International Business Review xxx (2014) xxx–xxx

Contents lists available at ScienceDirect

International Business Review

journal homepage: www.elsevier.com/locate/ibusrev

Sensitivity of external resources to cash flow under financial constraints

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ARTICLE INFO

Article history:
Received 20 May 2013
Received in revised form 4 February 2014
Accepted 5 February 2014

JEL classification:
G32
C33

Keywords:
Capital structure
Cash flow
Constrained
Unconstrained

ABSTRACT

This paper explores the external financing–cash flow relationship in capital structure theory by comparing unlisted (financially constrained) and listed (financially unconstrained) companies. We postulate that investment is determined *endogenously* in the case of unlisted firms, as they are strongly dependent on internally generated funds (cash flow). Consequently, unlisted firms invest their cash flow in profitable projects, using any residual cash flow to increase their holdings of safe assets. In turn, listed companies determine their investment *exogenously* and may reduce leverage if they raise an excess of cash flow. As a result, listed companies would react more negatively to shocks in cash flow. Our findings reveal that both unlisted and listed companies show a negative external financing–cash flow relationship, that of the latter being clearly more intense.

1. Introduction

Previous research on capital structure has highlighted the critical impact of financial restrictions when seeking funds (Faulkender & Petersen, 2006; Fazzari, Hubbard, & Petersen, 1988; Hubbard, 1998). More specifically, a number of studies emphasise that financially constrained firms obtain less funds and at a higher cost (Carpenter & Petersen, 2002). Recent empirical literature deems unlisted firms as highly constrained and states that they face more severe information asymmetry problems and boast less financial flexibility than their quoted counterparts (Brav, 2009). While unlisted firms face high flotation and adverse selection costs, listed firms mostly face flotation costs. Furthermore, the former are smaller, less diversified and more opaque. Hence, agency costs are also particularly high in unlisted firms (Smith, 2007).

The main objective of this study is to analyse the sensitivity of external financing to internally generated cash flow and to compare constrained (or unlisted) firms to their unconstrained (listed) counterparts. Over past decades, the pecking order theory has contended that the presence of (asymmetric) information costs determines a preference hierarchy when choosing capital structure sources. In this sense, internally generated funds (or cash flow) are the first choice (Myers, 1984; Myers & Majluf, 1984). A similar rationale leads firms to choose debt rather than equity. As a result, the pecking order theory should be more plausible for constrained firms than for unconstrained firms due to information asymmetries affecting the former to a greater extent.

Nevertheless, recent empirical research indicates that information costs play a significant role, although they do not tell the whole story. As Almeida and Campello (2010) state, information asymmetries are critical for constrained firms, but irrelevant for unconstrained firms. The latter choose cash flow as their first option merely because of the existence of adjustment costs, particularly flotation costs (Strebulaev, 2007). So how should this circumstance change our conception of the preference hierarchy hypothesis? According to Almeida and Campello (2010), constrained firms are strongly dependent on internal cash flow and are not free to decide on investment. In other words, investment is *endogenous* for this type of company as it can only be decided once internally generated funds are known. In contrast, unconstrained firms are free to choose their investments as they do not face significant adverse selection or agency costs. Hence, investment is *exogenous* for unconstrained firms. Consequently, constrained firms have to "absorb" cash flow shocks and then decide how much investment they can finance. As constrained firms will probably be unable to raise external funds in the future, they maintain the

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http://dx.doi.org/10.1016/j.ibusrev.2014.02.004
0969-5931/

current surplus of cash flow (if any) instead of paying off debt. In contrast, unconstrained firms will pay off debt if they generate more cash flow than they need. As a result of this behaviour, both constrained and unconstrained firms will show a negative relationship between external financing (debt or equity) and cash flow, that is, a substitution effect, although this effect will be much more intense for unconstrained firms.

The second objective of this study is to analyse the role of tangibility on the substitution effect. As constrained firms face important adverse selection costs, creditors will demand loan guarantees to protect their contracts. Therefore, constrained firms can be expected to invest their excess cash flow in tangible assets, such as fixed assets or inventories. Hence, we expect tangibility to facilitate new external funds to (particularly) constrained firms. As a consequence, the effect of cash flow on external financing could be more negative for constrained firms, whereas unconstrained or listed firms will remain unaffected.

The third objective of this research is to assess the external financing–cash flow relationship in an economic crisis, such as that of 2008–2010. We assume that constrained firms will find it even more difficult to achieve external funds during a crisis than their quoted counterparts. The reason is that macroeconomic conditions such as scarce resources in financial markets, higher interest rates and the like particularly affect weaker companies (Kiyotaki & Moore, 1997). This problem has become particularly serious in some European Union member states like Spain, the country this study focuses on. Once again, unconstrained firms will remain unaffected by this shock.

Spain meets the requirements for this research and is also a member of the European Union, where the sensitivity of external financing to cash flow has scarcely been studied. A substantial number of Spanish firms are sufficiently large to enter a capital market. However, these companies do not take action to go public. As some researchers have stated, the trade-off between the costs and benefits of being listed on a capital market determines the final decision (Pagano, Panetta, & Zingales, 1998). One of the main disadvantages for many Spanish companies is that their owners have to share the control of the firm with someone else (Álvarez & González, 2005). Therefore, this type of company apparently prefers to stay out of capital markets and face financial restrictions rather than go public. This research aims to shed light on this problem.

In order to analyse all these goals, we have selected two samples of Spanish firms for the period 1996–2010, namely (i) unlisted (or constrained) firms and (ii) listed (unconstrained) firms. Additionally, we have segmented our firms' sample according to size (small firms as constrained and large firms as unconstrained) and credit risk (high credit risk firms as constrained and low credit risk firms as unconstrained) without encountering any significant differences in the empirical results.

Previous empirical evidence on this topic of research is scant. It is worth highlighting the study by Brav (2009), which compares unlisted and listed companies in the British market, although this author's research mainly focuses on capital structure and financial flexibility determinants. Schoubben and Van Hulle (2011) also reported empirical evidence on financial flexibility for listed and unlisted companies on the Belgium capital market, the dependent variable being the variation in external financing. Almeida and Campello (2010) is also a relevant paper that analyses the substitution effect or external financing–cash flow relationship by using a large sample of North American listed companies. It is worth noting that they apply different criteria to split their sample into financially constrained and unconstrained firms. Other studies closely related to this field of research have also provided evidence of the importance of adjustment costs in choosing different sources of financing. Papers worthy of note include Fischer, Heinkel, and Zechner (1989), Altinkiliç and Hansen (2000), Hennessy and Whited (2005), Leary and Roberts (2005) and Flannery and Rangan (2006).

This paper contributes to the current state of the art in the following ways. Firstly, we provide empirical evidence on external financing–cash flow sensitivity for listed (unconstrained) and unlisted (constrained) companies and compare them. Unlike other papers, this research differentiates between constrained and unconstrained firms following a market-based criterion instead of a firm-characteristics criterion. Thus, it gives practitioners, academics and policy makers a new tool to analyse this relationship from which traditional financing approaches such as pecking order or trade-off hypotheses can be enriched. Secondly, our findings shed some light on the external financing–cash flow sensitivity in the European Union, which has received little attention to date in the literature. Although hypothesis testing is mainly carried out on a sample of Spanish firms, the main model has also been tested by using data from three similar European markets – Italy, Greece and Portugal. Thirdly, we test the external financing–cash flow sensitivity in a unique period partially characterised by a severe economic and financial crisis that has dramatically affected Mediterranean countries like Spain.

Our findings clearly show a negative relationship between external financing and cash flow, the negative effect being higher for listed (unconstrained) companies. This result holds regardless of the external financing definition used (that is, debt, debt plus equity or just equity). We have also tested the role of tangibility in the substitution effect and results are in line with our hypotheses. Moreover, the 2008–2010 period of special financial turmoil is observed to have a noticeable impact on the substitution effect in both constrained and unconstrained firms.

The rest of the paper is organised as follows. The next section analyses the theoretical framework of the study and presents the hypotheses to be tested. Section 3 expounds the empirical models and defines the variables used. Section 4 presents the data for the study and a descriptive analysis. Section 5 explains the econometric methodology and also discusses the results. Section 6 presents some robustness tests and, finally, Section 7 concludes.

2. Theoretical foundation and hypotheses

Internally generated funds have achieved currency in the core of most theories of capital structure. Profitable firms frequently raise a significant amount of cash flow. According to the trade-off theory, this type of company will increase leverage in order to take advantage of tax savings. However, the pecking order theory predicts a negative relationship between leverage and cash flow due to the existence of asymmetric information costs, which lead the company to choose internal funds (first) rather than debt (second) and external equity (third) (Frank & Goyal, 2008, chap. 12; Shyam-Sunder & Myers, 1999).

Recently, a different rationale has emerged to explain the external financing–cash flow relationship. Almeida and Campello (2010) developed this new approach, which distinguishes between constrained and unconstrained companies. As indicated above, we assume unlisted companies as being constrained and listed companies unconstrained. While the former are heavily affected by information asymmetries and significant adverse selection costs, the latter are not. Hence, unlisted firms are strongly dependent on internally generated funds and their investment is considered *endogenous*. In contrast, listed or unconstrained companies can decide ex-ante their investment – which is considered *exogenous* – as it does not depend so markedly on the cash flow they generate. As a result, unlisted firms will tend to use their cash flow firstly to finance profitable projects and secondly as fixed assets or working capital and cash. In short, they "invest" their remaining cash flow not used in profitable projects in

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safe assets that can be used in the future as a guarantee for new loans. Consequently, the external financing–cash flow relationship is expected to be negative, albeit not particularly intense (that is, a low-intensity substitution effect). In turn, listed firms will also use the cash flow they generate as their first option because it saves flotation costs. However, surplus cash flow will be employed to pay off outstanding debt, as unconstrained firms do not face significant difficulties in raising new funds when needed. Hence, listed companies are expected to record a stronger negative relationship between external financing and cash flow (that is, a high-intensity substitution effect). Keeping this in mind, our first hypothesis can be formulated as follows:

H1. External financing, debt and equity, and internally generated funds (cash flow) are negatively related, the expected relationship being stronger for listed or unconstrained firms.

Moving on, asset tangibility could improve the capability of firms to seek new financing as it is a way of securing the necessary collateral to provide investors with guarantees (Frank & Goyal, 2009, chap. 12; Rajan & Zingales, 1995). Positive income shocks would increase tangible assets, which would give rise to a higher substitution effect (that is, a more negative effect). Constrained or unlisted firms are more sensitive to increasing tangible asset holdings as they will face more financing problems in the future. Therefore, this effect should be more visible in unlisted firms as they frequently experience difficulties in raising funds. According to this rationale, we formulate our second hypothesis:

H2. Cash flow shocks give rise to a higher substitution effect in companies with greater asset tangibility, this effect only being relevant for unlisted companies.

Furthermore, it has been stated that financial constraints follow developments in the extant economy (Gertler & Gilchrist, 1995; Korajczyk & Levy, 2003). Therefore, in times of economic or monetary recession the differences between constrained and unconstrained firms regarding the external financing–cash flow relationship should be even greater. That is, unlisted firms will find it even more difficult to gain new financing and if they do, it will be at a higher cost. Meanwhile, economic or monetary crises will probably not affect listed firms as they decide on external financing exogenously. Consequently, we expect unlisted firms to "absorb" any cash flow shocks more noticeably. As a result, unlisted or constrained firms will experience greater complementarity between external financing and internal funds during periods of tighter financial restrictions. Bearing these arguments in mind, our third hypothesis reads as follows:

H3. The external financing–cash flow relationship will be less negative for unlisted (constrained) companies in times of economic crisis, while listed (unconstrained) companies will remain unaffected.

3. Models and variables

3.1. External financing–cash flow sensitivity

Following Almeida and Campello (2010), we consider two alternative models to analyse the relationship between external financing and internally generated funds. At the same time, these model specifications will test our first hypothesis (H1) formulated in Section 2.

The first model, hereafter referred to as the baseline model, establishes external financing as a function of internal funds, along with firm size and investment opportunities. External financing captures the (external) financing variation in a particular year and represents our foremost variable in this study. Our main focus will be on the effect of cash flow on external financing. However, this baseline model also takes into account firm size, realising the fact that larger firms could be more prone to substituting between internal and external funds in order to benefit from economies of scale. Moreover, this model incorporates growth opportunities into the analysis as they are expected to have a solid and positive influence on external financing.

Our baseline model specification is:

$$\mathrm{EXTFIN}_{it} = \beta_0 + \beta_1 \cdot \mathrm{SIZE}_{it} + \beta_2 \cdot \mathrm{GROWTH}_{it} + \beta_3 \cdot \mathrm{CASH\_FLOW}_{it} + \eta_i + \eta_t + \epsilon_{it} \quad (1)$$

where EXTFIN captures changes in external financing for the ith company at the time t, SIZE is the size variable, GROWTH is the growth variable, CASH_FLOW is the cash flow variable, η_i and η_t absorb firm- and time-specific effects, respectively and ε_{it} is the disturbance term.

We estimate the value of the dependent variable EXTFIN by calculating the difference between book value of debt and/or equity in periods t and $t-1$ as indicated below. This is equivalent to directly applying debt or equity issuances as is done by Almeida and Campello (2010). In order to standardise the calculated difference we divide by total sales (see Schoubben & Van Hulle, 2011).

- EXTFIN_D is the ratio of change in interest-bearing debt to total sales.
- EXTFIN_D + E is the ratio of change in interest-bearing debt plus change in capital share to total sales.
- EXTFIN_E is the ratio of change in capital share to total sales.

SIZE is defined as the natural logarithm of total assets, GROWTH is the percentage change in total sales[1] and CASH_FLOW is the ratio of operating income plus depreciation and amortisation to total assets.

A second alternative model of the cash flow sensitivity of external financing, hereafter referred to as the extended model, augments the baseline model in Eq. (1) by taking into account the a priori internal liquidity/wealth of firms and their initial financial structure. The reason for controlling for pre-existing stocks of cash holdings and other working capital items is because firms can use these alternative components of internal wealth to accommodate cash flow shocks. Moreover, and following previous research (e.g., Rajan and Zingales (1995), Almeida and Campello (2010)), a firm' stock of fixed assets and its lagged capital structure are considered additional determinants of the amount of new external financing that a firm could obtain.

More specifically, we model external financing as in Eq. (1) and also as a function of the beginning-of-the-year stock of cash and equivalents (CASH), inventory items, accounts receivable and fixed assets (COLLATERAL) and leverage ratio (LEVERAGE):

$$\mathrm{EXTFIN}_{it} = \beta_0 + \beta_1 \cdot \mathrm{SIZE}_{it} + \beta_2 \cdot \mathrm{GROWTH}_{it} + \beta_3 \cdot \mathrm{CASH\_FLOW}_{it} + \beta_4 \cdot \mathrm{CASH}_{it-1} + \beta_5 \cdot \mathrm{COLLATERAL}_{it-1} + \beta_6 \cdot \mathrm{LEVERAGE}_{it-1} + \eta_i + \eta_t + \epsilon_{it} \quad (2)$$

CASH is the ratio of cash and liquid securities to total assets, COLLATERAL is the ratio of inventory items plus accounts receivable plus fixed assets to total assets and LEVERAGE is the ratio of total liabilities to total assets. Finally, η_i and η_t absorb

[1] Due to no market prices being available for unlisted firms, sales growth replaces Tobin's Q ratio as a measure of growth opportunities. Nevertheless, Tobin's Q ratio, calculated as the quotient between the market value of the firm and its book value, will also be considered in the section devoted to robustness tests.

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firm- and time-specific effects, respectively and ε_{it} is the disturbance term.

Table A1 in the Appendix provides a summary of the definitions of the dependent and explanatory variables.

3.2. Tangibility effect

The foregoing empirical specifications (baseline and extended models) establish external financing as a function of internal funds (i.e., cash flow) plus control variables. In order to gain insight into the characterisation of the differential effect of cash flow on external financing, taking into account the particular effect of tangibility, we consider a measure of asset tangibility and an interaction term between this measure and cash flow. This new empirical specification enables us to test our second hypothesis (H2) formulated in Section 2. Thus, our third external financing model is:

$$\begin{aligned}\text{EXTFIN}_{it} = {} & \beta_0 + \beta_1 \cdot \text{SIZE}_{it} + \beta_2 \cdot \text{GROWTH}_{it} + \beta_3 \cdot \text{CASH\_FLOW}_{it} \\ & + \beta_4 \cdot \text{TANG}_{it} + \beta_5 \cdot (\text{TANG}_{it} \times \text{CASH\_FLOW}_{it}) \\ & + \eta_i + \eta_t + \epsilon_{it} \end{aligned} \quad (3)$$

TANG is a dummy variable that is equal to 1 if the ratio of fixed depreciable assets plus inventories to total assets is above the sample mean and zero otherwise.[2] Furthermore TANG × CASH_CASH_FLOW is an interaction term resulting from the multiplication of the dummy variable TANG and the CASH_FLOW variable.

3.3. Macroeconomic effects

As discussed in Section 2, differences in the external financing behaviour of constrained and unconstrained firms are likely to be more pronounced in negative macroeconomic scenarios. In other words, financial constraints supposedly exacerbate during recessions and monetary restrictions. Consequently, there should be a more distinct difference in the sensitivity of external financing to cash flow between constrained and unconstrained firms. In order to test this claim, asserted by our third hypothesis (H3), we use the following regression:

$$\begin{aligned}\text{EXTFIN}_{it} = {} & \beta_0 + \beta_1 \cdot \text{SIZE}_{it} + \beta_2 \cdot \text{GROWTH}_{it} + \beta_3 \cdot \text{CASH\_FLOW}_{it} \\ & + \beta_4 \cdot \text{MACRO}_{2008-2010} + \beta_5 \cdot (\text{MACRO}_{2008-2010} \\ & \times \text{CASH\_FLOW}_{it}) + \eta_i + \eta_t + \epsilon_{it} \end{aligned} \quad (4)$$

$\text{MACRO}_{2008-2010}$ is a time–year dummy variable that is equal to 1 if the years are 2008–2010 and zero otherwise.

4. Data and descriptive analysis

The data used in this paper come from two sources. The Sistema de Análisis de Balances Ibéricos (SABI), a database managed by Bureau Van Dijk and Informa D&B, S.A., provides the accounting information from financial statements, while financial market information comes from the quotation bulletins of the Spanish Stock Exchange.

The sample comprises all Spanish firms with audited and consolidated financial statements.[3] Screening the firms in this way avoids problems and/or noise from including both stand-alone firms and subsidiaries, which could distort financing policy findings (Rajan & Zingales, 1995). Moreover, the large size of these firms makes them comparable regardless of whether they are listed or unlisted.

Due to the fact that the definition of a firm' quotation status (listed or unlisted) is important for the analysis performed in this research, it is worth explaining how we arrive at this classification. When a company' shares have been publicly traded on the stock exchange for the entire sample period, it is directly considered a listed company. In turn, when a company' shares have been publicly traded only part of the time frame of the sample, then it is only treated as listed for those years, being considered unlisted for the rest of the years.

Our sample contains data from non-financial firms for the 15-year period spanning 1996 and 2010. This period of time corresponds to the largest time series of data that it was possible to obtain from the database provider at the time we carried out the study. As is standard in the empirical literature, financial institutions, utilities and governmental enterprises are disregarded because these types of companies are intrinsically different in the nature of their operations and financial accounting information. We also exclude companies that are not organised as limited liability companies. Furthermore, we remove the firm-years for which debt exceeds total assets (i.e., near-bankruptcy firms), those without any change in interest-bearing debt and capital share and those displaying asset growth exceeding 100%.[4]

Given the usual requirements of panel data models, we construct a sample of firms with at least four consecutive years of observations which also avoids survivorship bias. Overall, we have an unbalanced data panel containing 1989 firms with a total of 15,773 observations, 14,512 of which are unlisted firms and 1261 quoted firms. Table A2 in the Appendix reports the number of annual observations by firm quotation status.

In order to reduce the effect of outliers, all variables are winsorised at 0.5% in either tail of the distribution. Furthermore, all the financial amounts are deflated to 1996 euros, using the Consumer Price Index provided by the Spanish Statistical Institute. Table 1 presents summary statistics of the dependent and explanatory variables for unlisted and listed firms separately. Unlisted and listed companies differ on several firm characteristics. Firm sizes are different. The average book value of assets for unlisted firms is about €85 million compared with €117 million for listed firms. Furthermore, unlisted firms exhibit lower sales growth. This could imply that unlisted firms face financing constraints due to a lack of capital market access. It could also imply that faster growing firms pursue listing more actively. Unlisted firms appear less profitable in terms of cash flow and have higher collateral values. Finally, the leverage ratio of unlisted firms is noticeably higher compared with that of listed firms. The average debt to total assets ratio of unlisted firms is 60.72% compared with 57.45% for listed firms.

We have calculated the correlation matrix for both listed and unlisted subsamples. Additionally, we have performed a multicollinearity test using the variance inflation factor (VIF). Results are shown in Tables 2 and 3. As can be seen, the low values of VIF suggest the inexistence of collinearity among the variables considered.

We have also carried out a mean difference test for all the variables between listed and unlisted firms. The figures obtained (not reported) clearly indicate that all the variables differ statistically between listed and unlisted companies. The results also point out that the mean of the three versions of the dependent variable (i.e., external financing) is higher for listed firms.

[2] When using the sample median and the 75% percentile in the construction of this dummy variable the results remain unchanged.

[3] In Spain, a company is obliged to issue consolidated statements when it exceeds two of the following three thresholds: (i) total assets in excess of €11.4 million, (ii) turnover in excess of €22.8 million, (iii) more than 250 workers.

[4] This last filter erases the firm-years from the sample that register large jumps in business fundamentals, typically indicative of mergers, reorganisations and other major events that do not provide external cash flow.

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Table 1
Descriptive statistics.[a]

Variables	Mean	Median	St. dev.	Min.	Max.	Skewness	Kurtosis
EXTFIN_D							
Unlisted	0.0243	0.0015	0.1392	−0.2278	0.4190	1.0744	4.8432
Listed	0.0368	0.0063	0.1837	−0.3180	0.4904	0.6560	3.8274
EXTFIN_D + E							
Unlisted	0.0248	0.0007	0.1443	−0.2361	0.4364	1.1074	4.9177
Listed	0.0372	0.0069	0.1916	−0.3399	0.5019	0.5968	3.7717
EXTFIN_E							
Unlisted	−0.0026	−0.0009	0.0069	−0.0237	0.0120	−1.2773	6.2582
Listed	−0.0016	−0.0016	0.0133	−0.0346	0.0333	0.3032	5.3739
SIZE							
Unlisted	18.2605	17.5220	1.4760	10.8194	20.5014	−1.0260	3.9229
Listed	18.5777	17.5417	2.2378	11.6808	20.5026	−0.2383	1.5579
GROWTH							
Unlisted	0.0017	0.0288	0.1887	−0.4994	0.3129	−0.9407	3.9714
Listed	0.0242	0.0422	0.1628	−0.3855	0.3122	−0.7365	3.6631
CASH_FLOW							
Unlisted	0.0958	0.0886	0.0608	−0.0020	0.2267	0.4605	2.5300
Listed	0.1068	0.0978	0.0641	0.0008	0.2467	0.4860	2.6135
CASH							
Unlisted	0.2000	0.1337	0.1866	0.0156	0.6887	1.3002	3.7744
Listed	0.1865	0.1266	0.1717	0.0142	0.6296	1.2905	3.7239
COLLATERAL							
Unlisted	0.8422	0.8812	0.1253	0.5370	0.9825	−1.0252	3.1124
Listed	0.8153	0.8565	0.1418	0.4925	0.9831	−0.8516	2.6944
LEVERAGE							
Unlisted	0.6072	0.6324	0.1948	0.2203	0.8990	−0.3992	2.1917
Listed	0.5745	0.5911	0.1737	0.2414	0.8448	−0.3010	2.1522

[a] Table A1 in the Appendix provides definitions of all the variables.

Table 2
Correlation matrix and variance inflation factors (listed subsample).

	EXTFIN_D	EXTFIN_D + E	EXTFIN_E	SIZE	GROWTH	CASH_FLOW	CASH	COLLATERAL	LEVERAGE
EXTFIN_D	1.000								
EXTFIN_D + E	0.976 (0.000)	1.000							
EXTFIN_E	0.119 (0.000)	0.238 (0.000)	1.000						
SIZE	−0.004 (0.907)	0.001 (0.984)	0.042(0.162)	1.000					
GROWTH	0.299 (0.000)	0.303 (0.000)	0.179(0.000)	−0.009 (0.756)	1.000				
CASH_FLOW	−0.088 (0.004)	−0.088 (0.004)	0.035 (0.238)	0.023 (0.409)	0.223 (0.000)	1.000			
CASH	−0.067 (0.029)	−0.079 (0.010)	−0.057 (0.058)	0.052 (0.066)	−0.003 (0.909)	−0.054 (0.054)	1.000		
COLLATERAL	0.046 (0.138)	0.042 (0.176)	−0.030 (0.310)	0.040 (0.157)	0.011 (0.716)	0.051(0.070)	−0.657 (0.000)	1.000	
LEVERAGE	0.179 (0.000)	0.190 (0.000)	0.146 (0.000)	−0.254 (0.000)	0.029 (0.326)	−0.182 (0.000)	−0.101 (0.000)	−0.044 (0.121)	1.000
VIF				1.090	1.070	1.110	1.880	1.870	1.150

Significance levels in brackets. Table A1 in the Appendix provides definitions of all the variables.

5. Empirical results

5.1. Baseline model

The nature of our data makes it possible to use panel data methodology to test the financing models discussed in Section 3 by simultaneously combining cross-section and time-series data. This type of analysis controls for firm heterogeneity and reduces collinearity among the variables considered. Likewise, this econometric methodology enables us to eliminate potential bias in the resulting estimates due to correlation between unobservable individual effects and the explanatory variables included in the study. In order to verify the fixed or random nature of the unobservable individual effects, we use Hausman' (1978) specification test.

We start our empirical analysis by estimating our baseline model, that is, Eq. (1). Table 4 shows the estimation results for each group of firms.

Fixed-effect regression coefficients estimated from Eq. (1) with levels of critical significance in brackets. Wald's test statistic refers to the null hypothesis that all coefficients of the explanatory variables are equal to zero. Hausman's test refers to the null hypothesis of both fixed effects and random effects being equivalent. We also report the *p*-values of Chow' test (see Wooldridge, 2007), which analyses the statistical difference in the coefficients between the listed and unlisted subsamples.

External financing is seen to be negatively sensitive to cash flow in the case of both the unlisted and listed firms, all sensitivity values being significant at better than 1%. Listed firms always record a higher negative coefficient for the cash flow variable compared to their unlisted counterparts. In economic terms, the estimates in Table 4 indicate that for each euro of internal cash flow shortfall (scaled by total assets), an unconstrained (listed) firm will seek up to 76 cents in new external financing (debt plus equity), whereas this figure is only 46 cents in the case of a constrained (unlisted) firm. Similar findings are encountered when considering

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Table 3
Correlation matrix and variance inflation factors (unlisted subsample).

	EXTFIN_D	EXTFIN_D + E	EXTFIN_E	SIZE	GROWTH	CASH_FLOW	CASH	COLLATERAL	LEVERAGE
EXTFIN_D	1.000								
EXTFIN_D + E	0.967 (0.000)	1.000							
EXTFIN_E	−0.026 (0.005)	0.086 (0.000)	1.000						
SIZE	0.064 (0.000)	0.061 (0.000)	−0.005 (0.611)	1.000					
GROWTH	0.118 (0.000)	0.118 (0.000)	0.115 (0.000)	0.027 (0.003)	1.000				
CASH_FLOW	−0.123 (0.000)	−0.131 (0.000)	0.088 (0.000)	−0.061 (0.000)	0.265 (0.000)	1.000			
CASH	−0.064 (0.000)	−0.071 (0.000)	−0.036 (0.000)	−0.072 (0.000)	−0.012 (0.181)	0.164 (0.054)	1.000		
COLLATERAL	0.064 (0.000)	0.066 (0.000)	0.033 (0.000)	0.065 (0.000)	−0.012 (0.194)	−0.160 (0.000)	−0.786 (0.000)	1.000	
LEVERAGE	0.169 (0.000)	0.173 (0.000)	0.128 (0.000)	0.012 (0.160)	0.085 (0.000)	−0.280 (0.000)	−0.331 (0.000)	0.209 (0.000)	1.000
VIF				1.010	1.110	1.220	2.770	2.600	1.240

Significance levels in brackets. Table A1 in the Appendix provides definitions of all the variables.

Table 4
Estimation results of the baseline model (Eq. (1)).

Explanatory variables	Dependent variable (EXTFIN)	Unlisted	Listed	*p*-Value of difference
SIZE	DEBT	0.0317 (0.000)	0.0082 (0.105)	0.000
	DEBT + EQUITY	0.0322 (0.000)	0.0088 (0.094)	0.000
	EQUITY	0.0010 (0.000)	0.0008 (0.007)	0.012
GROWTH	DEBT	0.0981 (0.000)	0.3675 (0.000)	0.000
	DEBT + EQUITY	0.1002 (0.000)	0.3873 (0.000)	0.000
	EQUITY	0.0032 (0.000)	0.0152 (0.000)	0.000
CASH_FLOW	DEBT	−0.4351 (0.000)	−0.7397 (0.000)	0.073
	DEBT + EQUITY	−0.4649 (0.000)	−0.7627 (0.000)	0.082
	EQUITY	−0.0042 (0.005)	−0.0351 (0.002)	0.002
Observations		11,458	1060	
		11,458	1060	
		12,131	1119	
R-squared within		0.0368	0.0992	
		0.0373	0.1037	
		0.0185	0.0502	
Wald test (*F*-statistic)		121.85 (0.000)	34.27 (0.000)	
		123.71 (0.000)	35.98 (0.000)	
		64.16 (0.000)	17.49 (0.000)	
Hausman test (χ^2)		94.74 (0.000)	8.15 (0.043)	
		99.73 (0.000)	6.87 (0.076)	
		105.24 (0.000)	11.89 (0.008)	

debt or equity separately. Additionally, we have segmented our database by size and credit risk and results hold the same (results not reported). Therefore, these results confirm hypothesis H1 whereby external financing and internally generated funds are negatively related, this effect being stronger for listed or unconstrained firms.

The coefficients for the other two variables (SIZE and GROWTH) also conform to our expectations. A rise in investment opportunities makes it more likely that both sets of firms will look for external funding, while larger companies generally seek more external financing.

Wald's test of joint significance of regressors clearly rejects the null hypothesis of all the parameters being equal to zero in both the listed and unlisted group of firms. Likewise, Hausman's test also rejects the null hypothesis of fixed-effect and random-effect estimators being equivalent (in both groups of listed and unlisted firms), which leads to the selection of the former, that is, the fixed-effect estimator.

5.2. Extended model

In the estimation of our extended model (Eq. (2)), we expressly recognise the endogeneity of some corporate policies that may affect several explanatory variables. Examples of such policies could include demanding financial debt, which implies an increase in cash as well as a variation in a firm' capital structure, or a new issue of capital with analogous effects. In a Generalised Method of Moments (GMM) framework, we use lags 2–6 of the endogenous regressors included (CASH, COLLATERAL and LEVERAGE) in addition to the exogenous regressors (SIZE, GROWTH and CASH_FLOW) as instruments in Eq. (2).[5] Instrument validity is checked via Hansen' (1982) *J*-statistic, which in light of our instrument set, reduces to a $\chi^2(12)$ statistic. For brevity, we only report (see Table 5) the estimation results of our extended model (Eq. (2)) considering the dependent variable EXTFIN_D + E. Results hold when regressing this model with debt or equity, separately.

Instrumental Variable GMM regression coefficients estimated from Eq. (2) with levels of critical significance in brackets. CASH, COLLATERAL and LEVERAGE are lagged one year and have been instrumented with five lags. Hansen's *J* statistic results from a test of overidentifying restrictions, applying the null hypothesis to the validity of instruments. The last column reports the *p*-values of Chow' test.

The external financing–cash flow sensitivity estimates presented in Table 5 resemble the patterns reported in Table 4, where

[5] The estimation via GMM is performed by the user-written Stata command "xtivreg2" (Schaffer, 2010). Furthermore, we have tested the endogeneity problem using Hausman's (1978) test (results not reported), which confirmed that CASH, COLLATERAL and LEVERAGE variables should be considered as endogenous.

Please cite this article in press as: López-Gracia, J., & Sogorb-Mira, F. Sensitivity of external resources to cash flow under financial constraints. *International Business Review* (2014), http://dx.doi.org/10.1016/j.ibusrev.2014.02.004

Table 5
Estimation results of the extended model (Eq. (2)).

Explanatory variables	Unlisted	Listed	*p*-Value of difference
SIZE	0.1439 (0.000)	0.0108(0.122)	0.000
GROWTH	0.0482 (0.043)	0.3520(0.000)	0.000
CASH_FLOW	−0.2772 (0.004)	−1.2156(0.000)	0.075
CASH	0.0519 (0.747)	0.1898(0.496)	0.000
COLLATERAL	−0.3637 (0.132)	−0.0367(0.933)	0.045
LEVERAGE	−0.8055 (0.000)	−0.7353(0.025)	0.000
Observations	2843	389	
Hansen *J* statistic	7.906 (0.793)	12.135 (0.435)	

Table 6
Estimation results of the tangibility effect model (Eq. (3)).

Explanatory variables	Unlisted	Listed	*p*-Value of difference
SIZE	0.0321 (0.000)	0.0094 (0.071)	0.000
GROWTH	0.1010 (0.000)	0.3854 (0.000)	0.000
CASH_FLOW	−0.4042 (0.000)	−0.6279 (0.014)	0.063
TANG	0.0124 (0.103)	0.0667 (0.050)	0.000
TANG × CASH_FLOW	−0.1194 (0.052)	−0.2600 (0.331)	0.000
Observations	11,458	1060	
R-squared within	0.0377	0.1081	
Wald test (*F*-statistic)	75.01 (0.000)	22.56 (0.000)	
Hausman test (χ^2)	157.28 (0.000)	6.91 (0.227)	

controls for alternative internal funding sources (CASH), asset stock (COLLATERAL) and pre-existing capital structure (LEVERAGE) were included. Thus the coefficients for the cash flow variable are all negative and highly significant for both constrained (unlisted) and unconstrained (listed) firms. Moreover, as predicted, unconstrained or listed firms display higher estimate values than their unlisted counterparts. Once again, this corroborates hypothesis H1 regarding the relationship between external financing and internally generated funds. The other regressors show coefficients that attract either statistically non-significant estimates (CASH and COLLATERAL) or significant estimates with the expected sign (SIZE, GROWTH and LEVERAGE).

Regarding the diagnostic test statistic associated with our instrumental set, it can be stated that it corroborates the validity of those instruments to solve the endogeneity problem. Thus, note that the lowest *p*-value associated with Hansen' (1982) test of overidentifying restrictions is as high as 44%.

5.3. Tangibility effect

As discussed in Section 2, there is a tangibility effect whereby firms holding more tangible assets are more prone to seek external financing. This circumstance would, in turn, lead to a higher substitution effect. In this sense, it is assumed that constrained or unlisted firms are more sensitive to this effect and will try to accumulate more tangible assets. As a consequence, a cash flow shock on firms boasting more tangibility can lead to a higher substitution effect, that is, a more markedly negative relationship between external financing and cash flow. In order to test hypothesis H2, relative to the tangibility effect, we estimate Eq. (3). We only report the estimation results of Eq. (3) considering the dependent variable EXTFIN_D + E (see Table 6). Results hold when regressing this model with debt or equity, separately.

Fixed-effect regression coefficients estimated from Eq. (3) with levels of critical significance in brackets. Wald's test statistic refers to the null hypothesis that all coefficients for the explanatory variables are equal to zero. Hausman's test refers to the null hypothesis of both fixed effects and random effects being equivalent. The last column reports the *p*-values of Chow' test.

We now focus on the estimated coefficient associated with the interaction term TANG × CASH_FLOW, that is, the differential effect of cash flow on external financing depending on firms boasting greater or lesser tangibility. As shown in Table 6, the interaction between cash flow and tangibility draws statistically significant (negative) coefficients for unlisted firms, whereas the results for the group of listed firms are not significant. These estimation results are consistent with hypothesis H2, stressing the sensitivity of external financing to cash flow shocks in the presence of tangibility only for unlisted or constrained firms. The significant (negative) effect of the interaction term results in the financial behaviour of constrained (unlisted) and unconstrained (listed) firms converging. This is even more obvious when unlisted firms go through a funding surplus period. In contrast, listed firms boasting more tangibility do not react differently to such cash flow shocks, as they are supposedly unconstrained and determine external financing exogenously.

The response coefficients for the remaining variables in Eq. (3) are statistically significant and show identical signs to previous estimations. Parallel to the previous analysis, we perform a linear restriction test of coefficients between the cash flow variable and the interaction term TANG × CASH_FLOW. The aim is to ascertain whether the addition of the coefficients associated to these two variables is statistically significant. The results of this test (not reported) confirm that the addition of the two coefficients is clearly significant for both the unlisted and listed subsamples of firms with the exception of the third external financing dependent variable (i.e., including only equity) for the former group of firms.

5.4. Macroeconomic effects

As explained in Section 2, the existence of adverse macroeconomic conditions due, for example, to economic or monetary recessions, could worsen financial constraints and therefore exacerbate the difference in the substitution effect between constrained and unconstrained firms. In this sense, a more negative external financing–cash flow relationship is expected for listed (unconstrained) companies compared to unlisted (constrained) firms. The test of this prediction of macroeconomic effects, which was specified in Section 3, is reported in this subsection. Table 7 summarises the results from the estimation of Eq. (4). For brevity, we only report the estimation results of Eq. (4) considering the dependent variable EXTFIN_D + E. Results approximately hold when regressing this model with debt or equity, separately.

Fixed-effect regression coefficients estimated from Eq. (4) with levels of critical significance in brackets. Wald's test statistic refers to the null hypothesis that all coefficients for the explanatory variables are equal to zero. Hausman's test refers to the null hypothesis of both fixed effects and random effects being equivalent. The last column reports the *p*-values of Chow' test.

The estimates for the interaction term $MACRO_{2008-2010}$ × CASH_FLOW, in both groups of firms, show that cash flow has a positive incremental effect on external financing in times of economic crisis. This result is consistent with hypothesis H3 and can be explained by the fact that companies generate less internal funds during a crisis and probably react by seeking new external financing. As both coefficients for unconstrained and constrained firms are statistically significant, we must add the interaction term coefficient to the cash flow variable coefficient in order to compare the net effect of cash flow on external financing between them. As shown in Table 7, the results of the net effect are, respectively, −0.26 and −0.23, which is not consistent with H3. However, regarding the dependent variable with only debt, the net or global effect would result in −0.23 for the group of unlisted firms and −0.25 for the listed firms, which confirms hypothesis H3. Similarly, in the case of the third external financing dependent variable (i.e.,

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Table 7
Estimation results of the macroeconomic effects model (Eq. (4)).

Explanatory variables	Unlisted	Listed	*p*-Value of difference
SIZE	0.0361 (0.000)	0.0093 (0.075)	0.000
GROWTH	0.0680 (0.000)	0.3840 (0.000)	0.000
CASH_FLOW	−0.7262 (0.000)	−0.8336 (0.000)	0.054
$MACRO_{2008-2010}$	−0.0997 (0.000)	−0.0354 (0.191)	0.000
$MACRO_{2008-2010} \times$ CASH_FLOW	0.4659 (0.000)	0.6038 (0.017)	0.000
Observations	11,458	1060	
R-squared within	0.0727	0.1107	
Wald test (*F*-statistic)	150.01 (0.000)	23.17 (0.000)	
Hausman test (χ^2)	225.29 (0.000)	17.40 (0.004)	

including only equity), the empirical evidence corroborates H3, although the economic weight of the net effect of cash flow on external financing is minimal (−0.0038 and −0.0296, respectively). The coefficients of the rest of variables in Eq. (4) remain statistically significant and show identical signs to those in previous estimations.

Parallel to the preceding analysis, we perform a linear restriction test between the cash flow variable and the interaction term with the aim of ascertaining whether the addition of the coefficients associated to these two variables is statistically significant. The results of this test (not reported) show that the addition of the two coefficients is clearly significant for the subsample of unlisted firms, but not for the subsample of listed firms.

We have also extended the analysis of the macroeconomic effect by regressing the baseline model (Eq. (1)) separately for the periods 2006–2007 and 2009–2010, that is, two years before the starting point of the crisis and two years later. Our findings (not reported) indicate that unlisted firms consistently show a significant substitution effect in both periods, being less negative in the period 2009–2010. Moreover, this effect is not statistically significant for listed firms in any of the periods. As predicted, constrained firms seem more vulnerable in times of crisis and probably hoard internal funds as much as possible while encountering more difficulty in getting new external financing.

6. Robustness of results

In order to verify the robustness of our previous empirical evidence, we perform six different tests on the baseline model.

Firstly, we control whether or not there is a spurious relationship between external financing and cash flow by calculating another proxy for the variable growth opportunities, which can be assumed to be not correlated with the variable cash flow. This proxy is the average increase in sales of the sector the firm belongs to. Using this new proxy, the estimation results of the baseline model hold for both listed and unlisted firms.[6]

Nevertheless, the empirical literature is more prone to accept Tobin' *Q* as the correct way to approach growth opportunities. In order to check the possibility of mismeasurement of the growth opportunities variable (GROWTH) we have calculated Tobin' *Q* for the group of listed firms alone and estimated the baseline model only for this group. Table A3 in the Appendix shows the new estimation results. Only estimates for the dependent variable EXTFIN_D + E are shown (the results remain when using EXTFIN_D or EXTFIN_E). As expected, they corroborate our previous estimates of the baseline model. That is, when the explanatory variable TOBIN' *Q* is used on the subsample of listed firms instead of the variable GROWTH, the results remain unchanged. The analysis of the correlation between the variables GROWTH and TOBIN' *Q* (not reported) indicates a positive and statistically significant relationship, thus representing clear evidence of the validity of the previous estimations of our baseline model for both listed and unlisted companies.

Secondly, we control for the year in which a company made an initial public offering (IPO), because this action could lead to an abnormal increase in equity in that specific year and mislead our estimation results. After identifying the year in which a particular listed company was involved in an IPO, we first construct a dummy variable (denoted IPO) that equals 1 if the (listed) company has made an initial public offering in the corresponding year and zero otherwise. Afterwards, we regress the baseline model by introducing this new variable. As shown in Table A4, the previous results of the baseline model remain unchanged, although there is a statistically significant (negative) effect between IPO firms and non-IPO firms (except for the equity specification). In short, firms that have carried out an IPO display a minor level of external financing. We have additionally considered an interaction term between the variables CASH_FLOW and IPO in order to analyse the influence of an IPO on the substitution effect. The previous results of the baseline model continue in the same direction, although this interaction term is not statistically significant (results not reported). Alternatively, we have re-estimated our baseline model erasing those firm-year observations where an IPO had taken place and previous results do not change (results not reported).

Thirdly, we take a special look at the firm-year observations with zero, or close to zero leverage, due to their potentially different behaviour while searching for external financing. Once again, estimation results could mislead the actual substitution effect between constrained and unconstrained firms as both of them could behave very similarly to each other. Accordingly, we define a dummy variable (LOW_LEVERAGE) that equals 1 if the leverage ratio is below or equal to 5% and zero otherwise.[7]

When controlling for this new variable (LOW_LEVERAGE) and, additionally, by introducing an interaction term between the variables CASH_FLOW and LOW_LEVERAGE, previous results obtained from the baseline model are not modified. Moreover, these new variables are not statistically significant. We have also re-estimated our baseline model erasing those firm-year observations which are considered low-leveraged, but results do not differ (none of these regression results are reported).

Fourthly, we control for the external financing level. The idea is to look at the substitution effect focusing on the firm-year observations with a small increase of external financing, as they could feature special behaviour and mislead the estimation results. For this purpose, we first introduce a dummy variable (LOW_EXTERNAL FINANCING) that equals 1 if the external financing ratio is below or equal to 5% and zero otherwise (the results hold identical when using 1% or 10% as cut-offs). As Table A5 shows, there is a statistically significant difference between firms with a small increase in external financing and the rest of the firms, the negative sign indicating a lesser effect for the former group (that is, a minor constant in the regression).[8] Nevertheless and despite this difference, the previous results from the baseline model hold completely.

Additionally, we have also checked the substitution effect by introducing an interaction term between CASH_FLOW and LOW_EXTERNAL FINANCING variables. As results (not reported) indicate

[6] Results are available from the authors upon request.

[7] We have also taken into consideration other alternative cut-offs such as 1% and 10% in the construction of this dummy variable without encountering significant empirical differences.

[8] We only report the estimation results for the dependent variable EXTFIN_D + E. The rest of the results with dependent variables EXTFIN_D and EXTFIN_E are not presented, but remain unchanged.

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the difference between low-external financing firms and the rest of the firms holds the same. Furthermore, the coefficient associated with the interaction term is also statistically significant, the positive sign indicating a lower substitution effect for the firms affected by low external financing (−0.23 and −0.26 for unlisted and listed firms, respectively). As in the case of the preceding robustness tests conducted, we have also re-estimated our baseline model after removing the firm-year observations that are considered low external financing, but results do not vary (these regression results are not reported).

Fifthly, as the CASH_FLOW variable is key to our analysis, we have also constructed an alternative proxy including not only operating activities but also investing and financing activities. The new variable is defined as the sum of operating income plus depreciation and amortisation minus changes in capital expenditures and changes-in-working capital. The estimation results (not reported) considering this alternative measure hold the same.

Finally, we have tested our empirical baseline model by using data from other European countries with similar financial markets like Italy, Greece and Portugal. As shown in Table A6, the results support, in general, our estimates of the baseline model obtained previously for the Spanish firms' subsamples. Specifically, for the pooled sample including Italian, Greek and Portuguese companies and controlling the country of origin with dummies, external financing and internally generated funds appeared to be negatively related, this effect being stronger for listed or unconstrained firms. Individually, the previous result is replicated for the Italian subsamples, while it changes or it is not statistically significant for the Greek and Portuguese subsamples, respectively.

7. Concluding remarks and empirical implications

This paper provides empirical evidence on the relationship between external financing and cash flow, using a data panel of Spanish listed (unconstrained) and unlisted (constrained) companies covering the period 1996–2010.

Our results indicate that cash flow has a significant and negative effect on external financing regardless of the dependent variable selected (that is, variation in debt, debt plus equity or just equity). This negative relationship is stronger (that is, more negative) for listed companies, which in turn implies a stronger substitution effect, as predicted. Thus, unlisted or constrained firms tend to reduce debt (or any other source of financing) very little when they face cash flow shocks compared to listed firms. Presumably, information asymmetries could not be at the core of listed and unlisted companies' decisions regarding financing preferences. Instead, what is substantial to this decision and responsible for the difference existing between them is the endogeneity of investment and external financing for unlisted firms, as they are financially constrained. These results are also confirmed after extending the baseline model and performing several robustness tests. Our findings point to the possibility to extent this conclusion to other European economies similar to ours.

Furthermore, we have also tested the role of tangibility in the substitution effect in both unlisted or constrained and listed or unconstrained firms. Our findings indicate that tangibility plays a role in adjusting capital structure when firms react to cash flow shocks, this effect being relevant only in unlisted firms, as predicted. Although this is only a preliminary result, our empirical evidence shows that unlisted firms boasting a higher level of tangibility are more flexible when it comes to seeking external financing.

Finally, our findings confirm that unlisted firms face higher risk in seeking new external financing in times of financial turmoil, as shown by a lesser substitution effect. Unexpectedly, the regression results indicate that listed firms also suffer serious restrictions in financing their investment projects in periods of crisis. In summary, both unlisted and listed companies react by seeking new debt (or equity) as a consequence of cash flow shocks in periods of crisis, their final substitution effects being only slightly different.

Several empirical implications can be derived from our findings. Results corroborate a new avenue for future research that can be useful for academics, managers and policy makers. Thus, the main financial theories used by academics to explain debt or equity holdings like trade-off and pecking order theories could be complemented with the status of the firm, that is, constrained or unconstrained. A significant issue in this sense should be to explore more in-depth the criteria used to distinguish between constrained and unconstrained firms.

As far as listed firms' managers are concerned, they could behave with larger freedom when investing generated internal funds to the extent that financial constraints to raising new external funding are limited. Therefore, as indicated by our empirical findings, a significant substitution effect may lead to overinvestment costs and a reduction in the firm' value. Dividend or leverage policies, among others, can offset this opportunistic behaviour of directors.

Moreover, unlisted firms' managers are conscious of the difficulties in raising external financing as indicated by our empirical evidence. Thus, a moderated substitution effect is a clear symptom of endogenous investment which obviously leads to a conservative policy of cash flow holding. It reflects the fear the managers feel to not being able to raise external financing when needed. If corporate governance of these companies does not show a clear separation between management and control, most firms will make the decision to remain unlisted as they perceive the cost of raising new external funding lower than the cost of control dilution.

Moving forward, it is necessary to consider how relevant external financing is – debt or equity – for economic growth. Thereby, policy makers have to do their best to improve the requirements to enter the stock market and to reduce the opacity of those firms deciding not to enter. These implications look particularly relevant in periods of financial turmoil.

Acknowledgements

The authors are grateful to Pervez Ghauri (the editor) and three anonymous referees for comments; to Valentín Azofra, Félix López-Iturriaga, Juan Antonio Rodríguez-Sanz and Eleuterio Vallelado for their valuable comments and suggestions on earlier versions of this paper. We would also like to thank the participants in the 2012 Annual Conference of the Spanish Finance Association and, particularly, Pedro Martínez-Solano for his helpful comments. Francisco Sogorb-Mira acknowledges financial support from Ministry of Economy and Competitiveness research Grant ECO2012-34268.

Please cite this article in press as: López-Gracia, J., & Sogorb-Mira, F. Sensitivity of external resources to cash flow under financial constraints. *International Business Review* (2014), http://dx.doi.org/10.1016/j.ibusrev.2014.02.004

Appendix A

Table A1
Definition of variables.

Variables	Model	Definition
EXTFIN_D	Eqs. (1)–(4)	Ratio of change in interest-bearing debt to total sales
EXTFIN_D + E	Eqs. (1)–(4)	Ratio of change in interest-bearing debt plus capital share to total sales
EXTFIN_E	Eqs. (1)–(4)	Ratio of change in capital share to total sales
SIZE	Eqs. (1)–(4)	Natural logarithm of total assets
GROWTH	Eqs. (1)–(4)	Relative change in sales
CASH_FLOW	Eqs. (1)–(4)	Operating income plus depreciation and amortisation scaled by total assets
CASH	Eq. (2)	Cash and equivalents (liquid securities) scaled by total assets
COLLATERAL	Eq. (2)	Inventory items, accounts receivable and fixed assets scaled by total assets
LEVERAGE	Eq. (2)	Ratio of total liabilities to total assets
TANG	Eq. (3)	Dummy variable that is equal to 1 if the ratio of fixed depreciable assets plus inventories to total assets is above the sample mean
$MACRO_{2008-2010}$	Eq. (4)	Time–year dummy variable that is equal to 1 if the year is 2008–2010

Table A2
Sample characteristics.

Distribution of observations by quotation status			
Years	Unlisted	Listed	Total
1996	189	48	237
1997	395	62	457
1998	473	71	544
1999	562	78	640
2000	765	88	853
2001	922	95	1017
2002	1043	96	1139
2003	1185	95	1280
2004	1306	87	1393
2005	1378	87	1465
2006	1459	83	1542
2007	1444	94	1538
2008	1322	91	1413
2009	1257	93	1350
2010	812	93	905
Total	14,512	1261	15,773

Table A3
Estimation results of the baseline model for the listed subsample.

Explanatory variables	Dependent variable (EXTFIN_D + E)
SIZE	0.0242 (0.000)
TOBIN' Q	0.0001 (0.002)
CASH_FLOW	−0.2120 (0.002)
Observations	1060
R-squared within	0.0168
Wald test (*F*-statistic)	5.32 (0.001)
Hausman test (χ^2)	6.74 (0.034)

Fixed-effect regression coefficients estimated from Eq. (1) with levels of critical significance in brackets. Wald's test statistic refers to the null hypothesis that all coefficients for the explanatory variables are equal to zero. Hausman's test refers to the null hypothesis of both fixed effects and random effects being equivalent.

Table A4
Estimation results of the baseline model after controlling by an ipo (listed subsample).

Explanatory variables	Dependent variable (EXTFIN)	
SIZE	DEBT	0.0083 (0.100)
	DEBT + EQUITY	0.0088 (0.090)
	EQUITY	0.0008 (0.007)
GROWTH	DEBT	0.3717 (0.000)
	DEBT + EQUITY	0.3914 (0.000)
	EQUITY	0.0150 (0.000)
CASH_FLOW	DEBT	−0.7340 (0.000)
	DEBT + EQUITY	−0.7573 (0.000)
	EQUITY	−0.0352 (0.002)
IPO	DEBT	−0.0935 (0.003)
	DEBT + EQUITY	−0.0895 (0.001)
	EQUITY	0.0026 (0.365)
Number of obs.		1060
		1060
		1119
R-squared within		0.1029
		0.1068
		0.0510
Wald test (*F*-statistic)		26.72 (0.000)
		27.86 (0.000)
		13.32 (0.000)
Hausman test (χ^2)		9.28 (0.054)
		7.79 (0.099)
		11.87 (0.018)

Fixed-effect regression coefficients estimated from Eq. (1) with levels of critical significance in brackets. Wald's test statistic refers to the null hypothesis that all coefficients for the explanatory variables are equal to zero. Hausman's test refers to the null hypothesis of both fixed effects and random effects being equivalent.

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Table A5
Estimation results of the baseline model after controlling by low external financing.

Explanatory variables	Unlisted	Listed	*p*-Value of difference
SIZE	0.0213 (0.000)	0.0115 (0.008)	0.000
GROWTH	0.0315 (0.000)	0.1822 (0.000)	0.000
CASH_FLOW	−0.5399 (0.000)	−0.7445 (0.000)	0.052
LOW_EXTERNAL FINANCING	−0.1662 (0.000)	−0.2157 (0.000)	0.043
Observations	11,458	1060	
R-squared within	0.3582	0.3784	
Wald test (*F*-statistic)	1334.58 (0.000)	141.84 (0.000)	
Hausman test (χ^2)	63.41 (0.000)	11.25 (0.024)	

The dependent variable is EXTFIN_D + E. Fixed-effect regression coefficients estimated from Eq. (1) with levels of critical significance in brackets. Wald's test statistic refers to the null hypothesis that all coefficients for the explanatory variables are equal to zero. Hausman's test refers to the null hypothesis of both fixed effects and random effects being equivalent. The last column reports the *p*-values of Chow' test.

Table A6
Estimation result of the baseline model using European companies subsamples.

Explanatory variables	Pooled sample		Italy		Greece		Portugal	
	Unlisted	Listed	Unlisted	Listed	Unlisted	Listed	Unlisted	Listed
SIZE	0.0827 (0.000)	0.1290 (0.000)	0.0776 (0.000)	0.1732 (0.000)	0.1147 (0.000)	0.0725 (0.000)	0.1558 (0.001)	0.2155 (0.026)
GROWTH	0.2458 (0.000)	0.2892 (0.000)	0.2398 (0.000)	0.2621 (0.000)	0.2933 (0.000)	0.3025 (0.000)	0.2183 (0.000)	0.4413 (0.028)
CASH_FLOW	−0.5634 (0.000)	−0.6544 (0.000)	−0.5372 (0.000)	−1.1157 (0.000)	−0.5614 (0.000)	−0.3921 (0.009)	−1.1726 (0.000)	−0.7802 (0.338)
DUMMY_ITALY	0.0340 (0.000)	0.0835 (0.003)						
DUMMY_GREECE	0.0360 (0.000)	0.0767 (0.003)						
DUMMY_PORTUGAL	Omitted	Omitted						
Observations	19,997	2599	17,563	1175	1755	1291	679	133
R-squared within	0.1137	0.0936	0.1192	0.0967	0.1159	0.1205	0.0793	0.0840
Wald test (*F*-statistic)	674.49 (0.000)	76.28 (0.000)	625.56 (0.000)	35.32 (0.000)	61.18 (0.000)	50.76 (0.000)	14.27 (0.000)	3.33 (0.022)
Hausman test (χ^2)	319.75 (0.000)	69.91 (0.000)	313.10 (0.000)	71.07 (0.000)	23.92 (0.000)	14.14 (0.003)	18.64 (0.000)	3.64 (0.032)

The dependent variable is EXTFIN_D + E. Fixed-effect regression coefficients estimated from Eq. (1) with levels of critical significance in brackets. Wald's test statistic refers to the null hypothesis that all coefficients of the explanatory variables are equal to zero. Hausman's test refers to the null hypothesis of both fixed effects and random effects being equivalent. We have performed Chow' test (results not reported), encountering statistical differences in the coefficients between the listed and unlisted subsamples.

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Please cite this article in press as: López-Gracia, J., & Sogorb-Mira, F. Sensitivity of external resources to cash flow under financial constraints. *International Business Review* (2014), http://dx.doi.org/10.1016/j.ibusrev.2014.02.004