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Testing trade-off and pecking order theories financing SMEs

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Abstract This paper explores two of the most important theories behind financial policy in Small- and Medium-Sized Enterprises (SMEs), namely, the pecking order and the trade-off theories. Panel data methodology is used to test empirical hypotheses on a sample of 3,569 Spanish SMEs over a 10-year period dating from 1995 to 2004. Results suggest that both theoretical models help to explain SME capital structure. However, despite finding clear evidence that SMEs follow a funding source hierarchy (pecking order model), our results reveal that greater trust is placed in SMEs that aim to reach target or optimum leverage (trade-off model). This remains true even when SMEs take a long time to reach this level, due to the high transaction costs they have to face. Non-debt tax shields (NDTS), growth opportunities and internal resources all seem to play an important role in determining SME capital structure. Both size and age are also found to be significant factors. Moreover, the empirical evidence obtained confirms that SMEs clearly behave differently to large firms where financing is concerned.

Keywords Pecking order · Trade-off · Capital structure · Small- and Medium-Sized Enterprises

JEL Classifications G32 · C33 · L26

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1 Introduction

The vast majority of empirical studies that analyse the determinants of firm financing usually examine large publicly listed companies that often raise funds by issuing corporate debt or equity onto capital markets (Zingales 2000). The empirical literature suggests that the various theories addressing firm leverage are not accurate enough. Rajan and Zingales (1995) clearly arrive at the same conclusion, while Graham (1996) asks why firm leverage cannot be better explained—given the wide range of existing theories.

This paper mainly focuses on Small- and Medium-Sized Enterprise (SME) financing, as this type of company represents a large proportion of total companies in the economy of almost every developed nation. In addition to this, we aim to take the research that focuses on these firms a step further by carrying out a comparative study of two of the main theories

regarding capital structure, namely, the pecking order theory and the trade-off theory. SMEs often suffer problems linked to asymmetric information, which involves information costs. In this sense, they seem to be affected by the problems typically contemplated in the pecking order theory. Nevertheless, these firms could also use a target borrowing ratio to guide their financial policy, as maintained by the trade-off theory. As both the pecking order and trade-off theories can describe the financial behaviour of SMEs with some accuracy, the two approaches were first addressed separately. Later they are jointly tested and compared by means of a nested behavioural model which is necessary to conclude which of the two theories best fits these companies' characteristics and best explains their actions. In doing so, we aim to contribute to the literature on SME capital structure, as most research has focused on capital structure determinants on the whole rather than testing a particular theory (e.g., Jordan et al. 1998; Michaelas et al. 1999; Sogorb-Mira 2005). Moreover, this paper is also intended to further test these two theories on a new database comprising non-listed Spanish SMEs. We aim to find sufficient empirical evidence to be able to accept or reject the hypotheses we propose and also to obtain efficient estimates for the model regressions.

Therefore, the main objective of this paper is to jointly test the trade-off and pecking order theories in the field of SMEs, taking into account the characteristics of these types of companies. Compared to large firms, SMEs are not usually listed on a capital market and tend to be more affected by information asymmetries. As a result, they incur in more transaction costs when seeking financing. They are frequently owned and managed by only one director (or very few) who is not interested in sharing the control of the firm. SMEs are usually less leveraged, as they tend to be financially restrained by creditors. Consequently, they are more dependent on internal resources and short-term debt. Lastly, they are more volatile and as such more prone to bankruptcy. Bearing all these differences in mind, our main reference is that of Shyam-Sunder and Myers (1999) who carried out a comparative analysis of both the trade-off and pecking order theories. Alternative tests are also proposed in order to make results more robust. This research exploits the features of panel data and incorporates dynamic effects, while also controlling for temporary as well as specific unobservable company effects to try to provide more insight into the financial decisions taken by SMEs. In addition to this, the financial behaviour of SMEs is compared to that of large firms so as to confirm the liquidity restrictions presumably suffered by the former and which could bias the results.

Results clearly support both proposals, placing perhaps greater trust in the trade-off approach, as far as the 'ad hoc' comparative analysis pursued is concerned. Specifically, from the point of view of the trade-off approach, SMEs appear to pay a great deal of heed to transaction costs which presumably lead them to partially converge to an optimal level of debt, albeit rather slowly. Furthermore, SMEs clearly seem to adapt their financial policy to the principles of the pecking order approach. Lastly, our results also highlight a significant difference how SMEs and large companies act.

The rest of the paper has been organized as follows. Sects. 2 and 3 briefly address the theoretical grounds of the trade-off and pecking order theories. The available literature and hypotheses to be tested, as well as model specifications, are also discussed. Section 4 describes how the sample was chosen. Section 5 explains the econometric methodology applied and presents the results, including whether the proposed hypotheses are accepted or rejected. The robustness of results is also analysed. Lastly, Sect. 6 sums up the main conclusions of this research.

2 Trade-off model

2.1 Background and theoretical grounds

According to this theory, companies seek to obtain optimum capital structure and weigh up the advantages and disadvantages of an additional monetary unit of debt. The advantages of this approach include interest payments being deductible from company tax (Modigliani and Miller 1963; DeAngelo and Masulis 1980). Furthermore, the problem of free cash flow is reduced (Jensen 1986; Stulz 1990). The disadvantages of debt include the potential cost of financial distress (Kraus and Litzenberger 1973; Kim 1978) and agency costs arising between owners and financial creditors (Jensen and Meckling 1976; Myers 1977). If optimal capital structure is reached, the

benefits and shortfalls of debt offset each other and equilibrium is achieved. In this sense, Myers (1984) showed that the trade-off approach implied the rate of real company indebtedness reverting to a target or optimum level.

Frank and Goyal (2005) break Myers's earlier notion of trade-off into two parts: (i) the static trade-off theory (the firm's leverage is determined by a single period trade-off) and (ii) target-adjustment behaviour (the firm's leverage gradually reverts to the target over time). Many authors have recently developed dynamic trade-off models in an attempt to provide a unified framework (e.g., Hennessy and Whited 2005; Leary and Roberts 2005). Following this line of reasoning, we propose a dynamic model to verify the trade-off theory prediction that leverage reverts to an objective or optimal point. We also estimate how quickly this adjustment is made. Furthermore, as Fama and French (2002) show, empirical studies made within the framework of the trade-off theory, aimed at identifying the determinants of company indebtedness, normally carry out a simple cross-section regression—estimating the relationship between the ratios of observed debt and a set of explanatory variables using non-dynamic models (e.g., Bradley et al. 1984; Titman and Wessels 1988; Rajan and Zingales 1995). This type of approach has two limitations: (i) observed debt does not necessarily have to be identified with optimal debt, as this implies ignoring the difficulties companies suffer when adjusting their capital structure; and (ii) static empirical analysis is unable to explain the dynamic nature of company capital structure, that is to say, it does not really examine whether company debt reverts to a given optimal level or how quickly this reversion occurs. In the first place, Subsection 2.2 below indicates the main determinants of capital structure along with the corresponding hypotheses and proxies which have to be considered. Following this, Subsection 2.3 proposes a partial adjustment model where both the dynamic feature and the main determinants of capital structure are included.

2.2 Hypotheses and variables

Some stylized facts in the empirical literature which summarize the relationship between capital structure and its main determinants can be highlighted under this approach. Accordingly, the general hypotheses that we intend to verify by means of the trade-off approach are as follows:

(1) The role played by interest payments when calculating the tax burden is of particular importance as it is deductible from corporate income. This is mainly true for more profitable firms and those firms with less income volatility which should have a larger corporate tax deduction through interest payments. Thus, using debt as a source of financing holds a clear advantage, that of reducing income tax. While additional debt does not give rise to significant inherent costs of financial distress, companies will decide to increase their leverage ratio. Consequently, our first hypothesis is: *"the effective tax rate is expected to be positively related to the debt level"* (DeAngelo and Masulis 1980; Haugen and Senbet 1986; Fama and French 2002).

This hypothesis is verified by using the effective tax rate, ETR variable, which is defined as the ratio between tax paid and earnings before tax (EBT).

(2) Interest payments are not the only way to reduce income tax. According to DeAngelo and Masulis (1980), corporate tax structure is assumed to be more complex and the presence of non-debt tax shields (NDTS), such as accelerated depreciation or investment tax credits, should affect decisions on optimal capital structure. As firms increase NDTS, they appear less interested in debt in what is called an income-substitution effect. In other words, firms try to reduce their tax burden by using NDTS instead of debt, thus avoiding distress costs or any other adjustment costs (see Dammon and Senbet 1988). NDTS effects can be particularly important in the case of SMEs, which receive special treatment from the tax code. Spanish firms, for instance, take advantage of higher investment tax credits and also accelerated depreciation for fixed assets. According to DeAngelo and Masulis (1980) the following hypothesis can be formulated: *"Non-debt tax shields should be negatively related to firm debt"*.

This hypothesis can be verified by using the NDTS variable, measured by the ratio between depreciation and total assets.

(3) According to the trade-off theory, default risk works as a mechanism that offsets debt financing in order to safeguard firms from bankruptcy, thus preventing them from using debt in excess. Default risk gives rise to either direct or indirect financial

distress costs. Small firms are more prone to financial distress and they often suffer higher costs in relative terms. Following Wijst and Thurik (1993) and Wald (1999), the higher the financial distress costs, the lower the indebtedness of the firm. Thus our next hypothesis can be expressed as *"Default risk should be negatively related to the firm's debt ratio"*.

The specialized literature has considered the volatility of earnings as a proxy of default risk (e.g., Mackie-Mason 1990; Wald 1999). We approach default risk, referred to here as DR, by the standard deviation of companies' operating profit less the mean of companies' operating profit. Following Miguel and Pindado (2001), the mean is deducted in order to compensate for the companies with losses.

(4) As shown by Myers (1977), highly levered firms with significant growth opportunities face an underinvestment problem which leads them to forgo investment projects with a positive net present value. Therefore, by reducing debt, firms avoid the shareholder-bondholder agency conflict in which the benefits obtained by bondholders are from shareholders if the investment project is carried out. Furthermore, Jensen and Meckling (1976) described the asset substitution agency conflict, which also predicts a reduction in debt and implies the possibility that shareholders have to obtain benefits from bondholders when they undertake risky investment projects, as this greater risk is transferred to bondholders. Moreover, the agency problem of free cash flow (the remaining cash flow after covering all profitable investments), discussed by Jensen (1986), affects the relationship between leverage and growth opportunities. Debt can work as a mechanism to discipline managers, discouraging them from wasting free cash flow on perquisites. Therefore, firms with more growth opportunities (relative to earnings) will need less debt (see Fama and French 2002). For all the reasons described above, an additional hypothesis has been formulated: *"Companies with greater growth opportunities will have a smaller debt ratio"*.

While it is true that a vast majority of the empirical literature has adopted Tobin's q ratio, or a research and development ratio, as a proxy for investment opportunities, it is practically impossible to obtain such information from SMEs. As a result, following Scherr and Hulburt (2001), this hypothesis shall be verified by using the growth opportunities GO discrete variable that takes four values, based on the quartiles of the annual percentage change in sales. Furthermore, *sales growth* and *asset growth* will be used as alternative proxies for growth opportunities.

(5) According to the trade-off theory, a profitable business is expected to have a higher level of debt in order to offset corporate tax. Furthermore, agency problems derived from free cash flow (Jensen 1986) lead profitable firms to employ higher leverage in order to pay out more cash in excess. Thus, following the general consensus, one more hypothesis can be expressed as: *"There should be a positive relationship between debt ratio and firm profitability"* (Mackie-Mason 1990; Fama and French 2002). However, the empirical evidence provided by many studies is not always consistent with this prediction. For instance, both Rajan and Zingales (1995) and Barclay et al. (1995) find a negative relationship between debt and profitability, while Barton et al. (1989) and Jensen et al. (1992) show a positive relationship. Regarding SMEs, Michaelas et al. (1999) find a negative relationship.

We define the profitability ROA variable as a ratio of operating income over total assets.

(6) We have also introduced the firm's size as a control variable. Large companies frequently offer greater collateral guarantees and less risk as they tend to be more diversified (Titman and Wessels 1988). As a result, they have a better reputation on financial markets and can reach higher levels of debt. As a result, from the perspective of the trade-off theory, large firms can be pushed towards a higher leverage and the corresponding hypothesis is formulated as *"The size of the company should be positively related to the level of debt"* (Ang 1992). The firm size variable (SIZE) is obtained by using the natural logarithm of total assets.

It must also be considered that within the pecking order framework, size can be expected to have a negative effect on leverage as larger enterprises are faced with lower information costs and can obtain more internal resources, thus reducing the amount of debt required.

(7) Myers (1984) pointed out that the trade-off approach implied the rate of real leverage converging to a target or optimal level. The distance or gap between both real and target levels supposedly depends on transaction costs. SMEs probably face high transaction costs which are derived from typical

agency problems and financial restrictions in capital markets. Therefore, we expect small businesses to fall well short of their targets due to significant transaction costs. Following this rationale, our next hypothesis is expressed as: *"SMEs face significant transaction costs which keep them far from their target"* (Ang 1976; Jalilvand and Harris 1984).

Table A.1 in the appendix shows a summary of all the hypotheses formulated in this research. In addition to this, Table A.2 offers a detailed description of all the variables incorporated in the estimated models.

2.3 Model specification

In a perfect world without transaction costs (or any other adjustment costs), companies would automatically respond to any variation in their debt objective by increasing or decreasing their resources. So, at a given moment of time t, the observed debt of a given company i, D_{it}, should not differ from its debt target, D^*_{it}, that is, $D_{it} = D^*_{it}$. Nevertheless, in reality there are considerable transaction costs that impede companies from completely reaching D^*_{it}, so the adjustment is, in this case, partial. We can represent this process by means of the following partial adjustment model (Nerlove 1958):

$$D_{it} - D_{it-1} = \lambda \cdot (D^*_{it} - D_{it-1}) \tag{1}$$

where D_{it} and D_{it-1} are the ratio of total observed leverage in the current and previous period, respectively (they are defined as the natural logarithm of the quotient between total debt and equity). D^*_{it} is the ratio of target debt, and λ is the speed of adjustment or target-adjustment coefficient which is assumed to be constant across the sample. Transaction costs are inversely related to λ and can be referred to as $1 - \lambda$. Following Shyam-Sunder and Myers (1999), this model assumes that changes in the debt ratio are explained by deviations in the current ratio from the target. Equation 1 establishes how much the desired adjustment (from the debt ratio in $t - 1$ to the target ratio in t) depends on its adjustment parameter λ which in turn depends on the presence of transaction costs.

Equation 1 represents dynamic behaviour where a given firm adjusts its target D^*_{it} in the presence of transaction costs. In short, if the target-adjustment coefficient, λ, falls between 0 and 1, it follows that the firm will gradually bring its debt level in line with its target over time (see Drobetz and Wanzenried 2006). Furthermore, the adjustment coefficient, λ, works either for increasing or decreasing debt. For example, if a company decreases its level of debt from 70% to 60% and the target debt level (which will always be unknown) is assumed to be 30%, it follows from Eq. 1 that the adjustment speed coefficient should be 0.25. Moreover, if $\lambda > 1$, a firm adjusts (increasing or decreasing its debt) more than necessary and if $\lambda < 0$, a firm deviates from the target over time. According to the trade-off theory, this adjustment coefficient which was assumed constant should have a clearly positive value between 0 and 1. It should be noted that firms could actually have an individual adjustment coefficient as they face different transaction costs and, furthermore, because they are at different points in their life-cycle in our sample.

In order to estimate the model described above, the debt objective—which cannot be observed directly—must be calculated. Therefore, a proxy must be used for target debt. This proxy could be obtained from a regression equation that incorporates the explanatory variables corresponding to the determinants of firm debt that have been previously introduced (see Subsection 2.2 above). For company i, at moment t, we have the following equation:

$$D^*_{it} = \beta_0 + \beta_1 \cdot \mathrm{ETR}_{it} + \beta_2 \cdot \mathrm{NDTS}_{it} + \beta_3 \cdot \mathrm{DR}_{it} + \beta_4 \cdot \mathrm{GO}_{it} + \beta_5 \cdot \mathrm{ROA}_{it} + \beta_6 \cdot \mathrm{SIZE}_{it} + u_{it} \tag{2}$$

If we now include (2) in (1), reorganize the terms and take into account that regression is carried out with panel data, we arrive at:

$$\begin{aligned} D_{it} - D_{it-1} = {} & \lambda \cdot \beta_0 + \lambda \cdot \beta_1 \cdot \mathrm{ETR}_{it} + \lambda \cdot \beta_2 \cdot \mathrm{NDTS}_{it} \\ & + \lambda \cdot \beta_3 \cdot \mathrm{DR}_{it} + \lambda \cdot \beta_4 \cdot \mathrm{GO}_{it} \\ & + \lambda \cdot \beta_5 \cdot \mathrm{ROA}_{it} + \lambda \cdot \beta_6 \cdot \mathrm{SIZE}_{it} \\ & - \lambda \cdot D_{it-1} + \eta_i + \eta_t + u_{it} \end{aligned} \tag{3}$$

where η_i are the specific unobservable individual effects for each company from the panel, which do not vary over time; variable η_t captures any specific temporary effect; finally, u_{it} is an error term, independent and identically distributed (iid) with constant variance.

Expression (3) can also be organized as follows:

$$D_{it} = \lambda \cdot \beta_0 + \lambda \cdot \beta_1 \cdot \mathrm{ETR}_{it} + \lambda \cdot \beta_2 \cdot \mathrm{NDTS}_{it} + \lambda \cdot \beta_3 \cdot \mathrm{DR}_{it} + \lambda \cdot \beta_4 \cdot \mathrm{GO}_{it} + \lambda \cdot \beta_5 \cdot \mathrm{ROA}_{it} + \lambda \cdot \beta_6 \cdot \mathrm{SIZE}_{it} + (1-\lambda) \cdot D_{it-1} + \eta_i + \eta_t + u_{it} \quad (4)$$

Note that the parameter of the variable corresponding to the lagged debt ratio in expression (4) is 1 minus the adjustment coefficient, that is, the effect of transaction costs. Table A.3 in the Appendix summarizes all the estimated models.

3 Pecking order model

3.1 Background and theoretical foundation

The theory emerges as a result of asymmetric information present in financial markets. That is, corporate managers often have better information about the health and prospects of their companies than outside investors. Apart from the transaction costs involved in issuing new securities, companies have to accept the information costs arising from asymmetric information. In this sense, new securities issued on financial markets could be undervalued due to information asymmetries. This is especially the case with new equities. Consequently, company managers may decide not to launch potentially profitable projects if they have to be financed by risky financial instruments (Myers and Majluf 1984).

As a result, theory predicts a hierarchical order in a company's financing policy. This order is led by the financial sources that are least subject to information costs and at the same time involve less risk. Internally generated funds are the preferred source of financing, followed by low-risk short-term debt and then higher-risk long-term debt. The last option is new capital, which is the source of financing with the highest information costs (Donaldson 1961; Myers and Majluf 1984).

From the perspective of this approach, changes in the level of debt are not motivated by the need to reach a given debt target, but rather the need for external financing, once internal resources have been exhausted and assuming that opportunities for profitable investment exist. In line with this theory, the key to a firm's financing is the amount of internal resources that are obtained and the existence of profitable investments. Thus, one way of testing this theory is by examining financing decisions made after short-term changes in profits and investments, that is, by using the theoretical relationship between changes in the level of debt and a firm's need for funds. In this manner, debt is increased or decreased depending on whether or not investment requirements exceed the funds available internally (see Shyam-Sunder and Myers 1999). Additionally, the pecking order theory can be alternatively tested by regressing a firm's debt over the main factors that summarize the essential financial behaviour in this approach (see Jordan et al. 1998; Michaelas et al. 1999). Thus, firms will tend to be less indebted as they generate more internal resources. Consequently, our first regressor should be cash flow as a proxy for internal resources. Conversely, firms with more growth opportunities with respect to their cash flow tend to display greater leverage making the introduction of an interaction factor to account for this reciprocal influence necessary. The essential point of this approach is that firms will increase leverage to the extent of boosting investment opportunities provided that cash flow has run out. Therefore, we expect SMEs to be closely conditioned by both cash flow and investment opportunities which have to be considered jointly. Lastly, it is assumed that older firms could retain more earnings over time and will need less debt; thus age can also play an important role and has to be included in our model.

SMEs can be particularly affected by typical asymmetric information problems like adverse selection and moral hazard. Therefore, their financial behaviour can be naturally described by the pecking order approach (Cosh and Hughes 1994; Frank and Goyal 2003). The aforementioned problems faced by SMEs create severe financial restrictions in credit markets where mainly short-term debt financing can be achieved. At the same time, the director-owners of SMEs may decide not to seek financing that dilutes their shareholding in the company and therefore limits their ability to act. In this sense, they generally turn their attention to debt once internal resources have run out. Furthermore, the transaction costs of external sources of financing—especially equity—tend to be considerably higher for this group of firms as they have less organizational and management

power in credit markets. All these reasons together make SMEs perfect candidates to be described under the pecking order approach as well.

3.2 Hypotheses and variables

The following hypotheses could summarize the rationale developed on the pecking order theory in Subsection 3.1 above:

(8) Financial behaviour under this approach concentrates on the difference between a firm's investment needs and the internal resources it has generated, which is known as financing deficit. If this difference is positive, firms will seek more debt and the opposite occurs if it is negative (Shyam-Sunder and Myers 1999). The corresponding hypothesis can be formulated as "*The financing deficit ought to be positively related to the change in debt*".

We define the financing deficit of a firm i, FD_{it}, for period t, by the following difference:

$$\mathrm{FD} = [\Delta \text{ Fixed Assets} + \Delta \text{ Working Capital} + \Delta \text{ Long Term Debt}] - \mathrm{CF} \quad (5)$$

where Δ represents the first difference and CF accounts for earnings after tax plus depreciation.

(9) According to theory, the more internal resources a business generates, the less it needs to resort to debt, as internal resources have the lowest information costs. Therefore, under the pecking order approach, we presume that *cash flow*, as a proxy for internal resources, represents the main option of financing. The hypothesis to be tested is as follows: *"The level of a firḿs debt should be negatively related to the volume of cash flow"* (Myers 1984; Myers and Majluf 1984).

(10) As discussed in Subsection 3.1 above, interaction between internal resources and investment opportunities can play a significant role in determining firm capital structure, as these two factors jointly influence financing decisions. Thus, we try to capture the overall effect of this interaction on debt, as it does not make sense to account for these variables separately. Our next hypothesis is defined as follows: *"Companies with few investment opportunities and high cash flows should have low debt levels, while companies with strong growth prospects and reduced cash flows should have high debt ratios"* (Myers 1984).

In order to test this hypothesis, an interactive variable, CFGO, is constructed which combines two dichotomous variables named cash flow, CF, and growth opportunities, GO, both of which have been defined previously. GO and CF take four values based on their quartiles. GO ranges from 0 to 3 and CF from 3 to 0. By summing GO and CF we obtain CFGO, which ranges from 0 to 6. The interactive variable CFGO will take a value of 0 when there are very few growth opportunities and high liquidity and, therefore, almost no need to use debt as a mode of financing. It will take the value 1 when there are more growth opportunities than in the previous case and the same liquidity or the same growth prospects with less liquidity. In both cases, there is more need to lever the firm than the case where CFGO is equal to 0. This line of reasoning is used for the rest of the possible values of CFGO.

(11) Time elapsed enables businesses to save funds and therefore avoid resorting to debt. Thus, younger firms cannot retain earnings as easily as older firms can. Our last pecking order hypothesis is expressed as follows: *"The age of a firm should be negatively related to its level of debt"* (Petersen and Rajan 1994; Berger and Udell 1998).

We also have to take into account that according to the trade-off approach, age can have a positive effect on leverage, as older enterprises face lower agency costs and less bankruptcy problems. As a result, they could sustain a higher level of debt.

3.3 Model specification

According to the rationale and hypotheses described previously, we propose two different pecking order models which complement each other. The first one is based on Shyam-Sunder and Myers (1999), although our econometric specification employs panel data methodology:

$$\Delta D_{it} = \alpha + \beta \cdot \mathrm{FD}_{it} + \eta_i + \eta_t + \varepsilon_{it} \quad (6)$$

ΔD_{it} being the first difference of the ratio of total debt and FD_{it} the financing deficit explained in Subsection 3.2 above. Furthermore, η_i are the specific unobservable individual effects for each company from the panel and they do not vary over time; variable η_t captures any specific temporary effect; finally, ε_{it} is an error term.

The estimation of model (6) focuses on parameter β, which we expect to be statistically significant and near to 1. Therefore, debt variation over the year would be mainly explained by the financing deficit, which corresponds to the rationale of the pecking order theory. However, it is worth taking into account the possibility of this coefficient being biased, as SMEs are presumably affected by liquidity restrictions.

In addition to this, we present another pecking order model which alternatively captures a firm's financial behaviour. As explained in Subsection 3.1, the presence of some relevant factors in capital structure theory that traditionally explain the pecking order approach leads some researchers to also test the pecking order theory with a regression model that captures the relevant factors of the theory (e.g., Michaelas et al. 1999; Aybar et al. 2004). We combine the hypotheses proposed above in Subsection 3.2 in the following model:

$$D_{it} = \alpha + \beta_1 \cdot \mathrm{CF}_{it} + \beta_2 \cdot \mathrm{CFGO}_{it} + \beta_3 \cdot \mathrm{AGE}_{it} + \eta_i + \eta_t + \varepsilon_{it} \quad (7)$$

In Eq. 7, D is the total debt ratio, CF is the firm's cash flow and AGE is the natural logarithm of the company age in years. Furthermore, CFGO is an interactive variable that combines cash flow and growth opportunities. All three variables are relevant when it comes to evaluating this pecking order model, although parameter β_2 associated to the CFGO variable captures the essence of financial behaviour under this approach. That is, we expect β_2 to be statistically significant with a positive sign, meaning that the influence of interdependence between internal funds generated and growth opportunities plays a relevant role in capital structure decision making.

4 Sample selection

The sample of SMEs chosen for this study was taken from the SABI (Sistema de Análisis de Balances Ibéricos) database, managed by Bureau Van Dyck and Grupo Informa, S.A. This database contains economic and financial information on Spanish companies. At the time the sample was selected, the SABI database included approximately 600,000 firms. The firms in the sample meet the definition established by the European Commission for an SME (Recommendation 96/280/EC, 3 April, 1996) which is as follows: (i) less than 250 employees; (ii) less than €40 million invoiced or assets less than €27 million (one of the two) and (iii) independent firm, that is, no more than 25% of total shares can belong to any other firm (or joint firms) unless they are also SMEs.[1,2] Firms showing extreme or inconsistent figures were excluded from the sample. Furthermore, selected companies should have the necessary financial information for a minimum time-span of 8 years.

The final sample contains 3,569 SMEs with incomplete information for the 10-year period 1995–2004, resulting in a data panel with 35,690 observations (4,045 missing values). These firms are representative of Spanish SMEs because they cover all sectors, except finance and insurance due to their specific financial behaviour and uniqueness. The industry classification criteria were taken from the Spanish Economic Activities National Classification (CNAE-93, Real Decreto 1560/1992), adapted to the statistical notation of economic activities from the European Community (NACE). Table A.4 in the Appendix shows this industry classification and the percentage represented by each sector with respect to the sample as a whole. As can be seen in this table, three sectors account for 89.58% of the total (Sector 2, Manufacturing, 43.37%; Sector 5, Commerce, vehicles and others, 35.56%; and Sector 4, Construction, 10.65%).

5 Econometric analysis and results

5.1 Methodology and empirical tests

The nature of our data makes it possible to use panel data methodology to test the capital structure models discussed in Sects. 2 and 3 (trade-off and pecking order, respectively), by simultaneously combining

[1] On May 6th, 2003 the Commission adopted the new Recommendation 2003/361/EC which increased the financial ceilings and replaced Recommendation 96/280/EC as from January 1st, 2005.

[2] It should be noted that we have not corrected the figures of employment, sales or assets by subsidiaries and mother companies as the SABI database does not provide the necessary information.

cross-section and time series data. In comparison to traditional Least Squares (LS) regression, this technique has the advantage of capturing the unobservable individual effects of the agents (companies), such as the particular SME idiosyncrasy which is assumed to be different for every company and constant over time. Furthermore, another important advantage is the possibility of considering the variability of dependent and explanatory variables of every company over the span or period of time (here, 10 years in all) which produces better estimators than traditional Ordinary Least Squares (OLS). Lastly, a third advantage is that it allows temporary control variables to be included in the analysis.

Panel data from the sample of 3,569 non-financial Spanish SMEs, covering the 10-year period 1995–2004, are used to test the two cited groups of theoretical capital structure models, while at the same time enabling the main determinants of SME financial policy to be identified. In order to find out which of the models performs better, they have been nested from Eqs. 4 (trade-off) and 7 (pecking order) in a general capital structure model, resulting in the following expression:

$$\begin{aligned} D_{it} &= \delta + (1-\lambda)\cdot D_{it-1} + \lambda\cdot\beta_1\cdot \mathrm{ETR}_{it} \\ &\quad + \lambda\cdot\beta_2\cdot \mathrm{NDTS}_{it} + \lambda\cdot\beta_3\cdot \mathrm{DR}_{it} + \lambda\cdot\beta_4\cdot \mathrm{GO}_{it} \\ &\quad + \lambda\cdot\beta_5\cdot \mathrm{ROA}_{it} + \lambda\cdot\beta_6\cdot \mathrm{SIZE}_{it} + \beta_7\cdot \mathrm{CF}_{it} \\ &\quad + \beta_8\cdot \mathrm{CFGO}_{it} + \beta_9\cdot \mathrm{AGE}_{it} + \eta_i + \eta_t + u_{it} \end{aligned} \tag{8}$$

All the variables included in this nested model have already been defined in Sects. 2 and 3 and are summarized in Table A.2 in the Appendix.

All estimates are carried out by the statistical package Stata (StataCorp. 2005) using instrumental variable (IV) techniques, in order to avoid inconsistent estimators due to correlations that could arise between unobservable individual effects, regressors and error terms and also due to the presence of regressor endogeneity (Baltagi 1995).

The nested capital structure model described by Eq. 8 is tested with the Generalized Moments Method (GMM) using the Arellano and Bond (1991) estimator, as this model includes the lagged-dependent variable as an explanatory variable. The GMM estimation shows two application levels: (i) Homocedastic one-stage estimation and robust one-stage estimation, and (ii) Two-stage estimation. The second alternative, which employs the residuals of the one-stage estimation to construct an asymptotically weighted optimum matrix, is more efficient than the first if we assume that perturbances will show heteroskedasticity for relatively extensive sample data (Blundell and Bond 1998). We have used both GMM procedures for our estimation process without encountering any significant difference between the two; the robust version (i.e., one-stage estimation) is the one reported. Moreover, a set of tests are undertaken on our general model to verify the degree of consistency and robustness of the results obtained. More specifically, Sargan's test of over-identifying restrictions, tests of absence of both first- and second-order autocorrelation of residuals, and Wald's test of joint significance of the regressors are carried out.

By applying Wald's test of the nullity of beta parameters to model (8), alternatively in each of the group of parameters, it will be revealed whether it is the trade-off or pecking order approach that best describes SME capital structure. In other words, each group of parameters from the corresponding trade-off and pecking order models is considered as a restriction in the nested general model. Thus, if we accept the null hypothesis for all the parameters of one of the groups, this implies that it is the other group that performs well and vice versa.

The nested or general capital structure model has also been estimated for comparative purposes with the Two-Stage Least Squares (2SLS) IV procedure (Anderson and Hsiao 1982), which controls for potential endogeneity problems that could arise among the regressors. For identical reasons, the trade-off and pecking order specifications (Eqs. 4, 7, respectively), both nested in the general model, will also be separately estimated as a reference. While the trade-off model will be estimated by means of GMM and 2SLS IV procedures, the pecking order model is estimated by applying the 2SLS IV method.

Finally, the pecking order model based on Shyam-Sunder and Myers (1999), that is, Eq. 6, will be later estimated as a robustness specification (see Subsection 5.3) with the 2SLS IV procedure, also in order to control for potential endogeneity problems.

The main descriptive statistics of the dependent and explanatory variables are included in the Table below:

Table 1 shows that the mean ratio of total debt (as defined in Table A.2) in our SME sample is 64.97%, which in turn means that total debt constitutes

Table 1 Descriptive statistics of dependent and explanatory variables

Variable	Mean	Standard deviation	Minimum	Maximum
D	0.6497	0.9825	−5.6028	6.5570
ETR	0.3023	0.5852	0	30.2190
NDTS	0.0417	0.0353	0	0.6401
DR	−133614.2	254895	−4441216	1656506
GO	0.2156	11.7423	−0.9995	1825.631
ROA	0.0873	0.1078	−14.7266	3.6486
SIZE	14.472	1.1202	9.0182	18.2200
CF	317196.7	541607.9	−7519709	12000000
CFGO	3.1504	1.5808	0	6
AGE	2.6991	0.5273	1.0986	4.6540

D: total debt ratio; ETR: effective tax rate; NDTS: non-debt tax shields; DR: default risk; GO: growth opportunities; ROA: profitability; SIZE: firm size; CF: cash flow; CFGO: interactive variable between growth opportunities and cash flow; AGE: firm age

65.70% of total assets and the remaining 34.30% corresponds to equity. It is also worth pointing out that the SMEs in our sample have an average tax rate of 30.23%, which almost coincides with the 30% tax rate officially established for small companies by Spanish tax legislation (Law 24/2001, December 27th, of Fiscal, Administrative and Social Order Measures). SMEs are an average of 15 years old—the youngest company is aged 8 and the oldest 105. Average profitability, in terms of profitability over assets, stood at 8.73% for the period 1995–2004.

5.2 Results discussion

Table 2 below reports the results obtained for the GMM estimate of our nested or general capital structure model. Additionally, as a comparison reference, this table also shows the nested model estimate by using 2SLS procedure, the individual estimate of the trade-off model (Eq. 4) by using GMM and 2SLS procedures and the individual estimate of the pecking order model (Eq. 7) by using 2SLS method.

A set of tests that have been carried out verify the robustness of the results obtained in the GMM estimate. Wald's test of joint significance of regressors rejects the null hypothesis of all the parameters. Sargan's test of over-identifying restrictions confirms that the number of instrumental variables selected is correct and, lastly, empirical evidence visibly indicates that no second-order autocorrelation exists in the residuals.

In relation to the particular significance of regressors, the empirical evidence obtained indicates that SMEs face high transaction costs, as expected. According to Myers's notion of trade-off behaviour, it can be presumed that the existence of such high transaction costs justifies the gap between the target and the current level of debt, together with a very slow approach to the target. The estimated value of the parameter associated to the lagged leverage, $1-\lambda$, was statistically significant and turned out to be 0.64, thus implying a low-adjustment parameter λ of approximately 0.36. This estimation is lower than that produced by Miguel and Pindado (2001), $\lambda = 0.79$, for Spanish-listed companies and also for that found in the United States of America by Shyam-Sunder and Myers (1999), $\lambda = 0.41$. SMEs probably compare two kinds of costs when adjusting their capital structure: (i) the costs incurred when making the adjustment to target leverage and (ii) the costs of remaining in an unbalanced position, that is, far from the target. In this manner, the adjustment coefficient λ will be close to one if the costs of being unbalanced are larger than the costs of self-adjustment. Alternatively, the coefficient will be close to zero if the opposite applies. Thus, it can be deduced that Spanish SMEs seem to find the cost of an unbalanced position less of a burden than the cost of adjusting. Therefore, hypothesis (7), related to the presence of adjustment costs, can be accepted.

As far as fiscal factors are concerned, it is worth highlighting that NDTS clearly influence SME capital structure, but the effective tax rate does not. To be precise, results show that the presence of NDTS, such as depreciation, makes the tax advantage through debt less relevant. Thus, the estimated coefficient of the effective tax rate has turned out to be statistically non-significant, meaning that the taxes SMEs have to pay do not influence their financial behaviour. Possibly, financial restrictions that affect SMEs prevent them from using debt as a powerful mechanism to reduce the tax bill. Furthermore, it suggests that current Spanish tax regulation does not provide relevant advantages to SMEs. Accordingly, hypothesis (2) related to NDTS is confirmed but hypothesis

Table 2 Estimation results of capital structure models

Explanatory variable	Nested model GMM	Nested model 2SLS	Trade-off model GMM	Trade-off model 2SLS	Pecking order model 2SLS
D_{it-1}	0.6470	0.0090	0.750	−0.0053	
	(1 E^{-05})	(0.0830)	(1 E^{-05})	(0.3210)	
ETR	0.0021	−0.0016	0.0067	0.0011	
	(0.7130)	(0.4310)	(0.210)	(0.5720)	
NDTS	−0.4561	−0.2793	−1.4530	−0.2251	
	(0.050)	(0.0070)	(1 E^{-05})	(0.0310)	
DR	−1 E^{-05}	1 E^{-05}	−1 E^{-05}	1 E^{-05}	
	(0.1820)	(0.0130)	(0.4990)	(0.0760)	
GO	−0.0820	−0.0433	0.0039	0.0057	
	(1 E^{-05})	(1 E^{-05})	(0.2570)	(1 E^{-05})	
ROA	−0.3672	−0.2447	−0.5671	−0.3592	
	(0.0020)	(1 E^{-05})	(0.0270)	(1 E^{-05})	
SIZE	1.2979	1.2088	1.2074	1.1507	
	(1 E^{-05})	(1 E^{-05})	(1 E^{-05})	(1 E^{-05})	
CF	−1 E^{-05}	−1 E^{-05}			−1 E^{-05}
	(1 E^{-05})	(1 E^{-05})			(1 E^{-05})
CFGO	0.0813	0.0543			0.0353
	(1 E^{-05})	(1 E^{-05})			(1 E^{-05})
AGE	−0.8333	−0.7718			−0.4692
	(1 E^{-05})	(1 E^{-05})			(1 E^{-05})
Number of firms	3,569	3,569	3,569	3,569	3,569
Number of obs.	24,606	21,037	24,606	21,037	24,606
Wald test	162.40	843.90	181.12	849.97	50.75
	(1 E^{-05})	(1 E^{-05})	(1 E^{-05})	(1 E^{-05})	(1 E^{-05})
z_2	2.82 (0.480)		2.33 (0.285)		
Sargan test	48.43 (0.430)		28.81 (0.270)		

Estimated coefficients with the level of critical significance in brackets. All the models include both time and sector dummies. The intercept coefficient is not included. The first of the estimations is carried out by GMM and Arellano and Bond's (1991) estimator, robust version, taking the model in first differences and where D_{it-1}, ROA_{it}, CF and $CFGO_{it}$ have been instrumented with all their lags. The 2SLS column provides Anderson and Hsiao's (1982) estimation of the model in first differences where D_{it-1}, ROA_{it}, CF and $CFGO_{it}$ have been instrumented with all their lags. The Wald test statistic refers to the null hypothesis that all coefficients on the explanatory variables are jointly equal to zero. The test statistic z_2 tests the null hypothesis of no second-order autocorrelation in the residuals. The Sargan test statistic applies to the null hypothesis that over-identifying restrictions are valid

(1) is not. These results coincide with other studies, such as Michaelas et al. (1999), Miguel and Pindado (2001) and Ozkan (2001). It is also worth noting that the effective tax rate variable is highly volatile due to the fact that it is a flow variable and measures the taxes paid for past profits. In order to check the robustness of our results, this variable's trend was tested by specifying 3-year average values, but significant differences were not found in the results of the estimation.

As expected, growth opportunities have a negative and statistically significant impact on leverage. SMEs are also prone to having large growth prospects and high debt ratios, thus making them very sensitive to Myerś underinvestment problem. Moreover, in relation to Jensen's free cash flow problem, SMEs do not need to discipline directors by increasing debt, as owners and directors very often overlap. This estimate has also been tested by using a continuous specification of the variables *increase in sales ratio*

and *increase in assets ratio* with identical results (these results are not reported). Consequently, hypothesis (4) can be considered verified for SMEs. Empirical evidence from other authors is mixed. For instance, Titman and Wessels (1988) and Rajan and Zingales (1995) present a negative and positive relationship, respectively. Michaelas et al. (1999) find a positive relationship for SMEs and explain that it is due to the difficulties these companies have when trying to obtain internal resources or external resources other than bank credit.

As can be seen from Table 2, firm size and leverage are found to be positively connected, this relationship being statistically significant. Consequently, hypothesis (6) regarding firm size is also confirmed. This result coincides with a considerable number of previous studies on SMEs (e.g., Chittenden et al. 1996; Berger and Udell 1998; Michaelas et al. 1999) and means that even within this firm category, larger SMEs can access higher leverage. According to the trade-off approach, size seems to balance the risk of SME bankruptcy when leverage is increased. Thus, the larger SMEs are the more leverage they are able to have. Moreover, under the pecking order approach, larger firms accumulate more internal resources and, therefore, would need less debt. This means size has a negative effect. As our results show, hypothesis (6) on firm size has in the end been confirmed by the trade-off approach.

Eventually, the risk of default does not appear to be statistically significant, while profitability seems to be negatively related to firm leverage, contradicting the trade-off belief that the most profitable firms are the most levered. Surprisingly, income volatility as a measure of default risk is not a relevant factor in SME capital structure. This suggests that lenders—mainly banks—probably do not place a great deal of trust in SME financial statements, being guided by other indicators. As regards profitability, empirical evidence is mixed. For instance, both Rajan and Zingales (1995) and Barclay et al. (1995) find a negative relationship between debt and profitability, while Barton et al. (1989) and Jensen et al. (1992) obtain a positive relationship. Regarding SMEs, Michaelas et al. (1999) find a negative relationship, as we do. Profitability is closely related to cash flow, which is usually taken as a proxy of internal resources by the pecking order scheme. However, we predicted this variable to have a negative relationship with debt in this approach, not positive. Hence, it can be concluded that hypotheses (3) (default risk) and (6) (profitability) are not confirmed.

In keeping with the theoretical discussion in Sect. 3, the hypotheses formulated from the perspective of the pecking order theory (Eq. 7) are also tested by the GMM estimate of the general model (see Table 2). All the hypotheses—(9), (10) and (11)—are found to be overwhelmingly confirmed. As expected, cash flow is negatively related to firm leverage (hypothesis (9)); so the SMEs that generate the most internal resources are the least levered. This result is consistent with the pecking order theory prediction, which points to firms preferences for financing their investments with internal resources instead of external resources. This result suggests that SMEs face high information costs that prevent them from easily resorting to other financial resources. Moreover, information costs derive from asymmetric information in credit markets, giving rise to financial restrictions for SMEs that report less quality information and are accordingly less controlled by external agents. This rationale supports the idea that SMEs are actually dependent on internal resources and this is apparently their first source of financing.

The hypothesis referring to interaction between internal resources and investment opportunities (hypothesis (10)), within the scope of the pecking order theory, is also fulfilled. As predicted, a positive and significant relationship between the interactive variable CFGO and firm leverage is obtained. Hence, those SMEs with more investment opportunities, but less cash flow will need more resources, thus forcing them to resort to debt financing. This result illustrates an essential behaviour pattern under this approach. In short, it means that SMEs resort to debt when they run out of internal resources or when faced with high investment opportunities. It should be noted that while the *cash flow* variable individually fulfils the prediction of being negatively related to leverage (pecking order approach), the *growth opportunities* variable also individually fulfils the prediction of being negative (trade-off approach). This apparent contradiction leads us to presume that cash flow plays a stronger role than growth opportunities when interacting together in the pecking order theory.

Finally, as predicted, the results presented in Table 2 show that age has a negative and statistically

significant impact on SME financing (hypothesis (11)). Older SMEs may have generated sufficient internal resources to not depend as much on debt as younger SMEs, whose dependence on external resources will be greater. This behaviour is undoubtedly in line with the pecking order approach. However, it should be noted that the trade-off approach also suggests that older firms face less agency problems and default risk and, as a result, they should borrow more. Therefore, estimate results clearly support the pecking order approach.

As can be observed in Table 2, the GMM estimate of our nested or general capital structure model coincides with the 2SLS IV regression relatively well, except in the case of the transaction cost coefficient, which is only significant at 8.3%. Moreover, the associate parameter turned out to be very small. This difference could be due to technical reasons, because 2SLS IV regression provides consistent estimations of model parameters, although not necessarily efficient, as it does not use all the available moment conditions nor does it consider the different structure of residual perturbances. When the nested model GMM estimates are compared to the regressions of the individual or non-nested models (Eqs. 4, 7), results are once again found to be quite similar.

With respect to the performance comparison of both the trade-off and pecking order models, we have alternatively applied Wald's test of nullity of beta parameters in each of the group of parameters of the GMM estimate as restrictions of the nested model (Eq. 8), as explained above (see Subsection 5.1). Table 3 below provides the results of this test. Accumulated results of the test as well as separate results for each of the groups of parameters are reported. As a reference, we also show the results of this test when individually applied to both models.

Table 3 Wald test of significance of capital structure models comparison

Explanatory variable	Nested model (Accumulated)	Nested model (Separated groups)	Trade-off model	Pecking order model
D_{it-1}	$F(1,24573) = 407.97$ $(1\ E^{-05})$		$F(1,24580) = 567.25$ $(1\ E^{-05})$	
ETR	$F(2,24573) = 204.00$ $(1\ E^{-05})$		$F(2,24580) = 283.75$ $(1\ E^{-05})$	
NDTS	$F(3,24573) = 136.50$ $(1\ E^{-05})$		$F(3,24580) = 193.25$ $(1\ E^{-05})$	
DR	$F(4,24573) = 102.77$ $(1\ E^{-05})$		$F(4,24580) = 144.94$ $(1\ E^{-05})$	
GO	$F(5,24573) = 92.42$ $(1\ E^{-05})$		$F(5,24580) = 115.95$ $(1\ E^{-05})$	
ROA	$F(6,24573) = 88.32$ $(1\ E^{-05})$		$F(6,24580) = 104.75$ $(1\ E^{-05})$	
SIZE	$F(7,24573) = 623.00$ $(1\ E^{-05})$	$F(7,24573) = 623.00$ $(1\ E^{-05})$	$F(7,24580) = 564.01$ $(1\ E^{-05})$	
CF	$F(8,24573) = 555.14$ $(1\ E^{-05})$			$F(1,24587) = 184.18$ $(1\ E^{-05})$
CFGO	$F(9,24573) = 499.97$ $(1\ E^{-05})$			$F(2,24587) = 391.38$ $(1\ E^{-05})$
AGE	$F(10,24573) = 465.87$ $(1\ E^{-05})$	$F(3,24573) = 114.53$ $(1\ E^{-05})$		$F(3,24587) = 278.66$ $(1\ E^{-05})$

Each column includes the Wald test statistic which tests the null hypothesis that the coefficients on the explanatory variables are zero. Specifically, the first column reports the Wald test statistic for the nested model in cumulative form. The second column includes on the one hand, the Wald test statistic for the group of parameters associated to the trade-off approach within the nested model and on the other hand, the Wald test statistic for the rest of parameters linked to the pecking order stance. Finally, the third and fourth columns present the Wald test statistic for the trade-off and pecking order models, respectively, in cumulative form

The results of this test do not clearly reveal which of the two models best explains SME financial behaviour. Consequently, when we take the nullity of all the parameters of trade-off model as a first restriction of the nested model, the result of the test indicates an F-value of 623 (p-value or significance level equal 0). Hence, we cannot clearly opt for the pecking order model because the result of the test using the first restriction states that the trade-off model has significant parameters. A similar result arises when we apply the nullity of all the parameters associated to the pecking order model as a second restriction of the nested model. In this case the F-value is 114 (p-value equal 0), which indicates that the pecking order model also performs well. Consequently, it seems that both models can describe the capital structure of SMEs reasonably well, although according to the Wald test comparison, the trade-off model apparently performs better.

A summary of the discussion on the determinants of SME capital structure considering the trade-off and pecking order approaches is provided in Table 4, below. Both expected and actual relationships according to GMM estimation of the nested model are reported. We have also added the expected relationship of some variables that could be included in both models for comparison purposes.

As can be seen from Table 4, some variables have been incorporated in one of the models, but could also be considered within the scheme of the other, as mentioned above. Thus, growth opportunities (proxied by the GO variable) have been included in the trade-off model, although they could also be considered to have a positive effect on the dependent variable in the pecking order scheme. The prediction has been fulfilled for the trade-off model. Profitability (proxied by the ROA variable) was also included in the trade-off model with an expected positive effect on leverage, but can also be predicted with a negative effect from the perspective of the pecking order theory. In this case, the prediction turned out to be in favour of the pecking order approach. The cash flow variable is closely related to profitability and the result is consistent as its actual effect on the dependent variable is also negative under the pecking order approach. Lastly, size and age turned out to have a positive and negative effect on leverage, respectively.

Table 4 Expected and actual relations for the nested capital structure model (8)

Explanatory variable		Expected relation		Actual relation
Trade-off	Pecking order	Trade-off	Pecking order	
D_{it-1}		+		+
ETR		+		n.s.
NDTS		−		−
DR		−		n.s.
GO		−	+	−
ROA		+	−	−
SIZE		+	−	+
	CF	+	−	−
	CFGO		+	+
	AGE	+	−	−

D: total debt ratio. ETR: effective tax rate. NDTS: non-debt tax shields. DR: default risk. GO: growth opportunities. ROA: profitability. SIZE: firm size. CF: cash flow. CFGO: interactive variable between growth opportunities and cash flow. AGE: firm age

5.3 Robustness of results

The capital structure of SMEs could be influenced by the financial restrictions that lenders may impose on debtors. This could bias the results discussed previously in Subsection 5.2, and suggests more in-depth empirical analysis should be carried out. For this reason, a new firm sample has been selected from the SABI database comprising 628 large Spanish companies, that is, firms that do not meet the definition of SMEs explained in Sect. 4, for the 10-year period 1995–2004. It is assumed that the firms that belong to this new sample are not as financially constrained as SMEs. After estimating our general or nested model (Eq. 8) for this new sample, also by using GMM procedure, the results will be broadly compared to those reported in Table 2 for SMEs. Next, a formal comparative analysis of the financial behaviour of large firms versus SMEs will highlight the differences between unconstrained and constrained firms, respectively. This formal analysis is pursued by testing the differences between the two groups using Chow's test (see Wooldridge 2007). This method provides

empirical evidence to find out whether the coefficients of both groups are individually equal or not, variable by variable, and on the whole, for all the coefficients together.

Table 5 below shows the results of the GMM estimate of the nested model for large firms. In order to simplify the comparison to SMEs, the results for this group reported in Table 2 have been added. Furthermore, the 2SLS IV estimate for large firms is also reported as a reference.

In summary, the above results suggest that the financial behaviour of SMEs and large firms is only different in terms of growth opportunities, but actually quite similar in terms of the rest of characteristics (tax factors, default risk, profitability and size) as far as the trade-off approach is concerned. With respect to the pecking order approach, Table 5 indicates that their behaviour is radically different, as not one parameter estimate shows statistical coincidence. In order to confirm this general result, we next test the differences between SMEs and large firms (constrained and unconstrained firms) by using Chow's test. The results of this test are presented below in Table 6.

On the whole, as can be seen from Table 6, the results from Chow's test (F-test equal to 14.68 and significance level equal to 0) clearly show that both groups of firms behave, financially speaking, in a significantly different manner, thus confirming the presumable financial restrictions of SMEs. Moreover, as far as the trade-off model is concerned, the analysis indicates that no differences exist in terms of fiscal factors, but they are statistically significant with respect to the remaining characteristics (default risk, growth opportunities, profitability and size). Furthermore, differences between SMEs and large firms appear to be even more significant in the pecking order model, as all parameters are clearly different, both individually and as a whole, thus confirming once again that the two groups display different patterns in terms of financial behaviour. One relevant consequence of these findings is that whichever of the two approaches followed to determine SME capital structure—trade-off or pecking order—the presumable

Table 5 Estimation results of nested capital structure model (8) for large firms

Explanatory variable	GMM (SME)	GMM (LARGE)	2SLS (LARGE)
D_{it-1}	0.6470 (1 E^{-05})	0.5555 (1 E^{-05})	0.0524 (0.0010)
ETR	0.0021 (0.7130)	−0.0005 (0.6000)	−0.0001 (0.9160)
NDTS	−0.4561 (0.050)	−2.3363 (0.040)	−0.6696 (0.2410)
DR	−0.0000 (0.1820)	−0.0000 (0.5080)	0.0000 (0.0050)
GO	−0.0820 (1 E^{-05})	0.0080 (0.7540)	−0.0023 (0.8730)
ROA	−0.3672 (0.0020)	−2.3920 (1 E^{-05})	−1.9597 (1 E^{-05})
SIZE	1.2979 (1 E^{-05})	0.5109 (1 E^{-05})	0.5111 (1 E^{-05})
CF	−1 E^{-05} (1 E^{-05})	1 E^{-05} (0.3810)	1 E^{-05} (0.0360)
CFGO	0.0813 (1 E^{-05})	0.0163 (0.5240)	0.0364 (0.0060)
AGE	−0.8333 (1 E^{-05})	−0.0814 (0.4400)	−0.5446 (0.0010)
Number of firms	3,569	628	628
Number of observations	24,606	4,236	3,556
Wald test	162.40 (1 E^{-05})	15.44 (1 E^{-05})	41.31 (1 E^{-05})
z_2	2.82 (0.480)	0.63 (0.5260)	
Sargan test	48.43 (0.430)	34.03 (0.4663)	

Estimated coefficients with the level of critical significance in brackets. All the models include both time and sector dummies. The intercept coefficient is not included. The first of the estimations is carried out by GMM and Arellano and Bond's (1991) estimator, robust version, taking the model in first differences and where D_{it_1}, ROA$_{it}$, CF and CFGO$_{it}$ have been instrumented with all their lags. The 2SLS column provides Anderson and Hsiao's (1982) estimation of the model in first differences where $D_{it\_}$, ROA$_{it}$, CF and CFGO$_{it}$ have been instrumented with all their lags. The Wald test statistic refers to the null hypothesis that all coefficients on the explanatory variables are jointly equal to zero. The test statistic z_2 tests the null hypothesis of no second-order autocorrelation in the residuals. The Sargan test statistic applies to the null hypothesis that the over-identifying restrictions are valid

Table 6 Nested model GMM estimate's Chow test for differences between SME and Large Firms*

SME versus LARGE firms	Trade-off $F(1,28524)$	Pecking order $F(1,28524)$	Global trade-off $F(6,28524)$	Global pecking order $F(3,28524)$	General model $F(9,28524)$
ETR	0.17				
$\lambda \cdot \beta_{1SME} - \lambda \cdot \beta_{1LARGE} = 0$	(0.6783)				
NDTS	1.85				
$\lambda \cdot \beta_{2SME} - \lambda \cdot \beta_{2LARGE} = 0$	(0.1739)				
DR	3.46				
$\lambda \cdot \beta_{3SME} - \lambda \cdot \beta_{3LARGE} = 0$	(0.0628)				
GO	11.24				
$\lambda \cdot \beta_{4SME} - \lambda \cdot \beta_{4LARGE} = 0$	(0.0008)				
ROA	43.14				
$\lambda \cdot \beta_{5SME} - \lambda \cdot \beta_{5LARGE} = 0$	(1 E^{-05})				
SIZE	32.00		11.39		
$\lambda \cdot \beta_{6SME} - \lambda \cdot \beta_{6LARGE} = 0$	(1 E^{-05})		(1 E^{-05})		
CF		56.67			
$\beta_{7SME} - \beta_{7LARGE} = 0$		(1 E^{-05})			
CFGO		7.14			
$\beta_{8SME} - \beta_{8LARGE} = 0$		(0.0075)			
AGE		36.94		74.43	
$\beta_{9SME} - \beta_{9LARGE} = 0$		(1 E^{-05})		(1 E^{-05})	
Global difference					14.68 (1 E^{-05})

*p-value for F statistics in brackets

Each column includes the Chow test F statistic which tests whether or not there are significant differences between the parameters of the explanatory variables for SMEs and the ones corresponding for large firms. Specifically, the first and second columns report the Chow test F statistic for the trade-off and pecking order models, individually. The third column shows the Chow test F statistic for the whole group of parameters associated to the trade-off approach. The fourth column presents the Chow test F statistic for the whole group of parameters associated to the pecking order stance. Finally, the fifth column includes the Chow test F statistic for all the parameters contemplated

financial restrictions they face on capital markets must be taken into account.

Further proof of the robustness of our results can be attained by estimating the pecking order model described by Eq. 6. This specification is based on Shyam-Sunder and Myers (1999) and was discussed in Sect. 3. The implicit hypothesis to be tested in this model states that the financing deficit of SMEs should be positively related to the variation in debt level. The estimation will be carried out by following the 2SLS IV procedure with the aim of controlling for potential endogeneity problems. The results of the estimates are shown in Table 7 below. OLS regression results are also reported for comparative purposes.

Table 7 Estimation results of pecking order model (6)

Parameter	2SLS	OLS
FD	0.5820 (1 E^{-05})	0.5753 (1 E^{-05})
Number of firms	3,569	3,569
Number of observations	21,037	31,746
Wald test	163.28 (1 E^{-05})	232.41 (1 E^{-05})

Estimated coefficients with the level of critical significance in brackets. The intercept coefficient is not included. The first of the estimations provides 2SLS estimations with Anderson and Hsiao's (1982) estimator, while the second corresponds to OLS in levels. The Financing Deficit (FD) variable has been standardized by total assets and has been instrumented with all its lags. The Wald test statistic refers to the null hypothesis that all coefficients on the explanatory variables are jointly equal to zero

As can be seen in Table 7, the hypothesis formulated for this pecking order model is verified for our sample of SMEs, as the parameter associated to the financing deficit is positive and statistically significant. Therefore, it seems that Spanish SMEs adjust their debt level to their financing requirements. Nevertheless, it is important to point out that this pecking order model does not explicitly take into account the potential presence of liquidity constraints. Considering this fact could bias the final results, as there is a contrary effect between the cited constraints and observing a financial hierarchy in firm capital structure.

6 Conclusions

This paper provides empirical evidence related to the capital structure of small- and medium-sized Spanish companies using a large data panel covering the 10-year period 1995–2004. The hypotheses tested were derived from the trade-off and pecking order models. Two selected specifications of these approaches have been nested in a general model for comparative purposes and also in order to discern which of the two performs better. In other words, which one best describes the financial behaviour of SMEs. Additionally, empirical evidence has been obtained on the differences between SMEs (financially constrained) and large firms (unconstrained). The model estimates carried out have considered instrumental variable (IV) techniques.

Our findings show that both theoretical approaches help to explain SME financial behaviour and the results obtained can be considered robust. However, according to the "ad hoc" comparison pursued by applying Wald's test to the nested model, greater trust should be placed in the trade-off approach. Contrary to most of the research on SME financing, which has focused on a general perception of the determinants of capital structure, this paper focuses on the particular ability of each of the two approaches to describe the financial behaviour of these types of businesses.

Regarding the trade-off theory, results clearly indicate that SMEs face high transaction costs which are probably derived from typical agency problems and financial restrictions in capital markets. According to Myers' notion of trade-off, such high transaction costs are responsible for Spanish SMEs adjusting to their target ratio very slowly, much more so than listed companies. Small Spanish firms seem to find the cost of an unbalanced position lower than the cost of adjusting.

With respect to the pecking order theory, empirical evidence confirms that internal resources represent the main source of financing for SMEs. This indirectly suggests that they experience significant information costs which prevent them from easily resorting to other sources of financing. In keeping with this theoretical approach, our findings show that Spanish SMEs seek more debt when they boast high investment opportunities or lack the necessary cash flow. This outcome can be considered robust according to the different estimated specifications, although it is worth noting that SMEs are affected by potential liquidity constraints, which could bias the results.

In relation to the determinants of SME capital structure, empirical evidence proves that NDTS, growth opportunities and internal resources play an important role in the decision-making process. Additionally, size and age have emerged as important factors to be taken into account, as many other studies have pointed out. Some of these factors can be discussed from the point of view of both the trade-off and pecking order approaches and this is worth taking into account.

Finally, our findings highlight that SME and large firms display significantly distinct financial behaviour, thus confirming the presumable financial restrictions of SMEs. Moreover, these differences appear to be more relevant from the perspective of the pecking order approach. A clear consequence that stems from this finding is that considering these limitations in the models is important in order to avoid bias in the results when analysing the financial behaviour of SMEs.

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Appendix

Table A.1 Empirical hypotheses

Tested hypotheses	Model
(1) "The effective tax rate should be positively related to the level of debt"	
(2) "Non-debt tax shields ought to be negatively related to firm debt"	
(3) "Default risk should be negatively related to the firm's debt ratio"	
(4) "Companies with more growth opportunities will have a smaller debt ratio"	Trade-off (4)
(5) "There should be a positive relationship between debt ratio and firm profitability"	
(6) "The size of a company should be positively related to its level of debt"	
(7) "Firms follow a process of capital structure adjustment that depends on transaction costs"	
(8) "The financing deficit of SMEs should be positively related to the change in the level of debt"	Pecking order (6)
(9) "Firm debt should be negatively related to the volume of firm cash flows"	
(10) "Firms with few investment opportunities and high cash flow should have a low level of debt, while firms with strong growth prospects and reduced cash flow should have high debt ratios"	Pecking order (7)
(11) "The age of a company should be negatively related to its level of debt"	

Table A.2 Dependent and explanatory variables description

Total debt ratio (D)	$\ln\left(\frac{\text{Total Debt}}{\text{Equity}}\right)$
Effective tax rate (ETR)	$\frac{\text{Taxes}}{\text{EBT}}$, where EBT denotes Earnings Before Taxes
Non-debt tax shields (NDTS)	$\frac{\text{Depreciation}}{\text{Total Assets}}$, where Depreciation is taken as a flow variable
Default risk (DR)	$\sigma(\text{EBIT}) - \text{E}(\text{EBIT})$, σ and E being the standard deviation and the expected value operators, respectively, and EBIT denoting Earnings Before Interest and Taxes
Growth opportunities (GO)	Discrete variable that ranges from 0 to 3 based on the quartiles of the quotient $\frac{\text{Sales}_t - \text{Sales}_{t-1}}{\text{Sales}_{t-1}}$
Profitability (ROA)	$\frac{\text{EBIT}}{\text{Total Assets}}$
SIZE	Natural logarithm of total assets
Cash flow (CF)	Net Income + Depreciation
CFGO	Discrete variable that captures the interaction between growth opportunities and cash flow
AGE	Natural logarithm of number of years of firm's life

Table A.3 Capital structure models

Trade-off (Eq. 4)	$D_{it} = \lambda \cdot \beta_0 + (1-\lambda) \cdot D_{it-1} + \lambda \cdot \beta_1 \cdot \text{ETR}_{it} + \lambda \cdot \beta_2 \cdot \text{NDTS}_{it} + \lambda \cdot \beta_3 \cdot \text{DR}_{it} + \lambda \cdot \beta_4 \cdot \text{GO}_{it} + \lambda \cdot \beta_5 \cdot \text{ROA}_{it} + \lambda \cdot \beta_6 \cdot \text{SIZE}_{it} + \eta_i + \eta_t + u_{it}$
Pecking order (Eq. 6)	$\Delta D_{it} = \alpha + \beta \cdot \text{FD}_{it} + \eta_i + \eta_t + \varepsilon_{it}$
Pecking order (Eq. 7)	$D_{it} = \alpha + \beta_1 \cdot \text{CF}_{it} + \beta_2 \cdot \text{CFGO}_{it} + \beta_3 \cdot \text{AGE}_{it} + \eta_i + \eta_t + \varepsilon_{it}$
Nested model (Eq. 8)	$D_{it} = \delta + (1-\lambda) \cdot D_{it-1} + \lambda \cdot \beta_1 \cdot \text{ETR}_{it} + \lambda \cdot \beta_2 \cdot \text{NDTS}_{it} + \lambda \cdot \beta_3 \cdot \text{DR}_{it} + \lambda \cdot \beta_4 \cdot \text{GO}_{it} + \lambda \cdot \beta_5 \cdot \text{ROA}_{it} + \lambda \cdot \beta_6 \cdot \text{SIZE}_{it} + \beta_7 \cdot \text{CF}_{it} + \beta_8 \cdot \text{CFGO}_{it} + \beta_9 \cdot \text{AGE}_{it} + \eta_i + \eta_t + u_{it}$

Table A.4 Sample representation by sector

	Sectors	Firms	%
Sector 1	Agriculture and others	64	1.79
Sector 2	Manufacturing	1,548	43.37
Sector 3	Electricity, Gas and Water	11	0.31
Sector 4	Construction	380	10.65
Sector 5	Commerce, vehicles and others	1269	35.56
Sector 6	Hotel and catering	60	1.68
Sector 7	Transport and communications	56	1.57
Sector 8	Property and rental	138	3.87
Sector 9	Education, health and others	43	1.20
Total		3,569	100

References

Anderson, T. W., & Hsiao, C. (1982). Formulation and estimation of dynamic models using panel data. *Journal of Econometrics, 18*, 47–82.

Ang, J. S. (1976). The intertemporal behavior of corporate debt policy. *Journal of Financial and Quantitative Analysis, 11*, 555–566.

Ang, J. S. (1992). On the theory of finance for privately held firms. *The Journal of Small Business Finance, 1*(3), 185–203.

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies, 58*, 277–297.

Aybar Arias, C., Casino Martínez, A., & López Gracia, J. (2004). Efectos financieros y estratégicos sobre la estructura de capital de la pequeña y mediana empresa. *Moneda y Crédito, 219*, 71–98.

Baltagi, B. H. (1995). *Econometric analysis of panel data*. New York: John Wiley & Sons.

Barclay, M. J., Smith, C., & Watts, R. (1995). The determinants of corporate leverage and dividend policies. *Journal of Applied Corporate Finance, 7*, 4–19.

Barton, S. L., Hill, N. C., & Sundaram, S. (1989). An empirical test of stakeholder theory predictions of capital structure. *Financial Management, 18*(1), 36–44.

Berger, A. N., & Udell, G. F. (1998). The economics of small business finance: The roles of private equity and debt markets in the financial growth cycle. *Journal of Banking and Finance, 22*, 613–673.

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics, 87*, 115–143.

Bradley, M., Jarrell, G. A., & Kim, E. H. (1984). On the existence of an optimal capital structure: theory and evidence. *The Journal of Finance, 39*(3), 857–878.

Chittenden, F., Hall, G., & Hutchinson, P. (1996). Small firm growth, access to capital markets and financial structure: Review of issues and an empirical investigation. *Small Business Economics, 8*, 59–67.

Cosh, A. D., & Hughes, A. (1994). Size, financial structure and profitability. In A. Hughes, & D. J. Storey (Eds.), *Finance and the small firm*. London: Routledge.

Dammon, R. M., & Senbet, L. W. (1988). The effect of taxes and depreciation on corporate investment and financial leverage. *The Journal of Finance, 43*(2), 353–373.

DeAngelo, H., & Masulis, R. W. (1980). Optimal capital structure under corporate and personal taxation. *Journal of Financial Economics, 8*, 3–29.

Donaldson, G. (1961). *Corporate debt capacity: A study of corporate debt policy and the determination of corporate debt capacity*. Boston: Graduate School of Business, Harvard University Press.

Drobetz, W., & Wanzenried, G. (2006). What determines the speed of adjustment to the target capital structure. *Applied Financial Economics, 16*, 941–958.

Fama, E. F., & French, K. R. (2002). Testing trade-off and pecking order predictions about dividends and debt. *The Review of Financial Studies, 15*(1), 1–33.

Frank, M., & Goyal, V. (2003). Testing the pecking order theory of capital structure. *Journal of Financial Economics, 67*, 217–248.

Frank, M., & Goyal, V. (2005). Trade-off and pecking order theories of debt. In B. Eckbo (Ed.), *Handbook of corporate finance: empirical corporate finance. Handbooks in finance series*. North Holland: Elsevier.

Graham, J. R. (1996). Debt and the marginal tax rate. *Journal of Financial Economics, 41*, 41–73.

Haugen, R. A., & Senbet, L. W. (1986). Corporate finance and taxes: A review. *Financial Management, 15*(3), 5–21.

Hennessy, C. A., & Whited, T. M. (2005). Debt dynamics. *The Journal of Finance, 60*(3), 1129–1165.

Jalilvand, A., & Harris, R. S. (1984). Corporate behavior in adjusting to capital structure and dividend targets: An econometric study. *The Journal of Finance, 39*(1), 127–145.

Jensen, G., Solberg, D., & Zorn, T. (1992). Simultaneous determination of insider ownership, debt and dividend policies. *Journal of Financial and Quantitative Analysis, 27*, 247–261.

Jensen, M. C. (1986). Agency costs of free cash flow, corporate finance, and takeovers. *The American Economic Review, 76*(2), 323–329.

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: managerial behavior, agency costs and ownership structure. *Journal of Financial Economics, 3*, 305–360.

Jordan, J., Lowe, J., & Taylor, P. (1998). Strategy and financial policy in UK small firms. *Journal of Business Finance & Accounting, 25*(1&2), 1–27.

Kim, E. H. (1978). A mean-variance theory of optimal capital structure and corporate debt capacity. *The Journal of Finance, 33*(1), 45–63.

Kraus, A., & Litzenberger, R. H. (1973). A state-preference model of optimal financial leverage. *The Journal of Finance, 28*(4), 911–922.

Leary, M. T., & Roberts, M. R. (2005). Do firms rebalance their capital structures?. *The Journal of Finance, 60*(6), 2575–2619.

Mackie-Mason, J. K. (1990). Do taxes affect corporate financing decisions? *The Journal of Finance, 45*(5), 1471–1493.

Michaelas, N., Chittenden, F., & Poutziouris, P. (1999). Financial policy and capital structure choice in UK SME: Empirical evidence from company panel data. *Small Business Economics, 12*, 113–130.

Miguel, A. de, & Pindado, J. (2001). Determinants of capital structure: New evidence from Spanish panel data. *Journal of Corporate Finance, 7*, 77–99.

Modigliani, F., & Miller, M. H. (1963). Corporate income taxes and the cost of capital: A correction. *The American Economic Review, 53*(2), 433–443.

Myers, S. C. (1977). Determinants of corporate borrowing. *Journal of Financial Economics, 5*, 147–175.

Myers, S. C. (1984). The capital structure puzzle. *The Journal of Finance, 39*(3), 575–592.

Myers, S. C., & Majluf, N. S. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics, 13*, 187–221.

Nerlove, M. (1958). *Distributed and demand analysis for agricultural and other commodities.* Agricultural Hand Book No 141. US Department of Agriculture.

Ozkan, A. (2001). Determinants of capital structure and adjustment to long run target: Evidence from UK company panel data. *Journal of Business Finance and Accounting, 28*(1 & 2), 175–198.

Petersen, M. A., & Rajan, R. G. (1994). The benefits of lending relationships: Evidence from small business data. *The Journal of Finance, 49*(1), 3–37.

Rajan, R. G., & Zingales, L. (1995). What do we know about capital structure? Some evidence from international data. *The Journal of Finance, 50*(5), 1421–1460.

Scherr, F. C., & Hulburt, H. M. (2001). The debt maturity structure of small firms. *Financial Management, 30*, 85–111.

Shyam-Sunder, L., & Myers, S. C. (1999). Testing static tradeoff against pecking order models of capital structure. *Journal of Financial Economics, 51*, 219–244.

Sogorb-Mira, F. (2005). How SME uniqueness affects capital structure: Evidence from a 1994–1998 Spanish data panel. *Small Business Economics, 25*, 447–457.

StataCorp. (2005). *Stata statistical software: Release 9*. College Station: StataCorp LP.

Stulz, R. M. (1990). Managerial discretion and optimal financing policies. *Journal of Financial Economics, 26*, 3–27.

Titman, S., & Wessels, R. (1988). The determinants of capital structure choice. *The Journal of Finance, 43*(1), 1–19.

Van der Wijst, N., & Thurik, R. (1993). Determinants of small firm ratio: An analysis of retail panel data. *Small Business Economics, 5*, 55–65.

Wald, J. K. (1999). How firm characteristics affect capital structure: An international comparison. *The Journal of Financial Research, 22*(2), 161–187.

Wooldridge, J. M. (2007). *Econometric analysis of cross section and panel data*. Cambridge: The MIT Press.

Zingales, L. (2000). In search of new foundations. *The Journal of Finance, 55*(4), 1623–1653.