Title of Paper: The Relationship Between Fixed Investment and Cash Flow: Evidence for Portuguese Manufacturing Sector

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ABSTRACT

Recent developments in the field of information economics have demonstrated that there is a link between financial factors and business fixed investment decisions. This link is due to the existence of information asymmetries in financial markets, which prevents a perfect substitution between funds for finance that firms can access. Therefore, internal funds become cheaper than external funds – and an hierarchy of finance is created. In this paper we present the results of a study aimed at assessing the link between investment decisions of firms and their financial status for the case of the Portuguese manufacturing sector, based on the methodology proposed by Fazzari et al (1988). The results obtained seem to lend support to the financial restrictions hypothesis.

Key-words: Investment; Cash-flow; Financial Restrictions.

1 INTRODUCTION

The purpose of this paper is to evaluate the extent to which the financial restrictions model can explain fixed investment decisions of firms in the Portuguese manufacturing sector.

The aim is to assess whether information imperfections in capital markets affect business fixed investment decisions. In particular, we intend to verify if there are differences in investment behaviour of firms, when exposed to information problems in financial markets, as it is suggested by recent developments in the field of information economics. According to these developments, imperfect information between those who demand and those who offer funds for investment can lead to under investment, irrespective of investment projects have positive net present value. In this context, it could be argued that not only do real aspects of an investment decision matter, but also that financial one are equally relevant when firms have to decide on what investment to undertake.

This paper is organised as follows. In section 2 there is a brief description of the rationale behind the financial restrictions model, in explaining business fixed investment decisions. Section 3 comprises the empirical study. In this section we present the methodology of the study, the sample and the variables used, and the criterion for classifying firms. The specifications adopted for the econometric investment equation and the estimation results are shown.

2 FINANCIAL RESTRICTIONS MODEL

According to the investment models that assume perfect capital markets[1], the availability of internal funds do not affect investment decisions. Investment outlays in each period are determined in perfectly functioning capital markets. Financial factors are only considered in the cost of capital, which, in turn, is independent on the way, the firm finances itself. This independence derives form the assumption that capital markets are perfect. Thus, firms can obtain all financing that they need to implement investment projects, when the expected marginal return exceed the cost of capital.

[1] For example, the neoclassical model of Jorgenson (1963) and the Q-model of Tobin (1969).

In other words, it would not be expected that a company, with a profitable investment opportunity but an investment outlay greater than its available funds, would invest less than a company with the same investment opportunities but with greater cash flow. Any insufficiency will attract finance in capital markets as investors attempt to explore the profit opportunity. This also means that the marginal costs of financing by debt, by external equity capital and by internal funds are the same.

In this context, it could be argued that the availability of adequate cash flows is not a restriction on investment and that the financial characteristics of firms do not affect the cost of capital.

By contrast, the model of financial restrictions is based, primarily, on the assumption that capital markets are not perfect. In this case, the decision about the sources of finance become extremely important, since the cost of internal funds may diverge significantly from that of external funds. In this way, a hierarchy of finance is created, in which the firm begins to use the cheaper funds: internal funds first, debt next, and finally new equity capital.

Therefore, when a company has to decide about its investment costs, it should consider not only the real aspects of the investment decision[2], but also the financial aspects, namely, the generated cash flows and the level of internal funds, so that the company do not underestimate valuable investment opportunities.

It should be emphasised that the idea of including financial variables in an econometric investment equation is not new. The models that integrated these variables assumed great importance in the 1950's. However, three fundamental reasons justify their abandonment. Firstly, the *ad hoc* manner in which these variables were included in the estimating investment equations. Secondly, the famous proposition 1 of Modigliani and Miller (1958), which provided the theoretical foundations required to consider only the real aspects of the investment decision. Thirdly, the empirical results obtained with the models that included the financial variables in comparison with more consistent theoretical models, as the case of the neoclassical model (see Jorgenson (1971)), were poor.

The recent resurgence of investment models that integrate, as an explaining factor of investment, the financial features is due, fundamentally, to two reasons. The first one is related to the emergence of a new theoretical body, that flourished since the

[2] For example, the output, the relative price of inputs, or technology.

1970's, which provided a consistent justification for the relevancy of financial factors on investment decisions (and, of course, the inclusion of financial variables on an econometric investment equation). The theory of asymmetric information is associated with the works of Akerlof (1970), Stiglitz and Weiss (1981), Greenwald et al (1984), and Myers and Majluf (1984), and the agency theory to by Jensen and Meckling (1976). The second reason derives from the pioneer empirical study of Fazzari et al (1988), in which a new methodology for evaluating the impact of financial factors on investment decisions of firms was proposed.

The designation of this model as the financial restrictions model come from the basic assumption that companies can face financial restrictions. One can say that there are financial restrictions when a company cannot obtain all the amount of finance it needs, irrespective of the opportunity cost of funds. In other words, financial restrictions refers to the situation in which profitable investment projects, that would be undertaken if there were sufficient internal funds in the firm, would be abandoned since the availability of external funds for the company is limited due to information imperfections in capital markets and the cost of external funds is greater than that of internal funds (Kim, 1999).

In brief, the financial restrictions model emphasizes that, although some types of companies can easily obtain external funds to smooth their investment expenses when internal funds fluctuate, the time and amount of capital outlays of other firms, with limited or no access to external funds, will likely to be conditioned by fluctuations in internal cash flows. This fact may give rise to a situation of under investment of companies.

3 EMPIRICAL STUDY

To evaluate the impact of financial factors on investment decisions of companies, the methodology proposed initially by Fazzari et al (1988) was adopted. This methodology can be described as follows. Firstly, firms, belonging to the sample, are divided into two groups, according to how much they are affected, *a priori*, by information problems in capital markets, and thus more subject to financial restrictions. Secondly, to verify if there are systematic differences in the values obtained for the coefficients on financial variables (especially, on cash flow), an econometric investment

equation is estimated for each group, and the results obtained for the coefficients compared.

In this study two key hypotheses are tested. Firstly, the aim is to verify whether investment decisions of firms are affected by financial factors. This fact may derive as a result of a non-perfect substitutability between the different sources of funds that a firm can access, that is, internal funds, debt, and new equity capital. If this is the case, the financial structure of a firm is relevant, which implies that investment and financial decisions are not independent. So, one can conclude that internal funds are, apart from real variables, an important determinant of business fixed investment.

Secondly, the aim is to test whether the impact of financial factors differs between companies. That is, to determine the extent to which the effect of internal funds on investment decisions of firms is more important for those identified, *a priori*, as suffering more from information problems in capital markets and, consequently, where the differential between the costs of internal and external funds are higher, thus contributing for the existence of financial restrictions. Hence, the more a company is exposed to finance constraints the more its investment decisions should be determined by the availability of internal funds.

3.1 SAMPLE AND VARIABLES USED

In the present study, a panel data was used to obtain empirical evidence on whether firms belonging to the Portuguese manufacturing sector face financial restrictions.

According to Hsiao (2003), panel data has the following advantages. Firstly, panel data leads to an increase in the degrees of freedom and to a reduction in the colinearity between explanatory variables, since the investigator has access to numerous data, which allows an increase in the efficiency of the estimates. Secondly, panel data allows an investigator to construct and test more complex behavioural models, than would be the case if only cross-sectional or time series data were used. Thirdly, the use of panel data permits the minimisation of problems related to the interpretation of the estimated results that may arise from the effects that the omitted variables can have, specially when one suspects that these variables are correlated with explanatory variables.

The sample used in this study, comprised about 8090 firms, for a period between 1990 and 2000. This data came from the *Central de Balanços do Banco de Portugal*.

Since a balanced panel data was used, firms had to respect several criteria to be included in the sample. Firstly, only private firms, belonging to the manufacturing sector, with at least 25 employees, were considered. Secondly, only companies that presented values for all variables and for every year of the period considered were selected. As a result, the final sample comprised a total of 714 firms.

As far as the variables used were concerned, they were computed from the accounting data of the firms selected, and can be described as follows:

- Investment (I): acquisitions of new structures and equipments.
- Stock of capital (K): represented by fixed assets.
- Sales (S): total sales of the firm.
- Cash flow (CF): given by the sum of profits and depreciation.
- Working capital (WC): current assets minus current liabilities.
- Debt (LTD): correspond to the medium- and long-term debt of the firm.

Table 1 shows some descriptive statistics of the firms in the sample.

Variables	Full Sample		
	Mean	Median	S. D.
K	3311994	1173330	6308335
I	699019	202183	1659003
ΔWC	131562	32003	2748804
I_t/K_{t-1}	0.331	0.197	0.563
$\Delta WC_t/K_{t-1}$	0.068	0.054	1.195
S_t/K_{t-1}	6.276	3.901	8.187
CF_t/K_{t-1}	0.365	0.292	0.623
WC_{t-1}/K_{t-1}	1.143	0.528	2.674
$\Delta LTD_{t-1}/K_{t-1}$	0.033	0.000	0.516

Table 1 – Descriptive statistics for firms of the full sample. Number of observations 7140.

The most relevant features are the following. Firstly, the mean value of the fixed assets held by firms was € 3 311 994. Secondly, the mean value of the investment in fixed assets was € 699 019, whilst the mean value of the investment in working capital was € 131 562. Thirdly, the mean rate of investment in fixed assets was 33%, whilst the mean rate of investment in working capital was 7%. Finally, sales represented, on average, six times the value of fixed assets of the firms considered.

3.2 CRITERIA FOR SPLITTING THE SAMPLE

In this subsection the criterion used to identify firms that face greater financial restrictions, due to information problems in capital markets are described.

3.2.1 Dimension

The first criterion used to split firms into two groups was the firms' size (a group of large firms and a group of small firms).

The size of a firm can be defined in relation to several aspects, namely, total assts, market value, number of employees and sales. In this study sales was the variable used to identify the large and the small companies.

According to this criterion, it is assumed that large firms are, *a priori*, less subject to financial restrictions.

The decision to split the sample according to size can be justified as follows. Firstly, larger companies have an easier access to capital markets, due to the possibility of using the firm's assets as collateral. Secondly, it is likely that transaction and floatation costs for new share or bond issues decrease with dimension. Thirdly, larger companies can use more different sources of funds than small companies, which allow large companies to reduce the risk of financing. Fourthly, larger companies have, in general, to meet more obligations in terms of financial statements produced and information released about their activities and future prospects. Finally, it is likely that small firms suffer more of the idiosyncratic type of risk.

Table 2 shows descriptive statistics for both types of firms, large and small.

Variables	Large Firms			Small Firms		
	Mean	Median	S. D.	Mean	Median	S. D.
K	5957508	3108122	8067413	666479	420520	718849
I	1238918	538035	2203110	159119	76503	261752
ΔWC	240486	92558	3873230	22637	21093	297184
I_t/K_{t-1}	0.292	0.190	0.361	0.370	0.209	0.709
$\Delta WC_t/K_{t-1}$	0.042	0.045	0.599	0.093	0.068	1.580
S_t/K_{t-1}	5.454	3.706	5.601	7.098	4.106	10.067
CF_t/K_{t-1}	0.338	0.281	0.445	0.393	0.304	0.760
WC_{t-1}/K_{t-1}	0.851	0.499	1.499	1.435	0.560	3.448
$\Delta LTD_{t-1}/K_{t-1}$	0.036	0.000	0.514	0.030	0.000	0.518

Table 2 – Descriptive statistics for firms classified according with size. Number of observations 3570.

By comparing the figures for both types of firms, the following conclusions can be drawn. Firstly, the mean values of fixed assets, of investment in fixed assets and of investment in working capital are nine, eight, and eleven times greater for large firms than for small firms, respectively. Clearly, this fact shows how different are the firms included in each group.

Secondly, the mean rate of investment in fixed assets and the mean rate of investment in working capital are greater for small firms than for large firms (37% vs. 29% e 9% vs. 4%, respectively).

Finally, the proportion of the mean value of sales on the mean value of fixed assets is greater for small firms than for large firms.

3.2.2 Age

The second criterion used to divide firms into two groups was the firms' age (a group of mature firms and a group of young firms).

It is assumed that mature firms are less likely to face information problems in capital markets for: (a) creditors have, in general, more information about mature firms, since they have been visible for a longer period of time, and (b) mature firms can establish continued relationships with creditors and suppliers based on mutual confidence, which helps overcome information problems.

Table 3 shows descriptive statistics for both types of firms, mature and young.

Variables	Mature Firms			Young Firms		
	Mean	Median	S. D.	Mean	Median	S. D.
K	4583178	1852022	7917781	2040809	824976	3698288
I	936291	262078	2137560	461746	158738	907503
ΔWC	138967	39630	3533964	124157	27748	1620172
I_t/K_{t-1}	0.309	0.180	0.579	0.353	0.217	0547
$\Delta WC_t/K_{t-1}$	0.062	0.052	1.309	0.073	0.058	8.742
S_t/K_{t-1}	5.835	3.544	7.337	6.716	4.307	8.936
CF_t/K_{t-1}	0.345	0.284	0.588	0.386	0.300	0.655
WC_{t-1}/K_{t-1}	1.375	0.657	3.107	0.911	0.433	2.132
$\Delta LTD_{t-1}/K_{t-1}$	0.026	0.000	0.621	0.040	0.000	0.384

Table 3 – Descriptive statistics for firms classified according with age. Number of observations 3570.

Table 3 shows that mature firms have mean values for fixed assets and for investment in fixed assets that are twice as greater than those of young firms. This is an indication that mature firms tend to be greater than young firms. However, this effect

tends to be counterbalanced, since young firms show a mean rate of investment in fixed assets higher than mature firms (35,3% vs. 30,9%).

It is also important to point out that the mean values for investment in working capital, rate of investment in working capital and the proportion of sales on the stock of fixed assets, are similar between the two groups of firms.

3.2.3 Retention ratio

The last criterion used to classify firms was the profits retention ratio. Hence, there is a group that includes firms with the lowest retention ratio and another composed of firms that have the highest retention ratios.

The basic assumption for having used this criterion was that the availability of internal funds can restrict the investment expenses of firms with higher retention ratio. Two reasons justify this rationale. On one hand, firms may need funds to finance an amount of investment that exceeds their cash flow. Hence, they opt to retain all internal funds at low cost, which they generated from their normal activity. On the other hand, since dividend payments and investment outlays correspond to alternative uses of funds, companies that face severe restrictions in obtaining finance should choose low dividend payouts.

Table 4 shows descriptive statistics for both types of firms, lower and higher profit retention ratios companies.

Variables	Low Retention Firms			High Retention Firms		
	Mean	Median	S. D.	Mean	Median	S. D.
K	4046521	1428890	7194304	2577466	1008582	5173388
I	794617	214893	1840733	603421	188763	1448714
ΔWC	139043	23435	3095253	124081	39633	2352289
I_t/K_{t-1}	0.304	0.178	0.569	0.359	0.218	0557
$\Delta WC_t/K_{t-1}$	0.043	0.034	1.297	0.093	0.078	1.084
S_t/K_{t-1}	5.526	3.494	7.039	7.025	4.323	9.132
CF_t/K_{t-1}	0.337	0.266	0.643	0.393	0.309	0.601
WC_{t-1}/K_{t-1}	1.077	0.492	2.503	1.208	0.565	2.834
$\Delta LTD_{t-1}/K_{t-1}$	0.029	0.000	0.492	0.037	0.000	0.540

Table 4 – Descriptive statistics for firms classified according with retention practices. Number of observations 3570.

The main features are the following. Firstly, companies with a low retention ratio tend to be larger, since they have a mean value for the stock of fixed assets higher than their counterparts (€ 4 046 521 vs. € 2 577 466).

However, the mean values of investment in fixed assets and working capital, although higher for low retention firms, do not differ much between both types of firms. On the other hand, the mean rates of investment in fixed assets and in working capital are higher for high retention firms.

3.3 SPECIFICATIONS FOR THE ECONOMETRIC INVESTMENT EQUATION

To test the two hypotheses set forth at the beginning of this section, three alternative specifications for the econometric investment equation were estimated, based on Fazzari and Petersen (1993) model.

The basic idea of this model focuses on the role that working capital may perform in an investment equation, given the possibility that in some cases it corresponds to the use of funds and, in other cases, to a source of funds.

The argument, developed by Fazzari and Petersen (1993), is as follows: (a) if firms face restrictions in accessing funds for finance, (b) if fixed investment is relatively irreversible, and (c) if firms want to maintain unchanged their fixed investment, then the two kinds of investment (in fixed and working capital) compete for obtaining finance, due to information problems in capital markets. Hence, it would be expected a negative relationship between fixed investment and working capital investment, since firms use working capital[3] to smooth there fixed investment.

The first specification considered is given by the following expression:

$$I_{it}/K_{it-1} = \alpha_i + \alpha_t + \beta_1(S_{it}/K_{it-1}) + \beta_2(CF_{it}/K_{it-1}) + \varepsilon_{it} \qquad (3.1)$$

where investment of the firm in fixed assets (I) is a function of sales (S) and cash flow (CF). All variables are divided by the stock of capital (K) to address the problem of heteroscedasticity. (α_i) corresponds to the firm effect, (α_t) to the year effect and (ε_{it}) is the error term.

In the second specification, the variable change in working capital (ΔWC) was added, and is as follows:

$$I_{it}/K_{it-1} = \alpha_i + \alpha_t + \beta_1(S_{it}/K_{it-1}) + \beta_2(CF_{it}/K_{it-1}) + \beta_3(\Delta WC_{it}/K_{it-1}) + \varepsilon_{it} \qquad (3.2)$$

If the estimated coefficient for ΔWC is negative, this is an indication that firms may face financial restrictions.

[3] The investment in working capital may become even negative.

The third econometric specification adopted for the investment equation is:

$$I_{it}/K_{it-1}=\alpha_i+\alpha_t+\beta_1(S_{it}/K_{it-1})+\beta_2(CF_{it}/K_{it-1})+\beta_3(\Delta WC_{it}/K_{it-1})+\beta_4(\Delta LTD_{it}/K_{it-1})+\varepsilon_{it} \quad (3.3)$$

With this specification, the effect of the change in medium- and long-term debt (ΔLTD) is taken into account, for it is the second main source of funds. The existence of a positive relationship between variation in debt and investment costs means that firms adjust their financial structure in such a way that allows them to accomplish their investment plans.

3.4 ESTIMATION RESULTS

In this subsection we present the estimation results for the various specifications of the investment equation and for the various criteria used to split the sample.

All equations were estimated using a fixed effects model. Standard errors were corrected for heteroscedasticity by the White method.

3.4.1 Full Sample

Table 5 shows the regression results for the three specifications of the investment equation, for the full sample.

Independent Variable	Full Sample		
	(1)	(2)	(3)
S_{it}/K_{it-1}	0.030*	0.029*	0.026*
	(0.0010)	(0.0012)	(0.0013)
CF_{it}/K_{it-1}	0.048*	0.138*	0.328*
	(0.0051)	(0.0077)	(0.0122)
$\Delta WC_{it}/K_{it-1}$		-0.082*	-0.296*
		(0.0049)	(0.0124)
$\Delta LTD_{it}/K_{it-1}$			0.339*
			(0.0127)
Adjusted R^2	0.33	0.37	0.53
DW	1.89	1.90	1.95

Table 5 – Regression results for full sample, considering the alternative specifications of the investment equation. Dependent variable, I_t/k_{t-1}. Standard errors are in parenthesis. Number of observations 7140.
* Significant at 1% level.

The following conclusions can be drawn fro table 5. Firstly, for the three specifications of the investment equation, all explanatory variables are significant at one per cent level, and the estimated coefficients have the sign indicated by theory.

Secondly, the importance of including the variables investment in working capital, ΔWC, and change in the medium- and long-term debt, ΔLTD, should be

stressed, in terms of establishing an adequate picture of the role played by cash flow on an investment equation. It is also important to note that, in comparison with specification (3.1) of the investment equation, when investment in working capital is included there is a negative relationship between the two types of investment and that the coefficient estimated for cash flow increases almost three times. Additionally, when the variation in medium- and long-term debt (ΔLTD) is considered, companies adjust their capital structure to accomplish their investment plans and the estimated coefficients on cash flow and investment in working capital increase almost seven times and about three and half times, respectively. Finally, the explanatory power of the model increases sixty per cent.

3.4.2 Dimension

Table 6 shows the regression results for the three specifications of the investment equation, when the sample was divided by firm size.

Independent	Large Firms			Small Firms		
Variable	(1)	(2)	(3)	(1)	(2)	(3)
S_{it}/K_{it-1}	0.026*	0.024*	0.023*	0.034*	0.033*	0.026*
	(0.0009)	(0.0010)	(0.0013)	(0.0021)	(0.0024)	(0.0019)
CF_{it}/ K_{it-1}	0.032*	0.090*	0.234*	0.103*	0.219*	0.468*
	(0.0052)	(0.0074)	(0.0123)	(0.0125)	(0.0151)	(0.0183)
$\Delta WC_{it}/ K_{it-1}$		-0.057*	-0.219*		-0.117*	-0.418*
		(0.0032)	(0.0113)		(0.0108)	(0.0211)
$\Delta LTD_{it}/ K_{it-1}$			0.243*			0.495*
			(0.0197)			(0.0183)
Adjusted R^2	0.35	0.36	0.47	0.32	0.41	0.59
DW	1.82	1.84	1.87	1.95	1.97	2.04

Table 6 – Regression results for firms classified according to their size, considering the alternative specifications of the investment equation. Dependent variable, I_t/k_{t-1}. Standard errors are in parenthesis. Number of observations 3570.
* Significant at 1% level.

The main features of the regression results shown in table 6 are the following. Firstly, although the estimated coefficient of the cash flow variable is statistically significant for all the specifications of the investment equation for both types of firms, their value is always higher for small firms than for large firms. The biggest difference is for specification 3.1, in which the parameter for cash flow for small firms is twice that for large firms. In this case, an increase of one euro on cash flow of small firms leads to an increase of 47 centimes on their investment, whilst an identical increase in cash flow of large firms only increases investment by 23 centimes.

Secondly, the results shown in table 6 confirm that investments in fixed assets and in working capital compete for the finance available, and that this effect is more important for small firms.

Thirdly, there is a positive relationship between investment and variation in their medium- and long-term debt (ΔLTD). This means that, in order to undertake investment projects, firms adjust their financial structure.

Finally, it is important to point out that although sales were included in all the specifications estimated for the investment equation, cash flow becomes always statistically significant. This fact can be interpreted as an indication that cash flows themselves play a role in explaining investment expenses of firms, and they are not proxying for shifts in investment demand. Simultaneously, and because sales are statistically significant in all the specifications of the investment equation, this means that an accelerator component is an important factor in explaining investment.

3.4.3 Age

Table 7 shows regression results for the three specifications of the investment equation, when the sample was divided by age.

Independent	Mature Firms			Young Firms		
Variable	(1)	(2)	(3)	(1)	(2)	(3)
S_{it}/K_{it-1}	0.030*	0.028*	0.028*	0.029*	0.029*	0.023*
	(0.0010)	(0.0011)	(0.0012)	(0.0019)	(0.0024)	(0.0018)
CF_{it}/ K_{it-1}	0.034*	0.101*	0.193*	0.093*	0.189*	0.485*
	(0.0064)	(0.0093)	(0.0132)	(0.0083)	(0.0123)	(0.0177)
$\Delta WC_{it}/ K_{it-1}$		-0.070*	-0.165*		-0.101*	-0.456*
		(0.0059)	(0.0118)		(0.0078)	(0.0181)
$\Delta LTD_{it}/ K_{it-1}$			0.200*			0.514*
			(0.0129)			(0.0179)
Adjusted R^2	0.32	0.35	0.42	0.34	0.40	0.65
DW	1.86	1.87	1.89	1.92	1.94	2.03

Table 7 – Regression results for firms classified according to their age, considering the alternative specifications of the investment equation. Dependent variable, I_t/k_{t-1}. Standard errors are in parenthesis. Number of observations 3570.

* Significant at 1% level.

The following features are noteworthy. Firstly, given that, for the three specifications of the investment equation, the cash flow coefficient is always higher for young firms than for mature firms, it can be argued that young firms tend to suffer more from finance constraints than mature firms.

Secondly, this conclusion is enhanced by the behaviour of the variables investment in working capital (ΔWC) and change in medium- and long-term debt (ΔLTD). On one hand, the fact that both types of investment (in fixed and working capital) compete for the limited availability of funds for investment finance is confirmed and on other hand, there is a positive relationship between investment and change in medium- and long-term debt.

Finally, sales are statistically significant at one per cent level for all the specifications of the investment equation for both types of firms. This result confirms, on one hand, the importance of the principle of the accelerator as a determinant of investment expenses of firms and, on other hand, the need to control the investment opportunities that firms face to evaluate the true impact of financial factors on the investment of companies.

3.4.4 Retention Ratio

Table 8 shows regression results for the three specifications of the investment equation, when the sample was divided by profits retention ratio.

Independent Variable	Low Retention Firms			High Retention Firms		
	(1)	(2)	(3)	(1)	(2)	(3)
S_{it}/K_{it-1}	0.029*	0.029*	0.028*	0.027*	0.026*	0.022*
	(0.0009)	(0.0010)	(0.0012)	(0.0021)	(0.0025)	(0.0013)
CF_{it}/ K_{it-1}	0.022*	0.063*	0.180*	0.155*	0.253*	0.588*
	(0.0053)	(0.0069)	(0.0113)	(0.0131)	(0.0181)	(0.0186)
$\Delta WC_{it}/ K_{it-1}$		-0.047*	-0.171*		-0.122*	-0.532*
		(0.0044)	(0.0110)		(0.0102)	(0.0189)
$\Delta LTD_{it}/ K_{it-1}$			0.197*			0.586*
			(0.0095)			(0.0202)
Adjusted R^2	0.35	0.36	0.42	0.32	0.39	0.71
DW	1.88	1.88	1.89	1.91	1.94	2.07

Table 8 – Regression results for firms classified according to their retention practices, considering the alternative specifications of the investment equation. Dependent variable, I_t/k_{t-1}. Standard errors are in parenthesis. Number of observations 3570.
* Significant at 1% level.

This table shows that although the cash flow variable is statistically significant for a level of one per cent for all the specifications of the investment equation for both types of firms, the estimated coefficient is much higher for firms with high retention ratios (the difference between them reaches 0.408 for specification 3.3). This result is a clear indication that there are firms that face a finance hierarchy that can be explained by the existence of asymmetric information in financial markets.

From table 8 it is also possible to conclude that: (a) the impact of investment in working capital (ΔWC) and of the change in medium- and long-term debt (ΔLTD) on investment is higher for high retention firms, and (b) sales are an important determinant of fixed capital investment of firms.

4 CONCLUSION

There has been in recent times a growing interest, by empirical researchers, in the study of the determinants of business fixed investment decisions. This interest can be justified by two main reasons. Firstly, investment is a very volatile component of GDP, which means that it has a big influence over business cycles. Secondly, a new research topic about investment determinants (i.e., the role of financial constraints) was induced by recent developments in information economics.

The aim of this paper was to apply these new theoretical developments to the case of the Portuguese manufacturing industry, using an empirical methodology that has been used in several studies for a variety of countries. These studies have revealed the validity of the financial constraint hypothesis and, hence, the sensitivity of investment decisions to cash flow and to the strength of the balance sheet. Therefore, the independence between investment and financial decisions of firms is not actually the case.

In this paper we tested two key hypotheses. Firstly, internal funds are, apart from the real variables, important determinants of business fixed investment. Secondly, the effect of internal funds is more important for firms that are, *a priori*, more exposed to information problems and, hence, where the severity of financial constraints is more acute.

The results obtained with the estimation of the three specifications of the investment equation for the three criteria used to split the sample confirm both hypotheses set in this study. The main features of the regression results are the following. Firstly, the cash flow coefficient was greater for small, young, and high retention firms than for large, mature, and low retention firms, respectively, for all the specifications of the investment equation. Secondly, the coefficient on change in working capital (ΔWC) was always negative for all groups of firms, and the estimated value was greater for small, young and high retention firms than for the other categories

of firms. Thirdly, the estimated coefficient on change in medium- and long-term debt (ΔLTD) is positive, and greater for small, young, and high retention firms than for the other three groups of firms. Fourthly, the sales-accelerator principle shows a high explanatory power for investment expenses. Finally, the specification that shows the best empirical performance, for all types of firms, is specification (3.3). In fact: (a) all variables included in the regressions (sales, cash flow, change in working capital and change in long-term debt), are statistically significant for a level of significance of one per cent; (b) all estimated coefficients show the sign indicated by the theory; and (c) the adjusted R^2 increases significantly relatively to the other two specifications; and (d) it is clear that financial factors affect investment decisions of firms.

Identical results for the influence of financial factors on investment decisions were obtained by Fazzari et al (1988), Hoshi et al (1991), Hubbard and Kashyap (1992), Whited (1992), Fazzari and Petersen (1993), Schaller (1993), Vogt (1994), Bond and Meghir (1994), Chirinko and Schaller (1995), Mills et al (1995), Palenzuela and Iturriaga (1998), Kim (1999), and Chow and Fung (2000).

In terms of policy implications, the strong connection between firms' financial status and investment, suggests that in the case of a restrictive monetary policy the real economy will be affected not only through the traditional channel of the cost of capital, but also through two other channels. One is the availability of funds, which means that an increase in interest costs of firms will reduce the availability of relatively cheap internal funds and increase the cost of external funds. The other channel is related to the reduction of present value of colateralizable assets, which generates a decrease in the firm's net worth and an increase in the external financing cost.

Another important policy implication resulting from this study is the impact of tax policy changes. The main argument is that, when firms face limitations in obtaining finance due to imperfections in the financial markets, any increase in the tax revenue coming from tax charged to firms have a negative impact on investment, since it limits the availability of funds to which the company can access to achieve its investment plans. Therefore, it could be argued that tax policy measures such as the reduction in corporate tax rate, measures that disincentive high dividend payouts, accelerated depreciation allowances, and the introduction of an investment tax credit, could induce more investment in fixed capital by firms.

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