INVESTMENT DECISIONS AND FINANCIAL STANDING OF PORTUGUESE FIRMS*

*Luciana Barbosa***

*Ana Lacerda***

*Nuno Ribeiro***

1. INTRODUCTION

Classic macroeconomic models do not consider the impact of corporate financial decisions on the economy's real variables. These approaches reflect the Modigliani-Miller theorem (1958), which establishes the capital structure irrelevance principle, i.e. capital structure does not affect the decisions to accept and carry out investment projects, against a background of perfect financial markets. However, imperfections in capital markets, namely asymmetrical information between agents making investment decisions (corporate management) and those providing the respective financing (savers or financial intermediaries), establish a link between the corporate financial standing and investment decisions. The resulting distortions are a source of inefficiency in the allocation of resources and may involve the rationing of credit to firms at the prevailing market price (as shown by Stiglitz and Weiss (1981)), as well as translate into higher economic costs for external financing sources.

The cyclical volatility of corporate investment, strongly concentrated in specific periods which are followed by other periods of sharp decline, is a stylised fact in most economies, and is documented as the so-called financial accelerator literature (Bernanke and Gertler (1989); Bernanke, Gertler and Gilchrist (1996 and 1999)). In this type of models, the existence of imperfections in the credit market results in factor accumulation decisions which are dependent on corporate financial conditions, thus accounting for the widening and greater persistence of business cycles, in particular as far as corporate investment is concerned. Kiyotaki and Moore (1997) also summarise explanations for this phenomenon, by establishing possible relationships between the value of assets in the economies, including the market value of residual claims of corporate shareholders, and the aggregate expenditure and production of firms. In these models, the corporate financial conditions at a given point in time are liable to restrain access to external financing, spilling over into corporate business. These constraints will tend to be stronger in downturns than in upturns of economic activity.

In line with the theoretical literature, several empirical studies aim at assessing the impact of the corporate financial standing on the respective real decisions at microeconomic level. Fazzari, Hubbard and Petersen (1988) published a pioneering study analysing the sensitivity of corporate investment to fluctuations in internally-generated funds (giving rise to the cash flow sensitivity-related literature). The outcomes support the existence of a positive relationship between corporate cash flow and investment. In particular, and according to the authors, greater sensitivity of investment to the cash flow points to the existence of external financing constraints. Farinha (1995) gathers similar evidence for the Portuguese case, observing that, for most Portuguese firms, investment is positively influenced by the cash flow, and concludes that the results are consistent with the existence of liquidity constraints.

The positive relationship between investment and cash flow seems to be relatively consensual among researchers, against the background of frictions in the functioning of capital markets. However, some controversy remains in what concerns the interpretation of this relationship as an indication of firm's external financing constraints. Kaplan and Zingales (1997) initiated the discussion emphasising that there may be a positive relationship between corporate cash flow and investment even in those cases where firms are not facing financing restrictions. Hubbard (1998) presents several other studies that examine this relationship. When analysing the relationship between financial variables and job creation by firms, Nickell and Nicolitsas (1999), Sharpe (1994), Carpenter *et al*. (1994) also obtain a significant effect of financial variables.

More recently, the empirical literature has focused on interactions among measures characterising the financial pressure of firms and factor accumulation in the economy. Worthy of mention in this context are the works of Nickell and Nicolitsas (1999), Benito and Hernando (2002), Benito and Young (2002) and Hernando and Martínez-Carrascal (2003), which identify the ratio of interest paid to the operational cash flow as a relevant variable for firm's investment. This ratio is interpreted rather intuitively, making it possible to assess the extent to which corporate gross income (before interest) ensures that interest payments to creditors are met. This measure has also the advantage of reflecting the financial and operational performance of firms.

The importance of capital accumulation in the Portuguese economic growth, jointly with the indebtedness level reached by Portuguese non-financial corporations, warrants the identification of potential financial vulnerabilities, possibly spilling over into aggregate investment. In fact, as shown in Amador and Coimbra (2007) and Almeida and Félix (2006), capital stock developments made an important contribution to Portuguese economic growth in the past few decades. In parallel, indebtedness of Portuguese non-financial corporations grew significantly in recent years, particularly in the second half of the 1990s. This largely reflected the sharp decline in the level and volatility of nominal interest rates resulting from the convergence process and subsequent Portuguese participation in the euro area.

Hence, this study evaluates the extent to which the financial pressure of a firm, as assessed by the level of interest payments (as a percentage of operating income), affects its investment. In order to better identify the sources of constraints to corporate investment, the financial pressure indicator was broken down into three components that reflect the leverage, the operating profitability and the implicit interest rate faced by firms. In the sample under consideration, financial factors prove to have a non-negligible effect on the respective investment decisions. In particular, interest payments, the indebtedness level and operating profitability play an important role in investment decisions. However, these effects do not differ in periods of economic slowdown. Moreover, it can be concluded that a number of factors have an impact on the sensitivity of investment to interest payments: whether the firm is export-oriented, its size, the number of bank lending relationships, and the existence of past due credit. The analysis is mainly based on data from the Central Balance Sheet Database, obtained from an annual survey conducted by Banco de Portugal to a sample of Portuguese non-financial corporations. The database includes economic and financial data on an accounting basis for the 1995-2005 period.

This article is organised as follows. Section 2 characterises the financial standing of Portuguese firms, at an aggregate level, for the 1995-2006 period. Stress is laid on developments in interest burden, indebtedness, cost of financing and the profitability of Portuguese non-financial corporations. This section is essentially based on statistical information on non-financial national accounts (produced by National Statistics Institute - *INE*) and national financial accounts[1] (produced by Banco de Portugal). Section 3 characterises the financial standing of Portuguese firms, at an individual level, and qualifies

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(1) The analysis depends on data availability: non-financial national accounts are available only up to 2004 and financial national accounts up to 2006.

investment by these firms. The analysis is based on the financial statements of non-financial corporations reporting to the Central Balance Sheet Database. Section 4 presents the econometric model adopted and its results. Finally, Section 5 draws the main conclusions.

2. DEVELOPMENTS IN THE FINANCIAL STANDING OF PORTUGUESE FIRMS

In the 1990s, particularly in the second half, there was a significant increase in the indebtedness level of the Portuguese private sector in general, and of non-financial corporations in particular (Chart 1). This evolution took place against the background of a gradual development and integration of financial markets, which, jointly with the process of nominal convergence and the subsequent participation in the euro area, spilled over into a considerable decline in the level of interest rates and their volatility. Hence, although there was an increase of the indebtedness level of non-financial firms, there was no consequent rise in the share of the economy's output allocated to corporate interest payments. Interest payments as a percentage of GDP declined, stabilising afterwards (Chart 2). When assessing the relative weight of this burden on total corporate operating income similar patterns can be observed, as regards both the non-financial corporations aggregate and the set of firms with information available at the Central Balance Sheet Database[2] (Chart 3).

The ratio of the debt burden to gross operating income (B) is also a first proxy for the "financial pressure" faced by a given firm, insofar as it makes it possible to assess the capacity of the firm to make interest payments through internally generated resources arising from the respective business activity. In parallel, this indicator summarises different financial features of the firm, namely the average cost of financing (C), indebtedness (D) and gross operating profitability (R), since the interest payment indicator can be broken down into these three ratios (equation (1)). Hence, the analysis of developments in
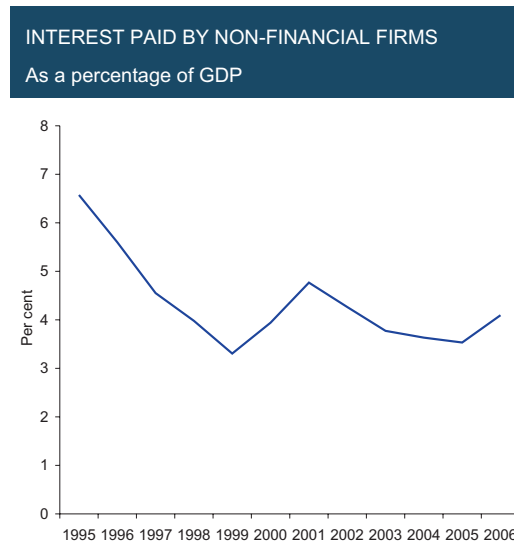
Chart 1
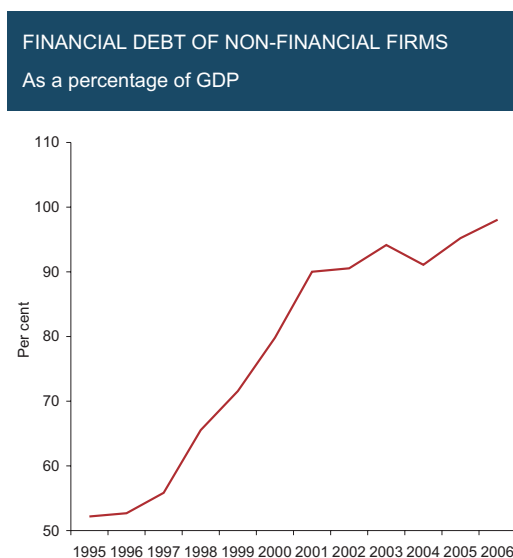
FINANCIAL DEBT OF NON-FINANCIAL FIRMS
As a percentage of GDP

Sources: *INE* (Non-Financial National Accounts) and Banco de Portugal (Financial National Accounts).
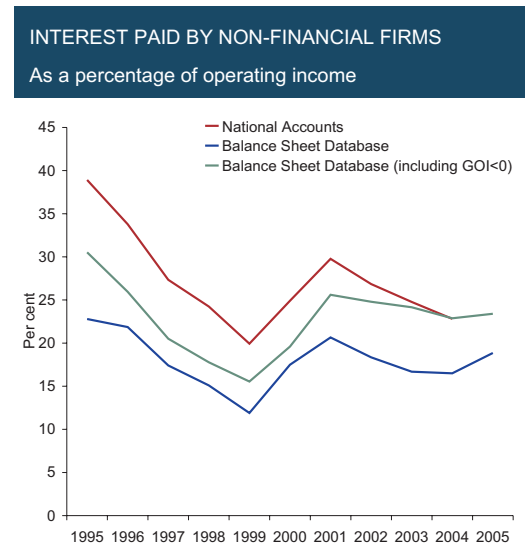**Note:** Financial Debt defined as the sum of loans and debt securities.

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(2) With regard to data obtained from the Central Balance Sheet Database, only a smaller group of firms was taken into consideration, after applying a set of filters to the raw data to ensure the consistency in the analysis throughout the study. The criteria applied are presented in Section 3.1. Data.

Chart 2

Chart 3

INTEREST PAID BY NON-FINANCIAL FIRMS

As a percentage of GDP

Sources: *INE* (Non-Financial National Accounts) and Banco de Portugal (estimates).

INTEREST PAID BY NON-FINANCIAL FIRMS

As a percentage of operating income

Sources: *INE* (Non-Financial National Accounts) and Banco de Portugal (estimates and Balance Sheet Database).
Note: GOI – Gross Operating Income

these variables over time allows a finer understanding on the sources of the change in financial pressure (or lack of it) in a company.

$$\underbrace{\frac{IP}{GOI}}_{B} = \underbrace{\frac{IP}{FD}}_{C} x \underbrace{\frac{FD}{NA}}_{D} x \underbrace{\frac{NA}{GOI}}_{1/R} \tag{1}$$
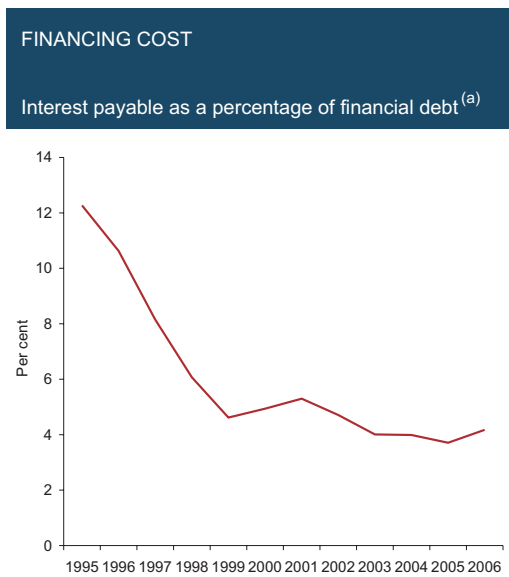
IP – Interest payable	FD – Financial debt
GOI – Gross operating income	NA – Net assets

Charts 4, 5 and 6 highlight the three ratios resulting from the breakdown shown in equation (1), using national accounts when available and estimates based on the Central Balance Sheet Database for the most recent period. Indebtedness growth, as can be seen in Chart 5, mirrors the significant decline in the average cost of financing in the period under analysis, shown in Chart 4, which, in turn, followed quite closely developments in interest rates on loans to non-financial corporations in Portugal. Indeed, the period preceding participation in the euro area was characterised by a sharp reduction in nominal interest rates in Portugal, previously well above the average of the group of countries that gave rise to the euro area. This decline was interrupted in 1999 and 2000, in parallel with the rise in the ECB's reference rates. From 2001 to end-2005, a period when key ECB interest rates declined and stabilised at historically low levels, the average cost of corporate financing decreased again considerably. In 2006, the average cost of financing started to rise again, following the increase in money market interest rates, underlying the successive rises in key ECB interest rates as from late 2005, which totalled 1.5 p.p. in accumulated terms until the end of 2006. The parallelism between money market interest rate and the cost of corporate financing developments reflects the fact that a large share of the financial debt of non-financial corporations in Portugal has a short term maturity or is index-linked to money market interest rates, thereby implying a rapid pass-through of monetary policy impulses to the actual cost of total corporate debt.
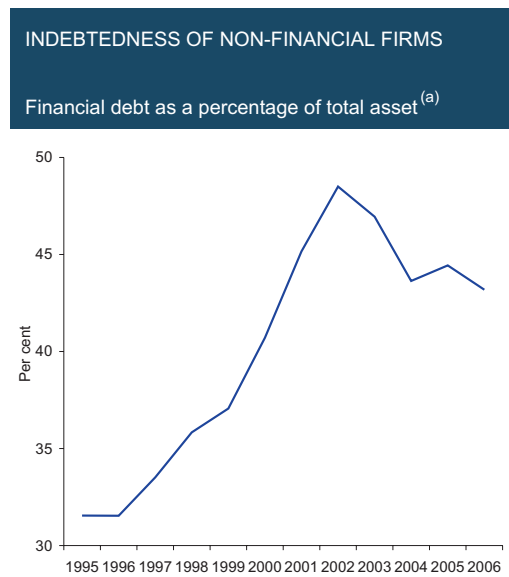
Chart 4

FINANCING COST
Interest payable as a percentage of financial debt [a]

Source: Banco de Portugal (Financial National Accounts).
Note: (a) Cost of financing defined as the ratio of interest payable to financial debt, defined as the sum of loans and debt securities.

Chart 5

INDEBTEDNESS OF NON-FINANCIAL FIRMS
Financial debt as a percentage of total asset [a]

Source: Banco de Portugal (Financial National Accounts).
Note: (a) Financial Debt defined as the sum of loans and debt securities. Total asset was approximated by the sum of financial liabilities, including debt securities.

In addition, the strong increase in financial debt, as shown in Chart 1, was not equally reflected in the degree of financial corporate leverage.[3] The reason is that the expansion in financial debt was followed by an increase, albeit to a lesser extent, in corporate equity, giving rise to significant asset accumulation by firms. In fact, the measure of financial leverage, calculated on the basis of national financial accounts, declined as from 2002, in line with the slowdown in corporate financial debt (Chart 5). The

Chart 6
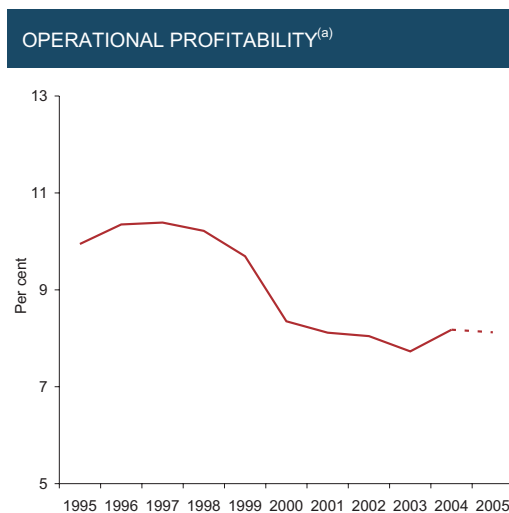
OPERATIONAL PROFITABILITY[a]

Sources: *INE* (Non-Financial National Accounts) and Banco de Portugal (Financial National Accounts and Balance Sheet Database).
Notes: National Accounts until 2004 and estimative for 2005 based on Balance Sheet Database. **(a)** Ratio of operating results (approximated by the gross operating results adjusted of net premium of non-life insurance) and total assets (adjusted of revaluations effects).

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(3) The degree of financial leverage is considered to be the share of assets that is financed by financial debt, as shown in Chart 5.

considerable rise in the second half of the 1990s should have reflected the increase in financing needs related to fixed capital investment, economic group restructuring, as well as the internationalisation of a few large firms, against the background of economic expansion, financial market development and sharp interest rate declines.

In turn, the operating profitability declined in the second half of the 1990s, possibly reflecting the structural change in the Portuguese economy related to the nominal convergence process and subsequent participation in the euro area. In fact, in a context of substantially higher nominal interest rates than in the current economic regime, nominal gross margins were wider. The ongoing downward trend of nominal interest rates, in parallel with increased competition, was followed by a compression of nominal operating profitability, without apparently implying greater financial weakness for firms. After 2000, nominal operating profitability has remained at a lower level than at the start of the sample period (Chart 6).

3. MICRO LEVEL DESCRIPTION OF DEVELOPMENTS IN INVESTMENT AND IN THE FINANCIAL STANDING OF PORTUGUESE FIRMS

3.1. Data

Microeconomic data used in the analysis that follows corresponds to the annual information of the Central Balance Sheet Database. The sample covers a high share of corporate economic activity, with an emphasis in larger firms. Amongst the group of small and medium-sized enterprises, those with a better financial standing are over-represented, reflecting the survey's voluntary nature. In sectoral terms,[4] "manufacturing", "electricity, gas and water" and "transport and communication" are the sectors with the highest coverage. In 2005 firms reporting annual data for 2004 and 2005 simultaneously accounted for 4.6 per cent of non-financial corporations, 36.0 per cent of the number of employees and 58.7 per cent of nominal gross value added.

Given the specificities of this study, it was necessary to put in place a few selection criteria for the group of firms to be analysed. As such, in addition to eliminating the incoherent or incomplete observations reported, observations that did not present strictly positive sales, financial debt and interest paid were also excluded. Moreover, self-employed persons, firms whose primary purpose was the holding of financial assets, as well as those that had not been considered in the database for a minimum period of three consecutive years were not considered in the analysis. In addition, regarding the annual rate of change in fixed assets, a criterion was also required in an attempt to eliminate the extreme values of the distribution.[5] In order to ensure overall consistency, namely a monotone relationship between the interest payment indicator and the corporate financial standing, observations for firms with negative gross operating income were also eliminated, corresponding to around 10 per cent of the sample. After applying the above criteria, a non-balanced panel of 29 253 observations was obtained, corresponding to 5 867 firms. In the following sections, the study is restricted to the analysis of this panel, and, as such, care should be taken in extrapolating the results to the Portuguese corporate sector at large.

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(4) In 2000, the criteria for data collection for the Central Balance Sheet Database were changed, with a view to covering all sectors of economic activity, except financial intermediation, general government, households and international organisations and other non-resident institutions (for further information on the Central Balance Sheet Database, see Banco de Portugal's Booklet No 7).

(5) In this context, account was only taken of firms whose fixed assets increased less than 500 per cent or decreased less than 75 per cent, which corresponds to eliminating approximately 5 per cent of initial sample observations.

3.2. Developments in investment and in the financial standing of Portuguese firms

This section describes the group of firms under analysis as regards the distribution of the rate of corporate investment,[6] the interest payment indicator and its respective components, as shown in the equation (1).

Chart 7 shows the unweighted distribution of the variables mentioned for the different years under analysis, considering the simple percentiles of order 10, 25, 50, 75 and 90. This approach makes it possible to evaluate the evolution of the representative firm (i.e. the median firm every year), as well as the evolution of more financial constrained firms. It is worth noting the downward trend of the investment rate, in particular for firms above the median, which also show higher dispersion. This distribution asymmetry, although present in all variables characterising corporate financial conditions, is more pronounced for the interest burden and average cost of debt financing distribution. In particular, for the interest burden variable, on average, the spread between the 90 and 75 percentiles is approximately four and a half times the one observed between the 25 and 10 percentiles. The distributions of the indebtedness and profitability variables, in addition to being less asymmetric, reveal higher stability in the time series dimension. The stability observed in the distribution of indebtedness is not inconsistent with the increase in aggregate debt (Charts 1 and 5), as Chart 7 depicts cross sections of the unweighted distribution. In fact, firms for which debt growth was stronger correspond to those with more marked asset accumulation, and larger firms raised their indebtedness level more markedly.[7] This implies very smooth developments in the unweighted distribution, in clear contrast to aggregate values that correspond to the weighted averages of this variable. It should be stressed also that the credit granted by the Portuguese financial sector is strongly concentrated, with 5 per cent of firms that resorted to credit accounting for 80 per cent of credit granted. However, in spite of the higher idiosyncratic risk of these firms, their default rates, in general, are much lower than in the remaining firms.

In order to evaluate the persistence of investment as well as financial characteristics of firms, the one-year transition between different quintiles of the distribution are presented (Table 1). As regards interest burden and the variables into which it can be broken down, there is a high persistence of firms in the same distribution quintile. This phenomenon is mainly observed in extreme quintiles, where the probabilities always exceed 50 per cent. Worthy of note are, in particular, the interest burden and indebtedness variables, for which the probability that, in a given year, a firm in the highest quintile does not move to another quintile stands at 64 and 71 per cent respectively. The degree of persistence of corporate investment, in turn, is not as high, even though the probability that a firm will remain in the same quintile for two consecutive years is higher than the probability of moving to any of the other quintiles. Moreover, moves occur chiefly into quintiles that are adjacent to the quintile where the firm initially was.
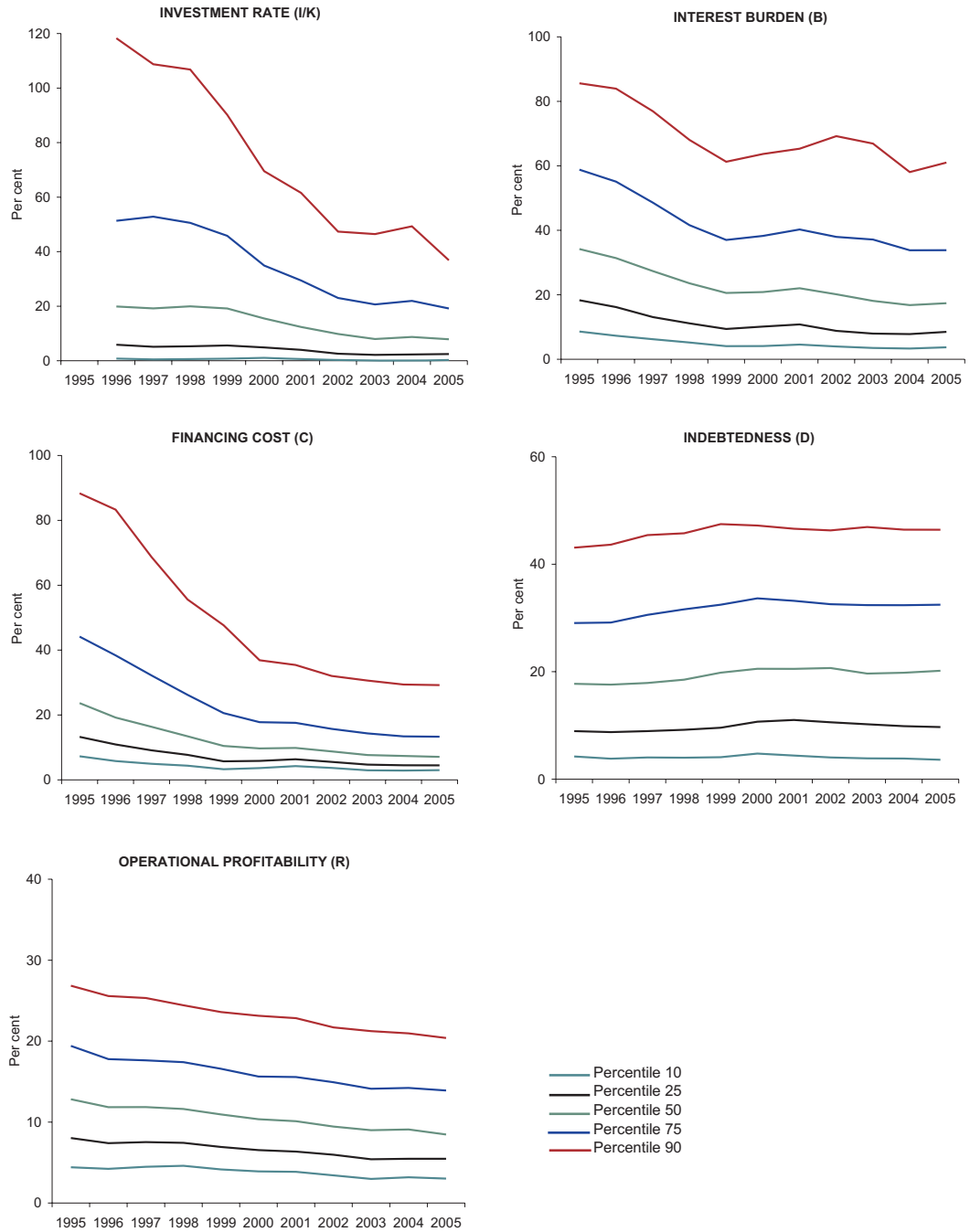
Based on the above distributions, and with a view to obtaining a first perception of the relationship between the investment rate of a given firm and its financial standing, the median investment rate was annually calculated for the group of firms that in the previous year were in different percentiles of distribution of the financial variables under review (Chart 8). In particular, firms in the first decile, in the last decile and the firms between percentiles 45 and 55 were considered. The observation of the chart suggests that the financial variables affect corporate investment decisions. Indeed, firms with higher interest burden tend to report lower investment rates in the subsequent year. This effect is coherent

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(6) The investment rate variable was built as the ratio of the change in corporate fixed assets during a given period to the capital stock at the start of the period. In turn, underlying the capital stock is a constant depreciation rate (10 per cent), as well as an initial value adjusted for future revaluations.

(7) For illustration, the firms that in 1996 were in the 90 percentile, in terms of total assets, accounted for 77 per cent of total financial debt, compared to 84 per cent in 2005.

Chart 7

EVOLUTION OF INVESTMENT RATE AND FINANCIAL VARIABLES

INVESTMENT RATE (I/K)

INTEREST BURDEN (B)

FINANCING COST (C)

INDEBTEDNESS (D)

OPERATIONAL PROFITABILITY (R)

Percentile 10
Percentile 25
Percentile 50
Percentile 75
Percentile 90

Note: The financial variables presented in the chart correspond to those defined in equation (1). Thus, the above panels correspond to the distributions of the investment by unit of capital stock (I/K), of interest payable as a percentage of gross operating income (B), of interest payable as a percentage of financial debt (C), of financial debt as a percentage of total asset (D), and of gross operating income as a percentage of total asset (R).

Table 1

TRANSITION MATRICES FOR ONE-YEAR TRANSITIONS BETWEEN QUINTILES

INVESTMENT RATE (I/K)

	1	2	3	4	5
Quintile 1	**40%**	22%	14%	12%	12%
Quintile 2	24%	**28%**	21%	16%	11%
Quintile 3	14%	22%	**26%**	22%	16%
Quintile 4	13%	17%	23%	**25%**	22%
Quintile 5	14%	16%	18%	25%	**28%**

INTEREST BURDEN (B)

	1	2	3	4	5
Quintile 1	**64%**	23%	8%	3%	2%
Quintile 2	21%	**43%**	23%	9%	4%
Quintile 3	5%	21%	**39%**	25%	10%
Quintile 4	2%	7%	21%	**44%**	26%
Quintile 5	2%	4%	9%	22%	**64%**

FINANCING COST (C)

	1	2	3	4	5
Quintile 1	**53%**	25%	11%	6%	5%
Quintile 2	20%	**40%**	25%	10%	4%
Quintile 3	9%	20%	**37%**	25%	9%
Quintile 4	5%	9%	20%	**41%**	25%
Quintile 5	5%	5%	8%	21%	**61%**

INDEBTEDNESS (D)

	1	2	3	4	5
Quintile 1	**62%**	22%	8%	5%	2%
Quintile 2	25%	**45%**	20%	7%	3%
Quintile 3	7%	24%	**43%**	20%	6%
Quintile 4	3%	7%	24%	**48%**	18%
Quintile 5	2%	2%	5%	20%	**71%**

OPERATIONAL PROFITABILITY (R)

	1	2	3	4	5
Quintile 1	**58%**	24%	10%	5%	3%
Quintile 2	25%	**39%**	22%	10%	4%
Quintile 3	9%	23%	**36%**	23%	8%
Quintile 4	6%	10%	24%	**39%**	22%
Quintile 5	3%	4%	8%	23%	**62%**

Note: Empirical one-year transitions in the period 1995 - 2005.

with the heterogeneity of investment presented by firms with different operating profitability and indebtedness. It what concerns average cost of financing, the effect is not so evident.

Chart 8

EVOLUTION OF INVESTMENT RATE FOR DIFFERENT LEVELS OF THE FINANCIAL VARIABLES
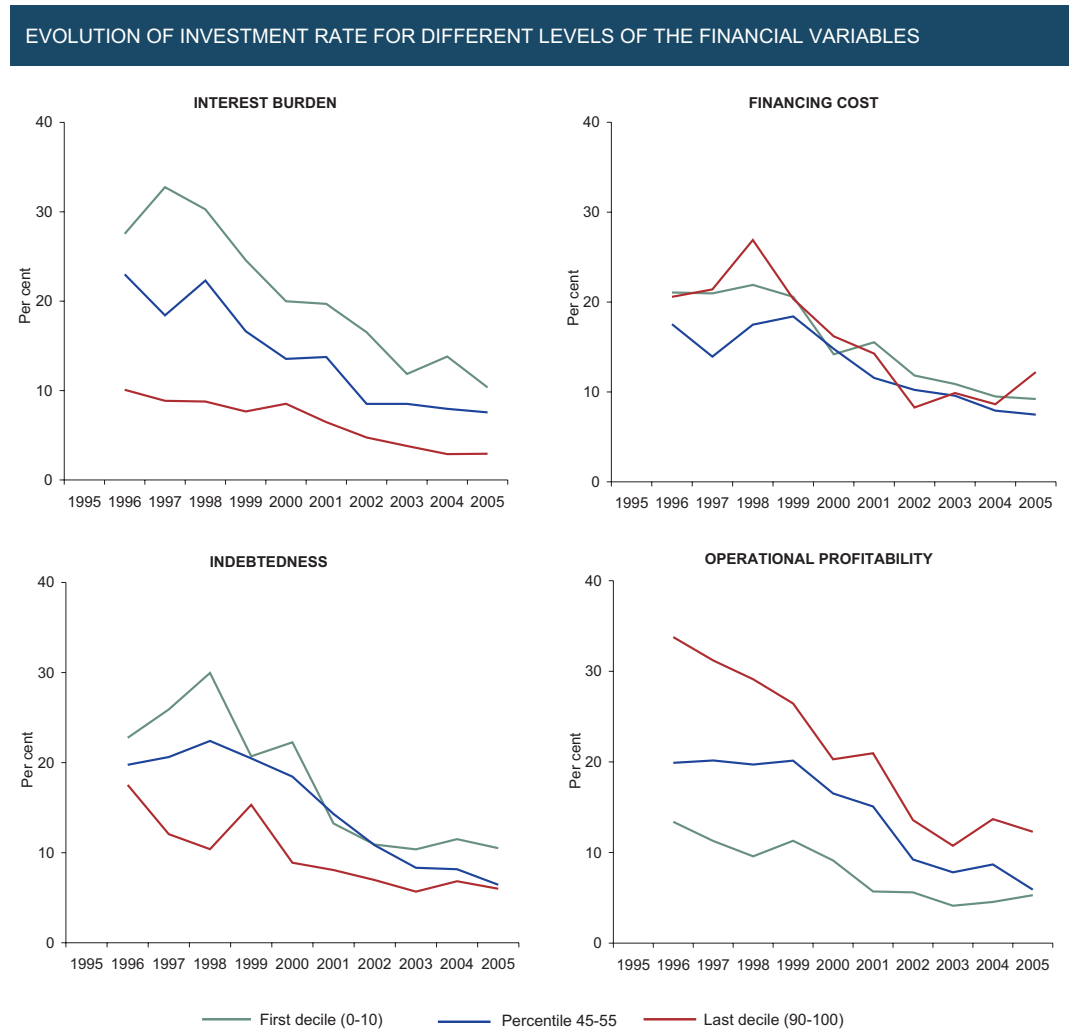
Note: In each panel the median investment rate is represented for firms located in the first decile, between the percentile 45 and 55, and in the last decile of the distribution of the financial variable under analysis.

4. ECONOMETRIC ANALYSIS

4.1 Methodology and estimated model

This section empirically tests the hypothesis that corporate investment decisions depend on their financial position, and attempts to characterize the way in which this dependence can be expressed. For this purpose, the following econometric specification was adopted:

$$\text{Inv}_{it} = \alpha_i + \gamma \text{Inv}_{it-1} + \beta x_{it-1} + \delta \Delta Sales_{it-1} + \varphi Size_{it-1} + \varepsilon_{it}, \tag{2}$$

where the investment rate $\left(\text{Inv}_{it}\right)$, defined as the investment/capital stock ratio, is the dependent variable. Investment was deemed to be a function of investment made in the previous period, incorporating possible adjustment costs of the capital stock, as well as of other variables characterising the financial standing of Portuguese firms $\left(x_{it-1}\right)$. The financial variables considered were the interest burden (*b*), cost of financing (*c*), indebtedness (*d*) and gross operating profitability (*r*), which were pre-

sented as logarithms and as deviations from the sample mean in order to facilitate the reading of results.[8] The estimated equations included variables controlling for corporate size, measured by the logarithm of total asset at constant prices, also in terms of deviations from the sample mean $\left(\text{Size}_{it-1}\right)$, and for the corporate growth potential, measured by the growth rate of the logarithm of sales $\left(\Delta\text{Sales}_{it-1}\right)$. Controls for macroeconomic context over investment (common to all firms) and for systematic effects associated with economic sector in which the firm operates were also considered.

Due to endogeneity problems in the specified equation, estimations were performed using the GMM System estimator. This method, proposed by Arellano and Bover (1995) and examined in detail in Blundell and Bond (1998), represents an extension of the estimator initially presented by Arellano and Bond (1991). Using this methodology, equations are estimated in levels and differences and instruments are the lagged values of the non-strictly exogenous explicative variables.

In what follows, the above specification was implemented, evaluating the impact on the investment rate of the variables characterising the financial position of the Portuguese firms under review. At a latter stage, the existence of differentiated effects in different stages of the economic cycle as well as the level of internationalisation, firm size, number of bank lending relationships and possible default situations were tested.

4.2 Results

In all regressions, the coefficient associated with the 1-period lagged investment rate assumes a positive value, in line with most empirical approaches to corporate investment at micro-economic level (e.g. Benito and Young (2002) and Bond (2002)). Firm size[9] shows a negative coefficient, suggesting that larger firms tend to present lower investment rates, in line with our prior that these firms are more mature in the respective life cycle. In turn, sales growth, a variable that seeks to capture corporate growth potential, shows a positive coefficient, validating the idea that corporate investment is sensitive to changes in demand for its goods and services. As regards financial variables, the interest burden variable is relevant in the analysis of Portuguese corporate investment, contributing negatively to its own development (column 1 of Table 2). A similar result was obtained by Benito and Young (2002)[10] and by Benito and Hernando (2002), for a sample of firms in the United Kingdom and Spain respectively. This outcome is also in line with the results obtained by Nickell and Nicolitsas (1999), which established a relationship between financial pressure and employment, wages and productivity in UK firms. Table 2 (column 2) shows the results of the estimation, considering as regressors the financial variables presented in equation (1), namely the average cost of financing, indebtedness and the inverse of gross operating profitability. These variables were introduced in the regression after the logarithmic change and in deviations from their sample mean. The simple observation of the coefficients associated with the three variables in question suggests that the parameters associated with these variables are different, which is corroborated by the Wald test for parameter equality. The evidence of the coefficients estimated is consistent with the literature. On the one hand, firms with a higher debt cost or a higher indebtedness level tend to show lower investment rates in the subsequent year, although only in the latter case the associated coefficient is statistically significant. On the other hand, firms with low profitability tend to show lower investment rates in the subsequent year.

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(8) The specification in question corresponds to considering for the interest burden *(B)*, for instance, the variable $b_{it} = \ln\left(B_{it}\right) - \overline{\ln\left(B\right)}$, where $\overline{\ln\left(B\right)}$ is the sample mean.

(9) Measured by the (natural) logarithm of the asset at constant prices.

(10) In addition to the evaluation of the impact of financial pressure on investment, an evaluation was also made of the impact of this variable on other variables, namely the corporate dividend policy.

Table 2

ECONOMETRIC RESULTS FOR THE INVESTMENT RATE (Inv_{it})				
	BASE MODEL		**BUSINESS CYCLE EFFECT** $D_{it} = 1$ if $t \in \{2001\ldots,2005\}$	
	(1)	**(2)**	**(3)**	**(4)**
Inv_{it-1}	0.0475	0.0493	0.0453	0.0485
	(0.000)	(0.000)	(0.000)	(0.000)
$Size_{it-1}$	-0.0253	-0.0258	-0.0254	-0.0257
	(0.000)	(0.000)	(0.000)	(0.000)
$\Delta Sales_{it-1}$	0.0854	0.0963	0.0809	0.0966
	(0.000)	(0.000)	(0.000)	(0.000)
$Interest\ burden_{it-1}$	-0.0556		-0.0617	
	(0.011)		(0.006)	
$Financing\cos t_{it-1}$		-0.0388		-0.0173
		(0.218)		(0.626)
$Indebtedness_{it-1}$		-0.0668		-0.0479
		(0.033)		(0.136)
$(Inverse\ of\ )\ Profitability_{it-1}$		-0.0215		-0.0204
		(0.003)		(0.057)
$Interest\ burden_{it-1}D_{it-1}$			-0.0199	
			(0.125)	
$Financing\cos t_{it-1}D_{it-1}$				-0.0372
				(0.258)
$Indebtedness_{it-1}D_{it-1}$				-0.0416
				(0.130)
$(Inverse\ of\ )\ Profitability_{it-1}D_{it-1}$				0.0019
				(0.876)
Hansen (*p-value*)	0.866	0.782	0.916	0.854
AR 1 (*p-value*)	0.000	0.000	0.000	0.000
AR 2 (*p-value*)	0.654	0.681	0.651	0.739
Observations	17 519	17 519	17 519	17 519
N of firms	5 867	5 867	5 867	5 867

Note: Estimation by GMM system estimator, using the routine xtabond2 (Stata 9.0), developed by Roodman (2005). In all estimated equations, lagged investment rates were used as instruments. In first-differences equations, lags 2 and 3 of the investment rate were considered, while in levels equations only the lag 2 was introduced as instrument. The variables firm size and sales growth were used as standard instruments, even thought the latter was only considered as instrument in levels equations. In column 1, lags 3 and 4 of interest burden were also included as instrument in level equations. In column 2, the additional instruments for first-difference equation were lags 2 and 3 of indebtedness and for levels equation the lags 2 and 4 of financing cost. The profitability was taken as strictly exogenous. Finally, in estimations presented in columns 3 and 4, lagged values for the interaction terms of financial variables and the dummy variable were also introduced as instruments.

Columns (3) and (4) of the same table show the results of the previous econometric specifications, but recognising that the coefficients associated with the financial variables may be different, depending on the macroeconomic framework. The sample was therefore divided into two sub-periods: the first one was characterised by high growth of the gross domestic product (1995-2000) and the second one by a marked economic slowdown (2001-2005). A categoric variable was introduced in the regression, interacting with the financial variables under review. The coefficients of the financial variables in the period of lower economic growth are not statistically different from the coefficients for the 1995-2000 period, suggesting that investment does not show different types of sensitivity to the different financial variables over the economic cycle. However, the observation of the coefficients of the temporal dummies[11] indicates a substantial difference at the level of the investment rate in both periods under review, confirming lower investment rates in periods of economic slowdown, given the strong pro-cyclical nature of investment.

In order to better characterize the impact that corporate financial standing may have on firms' investment decisions, we test the role of that other corporate characteristics may play in investment sensitivity to interest burden. Hence, we test for the differentiated sensitivity associated with the strength of the participation of the firm in export market, its size, the number of bank lending relationships and the existence of past due credit of the concerned firm, which tend to be related to a more precarious financial standing.

(11) These coefficients are not reported in the present article.

First the effect of the firm's presence in the external market on the coefficient of the interest burden variable was tested. The direct effect that the presence in the external market may have on the investment rate was also considered. This procedure consisted on estimating the following model:

$$\text{Inv}_{it} = \alpha_i + \gamma \, \text{Inv}_{it-1} + b_{it}\left[\beta_0 D_{it-1}^{NE} + \beta_1 D_{it-1}^{E} + \beta_2 s_{it-1} + \beta_3 s_{it-1}^2\right]$$
$$+ \lambda_0 D_{it-1}^{E} + \lambda_1 s_{it-1} \lambda_2 s_{it-1}^2 + \delta \Delta Sales_{it-1} + \varphi \, Size_{it-1} + \varepsilon_{it} \tag{3}$$

where variables pertaining to the participation of firms in international trade interact with the interest burden variable (b_{it}). Therefore the regression includes the share of sales to the external market of firm i in period t (s_{it}) and the categoric variables D_{it}^{E} and D_{it}^{NE} that assume the value 1 when firm i in period t is an exporting firm and when firm i in period t does not report sales to the external markets respectively. In this context, the coefficient β_0 is interpreted as the sensitivity of investment to interest burden, in the cases where the whole production of goods and services is placed on the domestic market. As regards exporting firms, when compared with the other firms, it is reasonable to acknowledge two driving forces behind higher or lower sensitivity. On the one hand, the firms present in export markets tend to show higher productivity (see e.g. Jensen, Redding and Schott (2007)), and their investment decisions should depend mainly on changes in marginal capital productivity, while the respective financial situation is less relevant. On the other hand, as the share of turnover in export markets grows, it is to be expected that firms become increasingly subject to more aggressive competition. Investment may even become gradually more sensitive to the corporate financial position, as a result of higher exposure to competition in markets of destination of exports. Table 3 (column (1)) shows the values estimated for the above equation, focusing on the different behaviour of exporting firms, as opposed to non-exporting firms. The results for the latter suggest that corporate investment is influenced by interest payments, since β_0 shows a negative and statistically significant value. As regards exporting firms, the focus is on the positive direct effect that their presence in the external market seems to have on the investment rate and on the (non-linear) impact of the export share on the coefficient of the interest burden variable, in line with the above reasoning. β_2 and β_3 indicate that, as regards exporting firms, there is an inverted-U relationship between the share of production placed in external markets and the sensitivity of investment to the corporate financial situation, although the coefficients are not statistically significant for a large percentage of the sample. Chart 9 shows estimates for the marginal impact of the interest burden variable on the share of sales assigned to the export markets, as well as the respective confidence intervals at 95 per cent probability. At a 5 per cent level of significance, such impact is negative and statistically significant and for the group of firms that export almost all their production, while not statistically different from zero for the remaining firms.

In what follows the possibility that the sensitivity of investment depends on corporate size is tested. This is relevant in terms of economic policy, since it is to be expected that smaller firms face higher constraints when obtaining external financing, given that they are less transparent in terms of information available to the general public. Therefore, the base model, presented in equation (2), is re-estimated considering that the coefficient of the interest burden variable changes linearly with size,[12] i.e.

$$\beta = \beta_0 + \beta_1\left[Size_{it-1}\right]$$

where the $Size_{it-1}$ variable corresponds to the deviations of the natural logarithm of total assets of each firm (at constant prices), *vis-à-vis* the respective sample mean, as previously mentioned. The value estimated for the coefficient β_1 was expected to be positive, since larger firms would tend to make the respective investment decisions in line with marginal capital productivity, wherefore the aspects associated with their financial structure would be less relevant. The estimations obtained confirm this hy-

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(12) A specification with a quadratic term was tested, but it was not statistically significant.

pothesis (column (2) of Table 3 and Chart 9). In the case of large firms, the fact that their interest burden is higher during a given period is not a relevant constraint to investment in the future. This may be warranted by the more persistent and phased nature of investment by these firms, for which interest payments may be the result of the investment cycle led by the firm.

In addition, an analysis was made of whether the sensitivity of investment to interest payments depended on other variables characterising the corporate financial position, namely the number of bank lending relationships and the existence of default situations.[13] In order to check the impact of the number of the abovementioned banking relationships, a model similar to that shown in equation (3) was estimated, where the variable share of exports was replaced by the variable number of banking
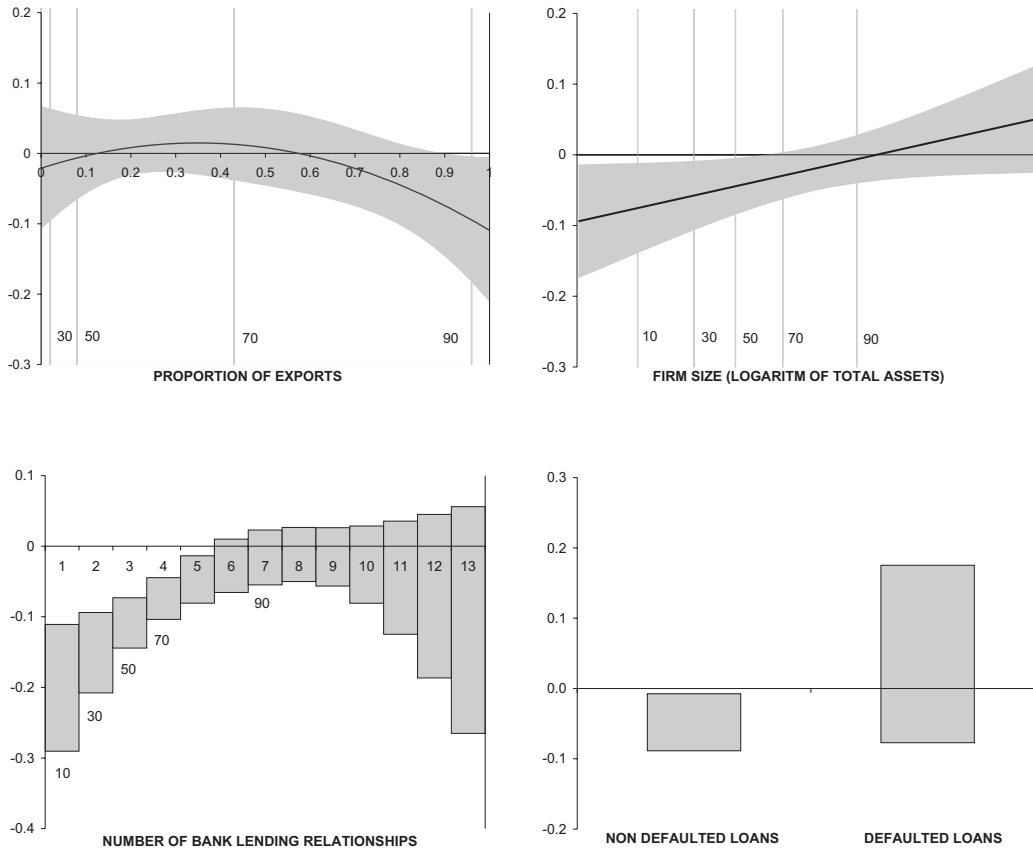
Table 3

DIFFERENCIATED IMPACT ON THE INVESTMENT RATE (Inv_{it})				
	EXTERNAL MARKET EFFECT	**FIRM SIZE EFFECT**	**BANK RELATIONSHIP EFFECT**	**DEFAULT LOANS EFFECT**
	(1)	**(2)**	**(3)**	**(4)**
Ψ_{it-1}	**Exportation share**	**Firm size**	**Number of bank lending relationship**	
Inv_{it-1}	0.0529	0.0507	0.0368	0.0476
	(0.000)	(0.000)	(0.000)	(0.000)
$Size_{it-1}$	-0.0251	-0.022	-0.0281	-0.0254
	(0.000)	(0.000)	(0.000)	(0.000)
$\Delta Sales_{it-1}$	0.0833	0.088	0.08	0.0888
	(0.000)	(0.000)	(0.000)	(0.000)
$Interest\ burden_{it-1} \cdot \overline{D}_{it-1}$	-0.0631		-0.0671	-0.048
	(0.009)		(0.267)	(0.020)
$Interest\ burden_{it-1} \cdot D_{it-1}$	-0.0211		-0.2005	0.0491
	(0.638)		(0.000)	(0.446)
$Interest\ burden_{it-1}$		-0.0442		
		(0.030)		
$Interest\ burden_{it-1} \Psi_{it-1}$	0.2054	0.0187	0.0535	
	(0.379)	(0.048)	(0.010)	
$Interest\ burden_{it-1} \Psi^2_{it-1}$	-0.2938		-0.0038	
	(0.189)		(0.048)	
Ψ_{it-1}	-0.0284		-0.0058	
	(0.636)		(0.010)	
Ψ^2_{it-1}	0.0263		-0.0038	
	(0.664)		(0.048)	
D_{it-1}	0.0146			-0.0973
	(0.109)			(0.017)
Hansen (*p-value*)	0.492	0.874	0.730	0.848
AR 1 (*p-value*)	0.000	0.000	0.000	0.000
AR 2 (*p-value*)	0.437	0.619	0.945	0.657
Observations	17 519	17 519	17 519	17 519
N of firms	5 867	5 867	5 867	5 867

Notes: The variable Ψ_{it-1} corresponds to exportation share, firm size and bank lending relationship in the estimations presented in columns 1, 2 and 3, respectively. In column 1, the dummy variable D_{it-1} takes the value one if firm *i* in period *t-1* exported and it takes the value zero otherwise. In turn, the variable $\overline{D}_{it-1}$ takes the value one if firm *i* in period *t-1* did not export and it takes the value zero otherwise. In column 3, the dummy variable D_{it-1} takes the value one if firm *i* in period *t-1* presented at least a bank lending relationship and it takes the value zero otherwise, while the dummy $\overline{D}_{it-1}$ takes the value one if firm *i* in period *t-1* did not have any bank lending relationship and it takes the value zero otherwise. In column 4, the dummy variable D_{it-1} takes the value one if the firm *i* in period *t-1* presented non-performing loans and it takes the value zero otherwise, while the dummy variable $\overline{D}_{it-1}$ takes the value one if the firm *i* in the period *t-1* did not present any default loan and it takes the value zero otherwise. Estimation by GMM system estimator, using the routine xtabond2 (Stata 9.0), developed by Roodman (2005), similarly to table 2. Regarding instruments, besides instruments mentioned in table 2, it was also taken into account in first-differences equations the values of the variables $b_{it-1}D_{it}$ and $b_{it}\overline{D}_{it}$, and in levels equations the values of the variables $b_{it}\Psi_{it}$ and $b_{it}\overline{\Psi}_{it}$, for lags 2 and 3, when applicable. The remaining regressors were considered as strictly exogenous.

Chart 9

CONFIDENCE INTERVAL FOR THE COEFFICIENT OF THE INTEREST BURDEN VARIABLE

Note: The panels present the confidence interval (at 95 per cent) of the coefficient of the interest burden variable as a function of the share of exports, firm size, number of bank lending relationships and the presence non-performing loans. Additionally, it is also presented some percentiles of the distribution of the exports share, firm size and number of bank lending relationships. However, it should be noted that in the panel related with the exports share, only exporting firms were taken into account in the computation of confidence interval and the respective percentiles.

relationships. In the literature, there is no consensus regarding the impact of the number of bank lending relationships on financing availability. On the one hand, Fama (1985) and Petersen and Rajan (1994) argue that the existence of close relationships with a small number of banking institutions raises the availability of additional financing, and associated financing conditions are better. On the other hand, Rajan (1992) and Bolton and Scharfstein (1996) suggest that the optimum debt structure depends on efficient bargaining, which has associated a sufficiently large number of banks. The estimated values for the coefficients β_2 and β_3 shown in column (3) of Table 3 corroborate the thesis that multiple bank lending relationships raise the bargaining power of the firm. For most firms considered in the analysis, the increase in the number of bank relationships contributes to weaken the sensitivity of investment to the initial financial standing.

Finally, it was examined whether the sensitivity of investment to the interest burden is differentiated for firms with loans in default, which correspond to approximately 4 per cent of the sample under review. The results obtained suggest that corporate investment of those firms with loans in arrears is, on average, significantly lower than in firms without loans in arrears (column (4) of Table 3). In addition, investment does not seem to be statistically sensitive to changes in the interest burden, to the extent that

marginal improvements in the respective financial standing are more likely to improve the value of the creditors' claims than the remaining stock holders.

5. CONCLUSIONS

Indebtedness of non-financial corporations, when evaluated as a percentage of GDP, has increased very significantly since the mid-1990s. This increase was also seen in the indicators calculated from the balance sheet items of the sector, namely the ratio of financial debt to total assets, in spite of the less marked development of this indicator.[14] The increase in indebtedness occurred against the background of a decline in the average level of nominal interest rates, which was associated with the nominal convergence process and subsequent participation in the euro area. Thus, it was the result of a change in the sustainable level of debt in this sector. In this context, the increase in aggregate indebtedness should be qualified on the basis of indicators measuring the capacity of firms to service debt, namely monitoring the ratio of interest payable to corporate current income, and the distribution of this indicator across firms. In aggregate terms, in recent years, this indicator has remained at a lower level than in the mid-1990s, with a much more marked decline in firms that posted the highest levels at the beginning of the period under study. The developments in this indicator corroborates the notion that the strong increase in corporate indebtedness may correspond to a structural change associated with the new economic regime underlying participation in the euro area, characterised by a lower interest rate level and volatility.

As regards monitoring financial stability, it is relevant to focus on the fact that the growth pace of financial debt was more marked for larger firms in the sample period. However, in the period under review, the strong asset accumulation was also higher in the group of larger firms, which partly corresponds to the buoyancy of the restructuring and internationalisation of Portuguese economic groups. Moreover, the corporate credit portfolio of Portuguese banks is significantly concentrated in a small number of large firms, which, in spite of their higher idiosyncratic risk, are usually associated with low default rates.

Monitoring this type of indicators is the more relevant the more the corporate financial standing is liable to affect the development of real activity, in a context of imperfect financial markets. This work reviews investment decisions by a group of non-financial corporations, using individual data for the period from 1995 to 2005. In particular, it gauges the manner in which financial pressure of a given firm, evaluated by the share of operating income allocated to interest payments in each period, has an effect on its investment in the subsequent period. Against this background, the results obtained for firms in the sample suggest that the financial standing is relevant for investment.

Therefore, for the group of firms under review, a negative relationship was found among the variables that measure the financial pressure of firms and their investment. Nonetheless, this sensitivity is not uniform across firms and depends on some of their specific characteristics. In particular, investment is less sensitive to financial pressure in larger firms and does not reveal any sensitivity if the firm has defaulted in its credits. It should be noted, however, that firms in default tend to show lower investment rates. Participation in international trade and the number of bank lending relationships have a non-linear effect on the sensitivity of investment to financial pressure of the firm. For most firms in the sample, though, the increased participation in world trade and the higher number of bank relationships imply a decrease in the sensitivity of investment to its financial standing. When considering the factors that are common to all companies, namely the macroeconomic context, different effects do not seem to exist in

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(14) In fact, the debt to assets ratio declined somewhat in the most recent period.

sensitivity of investment to the financial standing between downturns and upturns of economic activity (notwithstanding the pro-cyclical component characterising investment).

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