no definite consensus on the exact determinants of growth more generally (Sala-i-Martin et al., 2004). On the other hand, there is a long-established literature highlighting factors that impact export growth more specifically, which is our area of interest. In order to investigate the nonlinear relation between export growth and external debt we can set up a quadratic specification as follows:

$$Export_{it} = \alpha_{it} + \beta X_{it} + \gamma_1 Debt_{it} + \gamma_2 Debt_{i,t}^2 + \varepsilon_{it} \quad (1)$$

where $Export_{it}$ is the log difference in exports as a share of GDP. $X_{it}$ is the set of fairly standard control variables in an export function, including global economic growth, real exchange rate appreciation, terms of trade growth, and proxies for supply capacity. $Debt_{i,t}$ is the logarithm of external debt variable (share of GDP). We also include a lagged exports-to-GDP growth term to account for inertial effects. To avoid cyclical effects, we use three-year moving averages of all variables. We employ system-GMM to correct for endogeneity of debt and other control variables.[3] The empirics are based on a data set of 59 countries (including 27 developed countries and 32 developing countries), covering the sample period from 1980 to 2010 (depending on data availability for each economy) (Table 1).

As a robustness check, we re-estimate Eq. (1) using a spline function (IMF, 2011 and Pattillo et al., 2004). The first step is to estimate the model to ascertain the debt threshold ($Debt^*$) and the second step is to estimate the regressions by OLS with fixed effects for different thresholds and evaluate which regression produces the highest $R$-squared.[4] The spline function is as below:

[2] They find that the main reason for the negative impact on growth is a decline in efficiency of investment (i.e. distortion of resource allocation) as opposed to decline in investment per se (also see Pattillo et al., 2004). Reinhart and Rogoff (2009, 2011) also found a lower threshold of 60% for external debt (government plus private) to GDP for developing market economies. There is a tangential literature on debt "Laffer curve" which posits that larger debt stocks are associated with lower probabilities of debt repayment (Krugman, 1988; Sachs, 1989).

[3] The system-GMM has an advantage over differenced-GMM since it provides a more efficient estimation than the latter, and does not entirely eliminate the cross-country dimension of the data by first-differencing (such as differenced-GMM) or taking differences with respect to country means (such as fixed effects).

[4] We try all possible combinations and choose the pair that delivered the best fit in terms of the $R$-squared in order to ensure that the threshold levels are not derived in a non-arbitrary way.