New evidence on the existence of the pecking order theory

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Abstract

This study tests the pecking order theory using the financing deficit framework of Shyam Sunder and Myers (1999) and Frank and Goyal (2003). Using U.S. data from 1971 to 2024, it examines whether financing deficits explain net debt issuance under aggregated and disaggregated specifications and in the presence of conventional capital structure controls. The analysis is extended by incorporating firm-level debt capacity through a rating-based probability measure and by employing an international dataset covering 34 countries from 1980 to 2024 to examine the role of legal institutions.

The results show that support for the pecking order theory is highly time and firm specific. While strong evidence exists for early U.S. data and firms with stable reporting histories, while explanatory power declines sharply in later periods. Aggregation of the financing deficit holds mainly for large firms. Once conventional determinants are included, the financing deficit adds little explanatory power except for large firms. International evidence shows that stronger creditor rights are associated with closer adherence to pecking order behavior, while the role of shareholder protection depends on differences between developed and emerging financial systems.

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Resumo

Este estudo testa a teoria da hierarquia das fontes de financiamento utilizando o enquadramento do défice de financiamento de Shyam-Sunder e Myers (1999) e de Frank e Goyal (2003). Com base em dados dos Estados Unidos para o período de 1971 a 2024, analisa se os défices de financiamento explicam a emissão líquida de dívida em especificações agregadas e desagregadas e na presença de determinantes convencionais da estrutura de capital. A análise é alargada através da incorporação da capacidade de endividamento ao nível da empresa, medida por uma probabilidade baseada em ratings, e da utilização de um conjunto de dados internacional que abrange 34 países no período de 1980 a 2024, com o objetivo de examinar o papel das instituições legais.

Os resultados mostram que o apoio à teoria da hierarquia das fontes de financiamento é fortemente dependente do período e das características das empresas. Embora exista evidência robusta para os dados norte-americanos mais antigos e para empresas com históricos de reporte estáveis, o poder explicativo diminui acentuadamente em períodos mais recentes. A agregação do défice de financiamento verifica-se sobretudo para empresas de maior dimensão. Após a inclusão dos determinantes convencionais, o défice de financiamento acrescenta pouco poder explicativo, exceto no caso das grandes empresas. A evidência internacional indica que direitos dos credores mais fortes estão associados a uma maior adesão ao comportamento previsto pela teoria da hierarquia, enquanto o papel da proteção dos acionistas depende das diferenças entre sistemas financeiros desenvolvidos e emergentes.

Título: *Nova evidência sobre a existência da teoria da hierarquia das fontes de financiamento*

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Palavras-chave: *Estrutura de capital, Teoria da hierarquia das fontes de financiamento, Mercados financeiros internacionais*

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List of Abbreviations

POT – Pecking order theory

MTB – Market-to-Book

U.S. – United States

1. Introduction

Understanding how firms choose between debt and equity financing is a central question in corporate finance. While Modigliani and Miller (1958) show that financing decisions are irrelevant under perfect capital market assumptions, real-world frictions such as information asymmetries, agency conflicts, and financial constraints make capital structure choices economically meaningful.

The Pecking Order Theory proposed by Myers and Majluf (1984) addresses these frictions by predicting that firms prioritize internal funds and, when external financing is required, rely primarily on debt rather than equity. This implies that funding shortfalls should largely be financed through net debt issuance. However, empirical evidence on this prediction is mixed: early studies generally support the theory, whereas later research reports weaker results and highlights the role of firm characteristics, debt capacity, and institutional environments. Whether the Pecking Order Theory remains a useful description of firms' financing behavior therefore remains an open question.

Using a comprehensive sample of U.S. firms from 1971 to 2024 and an international dataset covering 34 countries between 1980 and 2024, this thesis evaluates the relationship between financing deficits and changes in corporate debt issuance. It further examines the behavior of the deficit's components and assesses its incremental explanatory power relative to traditional capital structure determinants. In addition, it considers the influence of debt capacity and institutional environments on financing behavior.

Chapter 2 reviews the relevant theoretical and empirical literature and develops the research hypotheses. Chapter 3 presents the methodology and variable construction, followed by a description of the data and descriptive statistics in Chapter 4. Chapter 5 reports the empirical results, which are discussed in Chapter 6.

2. Literature Review

The modern literature on capital structure begins with Modigliani and Miller (1958), who provide the benchmark framework for analyzing firms' financing decisions. Under perfect capital market assumptions, including the absence of taxes, bankruptcy costs and information asymmetries, they show that firm value is independent of capital structure.

First the value of an asset is independent of its capital structure. This means that it should be irrelevant whether the income stream is generated from equity or debt (Modigliani and Miller 1958, p. 271). Secondly a firm cannot change its value by changing the capital structure as the cost of capital is constant at different levels of debt as the levered cost of equity increases with higher leverage (Modigliani and Miller 1958, p. 269). The third is the result of the other two statements. As the cost of capital is independent from the source of funding, the company should always execute an investment opportunity if the return is higher than the average cost of capital independent of the financing (Modigliani and Miller 1958, p. 292). Thus, a firm's value is driven primarily by how effectively its assets generate profits, rather than how these assets are financed.

Donaldson (1961) challenged these three statements and the unrealistic assumptions of a perfect capital market by conducting detailed case studies and interviews with the management of large U.S. corporations. He found that the management will prioritize internal generated funds over newly issued equity (Donaldson 1961, p. 57).

Based on that two main capital structure theories were established with the goal of explaining firms' capital structure decisions outside the assumption of perfect capital markets:

(1) Trade-off theory

(2) Pecking order theory (POT)

The Trade-Off Theory builds on Modigliani and Miller's work. In their 1958 paper, they acknowledged that taxes could affect financing decisions but did not formally include them in their model. Modigliani and Miller (1963) later incorporated corporate income taxes, showing that the tax deductibility of interest creates a benefit of debt, forming the basis for the trade-off between tax advantages and financial distress costs. To counter the unrealistic prediction that firms could raise their value indefinitely by increasing leverage, later research introduced offsetting costs of debt, primarily the risk of bankruptcy. Kraus and Litzenberger (1973, p. 915) formalized this idea, proposing that a firm's optimal capital structure reflects a trade-off between the tax benefits of debt and the expected costs of financial distress. According to Myers (1984, p. 576), firms following this Trade-Off Theory set a target debt-to-value ratio and adjust gradually toward it by balancing tax advantages against bankruptcy and agency costs between bondholders and stockholders.

The thesis instead focuses on the POT. In 1984, Myers and Majluf introduced the concept of information asymmetry into corporate finance. They developed a model in which managers possess superior inside information about the firm's true value compared to outside investors. As a result, the issuance of new equity can be interpreted by the market as a signal that the firm

may be overvalued, since managers of undervalued firms would be reluctant to issue shares at prices below their intrinsic worth. Vice versa if debt is issued, investors will assume that management believes that the stock is undervalued. Therefore, firms will avoid issuing equity as long as debt remains a viable financing option.

However, once debt becomes sufficiently risky and begins to be mispriced to a similar extent as equity, this advantage disappears. In such cases, typically when the firm has reached its debt capacity (Myers, 1984, p. 589), equity issuance may become necessary.

Building on the information asymmetry framework, Myers (1984) formally introduced the POT. He argued that firms prefer internal financing and when external funds are required, favor debt over equity because managers seek to issue securities whose value is least sensitive to private information (Myers, 1984, p. 584-585). Frank and Goyal (2007) note the POT behavior may also stem from agency costs. In this view, the central conflict arises between external investors and the firm's managers or controlling shareholders. If outside investors doubt that their capital and an appropriate return will be safeguarded, they may be unwilling to provide additional equity financing. Financing decisions therefore reflect both information asymmetries and agency considerations.

The POT implies a negative relationship between profitability and leverage because highly profitable firms are expected to rely primarily on internal cash flows. This prediction contrasts with the trade-off theory, which suggests a positive relationship between profitability and leverage as profitable firms benefit more from the tax shield of debt (DeAngelo and Masulis, 1980).

Since then, many studies have examined this relationship empirically. Kester (1986, p. 13) found a negative correlation between profitability and leverage for Japanese and U.S. manufacturing firms. Friend and Lang (1988, p. 277) found a negative relationship between profitability and leverage for U.S. firms across industries, a result that Titman and Wessels (1988, p. 13) also observed for manufacturing firms. Extending the analysis internationally, Rajan and Zingales (1995, p. 1453) confirmed a negative relationship for the U.S. and Japan and found supporting evidence for Italy, the United Kingdom, and Canada. For Germany, they reported a positive relationship, while for France the result was economically insignificant.

Wald (1999, p. 174) also found a negative correlation between profitability and leverage for the U.S., Japan and the United Kingdom. In contrast to Rajan and Zingales, he observed a negative relationship for France and Germany as well. This difference can be explained by Wald's broader dataset and the different period he investigated. Both studies found that the relationship is strongest in Japan, which challenges the information asymmetry argument. Roe

(1993) describes the Japanese institutional system as one that reduces information asymmetry, particularly in comparison to the U.S. According to the POT, profitability should therefore be more strongly related to leverage in the U.S. than in Japan. However, empirical evidence shows the opposite pattern.

Although a negative relationship between profitability and leverage is consistent with the POT, it does not by itself confirm it, as alternative explanations exist (Fama and French, 2002). To shed light on how firms choose between debt and equity once internal resources are exhausted, Shyam-Sunder and Myers (1999) introduced the aggregated model of the POT. In their approach, the financing deficit is constructed by summing all external capital needs such as investments and dividend payments and subtracting internal sources of financing. Using data from 157 continuously traded U.S. firms between 1971 and 1989, they found strong support for the POT.

Building on this framework, Frank and Goyal (2003) introduced the disaggregated model, which does not assume that the components of the financing deficit are independent of each other. By separating the deficit into its elements, they could determine whether firms use debt to finance certain activities, such as dividends, but rely on equity for others, such as working capital. The aggregated model, by contrast, constrains all components to move together in a one-to-one positive relationship with total financing needs. Using a broader dataset of 2,186 publicly traded U.S. firms, Frank and Goyal (2003) found little evidence supporting the POT, except among large firms. Although Chirinko and Singha (2000) demonstrated a potential bias in the Shyam-Sunder and Myers approach, Frank and Goyal (2003, p. 220) argue that the magnitude of this bias is too small to account for the large differences observed in practice, leaving the main conclusions of the POT test unaffected.

More recent studies provide mixed evidence. Fama and French (2005), analyzing financing decisions of U.S. firms over a 29-year period, find little support for the theory, as equity issuance occurs far more frequently than the POT predicts. When the model is adjusted to account for debt capacity, as in Lemmon and Zender (2010), evidence in favor of the POT becomes stronger. Similarly, Faulkender and Petersen (2006) provide results consistent with the POT by showing that firms lacking access to public debt markets rely more heavily on internal funds and short-term debt. Leary and Roberts (2010) find limited evidence for the strict form of the theory but confirm the modified version once debt capacity and financial constraints are incorporated. They further examine whether POT behavior arises from information asymmetry or agency considerations by splitting the sample into low- and high-information-asymmetry groups. Consistent with previous studies (Cooney and Kalay, 1993; Halov and

Heider, 2004), their results indicate that firms are more likely to follow the financing hierarchy when information asymmetry is low, contradicting the original predictions of Myers and Majluf (1984).

In an international context, Seifert and Gonenc (2008) analyzed the POT for firms in the U.S., the United Kingdom, Germany and Japan. These countries were selected because the authors expected higher levels of information asymmetry, with weaker investor protection and more limited information flows in Japan and Germany and widely dispersed ownership structures in the U.S. and the United Kingdom. Their results did not provide support for POT behavior in the U.S., the United Kingdom or Germany. Japanese firms, however, displayed patterns consistent with the theory during the 1980s and early 1990s. Building on this work, Seifert and Gonenc (2010) investigated firms in twenty-three emerging economies and found that evidence for POT behavior is strongest in countries where information asymmetry and agency conflicts are particularly present.

The hypotheses developed in this thesis build on the theoretical foundations of the POT, established empirical evidence and more recent extensions. The influential studies of Shyam-Sunder and Myers (1999) and Frank and Goyal (2003) provide the basis for the core hypotheses, while the work of Lemmon and Zender (2010) on debt capacity and Seifert and Gonenc (2010) on international differences further motivates the extended hypotheses. On this basis, the following hypotheses are derived:

- *H1: According to the POT, a firm's financing deficit is expected to have a significant positive effect on its net debt issuance, with a coefficient close to one.*
- *H2: The effect on net debt issuance will not differ significantly across the main components of the financing deficit, supporting the validity of using an aggregate measure.*
- *H3: In a model that includes traditional capital structure determinants, the financing deficit will provide statistically significant incremental explanatory power for net debt issuance.*
- *H4: Debt capacity is expected to act as a positive moderator in the POT framework, with the result that the relationship between the financing deficit and debt issuance will be stronger for firms with higher debt capacity.*
- *H5: A country's institutional environment is expected to moderate financing choices according to the POT, such that stronger creditor protection and weaker shareholder are associated with stronger POT behavior.*

Hypotheses H1 to H4 are tested using a U.S. dataset, while H5 is examined using an international dataset.

3. Methodology

3.1 Aggregated model

To assess whether the U.S. follows the POT, the empirical framework of Frank and Goyal (2003), which builds on the approach developed by Shyam-Sunder and Myers (1999), is applied. According to their approach the notations are defined as follows:

DIV_t: Cash dividends in year t;

I_t: Net investment in year t (i.e., I_t = capital expenditures + increase in investments + acquisitions + other use of funds – sale of PPE – sale of investment

ΔW_t: change in working capital in year t (i.e., ΔW_t = change in operating working capital + change in in cash and cash equivalents + change in current debt);

C_t: Cash flow after interest and taxes (i.e., C_t = income before extraordinary items + depreciation and amortization + extraordinary items and discontinued operations + deferred taxes + equity in net loss – earnings + other funds from operations + gain (loss) from sales of PPE and other investments);

R_t: Current position of long-term debt in year t;

ΔD_t: Net debt issued in year t (i.e., ΔD_t = long-term debt issuance – long-term debt reduction);

ΔE_t: Net equity issued in year t (i.e., ΔE_t = sale of common stock minus stock repurchases).

Based on the notations the financing deficit can be defined as follows:

$$DEF_t = DIV_t + I_t + \Delta W_t - C_t = \Delta D_t + \Delta E_t \quad (1)$$

According to Frank and Goyal (2003) R_t is excluded as its in contrast to the accounting definition and they found it empirically not belonging to DEF.

Shyam-Sunder and Myers (1999) argue that after an IPO equity issues are only used rarely in extreme situations and not on a regular basis to finance the financing deficit. When applying these assumptions, the POT the regression can be written in the following way:

$$\Delta D_{it} = a + b_{PO} DEF_{it} + e_{it} \quad (2)$$

When assuming the strongest form of POT, that means that a company relies only on external debt financing to meet its financing deficit we expect a = 0 and b_{PO} = 1 (Shyam-Sunder and Myers, 1999, p. 224). This interpretation is intuitive, since the regression's slope indicates how

much of the firm's new debt issuance can be attributed solely to its requirement for external financing.

At elevated leverage ratios, the threat of financial distress will restrict a firm's ability to take on more debt, forcing it to turn to equity financing. To account for this pattern, the model can be evaluated in a semi-strong form. This version posits that companies primarily use debt to cover their funding shortfalls, treating equity issuance as both an infrequent event and a final option. While this semi-strong form does not provide a precise null hypothesis, it suggests that b_{PO} will be marginally below one (Chirinko and Singha, 2000, p. 419). This assumption is consistent with Shyam-Sunder and Myers (1999, p. 226), who argue that Equation (2) is not generally correct but should instead be viewed as a simplified benchmark that provides an approximation of financing behavior over a range of moderate leverage levels.

To account for differences in firm size, all variables are scaled by net assets (defined as total assets minus current liabilities), since this measure is not strongly correlated with the other variables in the regression.

Frank and Goyal (2003, p. 222) point out that the financing deficit used in the test is endogenous because it includes investment and dividend payments, both of which are determined by the firm's own choices rather than by external conditions. In the Myers and Majluf (1984) model, information asymmetry leads to adverse selection, which increases the cost of external finance and often causes firms to scale back investment. This underinvestment shows that investment adjusts to financing conditions and is therefore an endogenous component of the financing deficit. Dividend payments behave in a similar way, since managers adjust them in line with profitability or financing needs. Although these sources of endogeneity could make empirical results more difficult to interpret, Leary and Roberts (2010, p. 335 f.) argue that they do not invalidate the POT test. Even when investment or dividends shift because of financing frictions, firms that follow the POT continue to rely on the cheapest available source of funds, so these endogenous adjustments do not create false evidence against the theory.

Following Frank and Goyal (2003, p. 222 f.), I perform an out-of-sample validation to test each model's predictive performance. I estimate the model in the main sample and generate predicted debt issues for a subsequent four-year holdout period using independent variables. I evaluate these predictions by regressing them on the actual outcomes. The resulting out-of-sample R^2 is reported, which helps verify that the findings generalize beyond the estimation period and are not driven by sample specific noise.

To examine whether adherence to the POT varies over time, I follow Frank and Goyal (2003) by splitting the sample into two periods and comparing the estimated coefficients. In addition,

I estimate a model with a period dummy and an interaction term, which allows for a formal statistical test of whether the sensitivity of debt issuance to financing deficits differs across periods:

$$\Delta D_{it} = a + b_{PO} DEF_{it} + c_{PD} PERIOD_t + d_{PO,PD}(DEF_{it} * PERIOD_t) + \gamma_i + e_{it} \quad (3)$$

Finally, to exploit the full horizon and obtain a structural within-firm estimate of the POT mechanism, I estimate a firm- and time-fixed-effects model:

$$\Delta D_{it} = a + b_{PO} DEF_{it} + \gamma_i + \lambda_t + e_{it} \quad (4)$$

Here, firm fixed effects γ_i control for all time-invariant firm characteristics, while year fixed effects λ_t absorb macroeconomic shocks and regulatory changes. This specification isolates the within-firm response of debt issuance to financing deficits and complements the period-specific analysis.

3.2 Disaggregated model

Following Frank and Goyal (2003), the disaggregated model is estimated in addition to the aggregated specification. This step is used to assess whether aggregating all components into DEF_{it} is justified and that ΔD_{it} is not driven mainly by individual factors. Under the POT, it is the overall financing deficit that drives debt issuance, which implies that each component should have an identical marginal effect on ΔD_{it}. The disaggregated model is estimated as follows:

$$\Delta D_{it} = a + b_{DIV} DIV_t + b_I I_t + b_W \Delta W_t - b_C C_t + e_{it} \quad (5)$$

From this specification, the null hypothesis implied by the POT is:

a = 0 and $b_{DIV} = b_I = b_W = b_C = 1$

Additionally, I estimate a model with firm- and time-fixed-effects:

$$\Delta D_{it} = a + b_{DIV} DIV_t + b_I I_t + b_W \Delta W_t - b_C C_t + \gamma_i + \lambda_t + e_{it} \quad (6)$$

As for the aggregated model, firm and year fixed effects are included to control for time-invariant firm heterogeneity and common time effects.

3.3 Conventional model

The two models discussed above rely on distinct information sets and make different exogeneity assumptions than traditional empirical frameworks used to study leverage and capital-structure adjustment (Frank and Goyal, 2003, p. 223 f.). Harris and Raviv (1991) outline

the standard set of determinants used in capital-structure studies and Rajan and Zingales (1995) subsequently condense these factors into a straightforward cross-sectional framework.

$$\Delta D_i = \alpha + \beta_t \Delta T_i + \beta_{MTB} \Delta MTB_i + \beta_{LS} \Delta LS_i + \beta_P \Delta P_i + \beta_{DEF} DEF_i + \gamma_i + \lambda_{t+} e_i \qquad (7)$$

D_i: Market leverage (i.e., ΔD_i = total debt / (total debt + market value of equity));

T_i: Tangibility of assets (i.e., ΔT_i = fixed assets / total assets);

MTB_i: Market-to-book ratio (i.e., ΔMTB_i = (total assets - common equity + market value of equity) / total assets);

LS_i: Log sales (i.e., ΔLS_i = ln(sales));

P_i: Profitability (i.e., ΔP_i = operating income / total assets).

The variables used in the regression are denoted as first difference between years (Δ) as the conventional variables explain levels of leverage while the DEF_i explains changes in debt. Including year-fixed-effects allows the model to control for common macroeconomic shocks that persist over time, which alleviates the concern highlighted by Frank and Goyal (2003, p. 224) about shocks being correlated across years. In the following, the conventional leverage variables are interpreted in perspective of the POT.

3.3.1 Tangibility of assets

Harris and Raviv (1991, p. 308) note that firms with a relatively small share of tangible assets face more pronounced information asymmetry within the POT framework. Because outside investors find such firms harder to evaluate, they are more exposed to underinvestment problems than firms with more easily assessed assets. Consequently, these firms are expected to rely increasingly on debt financing over time, holding other factors constant. Put differently, when a firm's assets are transparent and easily valued, equity financing becomes less costly, which would imply lower leverage for firms with higher tangibility. Yet, if adverse selection primarily concerns the valuation of assets already in place, greater tangibility can increase information problems and encourage more debt issuance. Frank and Goyal (2009, p. 9) highlight that tangibility reflects several competing economic mechanisms, which explains why the POT does not provide a clear directional prediction.

Beyond informational arguments, a widely accepted view emphasizes the collateral role of tangible assets. Tangible assets, such as buildings, machinery and equipment, retain their value more effectively during periods of economic distress. They can also be more easily pledged to creditors than intangible assets, such as goodwill. Consistent with this view, Frank and Goyal

(2009) document a consistently positive and highly significant correlation between tangibility and leverage across all sample periods from 1950 – 2003. Using net property, plant, and equipment relative to total assets, they find that the relationship holds across four alternative leverage definitions: total debt scaled by market assets, total debt scaled by book assets, long-term debt scaled by market assets and long-term debt scaled by book assets.

Given this robust empirical pattern, I follow Frank and Goyal (2003) and expect a positive coefficient on tangibility, $\beta_t > 0$.

3.3.2 Market-to-book ratio

The MTB ratio is commonly used as a proxy for growth opportunities and Adam and Goyal (2008) show that it is the most reliable among the standard measures. Fama and French (2002, p. 9) argue that under the simple POT, the MTB ratio should be positively related to leverage, as firms with high MTB undertake more investment and rely on debt when investment exceeds internal funds. This implies a positive relationship between MTB and book leverage.

However, this prediction is rejected by several empirical studies. Huang and Ritter (2009) find that firms with a high MTB ratio are more likely to issue equity. Rajan and Zingales (1995), examining G-7 firms from 1987 to 1991, report a significant negative coefficient on MTB in market-leverage regressions. Similar negative correlations have been documented by Frank and Goyal (2003, 2007, 2009) and Seifert and Gonenc (2008).

Two main explanations are proposed for this negative relationship. First, under market timing, firms exploit high valuations by issuing equity, reducing leverage (Frank and Goyal, 2009, p. 8). Second, growth opportunities may reduce debt capacity, as debt can distort investment incentives (Barclay et al., 2006).

Based on the empirical evidence I follow the prediction of Frank and Goyal (2003) and assume $\beta_{MTB} < 0$.

3.3.3 Log Sales

Larger firms generally operate across a broader range of activities, which tends to stabilize their cash flows and reduce both the likelihood and the costs of financial distress relative to smaller firms. Their size also strengthens their bargaining position with lenders and improves their ability to secure external financing. Many large firms are publicly listed, which enhances

disclosure and reduces information asymmetry. As a result, they typically enjoy more favorable borrowing conditions and greater access to both domestic and international capital markets (Baker and Martin 2011). Empirical cross-sectional evidence consistently shows that leverage tends to rise with firm size, as documented by Frank and Goyal (2007).

From the standpoint of the POT, larger firms may exhibit lower leverage because their greater transparency reduces information asymmetry, making equity issuance less costly and therefore more feasible.

Nevertheless, following Frank and Goyal (2003), I assume a positive relationship between firm size measured as the log of sales and changes in net debt, implying $\beta_{LS} > 0$.

3.3.4 Profitability

The POT predicts an inverse relationship between profitability and leverage, as firms prefer to finance operations with internal funds before accessing external capital. This idea is strongly supported by empirical evidence. Frank and Goyal (2009), using an extensive sample of U.S. firms covering the period from 1950 to 2003, show that profitability is one of the most reliable determinants of leverage. In their analyses, profitable firms consistently appeared with lower debt ratios, an effect that is particularly strong when leverage is calculated on a book value basis. Earlier research reaches similar conclusions. Titman and Wessels (1988) report that more profitable firms rely less on debt, while MacKay and Phillips (2005) document comparable patterns in their study of industry dynamics. Fama and French (2002) likewise find that profitability is negatively associated with leverage, interpreting it as consistent with the financing hierarchy implied by the POT. Moreover, Fischer, Heinkel and Zechner (1989) emphasize that firms with strong earnings can use those earnings to reduce outstanding debt, reinforcing the tendency of profitable firms to maintain lower leverage ratios.

As in the paper of Frank and Goyal (2003) $\beta_P < 0$ is assumed.

3.4 Controlling for debt capacity

As outlined in the literature review, empirical evidence on whether firms follow POT remains mixed. One reason for these inconsistent findings is that many studies using the Shyam-Sunder and Myers (1999) approach do not account for differences in firms' debt capacities. As a result, they estimate a single slope coefficient that is assumed to be constant across firms and over

time, even though Myers (1984) emphasized that debt capacity varies across firms and periods. Within POT framework, debt capacity is reached when additional borrowing reduces the market value of outstanding debt, consistent with the role of information asymmetry in financing decisions (Myers 1977).

Frank and Goyal (2003) question the neglect of debt capacity by estimating their conventional model described above. When the financing deficit is added to traditional capital structure determinants, the explanatory power of the model increases only marginally, indicating that a substantial part of the variation is not captured by the financing deficit alone. This does not contradict the POT but suggests that firms do not respond uniformly to financing deficits, highlighting the relevance of heterogeneity in debt capacity.

Bolton and Freixas (2000) propose a model in which asymmetric information shapes a firm's choice between equity, bank loans and public bonds. Firms with strong financial positions tend to use public debt because it offers low borrowing costs when the likelihood of distress is small. Firms with higher risk rely on bank debt, which is more flexible but carries higher costs. The riskiest firms are limited to equity financing. In this framework, a credit rating signals access to public bond markets and thus higher debt capacity.

This thesis follows the more advanced approach of Lemmon and Zender (2010). Rather than assuming that rated firms always have high debt capacity, they estimate the likelihood that a firm can access the public debt market based on its characteristics. This probability is estimated using a logit model with lagged firm characteristics such as size, profitability, asset tangibility, MTB ratio, leverage, age and stock return volatility which is used as a proxy for cash flow volatility. As outlined under the paragraph on the disaggregated model, these variables are commonly used in the capital structure literature. By predicting access to public debt markets rather than observing ratings directly, their method limits selection bias and provides a more accurate measure of how close a firm is to its debt capacity.

$$\ln\left(\frac{\mathrm{PR}(BondRating_{it}=1)}{PR(BondRating_{it}=0)}\right) = a + b_{SIZE}\ln(SIZE_{it}^{-1}) + b_{PROF}\,PROF_{it}^{-1} + b_{TANG}TANG_{it}^{-1} + b_{MTB}\,MTB_{it}^{-1} + b_{LEV}LEV_{it}^{-1} + b_{AGE}\ln(Age_{it}^{-1}) + b_{VOL}VOL_{it}^{-1} \quad (8)$$

I test whether debt capacity, measured using the probability of having a credit rating, significantly influences financing decisions. Using four complementary approaches, I evaluate whether higher debt capacity strengthens POT behavior and whether this effect is distinct from firm size. This distinction is important because larger firms are more likely to hold a credit rating (Almeida and Campello 2010), which raises the question of whether the measure captures true debt capacity or merely firm size.

First, following Lemmon and Zender (2010), I sort firms into low-, mid-, and high-probability groups and estimate separate deficit regressions within each bucket.

$$\Delta D_{it} = a + b_{PO} DEF_{it} + e_{it} \quad (9)$$

A monotonic increase in b_{PO} across the groups would indicates that the probability measure behaves as intended as firms with a higher debt capacity follow the POT more closely.

Second, I expand their approach by estimating a continuous interaction model.

$$\Delta D_{it} = a + b_{PO} DEF_{it} + b_R ProbRating_{it} + b_{PO,R}(DEF_{it} * ProbRating_{it}) + e_{it} \quad (10)$$

A positive, significant $b_{PO,R}$ of meaningful magnitude relative to b_{PO} would provide evidence that debt capacity amplifies POT behavior much better than financing deficit alone.

Third, to examine whether the measure simply proxies for firm size, I split the sample into small and large firms and repeat the first test within each size group according to Lemmon and Zender (2010). If the probability measure captures more than just size, the monotonic pattern in b_{PO} should appear in both subsamples.

Finally, I extend Equation (10) to assess whether heterogeneity in POT behavior reflects firm size rather than debt capacity. Specifically, I jointly interact the financing deficit with both a proxy for debt capacity and firm size.

$$\Delta D_{it} = a + b_{PO} DEF_{it} + b_R ProbRating_{it} + b_{PO,R}(DEF_{it} * ProbRating_{it}) +$$
$$b_S \log(Assets)_{it} + b_{PO,S}(DEF_{it} * \log(Assets)_{it}) + e_{it} \quad (11)$$

Since firm size is commonly used as a proxy for financing flexibility, including both interaction terms allows debt capacity and size to compete as explanatory channels. If debt capacity represents an independent channel, $b_{PO,R}$ should remain sizeable and statistically significant even after controlling for size interactions, while $b_{PO,S}$ should be comparatively small or statistically insignificant.

3.5 Controlling for legal systems

Most empirical tests of the POT are based on U.S. data, even though countries differ substantially in legal systems, institutional quality, information environments and agency problems. These institutional differences shape both the degree of information asymmetry and the severity of agency conflicts that firms face when raising external financing. In theory, the POT should be more relevant in environments where these frictions are severe, conditions often associated with emerging markets.

A traditional way to examine cross-country differences is to categorize financial systems as bank-based or market-based. Bank-based economies such as Germany and Japan rely heavily on long-term bank-firm relationships, whereas market-based economies such as the U.S. and the U.K. rely primarily on public capital markets. However, the law-and-finance literature (La Porta et al., 2000) argues that this dichotomy is not the main determinant of financial development. Instead, the effectiveness of the legal system, particularly investor protection and contract enforcement, drives the availability and cost of external finance. Beck and Levine (2002) similarly show that once legal institutions are controlled for, the distinction between bank- and market-based systems has no explanatory power.

Motivated by this perspective, I focus on creditor and shareholder protection as institutional dimensions shaping POT behavior.

Creditor protection is measured using the Djankov et al. (2007) creditor-rights index, which ranges from zero (weak protection) to four (strong protection) based on rules governing reorganization, asset disposition, and creditor priority. Shareholder protection is captured by the Djankov et al. (2008) anti-self-dealing index, which aggregates several dimensions of minority-investor rights including voting mechanisms, preemptive rights, and remedies against expropriation. The regression is controlled for firm and time fixed effects.

$$\Delta D_{ict} = a + b_{PO} DEF_{ict} + b_{CR}(DEF_{ict} * CR_{ict}) + b_{SR}(DEF_{ict} * SR_{ict}) + \gamma_i + \lambda_t + e_{ict} \quad (12)$$

Under the POT, stronger shareholder protection should be associated with lower leverage, as reduced equity issuance costs weaken firms' reliance on debt when financing deficits arise. By contrast, stronger creditor protection should be associated with higher leverage, as it lowers borrowing costs by reducing enforcement risk and increasing expected recovery in default. Consequently, POT behavior is expected to be stronger in countries with strong creditor rights and weaker in countries with strong shareholder rights

4. Data

4.1 U.S. companies

4.1.1 Baseline POT tests

The construction of the dataset follows the general approach of Frank and Goyal (2003). Firm-level accounting data is obtained from Compustat, which provides the broadest coverage of U.S. listed companies over the sample period 1971 – 2024. Although earlier years are available, the sample begins in 1971 because U.S. firms only began reporting cash flow statements consistently from that year onward.

All monetary variables are converted into constant 2017 dollars to ensure comparability over time. Consistent with standard practice, firms in the financial sector (SIC 6000 – 6999) and regulated utilities (SIC 4900 – 4999) are excluded because their capital structures are heavily influenced by regulation. Major merger cases[1] and firms reporting format codes 4, 5 or 6 are also excluded.

Cash-flow formats (1, 2, 3, and 7) were harmonized and missing values for specific cash-flow items were set to zero when this was consistent with accounting identities. Frank and Goyal (2003) show that this procedure preserves the internal consistency of financial statements. After variable construction, all cash-flow components are trimmed to the 0.5% level in both tails to reduce the influence of outliers and data errors.

Appendix 1 reports average financing deficits and net external financing for selected years, scaled by net assets. Several patterns emerge. The number of observations increases until the late 1990s, accompanied by a rising reliance on debt financing. Following Frank and Goyal (2003), I examine whether this trend is driven by heightened IPO activity. Removing IPO years alters the levels only marginally, leaving the overall pattern unchanged. After the peak in listed firms around 2000 during the dotcom period, sample size declines steadily through 2024, while debt becomes a less important source of external finance. By 2024, net debt issuance accounts for only about 1.5% of external financing. Despite a decline in small firms due to fewer IPOs, debt usage continues to fall, indicating that the shift toward equity financing is not driven by IPO dynamics.

[1] Major merger observations were identified by selecting all firms for which the Compustat footnote field sale_fn reported the code “AB”.

Another notable trend is the decline in internal cash flow. From 2016 onward, average internal cash flows turn negative. Although investment spending and the change in working capital decrease, the need for external financing rises.

Internal cash flow, which was the dominant funding source early in the sample, loses its leading role after the late 1980s as firms rely more heavily on external financing.

Splitting the full sample at the median of total assets reveals clear size-related differences. Larger firms pay higher dividends, invest more, and generate positive internal cash flows on average, whereas smaller firms exhibit negative internal cash flows. Moreover, large firms finance over 40% of their external funding needs through debt, whereas small firms rely on debt for only about 6%. At first glance, this low reliance on debt among small firms appears inconsistent with the POT.

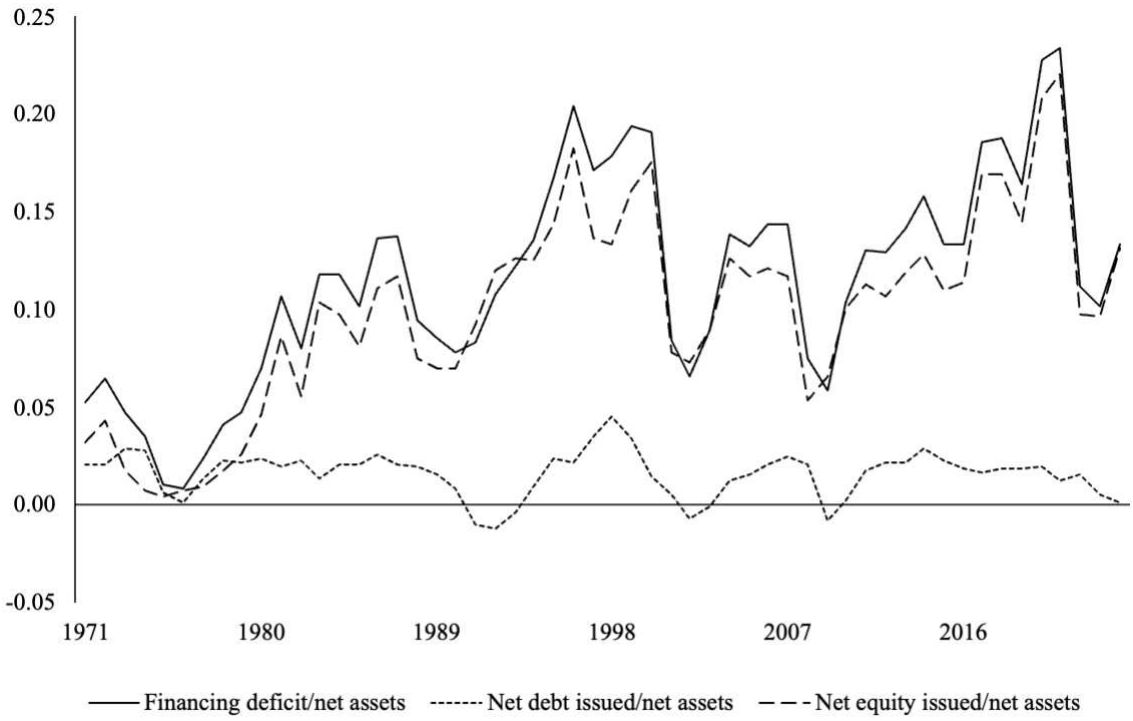

Figure 1
Average financing deficit to net assets, net debt issued to net assets and net equity issued to net assets for U.S. companies, 1971 – 2024

While Appendix 1 highlights selected years, Figure 1 provides a continuous view of how firms finance their deficits over time. The figure shows that equity issues track financing deficits far more closely than debt issues. The empirical correlation between the financing deficit and equity issuance is 0.9, compared with only 0.4 for debt. Except for the earliest years in the sample, equity is consistently the dominant form of external financing. This pattern contrasts

sharply with the prediction of the POT, which suggests that firms should rely primarily on debt when external funds are required.

4.1.2 Debt capacity analysis

The debt capacity analysis uses the same Compustat accounting panel as the baseline POT tests. Firm-level variables in the logit model are constructed using identical procedures, including industry exclusions, deflation to constant 2017 dollars and trimming of extreme observations. The main addition is the S&P long-term issuer credit rating, which serves as the dependent variable in the logit model. These ratings are available in Compustat North America from 1986 to 2017, defining the estimation window for the debt capacity measure. To incorporate stock return volatility, the Compustat panel is matched to CRSP using the CRSP–Compustat Merged file from WRDS, retaining link types LC and LU. Requiring firms to be listed with a valid link reduces the number of usable firm observations from roughly 150,000 in the full U.S. sample to about 47,000. The final dataset includes all observations with both accounting and return data necessary to estimate debt capacity.

4.2 International companies

The international data collection process follows the same logic as for the U.S. sample, with a few important differences. For global firm level accounting data, the two major providers are Compustat Global and Worldscope. I choose Worldscope, as it offers substantially broader country coverage and longer time series, with data going back to 1980 for most markets. After merging the raw files, I applied the same cleaning procedures as described for the U.S. sample. In addition, I excluded all firms for which the absolute difference between the financing deficit and net external financing exceeded +/-0.01, since such deviations almost certainly reflect reporting inconsistencies rather than genuine financing behavior. To ensure comparability across countries, I further restricted the sample to include only those with at least 20 years of continuous coverage and a minimum of 50 firm year observations per year. If there were breaks in the data, all observations before the last gap were dropped. After applying these filters, the final dataset contains 34 countries and over 700,000 observations.

Considerable heterogeneity emerges across countries, while some economies, such as the Russian Federation and Sri Lanka, display a comparatively high reliance on debt financing

relative to financing deficit, others, most notably the U.S. and the U.K., rely far more heavily on equity issuance.

Appendix 1 plots the average financing behavior over time across all countries. The time series pattern closely resembles that of U.S. firms. Financing deficits were modest until the early 1990s. They increased during the dotcom boom and stabilized between 0.05 and 0.10 thereafter, except for a temporary increase during the 2008 financial crisis. Again, when looking at Figure 2, equity issuance dominates debt issuance, which at face value appears inconsistent with strict POT behavior. This is confirmed by the correlations. The financing deficit correlates strongly with equity issuance (0.9) and less strongly with net debt issuance (0.5).

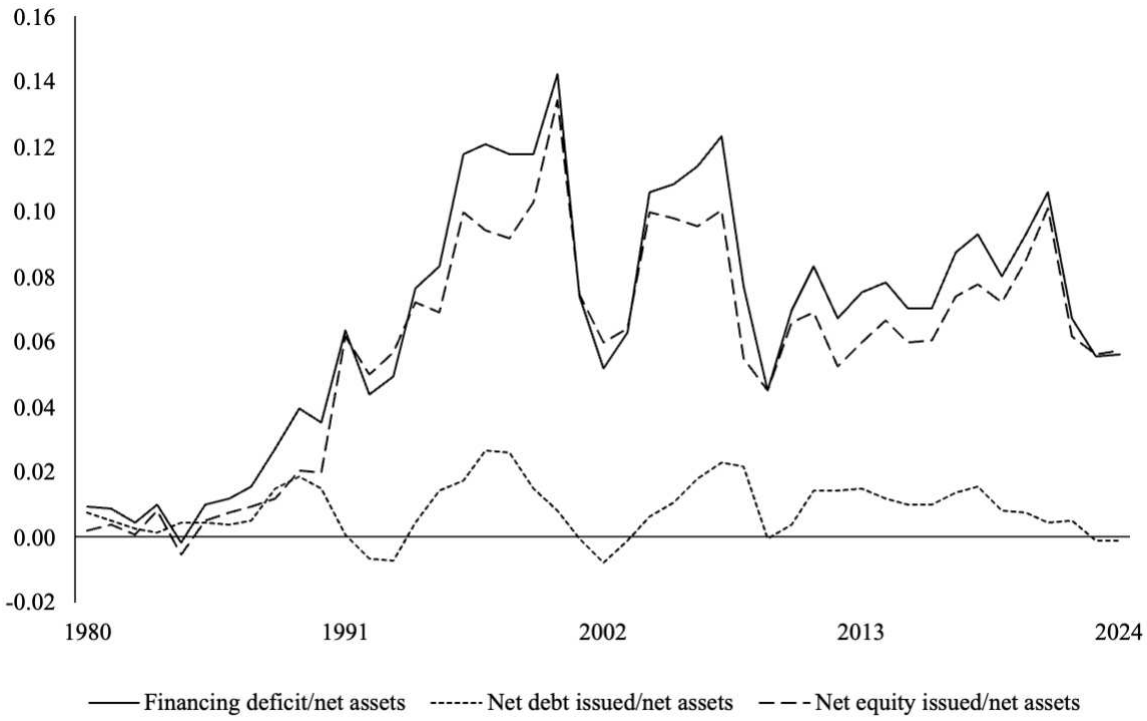

Figure 2
Average financing deficit to net assets, net debt issued to net assets and net equity issued to net assets for international companies. Values are averaged cross countries by year, 1980 – 2024

5. Results and analysis

5.1 Regression on the aggregated model

To examine the relevance of the POT and to estimate the aggregated model, I divide the full 54-year sample into two equal periods. The first period, 1971 – 1993, closely matches the sample used by Shyam-Sunder and Myers (1999) and subsequently replicated by Frank and Goyal (2003), which ensures comparability with the established literature. Results for this period are reported in Table 1. The second period, 1998 – 2020, is presented in Table 2. This later period is particularly interesting because Frank and Goyal (2003) found that the POT performed substantially worse in their second sample covering 1990 – 1998. Extending the analysis beyond the late 1990s allows to assess whether this decline persisted or reversed. Taken together, these two long subperiods cover more than half a century and help evaluate the POT under markedly different market conditions.

Following Shyam-Sunder and Myers (1999) and Frank and Goyal (2003), I report results separately for net debt issued, gross debt issued and the change in the debt ratio. In both sample periods, the financing deficit explains net debt issuance far better than the alternative measures. Net debt issued consistently yields the highest R^2, which aligns with earlier evidence.

Like prior studies, I first applied the strict data consistency requirement used by Shyam-Sunder and Myers (1999), which requires firms to report all flow of funds items without gaps. As Frank and Goyal (2003) also noted, enforcing this condition drastically reduces the usable sample. In my case, the full no gap rule resulted in only 17 firms for the first period. Because such a small sample would not allow meaningful inference, I relaxed the restriction and included all firms that consistently report the variables required to compute net debt issued, gross debt issued and the change in the debt ratio. This adjustment yields a panel of 480 firms with uninterrupted data over 23 years in the first period. Column (1) in Table 1 shows strong support for the POT, with an R^2 of 0.68 and a slope coefficient of 0.73. The results for the holdout period are reported using the restricted sample, meaning firms that already appear in the estimation sample.

In contrast, the full holdout sample includes all firms that appear between 1994 and 1997, regardless of whether they were part of the estimation period. For the restricted holdout period, the R^2 declines only slightly to 0.61, indicating that the model retains most of its explanatory

power. In contrast, the R^2 for the full holdout sample declines markedly to 0.13, indicating that the model's explanatory power does not extend to firms outside the estimation sample.

When the restriction is removed and gaps in reported data are permitted, the results change substantially. Column (4) shows that the R^2 declines to 0.27 and the coefficient falls to 0.29. Although my criterion for continuous reporting differs slightly from the one used by Frank and Goyal (2003), the characteristics of the firms that remain in the sample are similar. These firms tend to be larger in terms of book assets and rely more heavily on debt than the average firm in the dataset. This pattern suggests that firm size plays an important role in determining which firms follow the POT more closely.

To examine whether these findings depend on a specific market environment, I repeat the regressions for the second period from 1998 to 2020. The results in Column (1) of Table 2 immediately show a substantial deterioration relative to the earlier sample. Even within the restricted panel, the coefficient declines to 0.28 and the R^2 to 0.26, both markedly below the values observed for 1971 – 1993. Column (4) shows an additional decline in explanatory power once the full, unrestricted sample is used. Taken together, the evidence indicates that firms' financing behavior is strongly period dependent and that adherence to the POT is considerably lower in the more recent decades.

Table 1
Pecking order test, 1971 – 1993
The following regression is estimated $\Delta D_{it} = a + b_{PO} DEF_{it} + e_{it}$. The holdout period ranges from 1994 – 1997. All variables are scaled by net assets. Standard errors are reported in parenthesis and are clustered at the firm level. The Appendix 3 provides a detailed description of the Compustat codes used in the analysis.

	1971 – 1993			1971 – 1993		
	Data with no gaps permitted in the reporting of flow of funds data			Data with gaps permitted in the reporting of flow of funds data		
	Net debt issued	Gross debt issued	Change in debt ratio	Net debt issued	Gross debt issued	Change in debt ratio
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	<0.001***	0.068***	-0.003**	-0.009***	0.084***	-0.006***
	(<0.001)	(0.001)	(0.001)	(<0.001)	(0.001)	(0.001)
Financing deficit	0.730***	0.527***	0.306***	0.291***	0.204***	0.101***
	(0.019)	(0.028)	(0.038)	(0.005)	(0.005)	(0.007)
N	11,040	11,040	11,040	108,214	110,786	101,365
R^2	0.681	0.174	0.095	0.274	0.094	0.014
R^2 *- Holdout sample (full)*	0.128	0.030	0.002	0.128	0.030	0.002
R^2 *- Holdout sample (restricted)*	0.614	0.048	0.043			

**p < .05 **p < .01 ***p < .001*

Table 2
Pecking order test, 1998 – 2020
The following regression is estimated $\Delta D_{it} = a + b_{PO} DEF_{it} + e_{it}$. The holdout period ranges from 2021 – 2024. All variables are scaled by net assets. Standard errors are reported in parenthesis and are clustered at the firm level. The Appendix 3 provides a detailed description of the Compustat codes used in the analysis.

	1998 – 2020			1998 – 2020		
	Data with no gaps permitted in the reporting of flow of funds data			Data with gaps permitted in the reporting of flow of funds data		
	Net debt issued	Gross debt issued	Change in debt ratio	Net debt issued	Gross debt issued	Change in debt ratio
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.004***	0.113***	0.003***	-0.001***	0.103***	<0.001***
	(0.001)	(0.002)	(0.001)	(<0.001)	(0.001)	(0.001)
Financing deficit	0.281***	0.166***	0.112***	0.133***	0.092***	0.057***
	(0.014)	(0.017)	(0.018)	(0.002)	(0.002)	(0.004)
N	19,020	19,020	19,020	144,013	146,559	140,623
R^2	0.262	0.017	0.027	0.130	0.022	0.007
R^2 *- Holdout sample (full)*	0.086	0.009	0.004	0.086	0.009	0.004
R^2 *- Holdout sample (restricted)*	0.360	0.016	0.038			

*$p < .05$ **$p < .01$ ***$p < .001$

Table 3 provides additional evidence of a pronounced weakening of the POT over time. Being traded after 1998 reduces the sensitivity of net debt issuance to financing deficits by -0.179, which cuts the overall effect to less than half of what it was in 1971 – 1993. Firms therefore follow the POT much less closely after 1998.

Table 3
Testing the effect of different time periods on the financing deficit, 1971 – 2020
The following regression is estimated $\Delta D_{it} = a + b_{PO}DEF_{it} + c_{PD}PERIOD_t + d_{PO,PD}(DEF_{it} * PERIOD_t) + \gamma_i + e_{it}$. *The regression includes firm fixed effects. All variables are scaled by net assets. Standard errors are reported in parenthesis and are clustered at the firm level. The Appendix 3 provides a detailed description of the Compustat codes used in the analysis.*

	1971 – 2020
	Net debt issued
Constant	-0.026***
	(0.001)
Financing deficit	0.346***
	(0.007)
Period dummy (0=1971 – 1993; 1=1998 – 2020)	0.029***
	(0.001)
Period dummy * Financing deficit	-0.179***
	(0.001)
Firm Fixed Effects	Yes
N	250,192
Adjusted R²	0.267

*$p < .05$ **$p < .01$ ***$p < .001$

Following Frank and Goyal (2003), I investigate whether firm size influences the extent to which firms follow the POT. Firm size is widely linked to information asymmetries. Smaller firms typically face higher informational frictions because they disclose less information, receive less analyst and media coverage and are less likely to have credit ratings. In theory, these firms should rely more heavily on the financing hierarchy and therefore adhere more closely to the POT. To examine this relationship, I first follow Frank and Goyal (2003) and split the sample to compare periods. As a second approach and motivated by the substantial time variation, I estimate a firm- and time-fixed-effects model to analyze the full sample.

For the first approach, both sample periods from 1971 to 1993 and from 1998 to 2020 are divided into quartiles based on total assets, with the smallest firms placed in the first quartile and the largest firms in the fourth. For the first sample period, I also consider two additional groups that are generally viewed as facing lower information asymmetry. These include firms

that pay strictly positive dividends and firms with moderate leverage, where moderate leverage is approximated by MTB ratios that lie between the bottom and top two deciles. Firms in these groups tend to be more transparent and less affected by informational problems.

The results are presented in Table 4. A comparison of columns (1) and (2) with columns (3) through (12) shows that firm size is a much stronger differentiating factor than the additional information asymmetry indicators. Dividend payments and moderate leverage do not explain POT adherence as clearly as firm size does. Across all specifications, a consistent pattern emerges. Larger firms display financing behavior that aligns more closely with the POT. Although the relevance of the POT decreases in the more recent period, the influence of firm size remains clearly visible.

The results of the second approach, which covers the full sample period from 1971 to 2024, are presented in Table 5. When controlling for firm and time fixed effects over the full sample period, a similar picture emerges. Column (1) shows that the coefficient on the financing deficit is only 0.20 and the explanatory power remains relatively low, suggesting that the POT does not hold strongly for the overall U.S. sample. The results for the size groups in columns (4) to (7) again indicate that firm size plays an important role, while variables typically associated with lower information asymmetry appear to be less relevant. These two findings underscore the importance of firm size in determining the extent to which a company follows the POT, although it remains unclear whether size itself is the driving factor or merely proxies for underlying mechanisms.

Table 4
Pecking order test for different sub-samples and time frames, 1971 – 1993 and 1998 – 2020
The following regression is estimated $\Delta D_{it} = a + b_{PO} DEF_{it} + e_{it}$. The holdout period ranges from 1994 – 1997 for the first and from 2021 – 2024 for the second sample. To identify firms with moderate leverage, those in the highest and lowest 20% of the leverage distribution are excluded. For the size split, firms are assigned to quartiles based on their total assets. All variables are scaled by net assets. Standard errors are reported in parenthesis and are clustered at the firm level. The Appendix 3 provides a detailed description of the Compustat codes used in the analysis.

	1971 – 1993						1998 – 2020			
	Strictly positive dividend	Moderate leverage	Smallest firms	Medium small firms	Medium large firms	Largest firms	Smallest firms	Medium small firms	Medium large firms	Largest firms
	(1)	(2)	(3)	(4)	(5)	(6)	(9)	(10)	(11)	(12)
Constant	<0.001	-0.011***	-0.230***	-0.021***	-0.012***	-0.003***	-0.013***	-0.016***	-0.006***	0.013***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(<0.001)	(0.001)	(0.001)	(0.001)	(<0.001)
Financing deficit	0.485***	0.229***	0.190***	0.410***	0.580***	0.767***	0.094***	0.146***	0.338***	0.603***
	(0.016)	(0.006)	(0.006)	(0.010)	(0.010)	(0.010)	(0.003)	(0.004)	(0.008)	(0.009)
N	49,448	64,704	27,060	27,053	27,055	27,046	36,012	36,000	36,011	35,990
R^2	0.443	0.204	0.185	0.383	0.527	0.743	0.102	0.137	0.308	0.575
R^2 - *Holdout sample*	0.170	0.078	0.094	0.124	0.284	0.618	0.051	0.139	0.223	0.452

**p < .05 **p < .01 ***p < .001*

Table 5
Pecking order test for different sub-samples for the full time frame, 1971 – 2024
The following regression is estimated $\Delta D_{it} = a + b_{PO} DEF_{it} + \gamma_i + \lambda_t + e_{it}$. *All regressions include firm and time fixed effects. To identify firms with moderate leverage, those in the highest and lowest 20% of the leverage distribution are excluded. For the size split, firms are assigned to quartiles based on their total assets. All variables are scaled by net assets. Standard errors are reported in parenthesis and are clustered at the firm level. The Appendix 3 provides a detailed description of the Compustat codes used in the analysis.*

	1971 – 2024						
	Full sample	Strictly positive dividend	Moderate leverage	Smallest firms	Medium small firms	Medium large firms	Largest firms
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	-0.008***	0.002***	-0.016***	-0.019***	-0.026***	-0.012***	0.006***
	(0.004)	(<0.001)	(<0.001)	(0.001)	(0.001)	(0.001)	(<0.001)
Financing deficit	0.203***	0.547***	0.218***	0.122***	0.251***	0.473***	0.700***
	(0.003)	(0.010)	(0.004)	(0.003)	(0.006)	(0.008)	(0.008)
Firm and Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	300,986	99,694	157,435	72,439	72,613	73,801	74,943
Adjusted R²	0.227	0.567	0.247	0.170	0.258	0.438	0.675

*$p < .05$ **$p < .01$ ***$p < .001$

5.2 Regression on the disaggregated model

Relative to the aggregated model, the disaggregated specification decomposes the financing deficit into its individual components, allowing debt issuance to respond differently to each. This tests whether the aggregate deficit adequately captures financing behavior or whether individual components drive debt issuance.

Table 6 presents the results of the disaggregated model for the first sub-period, covering the years 1971 to 1993. As in the aggregated specification, the analysis initially restricts the sample to firms with continuous data availability. The results for this restricted sample are reported in columns (1) to (3).

Column (1) reports the regression results using net debt issued as the dependent variable. The estimates provide moderate support for both the aggregation step of the financing deficit and the POT, as the coefficients on the financing deficit components are relatively close to unity and the intercept is close to zero, while all coefficients are highly statistically significant. In contrast, when gross debt issued and the change in the debt ratio are used as dependent variables in columns (2) and (3), the evidence weakens considerably. Although the coefficients remain statistically significant, their magnitudes decline substantially and the explanatory power of the model, as measured by the R^2 decreases. This indicates little support for the aggregation hypothesis in these specifications. Columns (4) to (6) report the results when the restriction to firms with continuous data is relaxed. Across all dependent variables, support for the aggregation step and for firms following the POT declines markedly, even though all coefficients remain highly statistically significant. Nevertheless, net debt issued continues to deliver the highest coefficients and R^2 relative to gross debt issued and changes in the debt ratio, suggesting that it remains the dependent variable most aligned with POT predictions.

Table 7 extends the analysis to the full sample period from 1971 to 2024 and incorporates firm and year fixed effects, as well as controls for firm size. This broader time frame, combined with controls for unobserved heterogeneity, allows for more robust testing. Overall, the results provide no evidence in favor of the aggregation step or the existence of the POT when not controlling for firm size. Consistent with the earlier findings, the specification using net debt issued as the dependent variable in column (1) exhibits the strongest alignment with POT when compared to the regressions using gross debt issued and changes in the debt ratio in columns (2) and (3). When controlling the net debt issued regression for firm size, the results change. For the smallest quartile of firms, shown in column (4), there is no evidence supporting the

aggregation step and the POT. By contrast, the specification for firms in the largest size quartile in column (5) produces larger coefficient estimates and a lower intercept relative to the full-sample results in column (1), which offers some evidence in favor of the aggregation step and the POT.

Turning to the interpretation of the coefficients' signs, the results in Table 6 largely replicate the patterns documented by Frank and Goyal (2003) and are broadly consistent with the POT. Increases in dividends, investment and changes in working capital are associated with higher debt issuance, while higher internal cash flow reduces the need for external financing. An exception arises in the regression using gross debt issued as the dependent variable, where the coefficient on cash dividends is negative. Frank and Goyal (2003) attribute this finding to the fact that dividend-paying firms issue less long-term debt but also redeem less debt than non-dividend-paying firms.

When considering the results in Table 7 the signs of the coefficients remain largely unchanged. The main exception is the dividend coefficient in the gross debt issuance regression in column (2), which becomes positive. The inclusion of firm fixed effects removes persistent firm-specific financing policies and allows the analysis to focus on changes within firms over time. When a firm increases its dividend payments, internal funds decrease and the need for external financing rises. According to the POT, firms primarily meet this additional financing need by issuing debt, which explains the positive coefficient for gross debt issuance.

The results show limited support for aggregating the financing deficit and for the POT in the early period. Once the sample is extended and fixed effects are included, no support remains unless firm size is controlled for. This indicates that the financing deficit is not a sufficient statistic for all firms' financing decisions. Accounting for time-varying firm-specific factors, such as firm size, changes conclusions about whether aggregation is appropriate or not.

Table 6
Disaggregating the flow of funds deficit, 1971 – 1993
The following regression is estimated $\Delta D_{it} = a + b_{DIV}DIV_t + b_I I_t + b_W \Delta W_t - b_C C_t + e_{it}$. *The holdout period ranges from 1994 – 1997. All variables are scaled by net assets. Standard errors are reported in parenthesis and are clustered at the firm level. The Appendix 3 provides a detailed description of the Compustat codes used in the analysis.*

	1971 – 1993			1971 – 1993		
	Data with no gaps permitted in the reporting of flow of funds data			Data with gaps permitted in the reporting of flow of funds data		
	Net debt issued	Gross debt issued	Change in debt ratio	Net debt issued	Gross debt issued	Change in debt ratio
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-0.011***	0.079***	<0.001***	-0.027***	0.061***	-0.009***
	(0.002)	(0.004)	(0.006)	(0.001)	(0.001)	(0.001)
Cash Dividend	0.973***	-0.387***	0.521***	0.468***	-0.245***	0.232***
	(0.039)	(0.067)	(0.088)	(0.019)	(0.029)	(0.028)
Investments	0.767***	0.587***	0.375***	0.363***	0.363***	0.153***
	(0.016)	(0.029)	(0.028)	(0.005)	(0.006)	(0.009)
Δ Working capital	0.707***	0.4311***	0.203***	0.292***	0.147***	0.021***
	(0.024)	(0.031)	(0.058)	(0.006)	(0.005)	(0.009)
Internal cash flow	-0.725***	-0.474***	-0.396***	-0.257***	-0.154***	-0.141***
	(0.021)	(0.031)	(0.057)	(0.006)	(0.005)	(0.008)
N	11,040	11,040	11,040	108,214	110,786	101,365
R^2	0.688	0.208	0.132	0.290	0.140	0.044
R^2 - *Holdout sample (full)*	0.132	0.036	0.010	0.145	0.043	0.016
R^2 - *Holdout sample (restricted)*	0.635	0.054	0.037			

**p < .05 **p < .01 ***p < .001*

Table 7
Disaggregating the flow of funds deficit for the full time frame, 1971 – 2024
The following regression is estimated $\Delta D_{it} = a + b_{DIV}DIV_t + b_I I_t + b_W \Delta W_t - b_C C_t + \gamma_i + \lambda_t + e_{it}$. *All regressions include firm and time fixed effects. For the size split, firms are assigned to smallest and the largest quartile based on their total assets. All variables are scaled by net assets. Standard errors are reported in parenthesis and are clustered at the firm level. The Appendix 3 provides a detailed description of the Compustat codes used in the analysis.*

	1971 – 2024				
	Full sample			Smallest firms	Largest firms
	Net debt issued	Gross debt issued	Change in debt ratio	Net debt issued	
	(1)	(2)	(3)	(4)	(5)
Constant	-0.020***	0.081***	-0.006***	-0.023***	-0.008***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Cash Dividend	0.232***	0.164***	0.146***	0.058	0.829***
	(0.015)	(0.029)	(0.025)	(0.047)	(0.008)
Investments	0.284***	0.253***	0.108***	0.171***	0.699***
	(0.004)	(0.004)	(0.005)	(0.005)	(0.008)
Δ working capital	0.199***	0.137***	0.007*	0.133***	0.631***
	(0.003)	(0.003)	(0.004)	(0.004)	(0.111)
Internal cash flow	-0.177***	-0.149***	-0.111***	-0.121***	-0.611***
	(0.003)	(0.003)	(0.004)	(0.003)	(0.014)
Firm and Time Fixed Effects	Yes	Yes	Yes	Yes	Yes
N	300,986	307,031	288,020	73,843	73,546
Adjusted R²	0.243	0.323	0.048	0.180	0.653

*$p < .05$ **$p < .01$ ***$p < .001$

5.3 Regression on the conventional model

Following Frank and Goyal (2003), the conventional firm characteristics tangibility, MTB ratio, log sales, and profitability are used to explain capital structure over the full observation window from 1971 to 2024. In each regression, the financing deficit is included to assess whether it provides additional explanatory power beyond the conventional variables. Firms are classified as small if their total assets fall below the 25th percentile of the distribution and as large if they exceed the 75th percentile. The results are reported in Table 8.

Comparing the estimated coefficients with the expected effects discussed in the methodology section shows that the results are consistent with theoretical predictions and prior empirical findings. MTB and profitability exhibit statistically significant negative coefficients across all samples, indicating that firms with greater growth opportunities and higher internal cash flows tend to maintain lower leverage. In contrast, tangibility and log sales display statistically significant positive coefficients across the samples, suggesting that firms with more tangible assets and larger size are associated with higher leverage. This finding supports the view that tangible assets increase debt capacity by providing collateral, while larger firms benefit from more stable cash flows and improved access to debt markets.

Columns (2) and (4) show that adding the financing deficit provides little additional explanatory power and leaves the magnitude and significance of the baseline coefficients largely unchanged. In particular, the financing deficit is statistically insignificant for small firms in column (4), implying that short term financing needs play only a limited role in explaining their leverage changes. For large firms, however, the financing deficit becomes statistically significant and larger in magnitude, as shown in column (6). This difference likely reflects that larger firms are better able to finance funding shortfalls through debt issuance, whereas smaller firms rely more heavily on equity issuance or internal adjustments. Overall, these results suggest that financing decisions cannot be explained solely by the POT. Instead, firms appear to adjust leverage within constraints imposed by balance sheet characteristics that determine debt capacity. The persistence of these relationships over the long sample period from 1971 to 2024 indicates that the core determinants of capital structure have remained stable despite substantial changes in financial markets and the economic environment.

Table 8
Leverage regression with conventional variables and deficit for small and large firms, 1971 – 2024
The basic regression is $\Delta D_i = \alpha + \beta_t \Delta T_i + \beta_{MTB} \Delta MTB_i + \beta_{LS} \Delta LS_i + \beta_P \Delta P_i + \beta_{DEF} DEF_i + \gamma_i + \lambda_{t+} e_i$. *Here D is defined as the market leverage item (item 9 + item 34) / (item 199 * item 54 + item 9 + item 34)). Tangibility is calculated by item 8 / item 6. Market-to-book is (item 6 – item 60 + item 24 * item 25) / item 6. The log sales is ln(item 12). Profitability is defined as item 13 / item 6. All regressions include firm and time fixed effects. Small firms are those with a book value of assets less than the 25th percentile, while large firms are those with book value greater than the 75th percentile of the distribution. Standard errors are reported in parenthesis and are clustered at the firm level.*

	1971 – 2024		1971 – 2024		1971 – 2024	
	All firms		Small firms		Large firms	
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.007***	0.002***	0.009***	0.008***	0.001***	< -0.001
	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Δ Tangibility	0.248***	0.264***	0.235***	0.234***	0.194***	0.271***
	(0.008)	(0.008)	(0.015)	(0.015)	(0.015)	(0.014)
Δ Market-to-book	-0.003***	-0.003***	-0.001***	-0.001***	-0.013***	-0.011***
	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(0.003)	(0.002)
Δ Log sales	0.014***	0.011***	0.008***	0.008***	0.042***	0.012***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.004)	(0.004)
Δ Profitability	-0.032***	-0.034***	-0.014***	-0.015***	-0.414***	-0.315***
	(0.002)	(0.003)	(0.002)	(0.002)	(0.038)	(0.028)
Financing deficit		0.080***		0.004		0.261***
		(0.003)		(0.003)		(0.007)
Firm and Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
N	217,613	217,613	36,309	36,309	64,616	64,616
Adjusted R²	0.072	0.090	0.025	0.028	0.173	0.250

**p < .05 **p < .01 ***p < .001*

5.4 Regression on debt capacity

The results of the Lemmon and Zender (2010) logit regression are presented in Table 9. Except for tangibility, all coefficients are statistically significant at the one percent level. The direction of each coefficient matches theoretical expectations for their effect on the likelihood of obtaining a credit rating. Firms that are larger, more profitable, more levered and older, as well as those with greater asset tangibility, show a higher probability of being rated. In contrast, firms with high MTB and high volatility are less likely to obtain a rating. Using this model, I compute a predicted probability of having a credit rating for every observation. This predicted probability is used as a continuous measure of debt capacity in the subsequent analyses.

Table 9
Logit regression predicting the probability of having a bond rating, 1986 – 2017
Dependent variable is 1 if the firm has a bond rating. The explanatory variables are lagged one period. All variables are scaled by net assets. Standard errors are reported in parenthesis and are clustered at the firm level. The Appendix 3 provides a detailed description of the Compustat codes used in the analysis.

	1986 – 2017
Constant	-9.031***
	(0.314)
Log assets	1.064***
	(0.040)
ROA	0.500***
	(0.204)
Tangibility	0.213
	(0.170)
MTB	-0.107***
	(0.025)
Leverage	2.438***
	(0.173)
Log firm age	0.266***
	(0.037)
Annual volatility	-0.584***
	(0.137)
N	47,132
Pseudo R²	0.488

**p < .05 **p < .01 ***p < .001*

Table 10 reports the results of the original Shyam-Sunder and Myers (1999) regression, estimated separately for firms grouped by their debt capacity. For firms with low debt capacity,

the coefficient on the financing deficit is small and the explanatory power of the model is weak, which indicates that the POT provides little explanatory value for their financing behavior. As debt capacity increases, both the coefficient and the model fit improve steadily. In the highest debt capacity group, shown in column (3), the financing deficit coefficient reaches 0.727 and the R^2 increases to 0.662, suggesting that firms with greater access to debt markets follow POT consistent financing behavior much more closely.

Table 10
Firms classified into subsamples based on the probability of having a bond rating, 1986 – 2017
Firms are grouped into subsamples according to their predicted probability of holding a bond rating derived from the logit estimation in Table 9. Dependent variable is net debt issued. All variables are scaled by net assets. Standard errors are reported in parenthesis and are clustered at the firm level. The Appendix 3 provides a detailed description of the Compustat codes used in the analysis.

	1986 – 2017		
	Low probability	Medium probability	High probability
	(1)	(2)	(3)
Constant	-0.015***	-0.003***	0.012***
	(0.001)	(0.001)	(0.001)
Financing deficit	0.280***	0.657***	0.727***
	(0.014)	(0.020)	(0.017)
N	15,711	15,711	15,710
R^2	0.266	0.596	0.662

**p < .05 **p < .01 ***p < .001*

Although the initial results are convincing, it is essential to assess whether the debt capacity measure is merely capturing firm size. This concern is motivated by the high correlation of 0.889 between log(Assets) and the predicted probability of having a rating. Panel A of Table 11 reports the financing deficit coefficients for the smaller half of firms. Within this group, the coefficient increases steadily across the low- to high probability categories and all estimates are highly significant. Panel B shows the same pattern for larger firms. Although the financing deficit coefficient in the low-probability group is higher for large firms than for small firms and the increase from medium to high probability is somewhat smaller, the overall monotonicity remains intact. Importantly, the R^2 values also rise consistently across the probability groups in both size categories, indicating that model fit improves with debt capacity regardless of firm size. Taken together, the magnitude, significance and monotonic progression of the coefficients demonstrate that the rating-based probability measure captures meaningful variation in debt capacity beyond what is explained by firm size alone.

Table 11
Firms classified into subsamples based on firm size and the probability of having a bond rating, 1986 – 2017
Firms are grouped into two subsamples according to their value of total assets for each year. Within each group, the predicted probability of holding a bond rating from the logit estimation in Table 9 is used to sort firms into three categories. Dependent variable is net debt issued. All variables are scaled by net assets. Standard errors are reported in parenthesis and are clustered at the firm level. The Appendix 3 provides a detailed description of the Compustat codes used in the analysis.

	1986 – 2017		
	Low probability	Medium probability	High probability
Panel A. Small Firms	(1)	(2)	(3)
Constant	-0.012***	-0.013***	-0.014***
	(0.002)	(0.001)	(0.001)
Financing deficit	0.208***	0.441***	0.681***
	(0.015)	(0.028)	(0.001)
N	7,845	7,851	7,862
R^2	0.197	0.403	0.609

	1986 – 2017		
	Low probability	Medium probability	High probability
Panel B. Large Firms	(1)	(2)	(3)
Constant	0.012***	0.009***	0.011***
	(0.001)	(0.001)	(0.001)
Financing deficit	0.585***	0.734***	0.746***
	(0.020)	(0.023)	(0.022)
N	7,848	7,856	7,870
R^2	0.553	0.667	0.702

**p < .05 **p < .01 ***p < .001*

For a deeper analysis it is useful looking at the numbers presented in Table 12. Adding log(Assets) increases the R^2 only marginally from 0.425 to 0.441 a sign of multicollinearity. This means that the rating probability already absorbs most of the explanatory power associated with size. At first glance, this could raise the concern that the rating probability may simply be reflecting firm size. However, the subsequent results show that this is not the case.

The highly significant interaction terms in column (2) demonstrate that debt capacity has a far stronger moderating effect on the financing deficit relationship than log(Assets). A one standard deviation increase in the rating probability amplifies the deficit response by roughly 2.8 times more than a comparable increase in firm size. This indicates that debt capacity is the dominant factor explaining why some firms follow the POT more closely, rather than merely reflecting size. In comparison, firm size plays only a secondary role.

Table 12
Testing the predictive power of the prob. rating variable in perspective to log assets, 1986 – 2017
Dependent variable is net debt issued. All variables are scaled by net assets. Standard errors are reported in parenthesis and are clustered at the firm level. The Appendix 3 provides a detailed description of the Compustat codes used in the analysis.

	1986 – 2017	1986 – 2017
	(1)	(2)
Constant	-0.125***	-0.073***
	(0.001)	(0.002)
Financing deficit	0.340***	0.263***
	(0.003)	(0.006)
Prob. rating	0.039***	-0.052***
	(0.002)	(0.004)
Financing deficit * Prob. rating	0.695***	0.483***
	(0.011)	(0.056)
Log assets		0.014***
		(0.005)
Financing deficit * Log assets		0.024***
		(0.008)
N	47,132	47,132
R^2	0.425	0.441

**p < .05 **p < .01 ***p < .001*

5.5 Regression on legal systems

Table 13 reports the influence of creditor and shareholder rights on firms' adherence to the POT. Column (1) shows that stronger creditor rights increase the sensitivity of net debt issuance to the financing deficit, indicating closer adherence to the POT, whereas stronger shareholder rights reduce this sensitivity. Column (2) introduces firm and time fixed effects and confirms these patterns, with a slightly stronger creditor rights effect and a marginally weaker shareholder rights effect. Column (3), which excludes U.S. firms, produces a higher adjusted R^2 and retains the same effect directions. In this specification the shareholder rights coefficient nearly doubles, while the creditor rights coefficient becomes noticeably smaller, suggesting substantial cross-country heterogeneity in how legal protections shape financing behavior.

Table 13
Testing the influence of creditor rights and shareholder rights on firms' adherence to the POT, 1980 – 2024
Dependent variable is net debt issued. All variables are scaled by net assets. Standard errors are reported in parenthesis and are clustered at the firm level. The Appendix 4 provides a detailed description of the Worldscope codes used in the analysis.

	1980 – 2024	1980 – 2024	1980 – 2024 (excl. U.S.)
	(1)	(2)	(3)
Constant	-0.009***	-0.013***	-0.013***
	(<0.001)	(<0.001)	(<0.001)
Financing deficit	0.233***	0.268***	0.438***
	(0.006)	(0.009)	(0.011)
Financing deficit * Creditor rights	0.043***	0.047***	0.013***
	(0.002)	(0.003)	(0.003)
Financing deficit * Shareholder rights	-0.027***	-0.025***	-0.039***
	(0.002)	(0.003)	(0.003)
Firm and Time Fixed Effects	No	Yes	Yes
N	707,598	703,923	540,837
Adjusted R²	0.212	0.303	0.343

**p < .05 **p < .01 ***p < .001*

Because legal institutions correlate with economic development, Table 14 examines whether these results merely reflect differences between developed and emerging economies. Column (1) incorporates a developed country interaction and shows that firms in developed markets rely significantly less on debt to cover financing deficits. All variables remain highly significant, which indicates that creditor and shareholder rights are not simple proxies for development status. The shareholder rights coefficient changes sign once development is controlled for, which implies that the previously negative association largely reflected the fact that developed countries combine strong shareholder rights with greater reliance on equity. After removing this confounding effect, shareholder rights exhibit a small positive association with POT adherence. Creditor rights remain positively related to POT behavior, although with a reduced magnitude, which confirms that they exert an independent influence beyond development classification. Column (2) excludes U.S. firms and yields similar results with a slightly higher adjusted R^2.

Overall, creditor rights consistently strengthen adherence to the POT, whereas the negative effect of shareholder rights does not hold once differences between developed and emerging economies are taken into account. The most influential determinant of POT adherence is

whether a firm operates in a developed or an emerging financial system, reflecting broader structural differences in capital market depth and financing preferences.

Table 14
Testing the influence of creditor rights and shareholder rights on firms' adherence to the POT when controlling for developed vs. emerging countries, 1980 – 2024
Dependent variable is net debt issued. All variables are scaled by net assets. Standard errors are reported in parenthesis and are clustered at the firm level. The Appendix 4 provides a detailed description of the Worldscope codes used in the analysis.

	1980 – 2024	1980 – 2024 (excl. U.S.)
	(1)	(2)
Constant	-0.013***	-0.013***
	(<0.001)	(<0.001)
Financing deficit	0.486***	0.483***
	(0.010)	(0.012)
Financing deficit * Developed country	-0.355***	-0.357***
	(0.006)	(0.007)
Financing deficit * Creditor rights	0.019***	0.020***
	(0.002)	(0.003)
Financing deficit * Shareholder rights	0.014***	0.015***
	(0.003)	(0.003)
Firm and Time Fixed Effects	Yes	Yes
N	703,923	540,837
Adjusted R^2	0.347	0.394

**p < .05 **p < .01 ***p < .001*

6. Summary and Conclusions

6.1 Key Findings

The goal of this empirical study was to test if the POT is an adequate model to describe firms financing behavior using U.S. data and a comprehensive international data set. The analysis builds on the empirical approach of Shyam-Sunder and Myers (1999) and Frank and Goyal (2003). It is extended by incorporating measures of firms' debt capacity and the quality of national legal systems. In this study, five central hypotheses were examined:

- *H1: According to the POT, a firm's financing deficit is expected to have a significant positive effect on its net debt issuance, with a coefficient close to one.*

The empirical evidence for H1 is highly time and sample dependent. Consistent with Frank and Goyal (2003), there is strong support for the POT in the first period (1971 – 1993) when the sample is restricted to firms with continuous data and no gaps. This support weakens considerably in the second period (1998 – 2020) and interaction tests confirm that the difference between the two periods is statistically significant. For both periods, the evidence diminishes once the continuous data restriction is relaxed, indicating that POT behavior is particularly concentrated among firms with stable reporting histories, which tend to be larger and financially more established.

Building on this observation, the results indeed reveal substantial firm level heterogeneity. Larger firms exhibit financing behavior that is more consistent with the POT, whereas smaller firms rely far less on debt to finance their funding shortfalls. Finally, when the full U.S. sample (1971 – 2024) is analyzed using firm- and time-fixed effects, no statistically meaningful evidence in favor of the POT remains.

Overall, these findings indicate that U.S. firms do not uniformly follow the strict form of the POT. Instead, adherence appears to be period specific and concentrated among larger firms, which limits the general validity of H1.

- *H2: The effect on net debt issuance will not differ significantly across the main components of the financing deficit, supporting the validity of using an aggregate measure.*

The results provide only limited support for H2. Support is relatively strong in the restricted sample with continuous data, but it weakens when gross debt issued or the change in the debt ratio is used as the dependent variable. It declines further once the continuous-data restriction is relaxed, suggesting that aggregation primarily holds for firms with stable reporting histories, which tend to be larger, like the findings in the aggregated model. When the full period from 1971 to 2024 is examined with firm and year fixed effects, no support remains for aggregation in the overall sample, with meaningful evidence persisting only among the largest firms. Overall, the financing deficit cannot be regarded as a sufficient statistic for all firms' financing behavior, and the aggregation assumption appears valid only under specific conditions.

- *H3: In a model that includes traditional capital structure determinants, the financing deficit will provide statistically significant incremental explanatory power for net debt issuance.*

The evidence for H3 shows that the financing deficit does not add substantial explanatory power beyond conventional capital structure determinants. Tangibility, MTB, firm size, and profitability remain the dominant drivers of leverage and their effects are largely unchanged when the financing deficit is included. While the financing deficit becomes relevant for large firms, it is insignificant for small firms, suggesting that firms with greater financing flexibility

commonly associated with larger size are better able to finance funding shortfalls through debt. Overall, capital structure decisions cannot be explained solely by the POT and the incremental relevance of the financing deficit is limited and conditional.

- *H4: Debt capacity is expected to act as a positive moderator in the POT framework, with the result that the relationship between the financing deficit and debt issuance will be stronger for firms with higher debt capacity.*

The results provide strong support for H4. The sensitivity of net debt issuance to the financing deficit increases monotonically with debt capacity and model fit improves substantially, indicating that firms with greater access to debt markets follow POT more closely. This relationship remains robust within both small and large firms, showing that debt capacity is not merely a proxy for size. Additional interaction tests confirm that debt capacity moderates financing behavior far more strongly than firm size, making it the key factor explaining why some firms adhere more closely to the POT.

- *H5: A country's institutional environment is expected to moderate financing choices according to the POT, such that stronger creditor protection and weaker shareholder are associated with stronger POT behavior.*

The results provide mixed support for H5. Countries with stronger creditor rights show a higher sensitivity of net debt issuance to the financing deficit, meaning that firms in these countries follow the POT more closely. At first, shareholder rights seem to reduce adherence to the POT. However, once the difference between developed and emerging economies is considered, this negative effect disappears and becomes slightly positive. This shows that the initial result was mainly driven by the fact that developed countries usually have strong shareholder rights and rely more on equity financing. Creditor rights, in contrast, remain an important and robust factor. Overall, legal institutions matter for how firms finance themselves, but the most important difference is whether firms operate in developed or emerging financial systems.

6.2 Limitations & Future Research

This study has several limitations. First, although the analysis spans a long period, it treats profitability, investment, and financing decisions as largely independent, even though these factors likely influence each other. Future research could therefore examine their joint dynamics to better understand how financing decisions interact with firms' operating and investment policies.

Second, the international analysis relies on static measures of creditor and shareholder protection and a time invariant developed versus emerging classification. This means that institutional reforms and gradual legal improvements are not captured. Future research should employ time varying institutional indicators or exploit specific legal reforms to better understand how changing legal environments influence firms' adherence to the POT.

Third, debt capacity is measured using the probability of having a credit rating, which works particularly well in the U.S. setting but is limited by the availability of comparable international data. Extending this measure to broader international contexts would enhance external validity.

Finally, the rise of private credit markets and fintech-based lending may have fundamentally altered the traditional hierarchy. These sources often sit between traditional bank debt and public equity, potentially creating a new layer in the pecking order that warrants dedicated empirical investigation.

Addressing these limitations would allow future studies to refine the testing of the POT and deepen our understanding of how firm characteristics, institutional environments and evolving financial markets jointly shape corporate financing decisions.

7. Appendix

Appendix 1
Corporate cash flows for U.S. companies
The Appendix 3 provides a detailed description of the Compustat codes used in the analysis. All variables are scaled by net assets.

	Average funds flow and financing as a fraction of net assets								
	1971	1980	1989	1998	2007	2016	2024	Small companies	Large companies
Number of observations	2,238	4,655	5,577	7,987	6,437	5,837	5,288	158,904	158,945
Cash dividends [a]	0.021	0.017	0.013	0.008	0.013	0.013	0.012	0.007	0.018
Investments [b]	0.136	0.183	0.129	0.156	0.124	0.084	0.054	0.122	0.134
Delta working capital [c]	0.041	0.048	0.009	0.022	0.047	0.013	0.020	0.037	0.030
Internal cash flow [d]	0.145	0.178	0.065	0.007	0.042	-0.024	-0.048	-0.026	0.130
Financing deficit [a+b+c-d]	0.053	0.070	0.086	0.179	0.142	0.134	0.134	0.192	0.052
Net debt issues [e]	0.021	0.024	0.016	0.045	0.025	0.019	0.002	0.012	0.021
Net equity issues [f]	0.032	0.046	0.070	0.134	0.117	0.115	0.132	0.180	0.031
Net external financing [e+f]	0.053	0.070	0.086	0.179	0.142	0.134	0.134	0.192	0.052
Share of debt financing	0.396	0.343	0.186	0.251	0.176	0.142	0.015	0.063	0.404

Appendix 2
Descriptive statistics of corporate cash flows for international companies by country, averages from 1980 – 2024
The Appendix 4 provides a detailed description of the Worldscope codes used in the analysis.
The creditor rights index is based on Djankov et al. (2007). One point is awarded for each of the following legal provisions: the absence of an automatic stay on assets, priority repayment of secured creditors over other claimants such as the government or employees, the presence of legal requirements that restrict a firm's ability to enter reorganization without creditor approval or minimum payout conditions, and the removal of management control over firm assets during the reorganization process. The resulting creditor rights index ranges from 0, indicating weak protection of creditors, to 4, indicating strong creditor protection.
The shareholder rights index is based on Djankov et al (2008). The shareholder rights measure aggregates six country level legal provisions that reflect the strength of shareholder protection. These provisions include the ability to vote by mail, the requirement to block shares prior to shareholder meetings, the use of cumulative voting systems, safeguards for minority shareholders, the presence of preemptive rights and the minimum shareholding needed to call an extraordinary shareholders' meeting. This construction yields an index that takes values from 0, reflecting the absence of shareholder protections, to 6, reflecting strong shareholder protections.
All variables are scaled by net assets.

	1980 – 2024										
	N	Cash dividends[a]	Investments[b]	Delta working capital[c]	Internal cash flow[d]	Financing deficit a+b+c-d	Net debt issues[e]	Net equity issues[f]	Net external financing[e+f]	Creditor Rights (0–4)	Shareholder Rights (0–6)
Australia	31,764	*0.018*	*0.110*	*0.017*	*-0.056*	0.201	*0.004*	*0.196*	0.201	3	4
Brazil	5,648	*0.025*	*0.098*	*0.052*	*0.127*	0.048	*0.019*	*0.029*	0.048	1	5
Canada	32,779	*0.008*	*0.105*	*0.035*	*-0.055*	0.203	*0.006*	*0.197*	0.203	1	4
China	78,627	*0.024*	*0.100*	*0.056*	*0.127*	0.052	*0.021*	*0.031*	0.052	2	1
Denmark	3,063	*0.023*	*0.106*	*0.011*	*0.086*	0.054	*0.003*	*0.051*	0.054	3	4
Egypt	2,420	*0.056*	*0.075*	*0.053*	*0.162*	0.021	*0.008*	*0.013*	0.021	2	3
Finland	3,339	*0.040*	*0.087*	*0.016*	*0.105*	0.038	*0.000*	*0.038*	0.038	1	4
France	10,759	*0.018*	*0.095*	*0.013*	*0.065*	0.061	*0.011*	*0.050*	0.061	0	4
Germany	13,126	*0.019*	*0.094*	*0.015*	*0.087*	0.041	*0.003*	*0.039*	0.041	3	4
Greece	3,591	*0.016*	*0.069*	*0.021*	*0.081*	0.024	*0.009*	*0.016*	0.024	1	2
Hong Kong	27,168	*0.021*	*0.074*	*0.050*	*0.081*	0.063	*0.004*	*0.058*	0.063	4	5
India	51,168	*0.012*	*0.096*	*0.054*	*0.110*	0.052	*0.022*	*0.030*	0.052	2	5
Indonesia	11,107	*0.018*	*0.095*	*0.006*	*0.081*	0.037	*0.005*	*0.032*	0.037	2	4
Ireland	2,941	*0.015*	*0.109*	*0.032*	*0.042*	0.115	*0.017*	*0.098*	0.115	1	5

Appendix 2 - continued

Israel	6,588	*0.023*	*0.072*	*0.025*	*0.009*	0.110	*0.004*	*0.106*	0.110	3	4
Italy	6,146	*0.018*	*0.126*	*0.024*	*0.113*	0.054	*0.012*	*0.042*	0.054	2	2
Japan	76,799	*0.013*	*0.058*	*0.031*	*0.092*	0.011	*-0.003*	*0.013*	0.011	2	5
Korea (South)	37,577	*0.009*	*0.103*	*0.052*	*0.096*	0.067	*0.019*	*0.048*	0.067	3	5
Malaysia	19,417	*0.021*	*0.061*	*0.035*	*0.086*	0.030	*0.000*	*0.030*	0.030	3	5
Mexico	3,751	*0.021*	*0.085*	*0.030*	*0.117*	0.019	*0.004*	*0.015*	0.019	0	3
Netherlands	4,193	*0.024*	*0.118*	*0.031*	*0.122*	0.051	*0.011*	*0.041*	0.051	3	3
New Zealand	2,260	*0.042*	*0.099*	*0.007*	*0.085*	0.063	*0.002*	*0.061*	0.063	4	4
Norway	3,949	*0.022*	*0.117*	*0.017*	*0.045*	0.112	*0.016*	*0.096*	0.112	2	4
Philippines	4,269	*0.018*	*0.086*	*0.017*	*0.088*	0.033	*0.010*	*0.023*	0.033	1	4
Russian Federation	7,174	*0.016*	*0.082*	*0.021*	*0.097*	0.023	*0.017*	*0.006*	0.023	2	4
Singapore	12,181	*0.023*	*0.074*	*0.049*	*0.095*	0.052	*0.004*	*0.047*	0.052	3	5
South Africa	6,228	*0.041*	*0.115*	*0.037*	*0.159*	0.034	*0.006*	*0.028*	0.034	3	5
Spain	2,598	*0.022*	*0.108*	*0.028*	*0.101*	0.057	*0.023*	*0.034*	0.057	2	5
Sri Lanka	2,390	*0.022*	*0.080*	*0.031*	*0.108*	0.026	*0.015*	*0.011*	0.026	2	4
Sweden	10,197	*0.026*	*0.111*	*0.002*	*-0.024*	0.162	*0.006*	*0.156*	0.162	1	4
Switzerland	5,622	*0.028*	*0.085*	*0.018*	*0.099*	0.032	*0.004*	*0.028*	0.032	1	3
Thailand	13,368	*0.038*	*0.095*	*0.030*	*0.130*	0.033	*-0.004*	*0.037*	0.033	2	4
United Kingdom	41,268	*0.027*	*0.111*	*0.027*	*0.052*	0.113	*0.002*	*0.112*	0.113	4	5
United States	164,123	*0.009*	*0.092*	*0.052*	*0.029*	0.125	*0.010*	*0.115*	0.125	1	3

Appendix 3
Compustat item# definition

Variable	Format Code	Item#
Cash dividends	*1-3, 7*	*item127*
Investments	*1-3*	*item128 + item113 + item129 + item107 – item109*
	7	*item128 + item113 + item129 + item107 – item109 – item309 – item310*
Δ Working Capital	*1*	*item236 + item274 + item301*
	2-3	*– item236 + item274 – item 301*
	7	*– item302 – item303 – item304 – item305 – item307 + item274 – item312 – item301*
Internal cash flow	*1-3*	*item123 + item124 + item125 + item126 + item106 + item213 + item217 + item218*
	7	*item123 + item124 + item125 + item126 + item106 + item213 + item217 + item314*
Net debt issues	*1-3, 7*	*item111 – item114*
Net equity issues	*1-3, 7*	*item108 – item115*
Net assets	*1-3, 7*	*item6 – item5*

Appendix 4
Worldscope item# definition

Variable	Item#
Cash dividends	*item4551*
Investments	*item4601 + item4760 + item4355 – item4351 – item4440 + item4795 – item4796 + item4651*
Δ Working Capital	*– item4825 – item4826 – item4827 – item4828 – item4829 – item4830 + item4851 – item4446 + item4447 – item4821*
Internal cash flow	*item4201 + item4225 + item4840*
Net debt issues	*item4401 – item4701*
Net equity issues	*item4251 – item4751*
Net assets	*item2999 – item3101*

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