



Public debt and growth: Heterogeneity and non-linearity[☆]



Markus Eberhardt^{a,b,*}, Andrea F. Presbitero^{c,d,**}

^a School of Economics, University of Nottingham, UK

^b Centre for the Study of African Economies, Department of Economics, University of Oxford, UK

^c International Monetary Fund, Washington DC, USA

^d Money and Finance Research group (MoFiR), Ancona, Italy

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ABSTRACT

We study the long-run relationship between public debt and growth in a large panel of countries. Our analysis builds on theoretical arguments and data considerations in modelling the debt–growth relationship as heterogeneous across countries. We investigate the debt–growth nexus adopting linear and non-linear specifications, employing novel methods and diagnostics from the time-series literature adapted for use in the panel. We find some support for a negative relationship between public debt and long-run growth across countries, but no evidence for a similar, let alone common, debt threshold within countries.

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* Correspondence to: M. Eberhardt, School of Economics, University of Nottingham, Sir Clive Granger Building, University Park, Nottingham NG7 2RD, UK. Tel.: +44 115 846 8416.

** Correspondence to: A. Presbitero, International Monetary Fund, 700 19th Street NW, Washington DC 20431, USA. Tel.: +1 202 623 9899.

E-mail addresses: markus.eberhardt@nottingham.ac.uk (M. Eberhardt), apresbitero@imf.org (A.F. Presbitero).

1. Introduction

The relationship between public debt and economic growth has recently emerged once again as a hotly debated topic in academia and among policymakers. Starting from the seminal contribution of Reinhart and Rogoff (2010a,b) a large strand of literature has investigated this relationship, attempting to identify possible non-linearities and discussing to what extent debt accumulation has a detrimental and causal effect on GDP growth (for a recent review see Panizza and Presbitero, 2013).

This paper asks whether the relationship between public debt and economic growth is significantly negative and further investigates the presence of common or country-specific thresholds beyond which it changes in magnitude. The originality of our analysis arises from the adoption of recently developed methods from the panel time series literature which have significant bearings on how we can empirically model the debt–growth nexus: first, we can ask whether a negative long-run relationship between public debt and growth exists and whether this relationship differs substantially across countries. If the impact of debt on growth differed across countries then a focus on the average relation may be misleading for policy adoption in individual countries. Second, moving away from a strictly linear relationship for

the debt–growth nexus we can investigate whether *within individual countries* there is any evidence for thresholds or ‘high vulnerability regions’ (Reinhart and Rogoff, 2010a, p. 7) where this relationship may change from a positive significant or insignificant to a significant negative one. Third, and incorporated in both these sets of analysis, we allow for a very flexible way to account for unobserved heterogeneity (and thus endogeneity) in our models, which could arise from omitted variables and/or global shocks which differ in their impact across countries.

We analyse the empirics of the debt–growth nexus within a standard neoclassical growth model. Given the recent interest in this topic, cross-country empirical papers that are closely related to our work include Cordella et al. (2010), Checherita-Westphal and Rother (2012), Kourtellis et al. (2013), Panizza and Presbitero (2014), among others. We provide a synthetic review of this literature in a Technical Appendix.

Using total public debt data from 118 developing, emerging and advanced economies over the period 1960 to 2012 we find that long-run debt coefficients differ across countries and provide some evidence that countries with higher average debt-to-GDP ratios are more likely to see a negative effect on their long-run growth performance. This result is consistent with higher debt ratios being associated, on average, with lower GDP growth rates (Reinhart and Rogoff, 2010a,b). However, the debt–growth nexus differs significantly across countries and modelling non-linearities within-countries does not show the emergence of a common pattern in our sample. Viewed from this perspective, our results lend support to the view that debt overhang effects cannot be related to a specific debt thresholds, as one cannot “argue that growth will be normal at 89% and subpar (about 1% lower) at 91% debt/GDP any more than a car crash is unlikely at 54 mph and near certain at 56 mph” (Reinhart and Rogoff, 2010a, p. 3). By contrast, our evidence is suggestive of the fact that the relationship between public debt and growth is complex and the identification of a specific threshold which triggers a growth slowdown should take into account debt composition and a variety of country characteristics which could constrain government choices and affect the economy’s vulnerability to crises.

Our analysis is based on total government debt, measured at face value, as this definition is broadly comparable across countries and makes it possible to use a large and sufficiently long panel dataset. However, this choice does not come without costs. First, the exclusion of private debt may be problematic as private debt is a potential source of financial instability and crisis (Gourinchas and Obstfeld, 2012; Schularick and Taylor, 2012). Second, our measure of public debt does not consider that a high proportion of foreign currency-denominated debt could increase financial fragility and lead to sub-optimal macroeconomic policies, as pointed out by the vast literature on the ‘original sin’ (Hausmann and Panizza, 2011). Third, we consider gross public debt, although net debt would seem to be a better measure of government indebtedness (Panizza and Presbitero, 2013). Finally, considering the face value of debt could be misleading given that countries can borrow at different maturities and contractual forms (Dias et al., 2014). While data availability prevents us from dealing with some of these issues, we employ alternative definitions of the present value of public external debt for a large number of developing countries in order to focus on foreign-currency denominated debt and to have a better measure of indebtedness for developing countries. These results are qualitatively very similar to those for the total public (face value) debt data presented below and are therefore confined to a Technical Appendix.

The remainder of this study is organised as follows: Section 2 motivates our empirical approach from the existing theoretical and empirical literature. Section 3 considers how the complexities of the economic theory and data realities should inform our empirical analysis. Section 4 describes our data and provides an overview of the

econometric methods we apply. In Section 5 we present our empirical results and detailed analysis of heterogeneity and non-linearity in the debt–growth relationship across and within countries. Section 6 concludes.

2. Related literature

The first element of our analysis concerns the presence of a negative long-run relationship between public debt and growth. There are a number of theoretical arguments which can motivate such a long-run relationship between public debt and growth (Elmendorf and Mankiw, 1999). In standard overlapping generation models of growth public debt reduces savings and capital accumulation (via higher interest rates), thus weakening economic growth (Modigliani, 1961; Diamond, 1965; Blanchard, 1985). In endogenous growth models public debt has generally a negative effect on long-run growth (Barro, 1990; Saint-Paul, 1992). Alternatively, one could simply argue that debt has to be paid off by future reduction in public spending or distortionary taxation, with negative effects on growth. Consistent with this line of argument, Bohn (1998), Mendoza and Ostry (2008) and Lo and Rogoff (2015) show that governments react to a rising public debt by increasing the primary surplus or running smaller deficits. Moreover, high public debt limits the effectiveness of productive public expenditures on long-run growth (Teles and Mussolini, 2014), creates uncertainty or expectations of future financial repression (Cochrane, 2011), and could be associated with higher sovereign yield spreads (Codogno et al., 2003) leading to higher real interest rates and lower private investment (Laubach, 2009).

The second element of our analysis establishes whether the long-run relationship studied is broadly the same in each country, or whether there are significant differences in the debt–growth nexus across countries. There are a number of reasons to assume that the equilibrium relationship between public debt and growth may differ across countries. First, in line with the ‘new growth’ literature (see Temple, 1999) production technology may differ across countries, and thus also the relationship between debt and growth. In this vein some recent work (Reinhart et al., 2012; International Monetary Fund, 2012) has preferred to analyse single episodes of debt overhang in individual countries adopting qualitative methods in order to develop a typology of episodes. Second, the capacity to tolerate high levels of debt depends on a number of country-specific characteristics, related to past crises and the macro and institutional framework (Reinhart et al., 2003; Kraay and Nehru, 2006; Manasse and Roubini, 2009), many of which are either unobserved or difficult to capture in the empirical setup. Third, vulnerability to public debt depends not only on debt levels, but also on debt composition – domestic versus external, foreign or domestic currency denominated, long-term versus short term public debt (Reinhart et al., 2012; Dell’Erba et al., 2013) – which differs significantly across countries.

The final element of our analysis is the issue of non-linearity in the debt–growth relationship, which we approach with a number of alternative empirical strategies, enabling us to investigate a *country-specific* non-linearity or threshold.¹ This differs somewhat from the standard empirical approach to and interpretation of non-

¹ We do not address the issue of *time-varying* thresholds (i.e. time-varying parameters in a linear or non-linear debt–growth model). One could imagine that if a country-specific threshold exists, it could change over time, depending on the evolution of macroeconomic and institutional variables. However, our empirical framework is not well-suited to tackle this issue in a very satisfactory fashion due to the limited time series available for a comparison of results over time. At worst if the debt–growth relationship changes within countries over time the estimates presented can econometrically be argued to represent averages over time.

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