



**DETERMINANTS OF CAPITAL STRUCTURE: IMPACT OF THE NET  
FINANCING EXPENSES REGIME IN PORTUGAL**

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# DETERMINANTES DA ESTRUTURA DE CAPITAL: O IMPACTO DO REGIME DOS GASTOS DE FINANCIAMENTO LÍQUIDOS

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## **Resumo**

Em Portugal, desde 2013, o Código do IRC prevê uma limitação quantitativa aos gastos de financiamento líquidos que poderão ser deduzidos na base tributável, especificamente, até ao maior entre €1 M e 30% do EBTIDA ajustado. No período em análise, este regime impediu a dedução de gastos de financiamento no montante de €1.268,7 M por ano.

O objeto desta dissertação corresponde à avaliação se, e em que medida, o regime dos gastos de financiamento líquidos promoveu uma alteração na estrutura de capital das empresas portuguesas, especificamente o aumento do financiamento por capital próprio ao invés de passivo.

Mediante uma regressão “difference-in-differences”, concluiu-se que, após a introdução do regime dos gastos de financiamento líquidos, as empresas impactadas pelo regime (“grupo de tratamento”) reduziram o seu endividamento financeiro e endividamento total, respetivamente, em mais 4,4 e 5,9 pontos percentuais do que as empresas não impactadas (“grupo de controlo”). Em termos de magnitude, estes valores correspondem, respetivamente, a 8,6% e 8,2% do endividamento financeiro e endividamento total do grupo de tratamento anteriormente ao regime.

Adicionalmente, o grupo de tratamento reduziu com sucessiva maior intensidade o seu endividamento, padrão, hipoteticamente, causado por constrangimentos iniciais à adaptação da estrutura de capital ou pela possibilidade de reporte dos gastos de financiamento excessivos durante 5 anos.

**Palavras-chave:** Estrutura de capital; Endividamento; Gastos de Financiamento Líquidos; Imposto sobre o Rendimento das Pessoas Coletivas (IRC)

# DETERMINANTS OF CAPITAL STRUCTURE: IMPACT OF THE NET FINANCING EXPENSES REGIME IN PORTUGAL

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## **Abstract**

In Portugal, from 2013 onwards, a quantitative limitation applies to the amount of net financing expenses that can be deducted on the tax basis of the Corporate Income Tax, specifically, the higher between €1 M and 30% of an adjusted EBITDA. During the period in analysis, this regime precluded the deduction of financing expenses of €1,268.7 M per year.

The purpose of this dissertation is to assess if, and to which extent, the net financing expenses regime promoted a change on the capital structure of Portuguese companies, notably an increase of equity financing in lieu of debt financing.

Under a difference-in-differences regression, it was concluded that, upon enactment of the net financing expenses regime, the entities impacted by the regime (“treatment group”) decreased its financial leverage and total leverage, respectively, in 4.4 and 5.9 percentage points more than the entities not impacted (“control group”). In terms of magnitude, these figures correspond, respectively, to 8.6% and 8.2% of the average financial leverage and total leverage of the treatment group prior to the regime.

Moreover, the treatment group reduced its leverage with successive more intensity, pattern, hypothetically, caused by initial constraints to adjust the capital structure or by the possibility to carryforward excessive financing expenses during 5 years.

**Keywords:** Capital structure; Leverage; Net Financing Expenses; Interest Limitation Rule; Interest Barrier Rules; Corporate Income Tax (CIT).

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# INDEX

1. Introduction .....	7
2. Background .....	9
2.1. Treatment of debt and equity on the Portuguese tax law .....	9
2.2. Features of the net financing expenses regime .....	10
3. Literature review .....	14
3.1. Capital structure determinants: trade-off and pecking order theories .....	14
3.2. Taxes and capital structure .....	15
3.3. Tax policy instruments and capital structure: allowance for corporate equity and net financing expenses regime .....	16
4. Hypotheses development.....	17
5. Contribution .....	19
6. Methodology .....	20
6.1. Regression .....	20
6.2. Variables of the regression .....	21
6.3. Variables summary .....	25
6.4. Sample .....	26
7. Empirical analysis and results .....	28
7.1. Descriptive statistics.....	28
7.2. Hypothesis A – interpretation of the regression .....	32
7.3. Hypothesis B – interpretation of the regression .....	36
8. Robustness and sanity checks.....	40
8.1. Winsorizing .....	40
8.2. Hausman test .....	40
8.3. Common trend assumption evaluation .....	40
8.4. Sanity check of the conclusions on a narrowed treatment period .....	43
9. Conclusion.....	44
10. Limitations .....	46
11. References .....	48
11.1. Academic articles, books and working papers .....	48
11.2. Reports and statistics .....	51

## LIST OF TABLES

Table 1 – Rules of limitation of interest deduction on the tax basis .....	9
Table 2 – Evolution of the parameters of the net financing expenses regime .....	12
Table 3 – Non-deductible net financing expenses and recovery of excesses (2013-2017) .....	12
Table 4 – Variables of the regression .....	26
Table 5 – Sample characteristics – pre-treatment figures (2010-2012) – non-winsorized data .....	28
Table 6 – Adjustment of equity – share capital increases by the treatment group (2013-2017) .....	30
Table 7 – Regression parameters – Hypothesis A .....	32
Table 8 – Regression parameters – Hypothesis B .....	36
Table 9 – Hausman test results .....	40

## LIST OF FIGURES

Figure 1 – Milestones of the net financing expenses regime .....	11
Figure 2 – International benchmarking of the net financing expenses regime parameters .....	13
Figure 3 – Evolution of the corporate tax rates in Portugal (2010-2017) .....	25
Figure 4 – Evolution of FINANCIAL LEVERAGE (2010-2017) .....	29
Figure 5 – Evolution of TOTAL LEVERAGE (2010-2017) .....	29
Figure 6 – Adjustment of liabilities of the treatment group on the treatment period .....	30
Figure 7 – Industries segmentation on the sample (left) and on the treatment group (right) .....	31
Figure 8 – Common trend evaluation, under a placebo approach - FINANCIAL LEVERAGE .....	41
Figure 9 – Common trend evaluation, under a placebo approach - TOTAL LEVERAGE .....	42

## LIST OF ABBREVIATIONS

<b>Abbreviations</b>	<b>Designation</b>
EBITDA	Earnings before interest, tax, depreciation and amortization
EU	European Union
M	Million
OECD	Organization for Economic Co-operation and Development

# 1. INTRODUCTION

The preferential tax treatment of debt in comparison to equity has been on the spotlight. *The Economist* named it “The Great Distortion” on its cover page headline (The Economist, 2015) and decision-makers express unambiguous views on the subject: President Barack Obama said that «companies are taxed heavily for making investments with equity, yet the tax code actually pays companies to invest using leverage» (White House Press Releases Archive, 2011), while for the European Commission the debt tax bias «can contribute to an excessive accumulation of debts, with possible negative spill-over effects for the EU as a whole, should some countries face high waves of insolvency» (European Commission, 2021).

Within this context, in Portugal, the 2013 State Budget Proposal invokes the need to mitigate the debt tax bias and sets the so-called net financing expenses regime (Ministério das Finanças, 2012), a quantitative limitation on the amount of net financing expenses that can be deducted on the tax basis of the Corporate Income Tax, specifically the higher between €1 M and 30% of an adjusted EBITDA. During the period in analysis (2013-2017), on average, the net financing expenses regime precluded the deduction of financing expenses of €1,268.7 M per year.

The purpose of the dissertation is to assess if, and to which extent, the net financing expenses regime promoted a change on the capital structure of Portuguese companies, notably an increase of equity financing in lieu of debt financing.

From a doctrine perspective, such reduction of leverage can be grounded on the principles of the trade-off theory (Kraus and Litzenberger, 1973; Scott, 1976), specifically the lack of effectiveness of interest expenses in result of the net financing expenses regime reduces the marginal tax benefit of debt and causes a new equilibrium that comports lower levels of debt. Moreover, a path of deleverage has been observed in result of the German and US net financing expenses regimes (Buslei and Simmler, 2012; Carrizosa et al., 2020) and upon the decrease of tax rates, circumstance that also reduces the marginal tax benefit of debt (Huizinga et al., 2006).

In perspective, this dissertation is organized as follows: Section 1 starts with an overview of the tax treatment of debt and equity in Portugal, followed by a systematization of the features of the net financing expenses regime (Section 2) and by a literature review on the determinants of capital structure (Section 3). Sections 4 to 6 address the hypotheses and the methodology pursued to test them, namely a difference-in-differences regression.

Section 7 discusses the empirical analysis and results achieved, while Section 8 explains the robustness tests made to the model, notably on the common trend assumption.

Lastly, general conclusions and the limitations identified on the analysis, including future avenues of research, are presented, respectively, on Sections 9 and 10.

The results of the econometric model evidence that, upon the enactment of the regime, the treatment group decreased its financial leverage and total leverage more than the control group. This outcome is consistent with the hypothesis above that the net financing expenses regime promoted a change on the capital structure of Portuguese companies, notably an increase of equity financing in lieu of debt financing.

Moreover, the evolution of the difference-in-differences coefficients suggests that during the period in analysis the treatment group decreased its leverage in relation to the control group with successive more intensity. Hypothetically, this may be caused by initial constraints to adjust the capital structure, by the unanticipated need of endogenous funds to refund debt with equity or due to the possibility to carryforward excessive net financing expenses during 5 years.

Notwithstanding the above, the robustness tests to the model did not corroborate to the full extent the common trend assumption, particularly on the total leverage regression, as widely discussed along this dissertation.

It is thus concluded that the hypotheses raised are consistent with the difference-in-differences coefficients assessed (*i.e.*, these coefficients are negative), but it cannot be, necessarily, inferred that such outcome has a causal nexus with the net financing expenses regime. From my perspective, this assertion is a novel contribution for the comprehension of the effects of the regime in Portugal.

## 2. BACKGROUND

### 2.1. Treatment of debt and equity on the Portuguese tax law

The Corporate Income Tax applies in Portugal at the rate of 21%. This rate may be increased up to 31.5%, considering the effect of two surcharges:

- A State surcharge, applied on the taxable profit over €1.5 M, at the rates of 3%, 5% or 9%.
- A Municipal surcharge, to be set by each Municipality, up to a maximum rate of 1.5%.

The basis over which these taxes apply are constructed according to a wide concept of income, encompassing not only the profit of the year but also other forms of worth variation.

The financing of a company with debt or equity is treated differently, as the reward of debt (interest) generates a deductible expense on the tax basis, while no deduction is, generally, awarded to equity financing – the debt tax bias. However, from the perspective of the entity that concedes equity or debt financing, dividends, contrary to interest, are generally excluded from taxation under the Portuguese participation exemption regime.

In Portugal, this preferential treatment of debt is attenuated by factors that prevent, partially or totally, the deduction of interest on the tax basis of the debtor, including the net financing expenses regime, as listed in Table 1.

Table 1 – Rules of limitation of interest deduction on the tax basis

Methodology	Criterion to restrict interest deduction	Amount <sup>1</sup>
Qualitative assessment of the purpose of the debt	Debt not applied to obtain income subject to tax, <i>e.g.</i> , to acquire shares, since dividends and capital gains are commonly excluded from taxation – this technical view is not unanimous and has been disputed on Court cases	Not available
	Debt applied by holding companies to acquire shares eligible for the capital gain exemption under the holding company regime – rule revoked as of 2014	€446.6 M (2013)
Interest rate cap	Transfer pricing regime – interest rate on related party debt exceeding the arm's length rate	Not available
	Interest rate above Euribor 12-month plus a stated spread (applied in very limited situations to shareholder loans)	€7.3 M (2019)
Debt-to-equity cap	Thin capitalization regime – debt from related parties exceeding a 2:1 debt-to-equity ratio (applied only to non-EU lenders) – rule revoked as of 2013	€4 M (2012)
Interest-to-EBITDA cap	Net financing expenses restricted by the higher between €1 M and 30% of the adjusted EBITDA	€1,158.7 M (2019)
Anti-hybrid mismatches	Double deduction of an interest expense or deduction of an interest expense without taxation on the counterpart ( <i>e.g.</i> , financial hybrid instruments)	Not available

<sup>1</sup> The amounts refer to the last year available and are provided in Portuguese Tax Authorities statistics.

Another significant difference between equity and debt in the Portuguese law arises in terms of stamp duty, where the first is not subject to this tax, while the second is subject on the principal of the loan (at rates up to 0.6%) and, conditionally, on interest and guarantees.

Finally, Portugal foresees a notional interest regime applied on qualifying share capital increases to incentive equity financing. This benefit had, so far, a limited impact, reaching €25.7 M in 2019<sup>2</sup>. This is possibly caused by restrictive features of its rules, particularly for groups with excessive net financing expenses.

## **2.2. Features of the net financing expenses regime**

The net financing expenses regime, also known as interest barrier rule or earnings stripping rule, was set by the 2013 State Budget.

According to the Government Report to such Budget Proposal, the creation of the net financing expenses regime aimed to reduce the excessive indebtedness of the economy and to mitigate a historic propension of the tax system to treat more favorably debt financing (Ministério das Finanças, 2012).

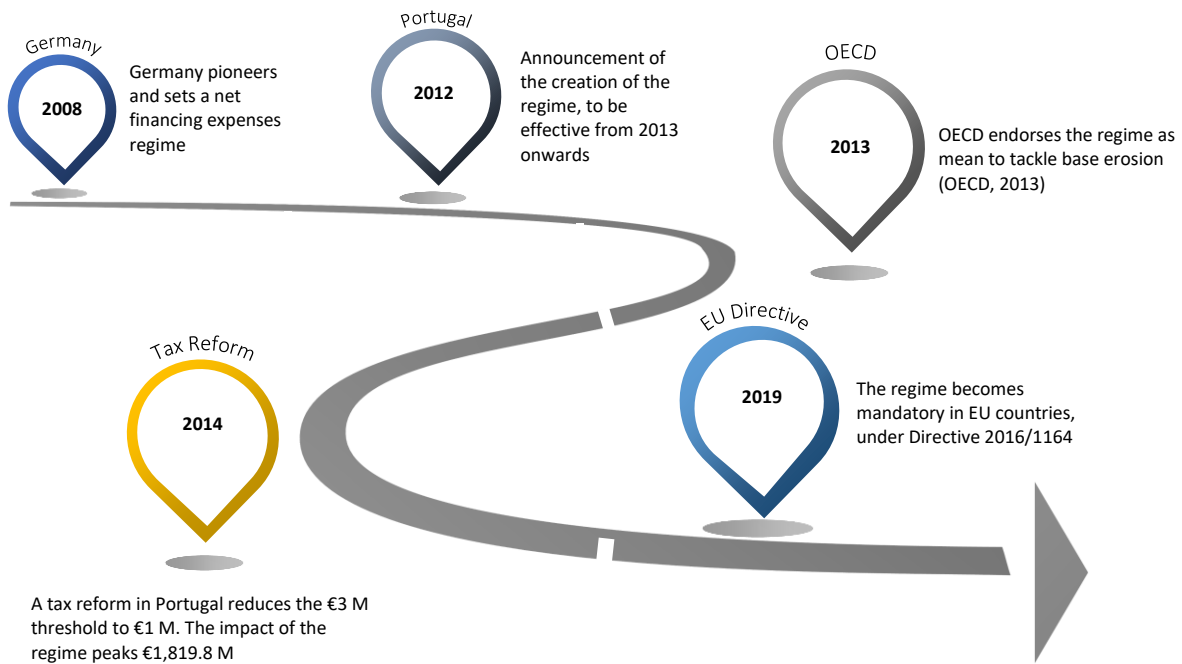
In terms of comparative law, the Portuguese net financing expenses regime follows closely the architecture of the 2008 German regime.

Figure 1 summarizes the milestones of implementation of the net financing expenses under the international trends.

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<sup>2</sup> Information from Portuguese Tax Authorities statistics.

Figure 1 – Milestones of the net financing expenses regime



The net financing expenses regime is a mechanism of quantitative limitation on the amount of net financing expenses that can be deducted on the tax basis of the Corporate Income Tax, specifically, up to the higher of two thresholds:

- €1 M (“Absolute Threshold”).
- 30% of an adjusted EBITDA, computed as the taxable profit or tax loss subject and not exempt from tax, added by the net financing expenses and depreciation and amortization that are tax deductible (“EBITDA Threshold”).

The concept of financing expenses includes a broad range of elements beyond interest, as foreign exchange losses on loans, guarantee fees and other fees related to the debt, among others. The net financing expenses correspond to the financing expenses less financing revenues.

Table 2 summarizes the evolution of the parameters of the net financing expenses regime since its creation. Due to an adjustment period, less restrictive thresholds were in force between 2013 and 2016.

Table 2 – Evolution of the parameters of the net financing expenses regime

Tax year	Absolute Threshold	EBITDA Threshold percentage	Concept of EBITDA
2013	€3 M	70%	Follows accounting
2014	€1 M	60%	Follows accounting, with some tax adjustments
2015	Idem	50%	Idem
2016	Idem	40%	Idem
2017	Idem	30%	Idem
2018	Idem	Idem	Idem
2019 onwards	Idem	Idem	Follows tax rules

As default rule, the computation of the net financing expenses is carried out on an entity-by-entity basis, but when there is a tax group in place it may be applied on aggregated terms for the perimeter, within certain specifications.

The excessive net financing expenses, and also the unused capacity of the EBITDA Threshold, can be carried forward during the subsequent 5 years, period after which those credits are forfeited.

The net financing expenses regime is not applicable to entities subject to supervision of Banco de Portugal or of the Portuguese Insurance and Pension Funds Supervisory Authority, and also to branches in Portugal of credit institutions, other financial institutions and insurance companies.

Table 3 presents the amount of financing expenses whose deduction was precluded by the regime and the excessive financing expenses recovered during the carryforward period.

Table 3 – Non-deductible net financing expenses and recovery of excesses (2013-2017)

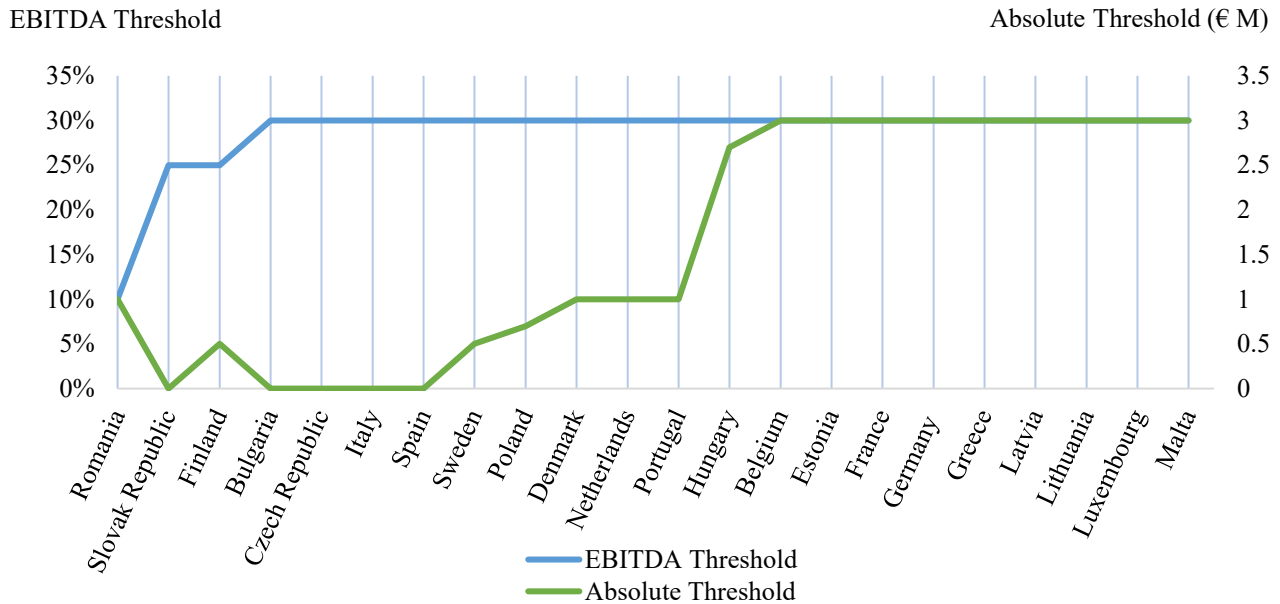
Year	Non-deductible net financing expenses (€M)	Recovery of excessive net financing expenses carried forward (€M)
2013	825.6	Not applicable
2014	1,819.8	56.7
2015	1,237.9	132.1
2016	1,264.0	28.2
2017	1,196.3	52.8

Source: Statistics by Portuguese Tax Authorities. The figures refer to the individual tax returns.

The regime had a notorious impact on the financing expenses treated as non-deductible, which averaged €1,268.7 M per year during the period in analysis (2013-2017). The excessive net financing expenses recovered during the carryforward period averaged €67.5 M per year, evidencing a low rate of recovery.

Finally, Figure 2 presents a benchmark of the parameters of the net financing expenses regime across the EU countries included in the OECD Dataset Interest Limitation Rules.

Figure 2 – International benchmarking of the net financing expenses regime parameters<sup>3</sup>



Source: OECD Dataset Interest Limitation Rules.

The Portuguese EBITDA Threshold aligns with the less restrictive positions set with the EU countries (30%). Conversely, Portugal is positioned closely to the median of the observations in relation to the Absolute Threshold, being noted that 10 countries set less restrictive marks.

In an overall conclusion, the net financing expenses regime shifted the tax policy paradigm concerning debt, by imposing a quantitative cap to the tax effectiveness of interest. This is far ahead of the mere correction of the terms of related party financing that deviates from market standards, as in the transfer pricing or thin capitalization regimes.

As a result, net financing expenses may enforce a “tax rentability” normalized by interest expenses that are supposedly excessive, even if such expenses result from arm’s length debt basis and interest rates.

<sup>3</sup> When applicable, amounts in foreign currency were converted at the exchange rates dated 30 May 2021.

### 3. LITERATURE REVIEW

#### 3.1. Capital structure determinants: trade-off and pecking order theories

The paper “The Cost of Capital, Corporation Finance and the Theory of Investment” by Modigliani and Miller (1958) is considered the landmark event in the modern theory of finance (Stiglitz, 1988). Since then, two theories on the factors of the capital structure had particular emphasis: the trade-off theory and the pecking order theory.

Under the trade-off theory, first formulated by Kraus and Litzenberger (1973) and Scott (1976), the use of debt in the construction of the capital structure is determined by a trade-off between the tax reduction induced by debt (*i.e.*, the deduction of interest on the tax basis) and the financial cost of the enhanced probability of bankruptcy associated with high debt (Tirole, 2006). Therefore, all the rest equal, companies are financed through debt to the point where the marginal benefit of an additional unit of debt equals its marginal cost.

In turn, Myers and Majluf (1984) formulate the pecking order theory, under which the source of financing is set by a hierarchy of preferences, where, respectively, internal recourses are preferred over debt and debt over equity, following the signaling effect that each source of financing entails. The pecking order theory does not prescribe an optimal capital structure (Baker and Wurgler, 2002) but if external funds are needed, the preference above is followed due to the asymmetry of information and the perception that a company is overvalued when opts to issue new shares. Hence, in the pecking order theory the level of debt is determined by the firm's net cash flows and investments outlays (Fama and French, 2002).

Fama and French (2002) tested both theories, concluding that they share many predictions that are confirmed. However, it was also concluded that none of the theories fully explain the capital structure and specific short-falls are pointed out, notably on the pecking order theory, concerning the large equity issues of small low-leverage growth firms.

In liaison with the above theories or with different views, other determinants of capital structure are noted by the doctrine:

- Agency costs – debt is used as a mean to diminish management discretion on the use of cash flow and the effects of the principal-agency dialectic (Jensen, 1986).
- Interest rate – all the rest equal, the demand for debt is lower for higher interest rates, due to

the increased cost associated.

- Profitability – the trade-off theory predicts that profitability, and its associated effects on agency costs and taxes, pushes to a new equilibrium entailing higher levels of debt, while the pecking order theory foresees the opposite, as higher profitability enhance earnings, source of financing ranked with priority in relation to external funding (Fama and French, 2002).
- Size – larger companies have higher leverage ratios in reason of a more diversified activity / lower likelihood of bankruptcy and higher capacity to issue securities (Titman and Wessels, 1988).
- Tangibility – tangible assets are usually employed as collateral, hence higher levels of tangibility enhance the capacity to raised debt (Frank and Goyal, 2003).

### **3.2. Taxes and capital structure**

Debt financing, taxwise, is generally treated more favorable than equity financing, as the reward of debt (interest) generates a deduction on the computation of the tax basis for Corporate Income Tax purposes, while no deduction is granted to equity financing – the debt tax bias. Hence, the higher the tax advantages of debt, the higher the optimal debt-equity ratio (Tirole, 2006).

Huizinga et al. (2006), considering data from 32 European countries, conclude that there is a positive correlation between the tax rate and leverage, specifically an increase of 10% on the rate increases leverage by 1.84%. Graham (2000) stated, however, that debt is not pursued up to the level that maximizes the tax reduction, possibly due to costs of incremental leverage or to a conservative debt policy.

In turn, leverage is found to be lower when companies have non-debt tax shields, given the substitutive effect of such credits, in relation to interest, on the reduction of the tax payable (DeAngelo and Masulis, 1980).

Not all tax factors incentive debt instead of equity financing. For example, the non-taxation of dividends (the so-called “participation exemption”) contribute to compensate the absence of deductibility of dividends as tax expense (Miller, 1977). Myers (2001) considers also that taxes as a determinant of capital structure are overestimated, as firms are not always profitable and investors cannot seize the future interest tax shields.

As general outcome, in the view of Tirole (2006), the effects of taxes on capital structure are conceptually straightforward, although the challenge is measuring their magnitude.

### **3.3. Tax policy instruments and capital structure: allowance for corporate equity and net financing expenses regime**

As reference, two tax policy instruments are, generally, noted as means to attenuate the debt tax bias: (i) the allowance for corporate equity and (ii) the net financing expenses regime.

The allowance for corporate equity provides a tax incentive to equity financing through a deemed tax interest expense, computed as a percentage of qualifying share capital increases. Belgium implemented one of the most notorious notional interest expenses regimes, estimated to cause a reduction of the leverage ratio between 2% and 7% (Princen, 2012).

In turn, the net financing expenses regime applies a quantitative limitation to the amount of net financing expenses that can be deducted on the tax basis, based on an interest-to-EBITDA relation.

The studies found to characterize its effects are essentially related with the German regime introduced in 2008. It was concluded that companies affected by the regime reduced their debt ratio 4.7 percentage points more than companies that are not affected or 6 percentage points if there were no liquidity constraints (Alberternst and Sureth, 2016). The reduction was more intense on national companies and external debt, rather than on multinational companies and internal debt (Dreßler and Scheuering, 2012). Moreover, companies that had interest expenses close to the limits split their assets / debt among different legal entities (Buslei and Simmler, 2012).

In the United States, the companies affected by an analogous regime set under the Tax Cut and Jobs Act of 2017 decreased their leverage in 2.9% compared to the companies not affected (Carrizosa et al., 2020). Finally, concerning Portugal, the regime, under its initial thresholds, was estimated to cause a reduction of the financial debt on the affected companies was between 4.48% and 6.67% (Carvalho, 2015).

## 4. HYPOTHESES DEVELOPMENT

The present dissertation assesses the following hypotheses:

### Hypothesis A

In Portugal, from 2013 onwards, a quantitative limitation applies to the amount of net financing expenses that can be deducted on the tax basis of Corporate Income Tax, specifically the higher between €1 M and 30% of an adjusted EBITDA.

Hypothesis A proposes that the net financing expenses regime promoted a change on the capital structure of Portuguese companies, notably an increase of equity financing in lieu of debt financing.

This prediction is grounded on the principles of the trade-off theory (Kraus and Litzenberger, 1973; Scott, 1976), under which companies are financed through debt up to the point where the marginal benefit of an additional unit of debt (*i.e.*, the deduction of interest on the tax basis) equals its marginal cost (*i.e.*, enhanced bankruptcy costs). In this sense, the lack of effectiveness of interest in result of the net financing expenses regime reduces the marginal tax benefit of debt and causes a new equilibrium that comports lower levels of debt.

This expectation is reinforced by the experience of deleveraging observed in result of the German and US net financing expenses regimes (Buslei and Simmler, 2012; Carrizosa et al., 2020) and upon decrease of the tax rates, circumstance that also reduces the marginal tax benefit of debt (Huizinga et al., 2006).

### Hypothesis B

Hypothesis B proposes that, during the period in analysis, companies reacted less intensively to the net financing expenses regime in 2013 and immediate years in comparison to the subsequent years.

This prediction is consistent with the fact that the net financing expenses regime was an unanticipated tax policy measure and there was a short period of time elapsing from its announcement (on 10 October 2012, within the 2013 State Budget Proposal) and its entry into force (1 January 2013). Hypothetically, this reduced the time required to adapt the constraints from financing commitments in place or to handle the unanticipated need of endogenous funds to refund debt with equity.

This prediction is also consistent with the perception from practitioners that the possibility to

carryforward excess net financing expenses for 5 years, and the expectation to recover the excesses within this period, had a role in several cases of postponing decisions to adjust the capital structure.

In conclusion, Hypothesis A proposes that the regime promoted a change on the capital structure of Portuguese companies, notably an increase of equity financing in lieu of debt financing. In turn, Hypothesis B proposes that such change on the capital structure was less intensive in 2013 and immediate years in comparison to the subsequent years.

## 5. CONTRIBUTION

On the outset of the tenth year of the net financing expenses regime, there is a very limited number of studies available to characterize the patterns of response of Portuguese companies to the regime.

This dissertation contributes with an econometric assessment of such response and is understood to bring new knowledge, namely with complementary views of leverage measurement, on the intensity of the response over time and on the argued causality between the regime and the deleverage of the impacted companies. Also, the evidence obtained clarifies that certain beliefs consolidated among practitioners in relation to the effects of the regime are not, in fact, consistent with the data, whereas others have been corroborated.

A secondary contribution of the dissertation is the full integration of legal technical features of the regime on the interpretation of its results (*e.g.*, the Portuguese and European law and OECD policy recommendations), enhancing the discussion on the possible causes underlying the patterns observed.

Finally, this study expands the knowledge of the net financing expenses regime in Portugal on a context of special interest on this tax policy instrument. Notably, the regime became mandatory in the EU countries from 2019 onwards and the debt tax bias is on the agenda again by the first quarter of 2022, with the creation of the DEBRA (debt-equity bias reduction allowance) at an EU level (European Commission, 2021)

## 6. METHODOLOGY

This section explains the methodology adopted to test the hypotheses acknowledged, notably the econometric regression pursued.

### 6.1. Regression

The hypotheses considered are assessed under a multivariable regression, using the difference-in-differences methodology, as follows:

$$Levarege_{i,t} = \alpha + \alpha_i + \beta_1 Treat_i + \beta_2 Post_t + \beta_3 Treat_i * Post_t + Control_{i,t} + \varepsilon_{i,t}$$

The difference-in-differences methodology aims to evaluate the differential effect between a treatment and a control group before and after an event, such as a policy change, allowing to control confounding influences (Beck, 2008).

The regression was modeled with fixed effects ( $\alpha_i$ ), based on the outcome of a Hausman test, which assesses if there is correlation across errors and the regressors (Hill, 2018). This leads to the omission of  $\beta_1 Treat_i$ . Section 8.2 is referred for further details.

From a methodological perspective, it is relevant to discuss the timeframe of introduction of the net financing expenses in Portugal and the modeling decisions taken in this regard.

The regime was introduced in 2013 and a period of adaptation, with less restrictive thresholds, was in force between 2013 and 2016, as explained in Section 2.2. This means that 2017 was the first year after the termination of the adaptation period and the one in which the final – and more severe – thresholds of the regime became applicable.

Therefore, the implementation of the net financing expenses regime was not a one-off event in time, but a successive set of more intense incentives to reduce leverage, whose parameters stabilized as of 2017. These conditions impose, by default, a certain degree of constraint on the capacity to evaluate the effects of the regime compared to a hypothetical tax policy change executed one-off in time.

In this context, the model pursued adopts as treatment period the years from 2013 to 2017, this is, from the implementation of the regime until the first year after the termination of the adaptation period, inclusively. This allows to capture the effects of the regime for the whole set of companies impacted and in relation to the final – and most severe – parameters of the regime (€1 M or 30%

of the adjusted EBITDA).

A sanity check was made to this modeling option on Section 8.4, specifically to test the regression solely to the first group of companies impacted and on the first year of the regime, being concluded that the results are not structurally different between regressions.

## 6.2. Variables of the regression

It is subsequently explained the variables considered in the regression.

### LEVERAGE (dependent variable)

Leverage corresponds to the dependent variable and is formulated in two alternative ways:

- FINANCIAL LEVERAGE, expressed by the ratio  $\frac{\text{Financial debt}_{i,t}}{\text{Assets}_{i,t}}$ . The scope of liabilities considered in the numerator are those expected to bear interest, specifically the ledgers “non-current financing obtained”, “shareholders”, “current financing obtained” and “other financial liabilities”, in turn excluding items as accruals of expenses, deferrals of revenues, deferred tax liabilities, suppliers, State, among others, which are, typically, not remunerated, hence not discouraged by the regime.
- TOTAL LEVERAGE, expressed by the traditional leverage ratio ( $\frac{\text{Liabilities}_{i,t}}{\text{Assets}_{i,t}}$ ). This ratio provides an alternative reading of the effects of the net financing expenses regime on the overall equity-liabilities mix.

The response of FINANCIAL LEVERAGE to the net financing expenses regime is expected to be more intense in comparison to TOTAL LEVERAGE, due to the relative higher concentration of interest-bearing liabilities on the numerator.

### TREAT

TREAT is a dummy variable intended to capture the entities that would be subject to the net financing expenses regime as per the figures of a financial year of the pre-treatment period. Hence, this variable is set as 1 for entities bound by the regime and 0 otherwise, setting, respectively, the treatment and control groups.

The net financing expenses thresholds considered were €1 M and 30% of the EBITDA, where the latter was computed pursuant to the provisions of the regime, *e.g.*, with exclusion of gains or losses

from the equity method and of impairments of non-depreciable assets.

Entities not subject or exempt from Corporate Income Tax and entities successively in a tax loss position were considered in the control group. The reasoning underlying this criterion is that a company to be treated should not be indifferent to the outcome of the net financing expenses regime (*i.e.*, the increase of tax payable), requiring that the company is subject and not exempt to Corporate Income Tax and is not on a successive tax loss position.

The effects of this variable are not reported separately but through the variable  $Treat_i * Post_t$ , where the difference-in-differences effect is expressed.

### POST

POST is a dummy variable set as 1 if the observation refers to the treatment period, specifically financial years from 2013 to 2017, as above discussed.

In turn, the pre-treatment period refers to the financial years 2010-2012, comprising 3 years before the implementation of the net finance expenses regime. Prior financial years were not considered due to comparability limitations arising from the enactment in 2010 of a new accounting system to non-financial companies (*inter alia*, transition adjustments in relation to the 2009 accounts were reflected one-off in the equity).

Considering the respective scopes, under Hypothesis A the model is composed solely of two periods, the pre-treatment and the treatment periods, with consolidation of the information of the financial years of each period to compute the respective variables. To assess Hypothesis B, given its nature, the model considers the information on a year-by-year basis.

The effects of this variable are not reported separately but through the variable  $Treat_i * Post_t$ , where the difference-in-differences effect is expressed.

### TREAT \* POST

TREAT \* POST captures the interaction between the variables TREAT and POST. It is the so-called “difference-in-differences coefficient”, *i.e.*, the incremental pre/post difference on the dependent variable for the treatment group relatively to the pre/post difference of the dependent variable for the control group (DeHaan, 2021).

It is expected that this coefficient is negative, meaning that, upon the introduction of the net financing expenses regime and the resulting restriction on the tax effectiveness of interest, the

treatment group decreased the leverage more than the control group.

Illustratively, a coefficient of -0.1 means that the variation observed on the leverage of the treatment group, from the pre-treatment to the treatment period, is 10 percentage points lower than the variation observed in the control group.

## **CONTROL VARIABLES**

Pursuant to the literature review, the control variables selected for the model were the RETURN ON ASSETS, NON-DEBT TAX SHIELDS, INTEREST RATE and TAX RATE.

A wide range of other variables were tested (tangibility, liquidity, deferred tax shields, among others), although not further considered on the regression, due to less satisfactory levels of significance.

### RETURN ON ASSETS

As already addressed, the literature diverges on the effects of profitability on leverage. The trade-off theory predicts that profitability, and its associated effects on agency costs and taxes, pushes to a new equilibrium entailing higher levels of debt, while the pecking order theory foresees the opposite, as higher profitability enhance earnings, source of financing ranked with priority in relation to external funding (Fama and French, 2002). These authors, on their research, concluded that a negative relation is derived from the data.

Following Fama and French (2002), the profitability was measured through a return on assets  $\left(\frac{\text{Earnings before interest and taxes}_{i,t}}{\text{Assets}_{i,t}}\right)$ .

### NON-DEBT TAX SHIELDS

NON-DEBT TAX SHIELDS refer to elements, apart of interest expenses, that generate deductions on the tax basis and a consequent reduction of the tax payable. Leverage is found to be lower when companies have non-debt tax shields, given the substitutive effect of such credits, in relation to interest, on the reduction of the tax payable (DeAngelo and Masulis, 1980).

The nature of non-debt tax shields is vast and can only be indirectly estimated in the absence of specific tax and accounting data. Depreciation, through the ratio  $\frac{\text{Depreciation}_{i,t}}{\text{Assets}_{i,t}}$ , is widely adopted by the literature as a proxy (*inter alia*, DeAngelo and Masulis, 1980).

## INTEREST RATE

All the rest equal, the demand for debt is lower for higher interest rates, due to the increased cost associated.

The interest rate incurred by a company is not an information objectively presented in the financial statements. Therefore, it was assessed the implicit interest rates of each company through the ratio  $\frac{\text{Financial expenses}_{i,t}}{\text{Financial debt}_{i,t}}$ , whereas financial debt corresponds to the set of items within liabilities expected to bear interest, as above defined.

Distortions on this ratio may derive from the different timeframe of the numerator and denominator, since the financial debt is a stock variable assessed as of the last day of the financial year and the financial expenses a flow variable assessed continuously on the financial year, being particularly sensitive to changes of the debt stock during the period.

A cap on the values of the variable was considered to curb the effect of artificial high rates due to significant reductions of debt on the period. The usury interest rate set in number 1 of article 1146 of the Portuguese Civil Code (*i.e.*, 4%, plus a spread of 5%) is a benchmark for a cap, noting however that there are different legal views on the range of debts covered by this rule or also on the terms of computation of the rates.

Despite of several layers of construction, the variable INTEREST RATE is significant on all regressions at strict levels (0.003 or lower), as discussed below.

## TAX RATE

Under the trade-off theory (Kraus and Litzenberger, 1973; Scott, 1976), companies are financed through debt up to the point where the marginal benefit of an additional unit of debt (*i.e.*, tax reduction from deducting interest to the tax basis) equals its marginal cost (*i.e.*, enhanced bankruptcy costs), meaning that an increase of the tax rates, all the rest equal, increases the marginal benefit of debt and sets a new equilibrium comporting higher levels of debt.

TAX RATE is constructed as the marginal tax rate applicable to the companies on the sample, tuned according to their profile, estimated tax basis and municipality, as follows:

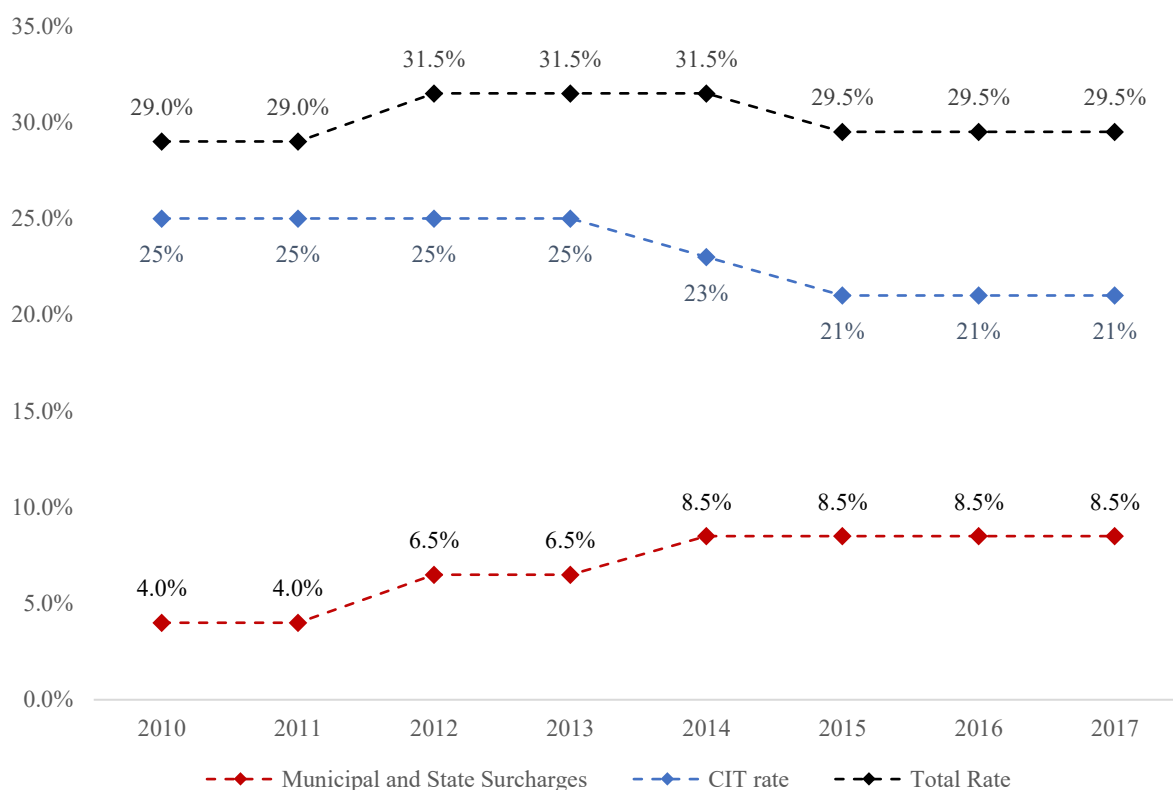
$$\text{Tax Rate}_{i,t} = \text{Corporate Income Tax Rate}_{i,t} + \text{Surcharges Rates}_{i,t}$$

This formulation is a proxy of the tax savings that result from the increase of an additional unit of

interest expenses. Under the same reasoning, this variable is set as zero if a negative tax basis is assessed.

The composition of the marginal tax rates changed during the period of analysis and, generally, companies benefited from lower tax rates, notably if not subject to State Surcharge (only applies to tax profits exceeding €1.5 M). A subset of companies with large size and subject to this Surcharge had in fact an increase of taxation during the period.

Figure 3 – Evolution of the corporate tax rates in Portugal (2010-2017)<sup>4</sup>



### 6.3. Variables summary

Table 4 summarizes the variables of the regression.

<sup>4</sup> Municipal and States Surcharges are depicted at the maximum legal rate.

Table 4 – Variables of the regression

Designation	Formula	Expected relation with the dependent variable
Financial Leverage <sub>i,t</sub> or Total Leverage <sub>i,t</sub> (dependent variables)	$\frac{\text{Financial debt}_{i,t}}{\text{Assets}_{i,t}}$ or $\frac{\text{Liabilites}_{i,t}}{\text{Assets}_{i,t}}$	Not applicable
Treat <sub>i</sub>	Dummy variable to capture entities that would be subject to the regime as per their pre-treatment period figures	Jointly reported on Treat <sub>i</sub> * Post <sub>t</sub>
Post <sub>t</sub>	Dummy variable to capture the treatment period	Jointly reported on Treat <sub>i</sub> * Post <sub>t</sub>
Treat <sub>i</sub> * Post <sub>t</sub>	Treat <sub>i</sub> * Post <sub>t</sub>	Under the proposed hypothesis, a negative sign is expected
Return on Assets <sub>i,t</sub>	$\frac{\text{Earnings before interest and taxes}_{i,t}}{\text{Assets}_{i,t}}$	Literature diverges on the effect
Non – Debt Tax Shields <sub>i,t</sub>	$\frac{\text{Depreciation}_{i,t}}{\text{Assets}_{i,t}}$	Negative
Interest Rate <sub>i,t</sub>	$\frac{\text{Financial expenses}_{i,t}}{\text{Financial debt}_{i,t}}$	Negative
Tax Rate <sub>i,t</sub>	Corporate Income Tax Rate <sub>i,t</sub> + Surcharges Rate <sub>i,t</sub>	Positive

## 6.4. Sample

The source of the data for the model was the database Sabi (update 267), developed by Bureau van Dijk. The following criteria were adopted to define the relevant sample for the analysis.

### Industry

The sample was refined to exclude entities in industries where the capital structure is governed by determinants that are atypical to the remaining set, as follows:

- Exclusion of entities within NACE K “Financial and insurance activities”, due to the regulation that bound their capital structure. Within this NACE, as exception, holding companies (NACE 64.20) were maintained, since these entities are, generally, not subject to the aforesaid regulation and are a subset of relevance on the analysis in virtue of the intragroup financing functions usually carried out.
- Exclusion of entities within NACE O “Public administration and defense; compulsory social security”, NACE T “Activities of households as employers; undifferentiated goods and services

–producing activities of households for own use” and NACE U “Activities of extraterritorial organizations and bodies” that are not organized as an entity with an entrepreneurial nature, as this indicates an absence of commercial / profit purpose.

### Size

The selection of entities from Sabi database solely by the criteria above would lead to an outsized sample of more than 241.000 entities, comprising 8 financial years. This imposes severe restrictions in terms of extraction and handling of data.

In this context, a minimum size threshold was considered, specifically €43 M of assets in 2013 (first year of application of the regime). The rationale for this figure derives from the EU recommendation 2003/361 and Portuguese law, where €43 M is the balance sheet benchmark to define an entity as large (i.e., not as a small or medium-sized entity).

This criterion should not impair the conclusions of the model in the sense that the regime is only applicable to companies with net financing expenses exceeding €1 M, hence entities with reduced scale are of relatively low interest for the purpose of analysis and could worsen the comparability of the treatment and control groups.

The minimum size criterion resulted, in fact, in an improvement of the quality of the model, assessed by the enhanced significance of the coefficients, overall significance of the regression and  $R^2$ .

### Other criteria

Other technical exclusions were made to the sample as follows:

- Further refinement of the sample by exclusion of entities within any NACE that do not have a legal form foreseen by the Portuguese Company Law (“Código das Sociedades Comerciais”), resulting in the exclusion of associations, religious and charity organizations, foundations and other entities without an entrepreneurial nature.
- Entities without information available to compute the necessary variables.

The resulting sample is composed by 1,213 entities, as further characterized.

## 7. EMPIRICAL ANALYSIS AND RESULTS

### 7.1. Descriptive statistics

Table 5 presents a characterization of the sample and of the treatment / control groups.

*Table 5 – Sample characteristics – pre-treatment figures (2010-2012) – non-winsorized data*

<b>Variable</b>	<b>Full sample</b>	<b>Treatment group</b>	<b>Control group</b>
Number of entities	1,213	184	1,029
FINANCIAL LEVERAGE (mean)	0.418	0.512	0.401
TOTAL LEVERAGE (mean)	0.650	0.722	0.637
RETURN ON ASSETS (mean)	0.035	0.056	0.031
NON-DEBT TAX SHIELDS (mean)	0.023	0.020	0.023
INTEREST RATE (mean)	0.046	0.056	0.045
TAX RATE (mean)	0.156	0.285	0.133
Assets (mean, €M)	781.8	1,111.3	722.8
EBITDA (mean, €M)	59.0	101.3	51.4
Net financing expenses (mean, €M)	10.5	20.6	8.7
Net financing expenses / EBITDA	0.178	0.204	0.169
Net income of the year (mean, €M)	30.5	58.6	25.5
Age of the companies (mean, years)	27.2	31.7	26.4

As expected, the core fundamentals underlying excessive net financing expenses are higher in the treatment group when compared to the control group, notably FINANCIAL LEVERAGE, TOTAL LEVERAGE, net financing expenses, interest rate and the net financing expenses / EBITDA ratio.

A remarkable outcome from the above is that the net financing expenses / EBITDA ratio of the treatment group does not exceed 30%. This suggests that a relevance subset of the treatment group would not be treated if the net financing expenses regime adopted the accounting concept of EBITDA as reference, and not an ad-hoc definition.

Treated entities evidence to be of a larger scale in comparison to control entities, consistently with the fact that entities with net financing expenses below €1 M are not impacted, hence not treated, regardless of the level of leverage. A hypothetically positive relation between size and leverage (Titman and Wessels, 1988) may also contribute to such outcome.

Concerning profitability, it is also higher on the treatment group. This should be a consequence of the fact that treated entities, as default condition, have to be sensitive to variations on tax basis, meaning that the net income of the period, adjusted for tax purposes (alias, tax basis) would have to be positive.

Figure 4 and Figure 5 plot the evolution of the ratios of the dependent variables considered (FINANCIAL LEVERAGE and TOTAL LEVERAGE)<sup>5</sup>. A vertical line is added to signal the last year of the pre-treatment period.

Figure 4 – Evolution of FINANCIAL LEVERAGE (2010-2017)

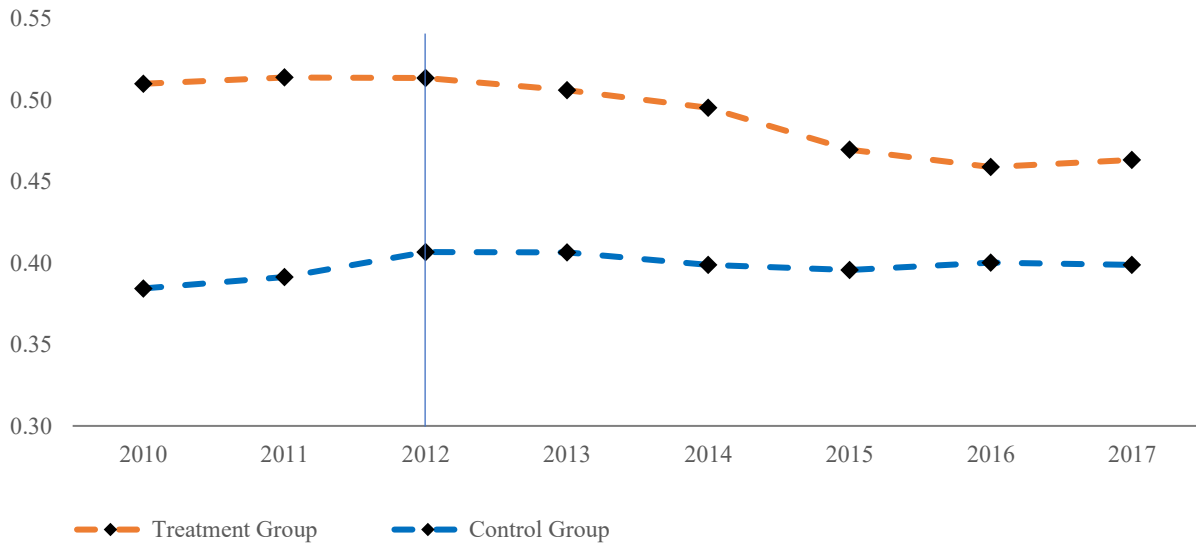
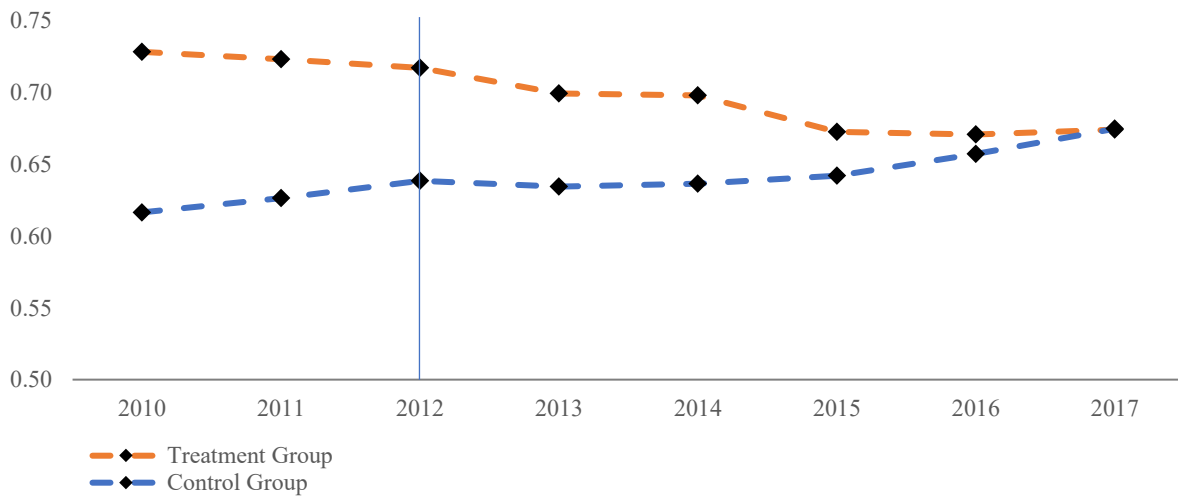


Figure 5 – Evolution of TOTAL LEVERAGE (2010-2017)



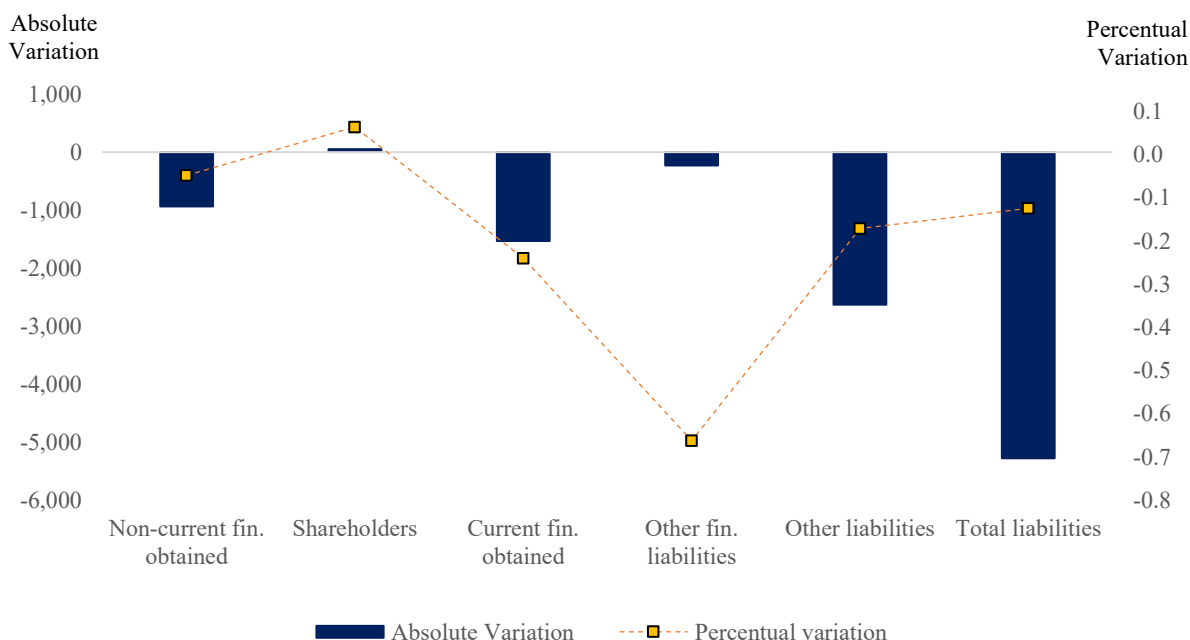
At this stage, it should be retained that, qualitatively, the leverage variables for the treatment group evolved, from 2013 onwards, under a downward trend for FINANCIAL LEVERAGE or a more accentuated downward trend for TOTAL LEVERAGE, what may suggest a reaction to the net financing expenses regime. On the same period, for the control group there is a relative steady path

<sup>5</sup> Data winsorized at 1%.

in relation to FINANCIAL LEVERAGE and an upward trend in relation to TOTAL LEVERAGE. Section 8.3 is referred for a throughout analysis of the trends, particularly on the pre-treatment period and concerning the common trend assumption.

Figure 6 presents the path of adjustment of the liabilities of the treatment group post-treatment, being noted an overall reduction of the liabilities of 12.4%.

Figure 6 – Adjustment of liabilities of the treatment group on the treatment period



Concerning equity, and specifically share capital, it was traced all share capital increases carried out in the entities of the treatment group during the treatment period. This was made by consultation of the Portal of the Ministry of Justice (<http://publicacoes.mj.pt/Pesquisa.aspx>), where share capital increases, operations subject to registration under the Portuguese Company Law, are publicized.

It is concluded that only 29 out of the 184 entities of the treatment entities had share capital increases during the treatment period. The number of operations total 39, as follows:

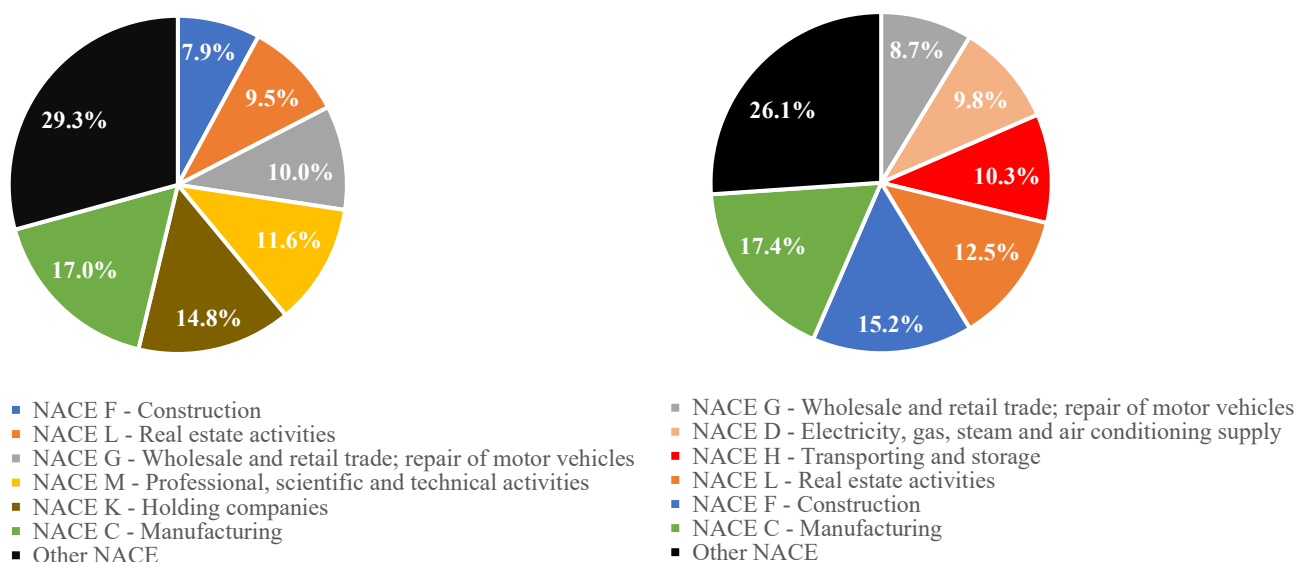
Table 6 – Adjustment of equity – share capital increases by the treatment group (2013-2017)

Type of share capital increase	Number of operations	Amount (€ M)
Cash	19	38.2
In-kind	12	335.0
Other (as mergers or incorporation of reserves)	6	25.7
Not identified	2	5.9
<b>Total</b>	<b>39</b>	<b>404.8</b>

Curiously, this characterization of share capital increases does not corroborate a perception within practitioners that the reversion of excessive net financing positions was made with relevant contributions of soft capitalization operations (i.e., refund of shareholder debt through share capital increases in-kind with these debts). In fact, the decrease of liabilities due to these soft capitalization operations was, at most, €335 M, this is, at most, 6.3% of the overall reduction of liabilities in the treatment period (€5,278 M, as per Figure 6).

Finally, Figure 7 depicts the industry composition of the samples and of the treatment group.

Figure 7 – Industries segmentation on the sample (left) and on the treatment group (right)



NACE C (Manufacturing), NACE K (Holding companies) and NACE M (Professional, scientific and technical activities) are the most represented industries on the sample. It is noteworthy that several industries increased relevantly their representation in the treatment group versus the sample, with emphasis to NACE D (Energy, gas, steam and air conditioning supply), NACE H (Transporting and Storage) and NACE F (Construction). This suggests that these industries have, in relative terms, intraspecific characteristics that led them to be more intensively impacted by regime, as leverage and interest coverage.

## 7.2. Hypothesis A – interpretation of the regression

Table 7 presents the parameters of the regression on the terms constructed to assess Hypothesis A.

Table 7 – Regression parameters – Hypothesis A

Column reference	With winsorizing at 1%		Without winsorizing	
	1	2	3	4
Variable	Financial Leverage	Total Leverage	Financial Leverage	Total Leverage
<b>Post</b>	<b>-0.007</b>	<b>0.004</b>	<b>0.009</b>	<b>0.023</b>
Standard error	0.006	0.007	0.010	0.013
p-value	0.258	0.538	0.367	0.066
<b>Treat * Post</b>	<b>-0.044</b>	<b>-0.059</b>	<b>-0.061</b>	<b>-0.080</b>
Standard error	0.011	0.011	0.014	0.016
p-value	0.000	0.000	0.000	0.000
<b>Return on Assets</b>	<b>-0.406</b>	<b>-0.503</b>	<b>-0.502</b>	<b>-0.713</b>
Standard error	0.108	0.152	0.263	0.378
p-value	0.000	0.001	0.057	0.060
<b>Non-debt tax shields</b>	<b>0.850</b>	<b>0.758</b>	<b>0.572</b>	<b>0.562</b>
Standard error	0.289	0.324	0.298	0.310
p-value	0.003	0.019	0.055	0.071
<b>Interest rate</b>	<b>-1.807</b>	<b>-0.835</b>	<b>-1.941</b>	<b>-0.907</b>
Standard error	0.224	0.247	0.272	0.308
p-value	0.000	0.001	0.000	0.003
<b>Tax rate</b>	<b>-0.092</b>	<b>-0.066</b>	<b>-0.075</b>	<b>-0.030</b>
Standard error	0.041	0.046	0.058	0.072
p-value	0.026	0.155	0.198	0.675
<b>Constant</b>	<b>0.505</b>	<b>0.692</b>	<b>0.524</b>	<b>0.708</b>
Standard error	0.015	0.017	0.018	0.019
p-value	0.000	0.000	0.000	0.000
<b>Prob &gt; F</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>
<b>R<sup>2</sup></b>	<b>0.1069</b>	<b>0.0748</b>	<b>0.1058</b>	<b>0.0812</b>

The regression is subsequently analyzed under four streams: (i) difference-in-difference coefficients, (ii) other variables, (iii) overall significance of the regression and R<sup>2</sup> and (iv) conclusion on Hypothesis A.

(i) Difference-in-difference coefficients

The variable of main interest on the model is the difference-in-differences coefficient (TREAT \* POST), basis for testing the hypotheses raised, as below commented.

The difference-in-differences coefficients are negative across all approaches, leverage formulations and winsorizing levels. Focusing on winsorized data, this coefficient is -0.044 in relation to FINANCIAL LEVERAGE and -0.059 in relation to TOTAL LEVERAGE (columns 1 and 2).

The difference-in-differences coefficient should be interpreted as the incremental pre/post difference on the dependent variable for the treatment group relatively to the pre/post difference of the dependent variable for the control group (DeHaan, 2021). Applying to the specific case, the coefficients aforesaid mean that the treatment group reduced its FINANCIAL LEVERAGE and TOTAL LEVERAGE from the pre-treatment (2010-2012) to the treatment period (2013-2017) in, respectively, 4.4 and 5.9 percentage points more than the control group.

In terms of magnitude, these figures correspond to 8.6% and 8.2% of the average FINANCIAL LEVERAGE and TOTAL LEVERAGE of the treatment group prior to the regime. The higher relative dimension of the reduction of FINANCIAL LEVERAGE comparing to TOTAL LEVERAGE was expected, as the first captures a higher concentration of interest-bearing liabilities, hence a more intense restriction from the regime.

Notwithstanding, the fact that the magnitudes are similar is an interesting outcome and may suggest that liabilities not captured by FINANCIAL LEVERAGE may be also responding to the regime, notably those that are not financing obtained but that generate financing expenses. Some examples are non-financial liabilities at amortized cost, provisions at the present value (with special relevance of repairment provisions), non-financial credits remunerated under the transfer pricing rules, among others. Another lead for this outcome may be the irrelevance for the regime until 2019 of interest capitalized in the asset cost, very relevant feature for business models highly present in the treatment group, as construction and real estate.

In terms of significance, the difference-in-difference coefficient is significant on all regressions at a 0.000 level.

As a final note, the output is presented for the data “as is” and with winsorizing at 1%, *i.e.*, the

values lower than the first percentile or higher than the 99<sup>th</sup> percentile are, respectively, replaced by the value of such percentiles. The winsorizing did not affect the significance of the difference-in-differences coefficient. With winsorized data there is a reduction of the dimension of the coefficient as it normalizes the effect of a subset of the control group with very high increases of the dependent variable against the treatment group.

(ii) Other variables

The subsequent considerations focus on the regressions with winsorized data.

POST corresponds to the variation of the dependent variable on the whole sample from the pre-treatment to the treatment period. It yields values close to zero and not significant at a 5% level.

In terms of control variables, the following is noted:

- RETURN ON ASSETS – as already addressed, the literature diverges on the relation between profitability and leverage. On the regression, the sign associated to this variable is negative, in line with the evidence gathered by Fama and French (2002). This fits to the prediction of the pecking order theory, under which higher profitability enhance earnings, source of financing ranked with priority in relation to external funding (Fama and French, 2002).
- NON-DEBT TAX SHIELDS – a positive sign is associated with this variable, outcome in opposition to the predictions from the literature. The formulation of the variable, in the case  $\frac{\text{Depreciation}_{i,t}}{\text{Assets}_{i,t}}$ , is largely followed by the literature (*inter alia*, DeAngelo and Masulis, 1980), but it could be questioned if it may be disguisedly tracking factors positively associated with leverage, as the tangibility of assets. Book-to-tax timing differences of depreciation may also explain part of the unexpected outcome.
- INTEREST RATE – a negative sign is associated with the variable, outcome aligned with the expectations, as, all the rest equal, the demand for debt is lower for higher interest rates, due to the increased cost associated. The coefficients are highly material on the regressions, evidencing a fundamental role of the variable as determinant of leverage.
- TAX RATE – a positive sign is associated, outcome in opposition to the predictions from the literature. A similar event to NON-DEBT TAX SHIELDS may hypothetically be occurring herein, this is, the marginal tax rates applicable to each company depend on the level of taxable

profit and, in turn, on the level of net income of the period, with some adjustments. This means that TAX RATE is correlated with profitability, for which a negative relation with leverage is assessed under the pecking order theory.

In terms of significance, across the regressions with winsorized data, all control variables are significant at a 5% level, with exception of TAX RATE in relation to the TOTAL LEVERAGE regression.

### (iii) Overall significance of the regression and $R^2$

The overall significance of the regression (Prob > F) holds for a strict level of 0.0000. This provides strong evidence to reject that the parameters of the model as a whole, with exception of the intercept, are simultaneously zero (Hill, 2018).

Finally,  $R^2$  ranges from 0.0748 to 0.1069 on the regressions with winsorized data. This figure is not unexpected, since the capacity of a model to explain the specific behavior of each single entity is, by default, lower, as is recognized by Fama and French (2002) in relation to cross-sectional studies. In addition, the  $R^2$  achieved are analogous to those of studies concerning net financing expenses regime in German and US (*inter alia*, Buslei and Simmler, 2012; Carrizosa et al., 2020).

### (iv) Conclusion on Hypothesis A

The difference-in-differences coefficients are consistently negative across all approaches, leverage formulation and winsorizing levels, meaning that the treatment group reduced its leverage more than the control group from the pre-treatment (2010-2012) to the treatment period (2013-2017), on the case more 4.4 and 5.9 percentage points in relation to FINANCIAL LEVERAGE and TOTAL LEVERAGE, respectively.

This path is consistent with Hypothesis A, which proposed that the net financing expenses regime promoted a change in the capital structure of Portuguese companies, specifically increased their financing through equity in alternative of debt. From a doctrine perspective, this outcome can be grounded on the principles of the trade-off theory (Kraus and Litzenberger, 1973; Scott, 1976), under which companies are financed through debt up to the point where the marginal benefit of an additional unit of debt (*i.e.*, the deduction of interest on the tax basis) equals its marginal cost (*i.e.*, enhanced bankruptcy costs). Applying these principles to the case, the lack of effectiveness of interest expenses in result of the net financing expenses regime reduces the marginal tax benefit of

debt and causes a new equilibrium that comports lower levels of debt.

The results obtained are structurally aligned with the outcomes observed in Germany and US, where the introduction of net financing expenses also resulted in a reduction of leverage (Buslei and Simmler, 2012; Carrizosa et al., 2020).

The significance of the difference-in-difference coefficients holds for a strict level of 0.000 and the overall significance of the regression (Prob > F) holds for a strict level of 0.0000.

A due note to the above is that the validity of the causality effect under difference-in-difference regressions relies on the common trend assumption. In this regard, the robustness tests to the model did not corroborate to the full extent the common trend assumption, particularly on the TOTAL LEVERAGE regression (reference is made to Section 8.3).

It is thus concluded that the hypotheses raised are consistent with the difference-in-differences coefficients assessed (*i.e.*, these coefficients are negative), but it cannot be, necessarily, inferred that such outcome has a causal nexus with the net financing expenses regime. From my perspective, this assertion is a novel contribution for the comprehension of the effects of the regime in Portugal.

Section 8.3 further discusses the common trend assumption.

### 7.3. Hypothesis B – interpretation of the regression

To assess Hypothesis B, the data / parameters of the regression were desegregated on a year-by-year basis. Table 8 presents the parameters of the regression, with data winsorized at 1%.

Table 8 – Regression parameters – Hypothesis B

Variable		Financial Leverage	Total Leverage
<b>Post 2013</b>		<b>0.016</b>	<b>0.008</b>
	Standard error	0.005	0.005
	p-value	0.000	0.085
<b>Post 2014</b>		<b>0.009</b>	<b>0.012</b>
	Standard error	0.006	0.006
	p-value	0.093	0.044
<b>Post 2015</b>		<b>0.001</b>	<b>0.018</b>
	Standard error	0.008	0.010
	p-value	0.883	0.084
<b>Post 2016</b>		<b>-0.008</b>	<b>0.020</b>
	Standard error	0.010	0.013
	p-value	0.403	0.111

<b>Post 2017</b>		<b>-0.003</b>	<b>0.047</b>
	Standard error	0.012	0.018
	p-value	0.823	0.009
<b>Treat * Post 2013</b>		<b>-0.025</b>	<b>-0.039</b>
	Standard error	0.010	0.009
	p-value	0.010	0.000
<b>Treat * Post 2014</b>		<b>-0.030</b>	<b>-0.041</b>
	Standard error	0.012	0.012
	p-value	0.016	0.001
<b>Treat * Post 2015</b>		<b>-0.056</b>	<b>-0.077</b>
	Standard error	0.015	0.015
	p-value	0.000	0.000
<b>Treat * Post 2016</b>		<b>-0.069</b>	<b>-0.086</b>
	Standard error	0.018	0.019
	p-value	0.000	0.000
<b>Treat * Post 2017</b>		<b>-0.072</b>	<b>-0.108</b>
	Standard error	0.023	0.026
	p-value	0.002	0.000
<b>Return on Assets</b>		<b>-0.525</b>	<b>-0.700</b>
	Standard error	0.077	0.112
	p-value	0.000	0.000
<b>Non-debt tax shields</b>		<b>0.559</b>	<b>0.568</b>
	Standard error	0.254	0.333
	p-value	0.028	0.088
<b>Interest rate</b>		<b>-1.813</b>	<b>-0.809</b>
	Standard error	0.147	0.165
	p-value	0.000	0.000
<b>Tax rate</b>		<b>-0.080</b>	<b>0.000</b>
	Standard error	0.034	0.046
	p-value	0.019	0.998
<b>Constant</b>		<b>0.514</b>	<b>0.690</b>
	Standard error	0.012	0.015
	p-value	0.000	0.000
<b>Prob &gt; F</b>		<b>0.0000</b>	<b>0.0000</b>
<b>R<sup>2</sup></b>		<b>0.1752</b>	<b>0.1383</b>

Given the throughout explanation of the regression in the previous section, the comments below are narrowed to the essential aspects of Hypothesis B.

The difference-in-differences coefficients (TREAT \* POST) are negative for all financial years and regressions, consistently with the conclusions on Section 7.2. From a methodology perspective, the coefficients on a year-by-year basis reflect the difference-in-differences estimator of the year relatively to the average of pre-treatment years.

Moreover, the difference-in-difference coefficients are significant at levels that vary from 0.000 to 0.016, depending on the financial year. In turn, the overall significance of the regression (Prob > F) holds also for a significance level of 0.0000.

There are no major considerations regarding the other variables that are not already reflected in the comments to the previous regression.

### Conclusion on Hypothesis B

Hypothesis B proposes that, during the period in analysis, companies reacted less intensively to the net financing expenses regime in 2013 and immediate years in comparison to the subsequent years.

From the regressions, it is noteworthy that the coefficients are negative and successively lower (*i.e.*, more negative) from financial year to financial year, path that is consistent with Hypothesis B.

In terms of literature, no specific research was found to guide on the fundamentals of this pattern in terms of net financing expenses regime. I conjecture plausible causes of an increasing response over time of the treatment group to the net financing expenses regime:

- The implementation of this regime was an unanticipated tax policy measure and there was a short period of time elapsing from its announcement (on 10 October 2012, within the 2013 State Budget Proposal) and its entry into force (1 January 2013).
- The refund of bank / non-group debt by equity requires endogenous recourses of shareholders, what may not be immediately available or has not been anticipated due to the pattern of implementation of the law.
- The regime foresaw an adaptation period and the carryforward of excess net financing expenses during 5 years. This carryforward mechanism, and the expectation to recover the excesses within the 5-year period, may had a role in postponing decisions to adjust the capital structure.

- The introduction of the net financing expenses regime (in 2013) is comported within the period of the financial assistance program between Portugal and the International Monetary Fund, European Commission and the European Central Bank. Capital structure adjustments have time determinants, one of them being the lower speed of adjustment with contingent economic prospects (Drobetz and Wanzenried, 2006).

As before, it is noted that Sections 7.2 and 8.3 discuss the common trend assumption and the respective implications on the interpretation of the results.

## 8. ROBUSTNESS AND SANITY CHECKS

The analysis carried out included the robustness and sanity checks subsequently addressed.

### 8.1. Winsorizing

The regressions were operated considering winsorizing at 1%, meaning that the values lower than the first percentile or higher than the 99<sup>th</sup> percentile are, respectively, replaced by the value of such percentiles. This allows to control for distortions that outliers could have on the results.

The regressions with winsorized data were commented above, being noted that the sign of the difference-in-differences coefficients (key feature to test the hypotheses) maintained negative. Moreover, with winsorized data, the difference-in-difference coefficients are significant at levels from 0.000 to 0.016 and the overall significance of the regression (Prob > F) holds for a strict level of 0.0000.

It can be concluded that the corroboration of the hypotheses did not result from a by-catch effect of the outliers on the data.

### 8.2. Hausman test

A Hausman test was performed to ascertain if the regressions should be carried out under a fixed or random effects approach. This test compares the coefficients from both approaches in order to assess if there is correlation across errors and the regressors, case in which random effects should be rejected (Hill, 2018). The test evidenced the following results:

*Table 9 – Hausman test results*

	With winsorizing at 1%		Without winsorizing	
	Financial Leverage	Total Leverage	Financial Leverage	Total Leverage
Prob > Chi2	0.0000	0.0000	0.0000	0.0000

Based on the results obtained, it is rejected that the individual-based effects are adequately estimated by random effects, being applied fixed effects on the model.

### 8.3. Common trend assumption evaluation

The casual inference under differences-in-difference regressions relies on the common trend assumption, this is, that in the absence of the treatment, the average outcome for the treatment

group and the average outcome for the control group would experience the same variation over time (Abadie and Cattaneo, 2018). This assumption relies on a counterfactual outcome and, by default, is not directly observable.

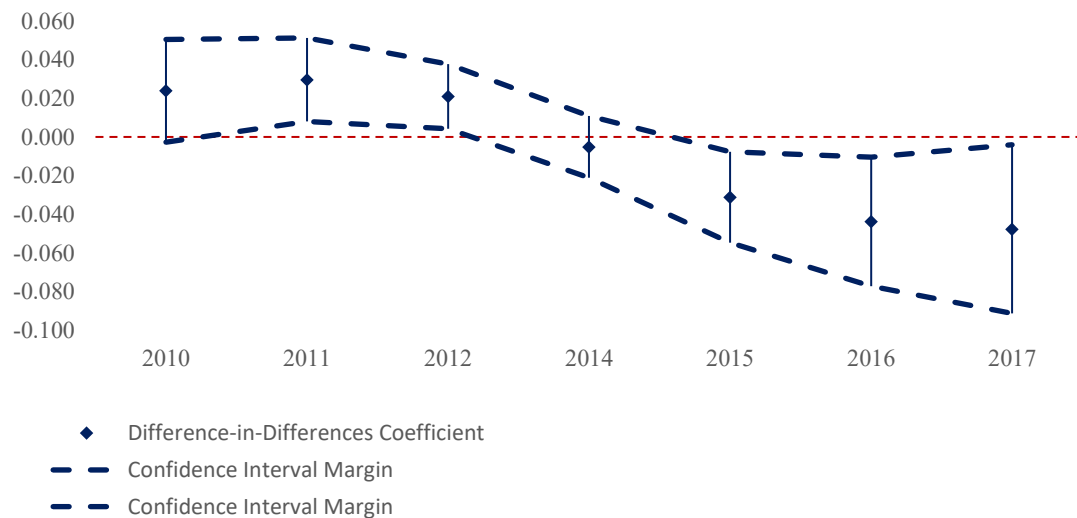
Taking into consideration Abadie and Cattaneo (2018) and Bonfim et al. (2020), it is subsequently evaluated the common trend assumption by the extension of the interactions of the treatment variable (TREAT) to the pre-treatment years of the model, a so-called “placebo treatment”.

The aim is to assess the difference-in-differences coefficients generated and their 95% confidence interval, and, particularly, if the band of values within the interval has a consistent trend for the pre-treatment period.

If the case, the evolution of the dependent variable may be driven by pre-existing factors, and not by the treatment, hence, it is not, necessarily, corroborated the causal nexus between the treatment and the variation of the dependent variable on the treatment group.

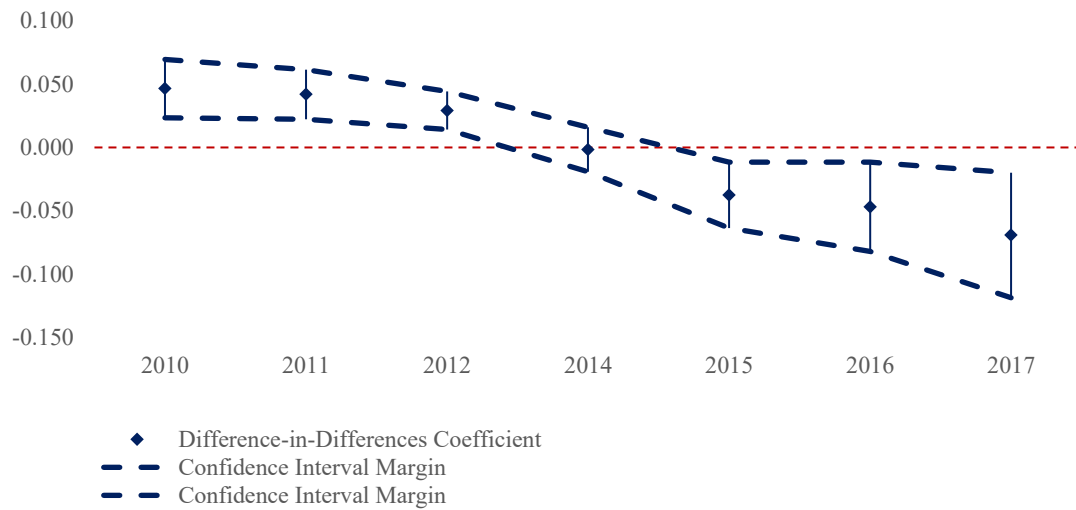
Figure 8 and Figure 9 plot the difference-in-differences coefficients and the respective band of values within the 95% confidence interval in relation to the FINANCIAL LEVERAGE and TOTAL LEVERAGE regressions, now adjusted to extend the interactions of the treatment variable (TREAT) also with pre-treatment years (2010-2012).<sup>6</sup>

Figure 8 – Common trend evaluation, under a placebo approach - FINANCIAL LEVERAGE



<sup>6</sup> To be noted that due to collinearity, one of the years, in the case 2013, is not presented.

Figure 9 – Common trend evaluation, under a placebo approach - TOTAL LEVERAGE



As general pattern, all pre-treatment period coefficients are positive and all treatment period coefficients are negative. The plot of the 95% confidence intervals emphasizes that on the pre-treatment period the range of values is consistently positive. In this regard, not all coefficients are significant at a 5% level for the FINANCIAL LEVERAGE regression, while the opposite occurs for the TOTAL LEVERAGE regression.

In conclusion, the induced interactions between the treatment variable and the years preceding the introduction of the net financing expenses regime suggest that the common trend assumption is not corroborated to the full extent, particularly on the TOTAL LEVERAGE regression.

An integrated reading of this test, in liaison to the previous sections, is that (i) the hypotheses raised are consistent with the difference-in-differences coefficients assessed (*i.e.*, these coefficients are negative), (ii) but it cannot be, necessarily, inferred that such outcome has a causal nexus with the net financing expenses regime, particularly on the TOTAL LEVERAGE regression.

A noteworthy point is that the absence of corroboration of the causal effect is not, by itself, the denial of such effect. For example, potential pre-existing factors that concur to a reduction of leverage on the treatment group do not preclude that the treatment, by itself, is also a cause of the deleverage observed.

#### **8.4. Sanity check of the conclusions on a narrowed treatment period**

Section 6.1 discusses that the implementation of the net financing expenses regime was not a one-off event in time, but a successive set of more intense incentives to reduce leverage, whose parameters stabilized as of 2017. This imposes a certain constrain on the capacity to evaluate the effects of the regime compared to a one-off tax policy change.

The approach considered in the model was to set as treatment period the years from 2013 to 2017. As sanity check, the model was reassessed to test if different conclusions result in relation to the regime as initial formulated (thresholds of €3 M and 70% of the EBITDA), solely tracking the subset of companies firstly impacted and only on the first year of the law.

The difference-in-differences coefficients maintained negative (respectively, -0.068 and -0.075 for the FINANCIAL LEVERAGE and TOTAL LEVERAGE regressions) and, therefore, no fundamental differences were identified in this regard concerning the model. These coefficients are significant at a 0.001 level and the overall significance of the regression (Prob > F) is in both cases 0.0000.

## 9. CONCLUSION

In Portugal, from 2013 onwards, a quantitative limitation applies to the amount of net financing expenses that can be deducted on the tax basis of the Corporate Income Tax, specifically, the higher between €1 M and 30% of an adjusted EBITDA. During the period in analysis (2013-2017), this regime precluded the deduction of financing expenses of €1,268.7 M per year.

The purpose of the dissertation is to assess if, and to which extent, the net financing expenses regime promoted a change on the capital structure of Portuguese companies, notably an increase of equity financing in lieu of debt financing (Hypothesis A).

This hypothesis was evaluated under a difference-in-differences regression, estimation of the differential effects between entities impacted by the regime (“treatment group”) and entities not impacted (“control group”), before and after its enactment. For the period in analysis (2013-2017), it is concluded that, upon enactment of the net financing expenses regime, the treatment group decreased its FINANCIAL LEVERAGE and TOTAL LEVERAGE, respectively, in 4.4 and 5.9 percentage points more than the control group. This outcome is consistent with the proposition of Hypothesis A (*i.e.*, that the net financing expenses regime promoted a change on the capital structure of Portuguese companies, notably an increase of equity financing in lieu of debt financing). In terms of magnitude, these figures correspond, respectively, to 8.6% and 8.2% of the average FINANCIAL LEVERAGE and TOTAL LEVERAGE of the treatment group prior to the regime.

Moreover, the evolution of the difference-in-differences coefficients suggests that, in the period in analysis, the treatment group decreased its leverage in relation to the control group with successive more intensity over time, consistently with the proposition of Hypothesis B.

It may be hypothesized that this is caused by the time needed to adapt the constraints from financing commitments in the short run or by the unanticipated need of endogenous funds to refund debt with equity upon introduction of the regime. A softer reaction to excessive net financing expenses positions in the short run may also derive from an expectation to recover the credits during the available carry-forward period of 5 years.

A due note to the above is that the validity of the causality effect under difference-in-difference regressions relies on the common trend assumption. In this regard, the robustness tests to the model

did not corroborate the common trend assumption to the full extent, particularly on the TOTAL LEVERAGE regression.

Thus, the hypotheses raised are consistent with the difference-in-differences coefficients assessed (*i.e.*, these coefficients are negative), but it cannot be, necessarily, inferred that such outcome has a causal nexus with the net financing expenses regime, particularly on the TOTAL LEVERAGE regression. From my perspective, this assertion is a novel contribution for the comprehension of the effects of the regime in Portugal.

## 10. LIMITATIONS

The implementation of the net financing expenses regime was not a one-off event in time and this imposes a certain degree of constraint on the capacity to evaluate the effects of the regime. Section 6.1 discusses this matter. The assessment of the impacts of the regime under different perspectives and timeframes, as per Sections 7.2, 7.3 and 8.4, curbs this limitation.

In addition, the robustness tests to the model did not corroborate to the full extent the common trend assumption, particularly on the TOTAL LEVERAGE regression. This matter is extensively discussed on Sections 7.2 and 8.3.

Also, the formulation of tax-sourced indicators (*e.g.*, tax basis) may have limitations, as the exact figures could only be derived from the returns filed by the companies. These indicators were estimated from the balance sheet and profit and loss statement according to the most reasonable solution available to mitigate misrepresentations.

The data is impacted by the exceptional economic environment steamed from the 2008 financial crisis and from the 2011-2014 financial assistance program between Portugal and the International Monetary Fund, European Commission and the European Central Bank. The associated effects on the model are arguably mitigated by the difference-in-differences methodology, particularly to the extent such effects applied uniformly on the determination of the capital structure among the treatment and control groups.

Due to its scope and limitation of dimension, the dissertation does not evolve interesting analysis identified during its construction, notably:

- Assess the impact of business profiling aspects on differential reactions to the regime (*e.g.*, insertion on a group of companies, multinational vs. Portuguese-based groups, industry segmentation, among others).
- Assess if the standards of measurement of the drivers of the net financing expenses regime trigger different outcomes, notably the adoption by Portuguese companies of the IFRS versus the general Portuguese GAAP (SNC). A relevant dimension in this regard is IFRS 16 (Leasings).

- Assess the relation between the Portuguese notional interest expenses and net financing expenses regimes, instruments to curb the debt tax bias. An interest point is if the modest use of the first regime is related with the restrictive conditions that it imposes on the second regime.

Yet, these limitations of analysis can be regarded as leads for future research and expansion of the knowledge about the net financing expenses regime.

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