Predicting NFCs vulnerability and debt sustainability using a micro-based approach: the case of Portugal

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# Portuguese NFCs high indebtedness was a chief vulnerability in the run up to the last crisis

➢ NFCs indebtedness decreased following the economic and financial crisis. But Portuguese NFCs' leverage is currently higher than the euro area average.

➢ Was the deleveraging process enough? Are there signs of NFCs' over indebtedness?

➢ If that is the case, how is over-indebtedness distributed among different NFCs, in particular, by firm size and sector of activity?

NFCs financial indicators | Percentage of total NFCs assets
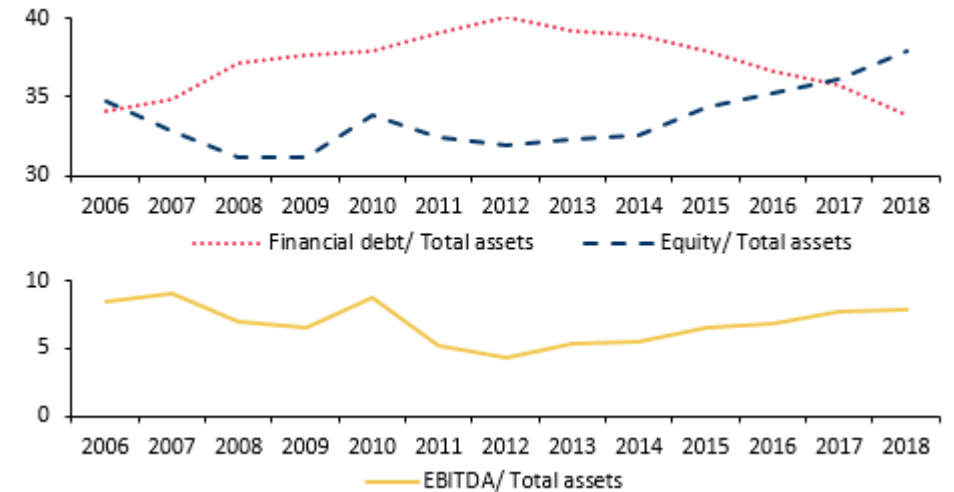
Source: Banco de Portugal calculations.

NFCs leverage in the euro area | Per cent
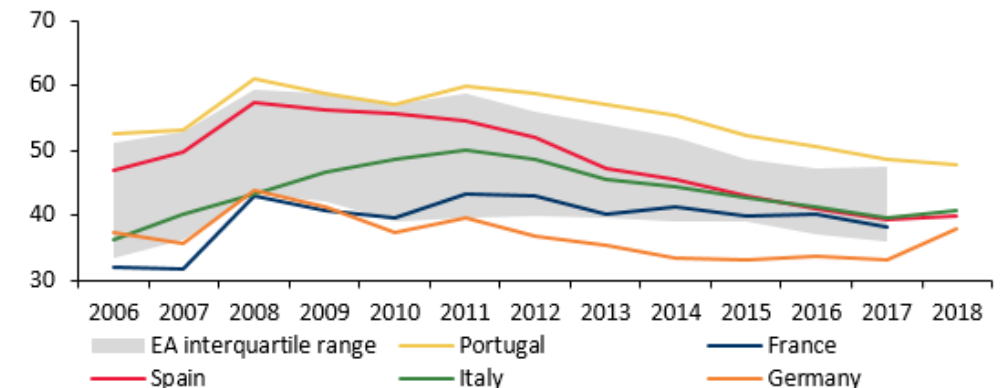
Note: Leverage defined as the quotient of financial debt to the sum of equity and financial debt.
Source: Eurostat (Banco de Portugal calculations).

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Agenda

1. **Identifying firms vulnerability and excess debt**

    a)   **Data**

    b)   **Financial indicators**

    c)   **Individual financial statement items' estimation**

2. **Projecting the financial vulnerability indicator and excess debt in alternative macroeconomic scenarios**

    a)   **Baseline scenario**

    b)   **2011-2013 crisis scenario**

Data sources	Individual Central Balance sheet data (IES)
	Central credit register
	National accounts
Population	Private non-financial corporations
Timespan	2006-2017 *(Last year available for IES)*

1. Financial indicators

Vulnerability

➢ Financial debt of firm *i* is considered ***vulnerable*** in year *t* (***Financial vulnerability***$_{it}$ = **1**) if:

$$ICR_{it} > 0.5 \; or \; EBITDA_{it} < 0 \quad \text{where} \quad \textit{Interest coverage ratio } (ICR)_{it} = \frac{Interest\ paid_{it}}{EBITDA_{it}}$$

Excess debt

➢ *NFC's unsustainable debt measured*, at firm level, by the debt in excess of an implied threshold:

$$\textit{Excess debt}_{it} = \max \{ \textit{Observed Financial debt}_{it} - \overline{\textit{Financial debt}_{it}} \; ; \; 0\}$$

$$\overline{Financial\ debt_{it}} = \frac{Interest\ paid_{it}}{EBITDA_{it}} * \frac{1}{Implicit\ interest\ rate_{it}} * EBITDA_{it}$$

= 0.5

= taken from NFCs balance sheet and P&L

= average of the previous three years

⇨ If a NFC has negative EBITDA, all its financial debt is considered as excess debt.

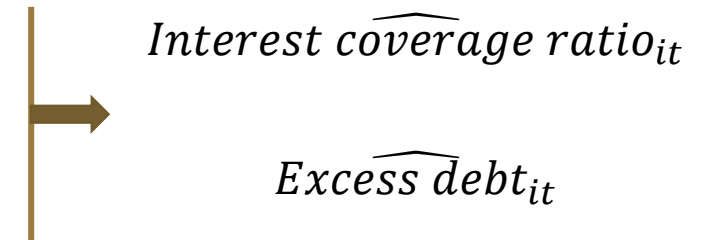## 1. Individual financial statement items' estimation

Methodology: DeSoccio & Michaelangeli (2017)

For each firm *i* in year *t*, the estimate of each financial statement item corresponds to the **sum of the estimated variation** and **the previous year observed value** (*t-1*):

$$\widehat{EBITDA}_{it} = EBITDA_{i(t-1)} + \boldsymbol{\Delta\ \widehat{EBITDA}_{it}}$$

$$\widehat{Interest\ Paid}_{it} = Interest\ Paid_{i\ (t-1)} + \boldsymbol{\Delta\ \widehat{Interest\ Paid}_{it}}$$

$$\widehat{Financial\ debt}_{it} = Financial\ debt_{i\ (t-1)} + \boldsymbol{\Delta\ \widehat{Financial\ debt}_{it}}$$

$$Interest\ co\widehat{vera}ge\ ratio_{it}$$

$$Exce\widehat{ss\ de}bt_{it}$$

1. Individual financial statement items' estimation | Econometric approach

| Financial statement variables	Sub-sample	Explanatory variables				Other control variables
$\Delta \widehat{EBITDA}$	e.g. Size, Age, NACE	Y-o-y Gross value added	Y-o-y Compensation of employees			e.g. Exporting activity
$\Delta \widehat{\text{Interest paid}}$	e.g. Size, Age, NACE	Y-o-y NFCs financial debt	Δ Banks' new loans interest rate	Y-o-y NFCs financial debt ∗ Dummy (vulnerable at t−1)	Δ Banks' new loans interest rate * Dummy (vulnerable at t-1)	e.g. Exporting activity
$\Delta \widehat{\text{Financial debt}}$	e.g. Size, Age, NACE	Y-o-y NFCs financial debt	Δ Banks' new loans interest rate	Dummy (vulnerable at t−1)		e.g. Exporting activity

On the estimation procedure:

✓ The **decomposition by firm size** (with no additional controls) was the best model for the estimation of the three financial statement variables.

As firm size increases, the relative (in-sample) impact of changes in EBITDA decreases. The relative impact of Interest paid does not present such a well defined pattern.
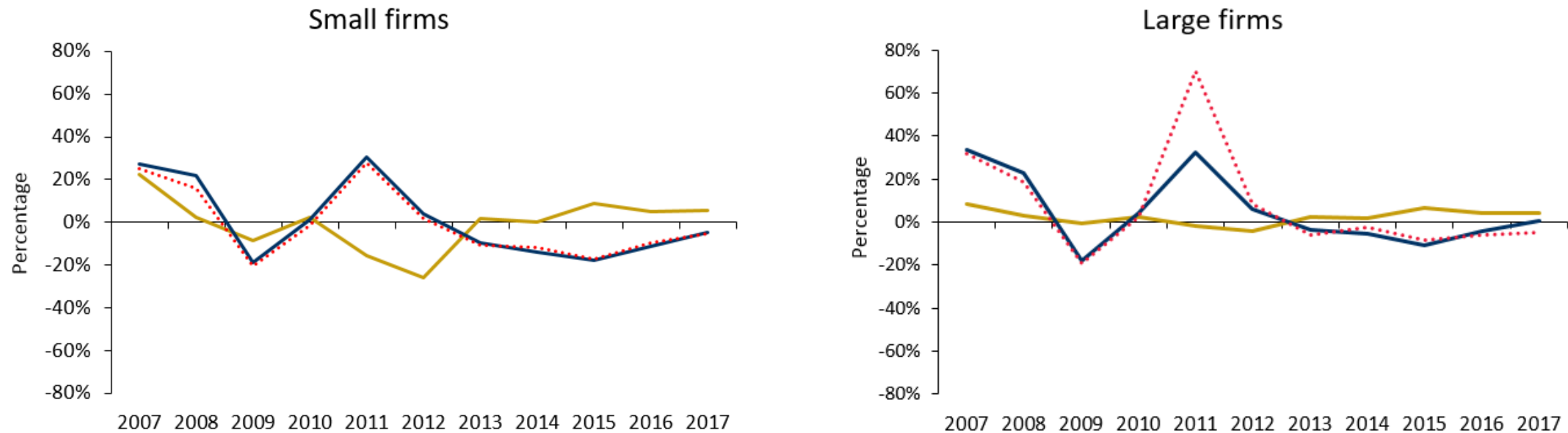
Note: Each data point in the graph considers the ratio between each year's estimate and the previous year variable average.

——— Changes in EBITDA@t /EBITDA@t-1

——— Changes in Interest paid, non-vulnerable firms@t /Interest paid, non-vulnerable firms@t-1

········· Changes in Interest paid, vulnerable firms@t /Interest paid, vulnerable firms@t-1

1. Individual financial statement items' estimation | Vulnerability projection

On average, **the one year-ahead** estimations correctly predict 83% of financial debt allocation between vulnerable and non-vulnerable firms.

Nevertheless, transitions between different vulnerability states are less well identified. **This is specially relevant for firms exiting vulnerability**. There is strong past dependence which limits the identification of abrupt shocks.

Number of firms

Observed \ Estimated	Non-vulnerable	Vulnerable
Non-vulnerable	81%	19%
Vulnerable	35%	65%
Accuracy	75%	

Financial debt

Observed \ Estimated	Non-vulnerable	Vulnerable
Non-vulnerable	86%	14%
Vulnerable	22%	78%
Accuracy	83%	

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2. Indicators' projection | Two scenarios

We have considered **two alternative** macroeconomic scenarios.

➢ *The Baseline Scenario*: based on BdP's March 2019 Economic Bulletin macroeconomic projections;

Variable	y-o-y GVA*	Change in Interest rates
2018	3.3%	-0.1%
2019	2.6%	-0.1%
2020	2.8%	-0.2%
2021	2.9%	0.0%

Note: GVA was proxied by the nominal GDP y-o-y rate.

➢ *The 2011-2013 Scenario*: considers a variation in macroeconomic variables similar to the one observed during the economic and financial crisis.

Variable	y-o-y GVA	Change in Interest rates
2018	3.3%	-0.1%
2019	-2.6%	1.5%
2020	-4.5%	0.0%
2021	1.6%	-0.6%

Vulnerable financial debt is expected to **stabilize in the projection horizon**.

The decrease in the proportion of vulnerable financial debt is expected to be more significant for small and medium size firms. The evolution for micro and large firms is expected to be more stable.
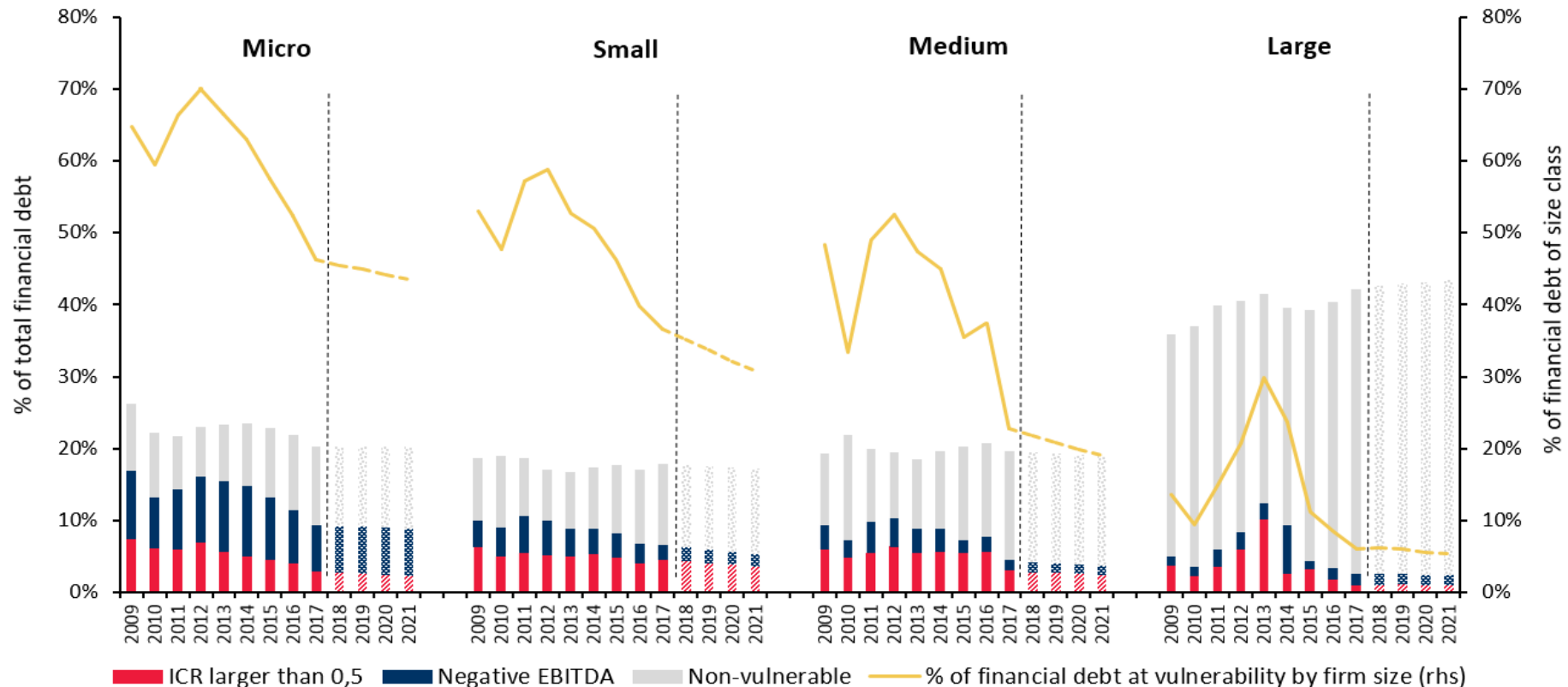
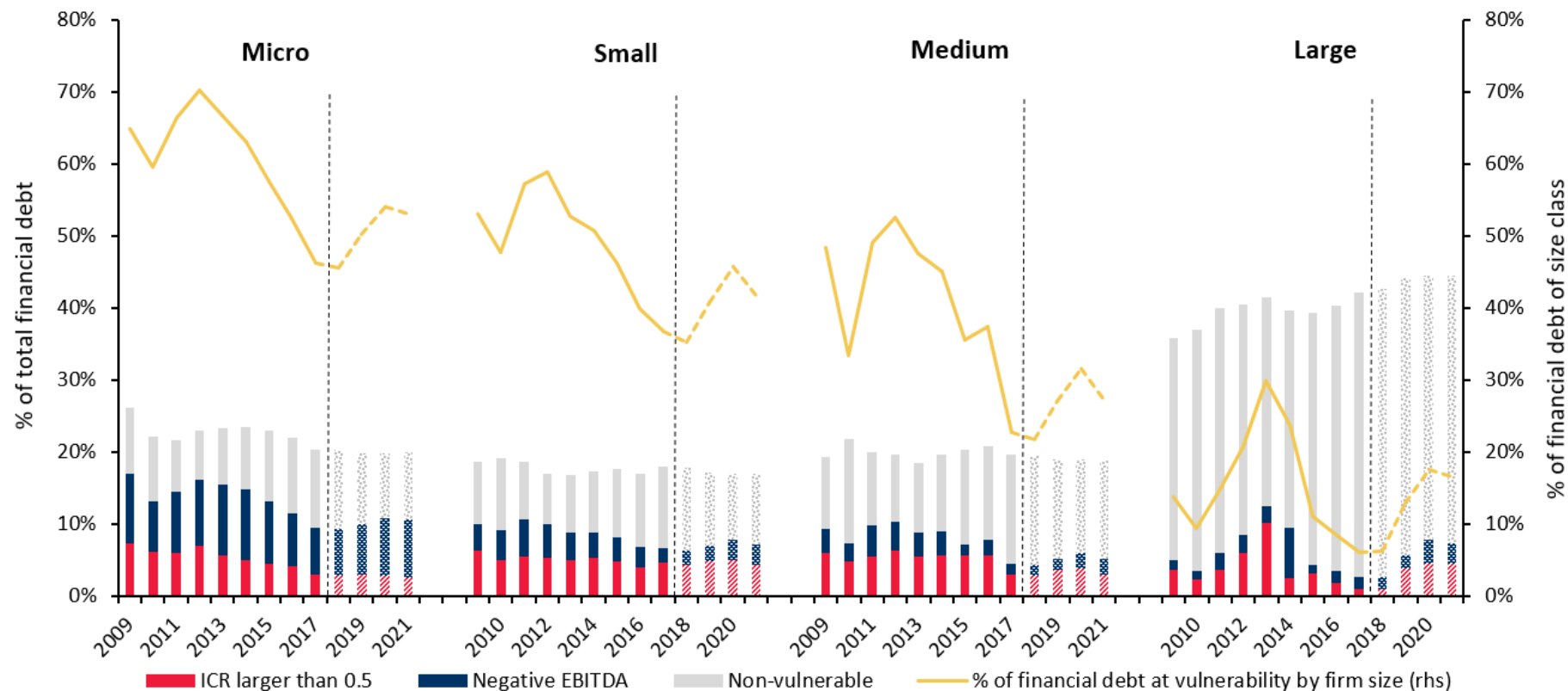*Vulnerable financial debt | By firm size*

The levels (and proportions) projected for both firms' vulnerability indicators **remain below those observed during the previous crisis**.

The proportion of vulnerable financial debt for large firms would increase more significantly than that of micro, small and medium size firms in the adverse scenario.

Vulnerable financial debt | By firm size

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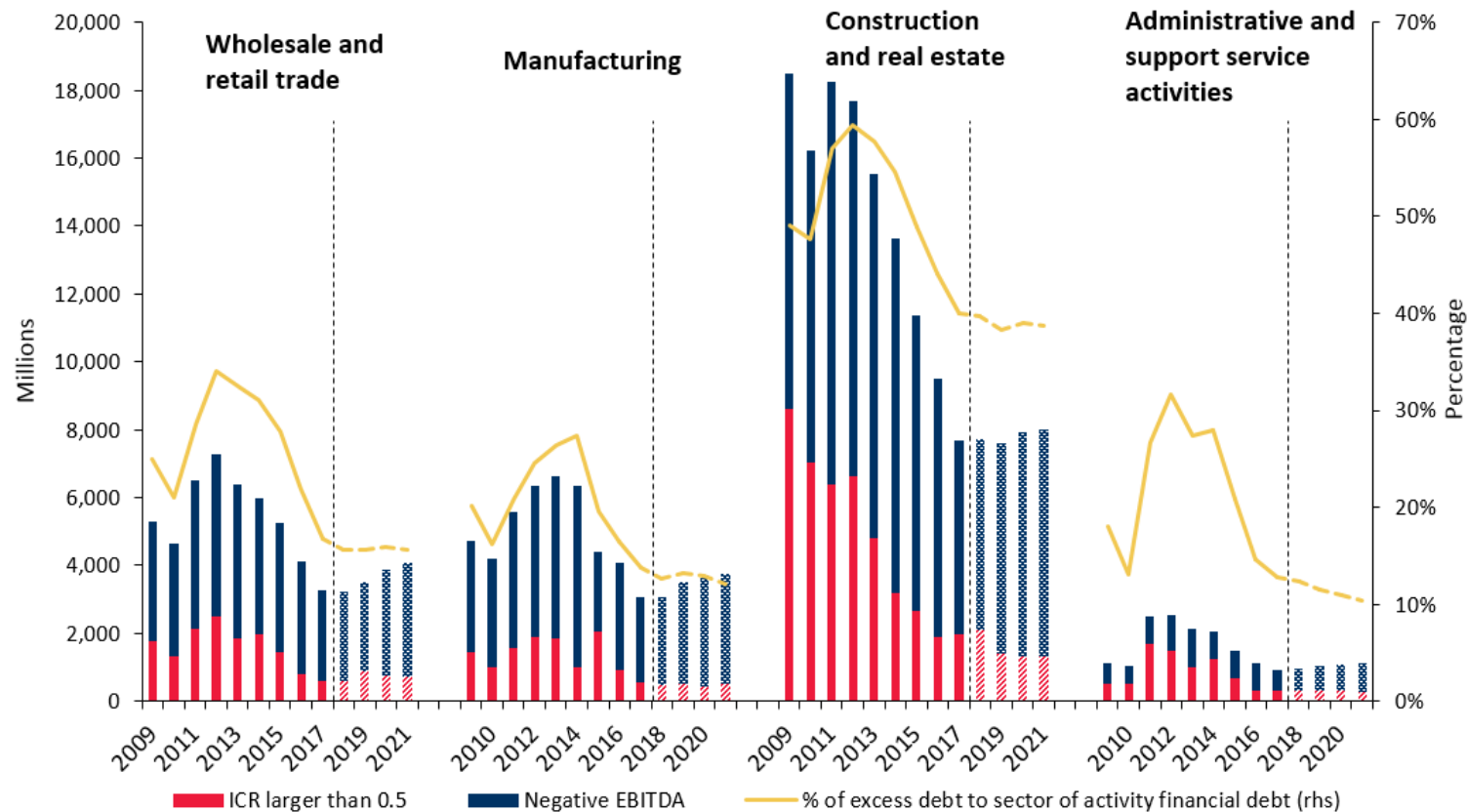
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2. The Baseline Scenario | Excess debt by NFCs' sector of activity

The projections suggest the **stabilization of the proportion of excess debt held by NFCs from 2019 to 2021**.

The increase in nominal excess debt is common to most sectors of activity, although the proportion of excess financial debt in the sector's total debt is expected to remain constant or decrease marginally.
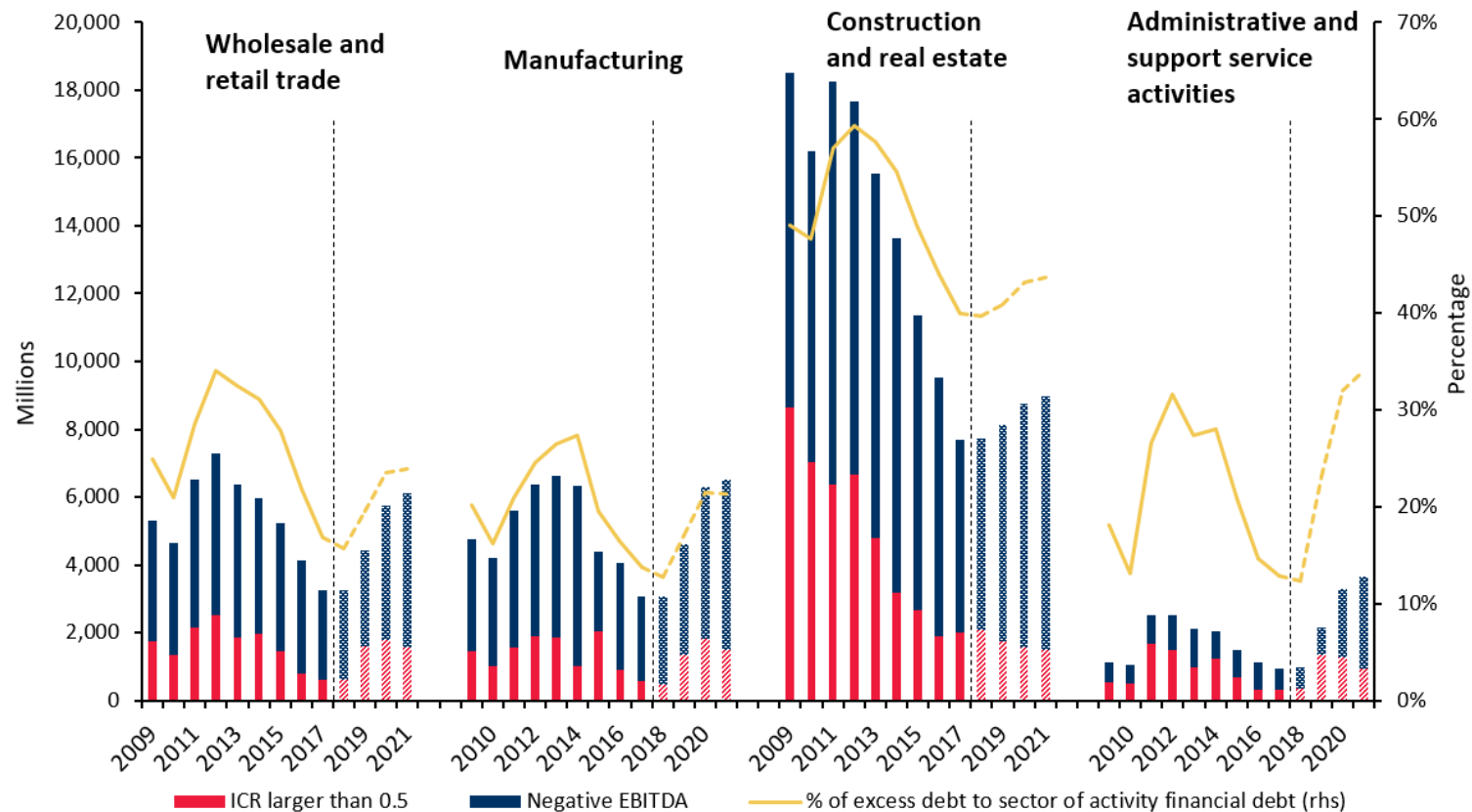
Excess debt | By sector of activity

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The **adverse scenario has a larger impact on** *Manufacturing, Wholesale and retail trade* and *Administrative and support service activities*.

Excess debt (measured by nominal financial debt or its proportion on total debt) in the *Administrative and support service activities sector* would, in the adverse scenario, **surmount that observed during the crisis**.

Excess debt | By sector of activity

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Main conclusions

➢ Overall, the resilience of Portuguese NFCs appears to have increased. However, results indicate that debt levels are still excessive thus pointing to the need for further deleveraging;

➢ Under the baseline scenario **NFCs' financial vulnerability and excess debt are expected to stabilize**;

➢ **A scenario replicating the 2011-2013 crisis is expected to have a smaller impact when compared to the impact observed during the last crisis**, because firms are now in a better situation than in the beginning of the crisis. Large firms would be the most affected.

➢ *Manufacturing*, *Wholesale and retail trade* and *Administrative and support sectors* may face relevant increases in excessive debt in an adverse scenario.

Next steps

➢ Reconsider the model evaluation to achieve more economic significance and better fit in the transition matrices;

➢ Evaluate different ICR thresholds by sector of activity;

➢ Explicitly consider NFCs' resilience if in a state of vulnerability;

➢ Evaluate how to consider firms' entry in and exit from the financial debt market.