# When does leverage hurt productivity growth? A firm-level analysis[☆]

Fabrizio Coricelli [a]*, Nigel Driffield [b], Sarmistha Pal [c], Isabelle Roland [d]

[a] Paris School of Economics and CEPR, France
[b] Aston Business School, UK
[c] University of Surrey & IZA, UK
[d] London School of Economics, UK

## ABSTRACT

In the wake of the global financial crisis, several macroeconomic contributions have highlighted the risks of excessive credit expansion. In particular, too much finance can have a negative impact on growth. We examine the microeconomic foundations of this argument, positing a non-monotonic relationship between leverage and firm-level productivity growth in the spirit of the trade-off theory of capital structure. A threshold regression model estimated on a sample of Central and Eastern European countries confirms that TFP growth increases with leverage until the latter reaches a critical threshold beyond which leverage lowers TFP growth. This estimate can provide guidance to firms and policy makers on identifying "excessive" leverage. We find similar non-monotonic relationships between leverage and proxies for firm value. Our results are a first step in bridging the gap between the literature on optimal capital structure and the wider macro literature on the finance-growth nexus.

© 2012 Elsevier Ltd. All rights reserved.

* Corresponding author.
  E-mail address: fabrizio.coricelli@gmail.com (F. Coricelli).

## 1. Introduction

The global financial crisis has revived interest in the risks of excessive credit expansion at the macroeconomic level. In a recent paper titled "Too much finance", Arcand et al. (2011) identify a threshold level of domestic credit to the economy beyond which output growth begins to fall. Reinhart and Rogoff (2010) identify a similar non-monotonic relationship between public debt and growth.

In this paper we argue that there can be a non-monotonic relationship between leverage and productivity growth at the firm level; using insights from the macroeconomic and corporate finance literatures, we identify a threshold level of leverage beyond which further increase in leverage can lower firm-level productivity growth.

Corporate leverage decisions are among the most important decisions made by firm executives and have been the focus of intense scrutiny since Modigliani and Miller (1958). Financial conditions in the corporate sector not only affect firm performance but, as macroeconomists have long recognized, they can have a powerful effect on macroeconomic outcomes. The literature on "financial accelerators" is concerned with the role of financial conditions in amplifying shocks to the economy (see e.g. Bernanke et al. (1999)) while the literature on the finance-growth nexus (e.g. see Ang (2008) for a recent survey) is concerned with their contribution to long-term growth. The present paper is a first attempt at bridging the gap between the literature on optimal capital structure and the macroeconomic literature on finance-growth linkages. We use threshold regressions to investigate the non-monotonic relationship between leverage and several indices of firm performance, and the extent to which this relationship varies across types of firms.

Among all possible measures of firm performance, our analysis particularly focuses on total factor productivity (TFP) growth for several reasons. Productivity growth is generally considered to be the main driver of growth at the macroeconomic level. A number of studies have demonstrated that TFP growth is more important for income growth than other factors such as capital accumulation, and that TFP differences explain more of the variation in cross-country per capita GDP than variables like human capital, physical capital or trade.[1] Productivity has also been used to gauge firm performance in the corporate finance literature,[2] the management accounting literature,[3] and the literature on corporate control.[4] It is an important determinant of how firms react to business cycle fluctuations. In the framework of Imrohoroglu and Tüzel (2011), low TFP firms are more vulnerable to business cycles and hence are riskier than firms with high TFP. Low TFP firms have a higher implied cost of capital (ICC) and both the levels of ICC and the ICC spread between low and high TFP firms are countercyclical. Therefore, understanding the effects of leverage on productivity gains is relevant both from the perspective of capital structure theory and the macroeconomic perspective of long-term growth and business cycle fluctuations.

Several papers find that productivity is positively related to firm value.[5] Intuitively, productivity growth results in the efficient use of scarce inputs. This allows the firm to reduce its output prices while maintaining or increasing profit margins, and in the long-run, to survive. This enhances shareholders' wealth. Therefore, our starting point to understand the link between leverage and productivity growth is the finance literature that relates leverage to firm value. In particular, our hypothesis is inspired by the trade-off theory of optimal capital structure, which explains firms' choice of leverage by a trade-off between the benefits and costs of debt. The second most influential theory of corporate leverage is the pecking order theory due to Myers (1984). We however focus on the trade-off theory rather than the pecking order theory for various reasons. From a policy perspective, it is important to identify firms or

---

[1] See for example Klenow and Rodriguez-Clare (1997), Hall and Jones (1999), Easterly and Levine (2001), and Henry et al. (2009).

[2] See for example Schoar (2002), Maksimovic and Phillips (2002), McGuckin and Nguyen (1995), and Imrohoroglu and Tüzel (2011).

[3] See for example Kaplan (1983).

[4] See for example Köke and Renneboog (2005).

[5] See for example Bao and Bao (1989), Riahi-Belkaoui (1999), Dwyer (2001), and Balasubramanyan and Mohan (2010).