

Built Like a House of Cards?

Corporate Indebtedness and Productivity Growth in the Portuguese Construction Sector¹

Nuno Tavares

Strategy and Research Office - Ministry of Economy and ISEG

February 10, 2020

¹ Joint work with Gabriel Barros (GEE) and José Santos (Nova SBE)

Outline

1. Backdrop
2. Motivation
3. Empirical Approach
4. Results
5. Robustness
6. Preliminary Conclusion

Backdrop - The Problem

- **Productivity growth** is an **essential component of long-run economic growth**.
- **Productivity slowdown in advanced economies** (Duval, Hong, and Timmer 2017):
 - Started around late 1960s;
 - Small transitory reversal during 1990s followed by renewed slowdown since early 2000s;
 - Further slowdown following the global financial crisis (GFC).
- Productivity slowdown in advanced economies **is somewhat of a puzzling result** - "*Productivity paradox 2.0*".
 - Why we're getting more innovation but less growth?
 - Why brilliant AI technologies are not leading to widespread growth and prosperity?

Backdrop - Productivity slowdown debate in a nutshell

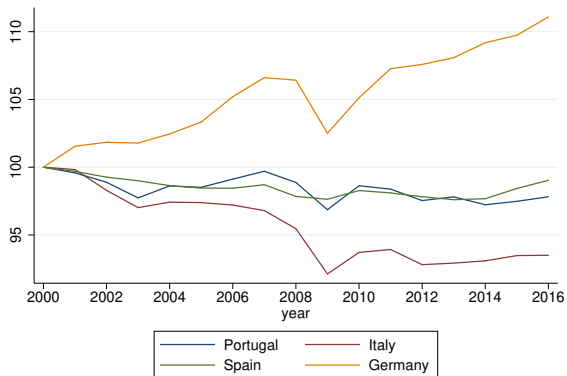
- **Mismeasurement:**
 - (Feldstein 2017)
- **Technological diffusion and business dynamism:**
 - (Haltiwanger 2012), (Haltiwanger, Hathaway, and Miranda 2014), (Andrews, Criscuolo, and Gal 2015)
- **Resource misallocation:**
 - (Hsieh and Klenow 2009), (Moll 2014), (Midrigan and Xu 2014), (Gopinath et al. 2017), (Schivardi, Sette, and Tabellini 2017).
- **Institutional factors:**
 - (Nicoletti and Scarpetta 2003), (Kim and Loayza 2017), (Pellegrino and Zingales 2017).

Backdrop - What about Debt?

- What is our contribution to the debate? - How did persistent debt accumulation by Portuguese construction firms impacted their long-run TFP.
- Related literature:
 - **Impact of high and rising public and private debt on the macroeconomic performance** of different countries :
 - (Reinhart and Rogoff 2010), (Mian and Sufi 2010), (Chudik et al. 2017).
 - **Impact of debt overhang on corporate investment** by southern European firms:
 - (Kalemli-Ozcan, Laeven, and Moreno 2015)
 - **Impact of debt overhangs outside of crisis periods and persistent debt accumulation by firms on their long-term TFP:**
 - (Anderson and Raissi 2018)

Motivation - Productivity Growth

Figure 1: MFP Selected Countries, 2000=100

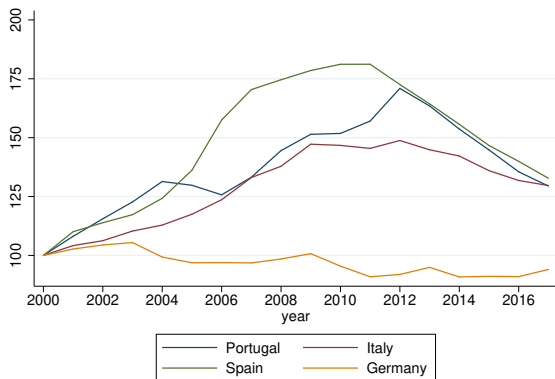


Source: STAN OECD and authors calculations

- **Productivity growth** has been persistently **anemic** for some European countries over the 2000-2016 period.
- This trend is particularly evident for **southern European countries** such as **Italy, Spain and Portugal**.

Motivation - Indebtedness Growth

Figure 2: Corporate Debt to GDP, 2000=100

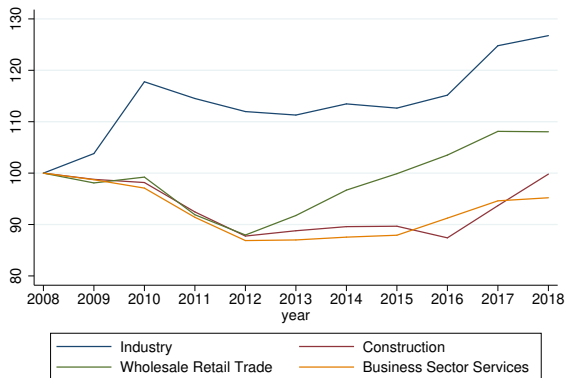


Source: IMF and authors calculations

- Meanwhile, **corporate indebtedness** increased consistently in southern European countries.
- Portuguese **corporate indebtedness peaked in 2012** but has been decreasing ever since. The same trend can be seen for Spain and Italy.

Motivation - Productivity Growth at the Sector Level

Figure 3: Labour Productivity by Sector, 2008=100

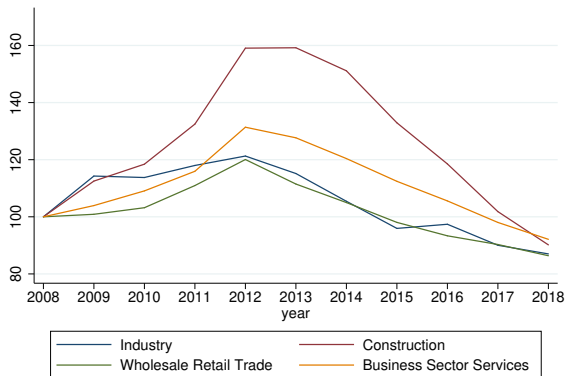


Source: INE – Authors calculations

- Despite differences across sectors, **Labour Productivity** in Portugal has also shown **signs of a slowdown**.
- This effect was particularly evident in the Business Sector Services and for the **Construction Sector**.

Motivation - Indebtedness Growth at the Sector Level

Figure 4: Debt to GVA by Sector, 2008=100



Source: INE and BdP – Authors calculations

- At the same time **indebtedness levels have ratcheted up** quite substantially until 2012.
- This was a common trend across sectors, but **notably in the construction sector.**

Empirical Approach - The Data

- Our empirical strategy relies on firm-level data sourced from **Banco de Portugal's Microdata Research Laboratory (BPlim)**.
- Balance-sheet and income-statement information for **non-financial corporation over the period of 2006-2017**.
- We relied on BPlim's **harmonized version of the data set**, which allows a **consistent definition of variables** throughout the accounting vintages.
- From this data we constructed a **balanced panel** of construction firms.

Empirical Approach - Baseline Measure of Indebtedness

- We define our baseline measure of indebtedness, **DEBT**, as **the ratio of firms' debt to its nominal value-added**.
- We define total **debt** as the **sum of current and non-current obtained funding** as reported by firms in their balance-sheet.
- We compute the nominal **value-added** as the **difference between total output and intermediate consumption**.
- This formulation is relatively **unresponsive to asset price volatility or revaluation**, which could contaminate our estimates.

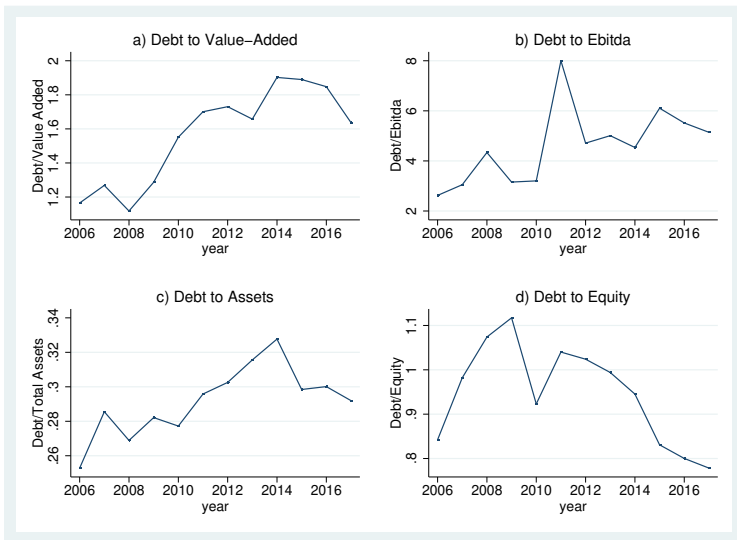
- We **estimated TFP** as the fitted residuals of a standard log-linearized Cobb-Douglas production function:

$$y_{i,t} = \beta_k k_{i,t} + \alpha_l l_{i,t} + u_{i,t}$$

where $y_{i,t}$ is the **log of value-added**; $k_{i,t}$ is the **log of capital** (computed through the perpetual inventory method using firms data); $l_{i,t}$ is the **log of labour** (number of employees) and $u_{i,t}$ is the **log of TFP**.

Empirical Approach - Measures of Firm Indebtedness

Figure 5: Different Measures of Firm Indebtedness - Balanced Panel



Empirical Approach - Firm Indebtedness by Size Class

Table 1: Debt to Value Added, by Size Class (%)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Size Class												
Micro	60.4	58.4	65.4	69.0	71.7	70.0	72.2	70.0	71.0	62.5	63.1	58.7
Small	53.3	52.3	49.2	56.2	66.2	65.7	63.7	61.9	62.5	54.5	55.0	49.6
Medium	30.8	32.4	37.5	40.2	65.8	59.0	75.8	77.8	73.7	66.3	65.8	57.4
Large	45.9	50.5	59.0	49.6	80.6	90.1	106.5	112.8	94.5	93.4	93.5	111.7

Notes: The table shows the median value of debt to added value for the balanced panel of construction firms in the period.

Empirical Approach - Measures of Productivity

Figure 6: Mean and Median TFP Growth

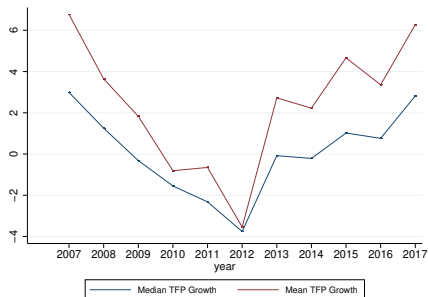
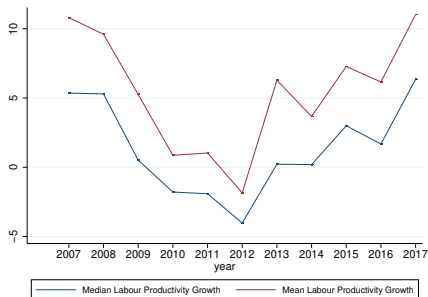


Figure 7: Mean and median LP Growth



Empirical Approach - TFP by Size Class

Figure 8: Mean TFP Growth

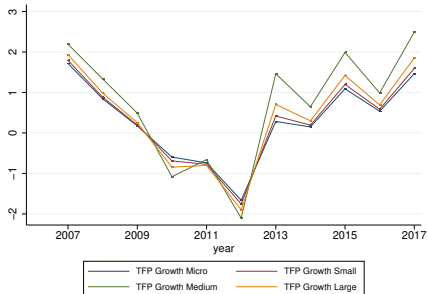
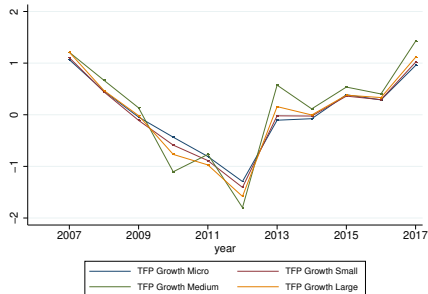


Figure 9: Median TFP Growth



Econometric Approach - Baseline ARDL and DL

- **Joint dynamics of productivity growth and indebtedness:**

$$\Delta TFP_{it} = \alpha_{i,y} + \delta_i \Delta TFP_{it-1} + \tau_i \Delta d_{it-1} + \varepsilon_{it}$$

$$\Delta d_{it} = \alpha_{i,d} + \rho_i \Delta d_{it-1} + \omega_i \Delta TFP_{it-1} + \varepsilon_{it}$$

- **ARDL(1,1) representation of productivity growth:**

$$\Delta TFP_{it} = c_i + \lambda_i \Delta TFP_{it-1} + \beta_{i0} \Delta d_{it} + \beta_{i1} \Delta d_{it-1} + u_{it}$$

- Alternatively we use a **distributed lag (DL)** approach to assess this effect directly:

$$\Delta TFP_{it} = c_i + \theta_i \Delta d_{it} + \sum_{l=0}^p \delta_{il} \Delta^2 d_{it} + v_{it}$$

Results - Baseline Specifications

Table 2: Estimates of Long-Run Effects of Corporate Indebtedness on TFP Growth

Lags	ARDL			DL	
	(1,1)	(1,2)	(2,1)	p=1	p=2
$\hat{\theta}_{\Delta d}$	-0.054*** (0.002)	-0.056*** (0.002)	-0.045*** (0.002)	-0.135*** (0.007)	-0.139*** (0.009)
Observations	10,940	9,846	9,846	10,940	9,846
CD	67.667***	67.367***	68.906***	43.200***	21.470***

For the ARDL we report PMG estimates while for the DL we report MG estimates. CD refers to test statistic for cross-sectional dependence. Standard errors are reported in parentheses. Symbols *, **, and *** denote significance at 10%, 5%, and at 1% respectively.

Results - Cross-Sectionally Augmented ARDL and DL

- Until now, we have assumed a somewhat restrictive assumption about the nature of the cross-sectional errors - we have assumed that the **errors in the DEBT/TFP relationship are cross-sectionally independent**.
- Factors that can lead to cross-sectional dependencies (most likely unobserved):
 - Financial crises and recession;
 - Labour and product market frictions;
 - Institutional factors and other omitted common factors.
- Both ARDL and DL specifications are **augmented with cross-sectional averages (and their lags in the case of DL) of productivity and indebtedness growth**.

Results - Cross-Sectionally Augmented ARDL and DL

Table 3: Estimates of Long-Run Effects of Corporate Indebtedness on TFP Growth

Lags	CS-ARDL			CS-DL	
	(1,1)	(1,2)	(2,1)	p=1	p=2
$\hat{\theta}_{\Delta d}$	-0.060*** (0.002)	-0.037*** (0.002)	-0.044*** (0.001)	-0.145*** (0.011)	-0.192*** (0.037)
Observations	10,940	9,846	9,846	10,940	9,846
CD	66.753**	69.904***	69.089***	-1.296	-1.192

For the CS-ARDL we report PMG estimates while for the CS-DL we report MG estimates. CD refers to test statistic for cross-sectional dependence. Standard errors are reported in parentheses.

Symbols *, **, and *** denote significance at 10%, 5%, and at 1% respectively.

Robustness - Alternative measure of Indebtedness

Table 4: Estimates of Long-Run Effects on TFP Using Debt to Assets

<u>Lags</u>	CS-ARDL			CS-DL	
	(1,1)	(1,2)	(2,1)	p=1	p=2
$\hat{\theta}_{\Delta d}$	-0.022*** (0.002)	-0.065*** (0.002)	-0.532*** (0.001)	-0.047* (0.025)	-0.001 (0.198)
Observations	10,940	9,846	9,846	10,940	9,846
CD	72.402***	58.875***	60.601***	-1.417	-1.348

Notes: For all specifications, indebtedness is measured by the ratio of debt to Assets. For the CS-ARDL we report PMG estimates while for the CS-DL we report MG estimates. Symbols *, **, and *** denote significance at 10%, 5%, and at 1% respectively.

Robustness - Alternative measure of Productivity

Table 5: Estimates of Long-Run Effects of Corporate Indebtedness on Labour Productivity

<u>Lags</u>	CS-ARDL			CS-DL	
	(1,1)	(1,2)	(2,1)	p=1	p=2
$\hat{\theta}_{\Delta d}$	-0.074*** (0.003)	-0.061*** (0.003)	-0.025*** (0.001)	-0.147*** (0.017)	-0.178*** (0.068)
Observations	10,940	9,846	9,846	10,940	9,846
CD	64.407***	66.622***	70.921***	-0.912	2.381**

Notes: For all specifications, indebtedness is measured by the ratio of debt to value-added and productivity by labour productivity. For the CS-ARDL we report PMG estimates while for the CS-DL we report MG estimates. CD refers to test statistic for weak cross-sectional dependence. Standard errors are reported in parentheses. Symbols *, **, and *** denote significance at 10%, 5%, and at 1% respectively.

Preliminary Conclusions



- Our empirical approach suggests a **significant and negative relationship**, between debt accumulation and TFP growth for construction firms.
 - This result is consistent with what Anderson and Raissi (2018) found for the Italian economy.
- This result is **robust to different measures of firm indebtedness** as well as to various measures **TFP and labour productivity**.
- These results highlight the importance of policy measures that **enable alternative forms of firms' financing - Flagship Program "Capitalizar" as an example**.

Thank You!

References I

-  Anderson, Gareth and Mr Mehdi Raissi (2018). *Corporate indebtedness and low productivity growth of Italian firms*. International Monetary Fund.
-  Andrews, Dan, Chiara Criscuolo, and Peter N Gal (2015). “Frontier Firms, Technology Diffusion and Public Policy”. In:
-  Chudik, Alexander et al. (2017). “Is there a debt-threshold effect on output growth?” In: *Review of Economics and Statistics* 99.1, pp. 135–150.
-  Duval, Mr Romain A, Mr Gee Hee Hong, and Yannick Timmer (2017). *Financial frictions and the great productivity slowdown*. International Monetary Fund.
-  Feldstein, Martin (2017). “Underestimating the real growth of GDP, personal income, and productivity”. In: *Journal of Economic Perspectives* 31.2, pp. 145–64.
-  Gopinath, Gita et al. (2017). “Capital allocation and productivity in South Europe”. In: *The Quarterly Journal of Economics* 132.4, pp. 1915–1967.
-  Haltiwanger, John (2012). “Job creation and firm dynamics in the United States”. In: *Innovation policy and the economy* 12.1, pp. 17–38.

References II

-  Haltiwanger, John, Ian Hathaway, and Javier Miranda (2014). “Declining business dynamism in the US high-technology sector”. In: *Available at SSRN 2397310*.
-  Hsieh, Chang-Tai and Peter J Klenow (2009). “Misallocation and manufacturing TFP in China and India”. In: *The Quarterly journal of economics* 124.4, pp. 1403–1448.
-  Kalemli-Ozcan, Sebnem, Luc Laeven, and David Moreno (2015). “Debt Overhang in Europe: Evidence from Firm-Bank-Sovereign Linkages”. In: *University of Maryland*.
-  Kim, Young E and Norman Loayza (2017). “Productivity and its Determinants: Innovation, Education, Efficiency, Infrastructure, and Institutions”. In: *Unpublished Working Paper*.
-  Mian, Atif and Amir Sufi (2010). “Household Leverage and the Recession of 2007–09”. In: *IMF Economic Review* 58.1, pp. 74–117.
-  Midrigan, Virgiliu and Daniel Yi Xu (2014). “Finance and misallocation: Evidence from plant-level data”. In: *American economic review* 104.2, pp. 422–58.

References III

-  Moll, Benjamin (2014). “Productivity losses from financial frictions: Can self-financing undo capital misallocation?” In: *American Economic Review* 104.10, pp. 3186–3221.
-  Nicoletti, Giuseppe and Stefano Scarpetta (2003). “Regulation, productivity and growth: OECD evidence”. In: *Economic policy* 18.36, pp. 9–72.
-  Pellegrino, Bruno and Luigi Zingales (2017). *Diagnosing the Italian disease*. Tech. rep. National Bureau of Economic Research.
-  Reinhart, Carmen M and Kenneth S Rogoff (2010). “Growth in a Time of Debt”. In: *American economic review* 100.2, pp. 573–78.
-  Schivardi, Fabiano, Enrico Sette, and Guido Tabellini (2017). “Credit misallocation during the European financial crisis”. In: *Bank of Italy Temi di Discussione (Working Paper) No 1139*.