Firm Financing: Debt or Equity?*

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Project Summary

Abstract

This paper contributes to the debate on how business taxation and regulation shapes firm financing decisions by documenting a secular decline in corporate leverage in Sweden. The average debt-to-equity ratio fell from 2.18 in 1998 to 1.08 in 2024, this decline holds across firm characteristics such as size and productivity, and occurs within firms over time rather than reflecting compositional shifts across the population of firms. We identify three candidate explanations for this trend: falling corporate tax rates and tightening interest-deduction limits; post-GFC bank capital regulation; and sustained retained-earnings growth among closely held firms, driven by dividend-versus-wage taxation rules. We build a partial-equilibrium dynamic firm model incorporating these three channels to quantitatively assess their relative contributions to the decline in the debt-to-equity ratio.

Keywords: Capital Structure, Debt-to-Equity, Firm Dynamics

JEL classification: G32, H25, H32

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1 Introduction

Firm financing decisions respond strongly to business taxation. The choice between debt and equity is a prime example: the tax deductibility of interest payments, a feature of most corporate income tax systems, has no equivalent for the cost of equity, creating a persistent tax-induced distortion in firms' capital structure. This asymmetry has fueled an active debate over whether tax systems should continue to favor debt over equity, prompting some jurisdictions to restrict interest deductibility (e.g., limitation rules under the EU Anti-Tax Avoidance Directive and the U.S. Tax Cuts and Jobs Act).

This paper contributes to this debate by documenting a secular decline in corporate leverage in Sweden, measured as the ratio of total debt to shareholders' equity. Sweden offers an attractive setting for this analysis: full-population administrative data allow us to observe the balance sheets of all limited liability corporations rather than a sample of listed or large firms, and the tax system has undergone substantial changes in corporate and dividend taxation over our sample period. Using this data, we show that the average debt-to-equity ratio fell from 2.18 in 1998 to 1.08 in 2024. This decline is held constant across firm characteristics, such as size and productivity, and occurs within firms over time rather than reflecting compositional shifts across firms.

We examine a wide set of candidate explanations for this trend. Our data allow us to rule out most of them, leaving corporate and dividend taxation, interest deductibility, and bank capital requirements as the leading candidates. To evaluate these mechanisms, we develop a dynamic model of firm financing in which firms choose their mix of debt and equity to finance production, subject to corporate and dividend taxation and bank capital requirements. As next steps, we will calibrate the model to key moments in our data and quantify each mechanism's contribution to the observed decline in leverage, with the goal of drawing policy implications for the design of business taxation.

The remainder of this project summary proceeds as follows. Section 2 describes our data. Section 3 documents the long-run decline in the average debt-to-equity ratio and lists possible explanations. Section 4 presents our dynamic partial-equilibrium model of firm financing that incorporates corporate and dividend taxation, interest deductibility, and bank capital requirements. Section 5 concludes with the next steps.

2 Data

Our empirical exercise relies on the Serrano Database, which consists of company-level financial statements obtained from the Swedish Companies Registration Office that

are available since 1998. This dataset covers most legal forms in the Swedish business community, with full coverage of limited liability corporations. We restrict our sample to privately owned limited liabilities with a minimum of two employees. We exclude pure financial firms (i.e., those with only financial assets), firms with balance sheet discrepancies[1], and firms with negative equity. Furthermore, we consolidate firms belonging to a group into one entity to remove potential bias resulting from different accounting techniques. Potential concerns are subsidiaries operating in different industries and of different ages. We assign each firm group the age of its parent company and the most frequent industry among its subsidiaries. Our final sample consists of 3,011,921 firm-year observations between 1998 and 2024, with an average of 111,510 firms per year. Table 1 provides summary statistics for our sample in the first and last available years.

Table 1: Summary Statistics

	Obs.	Mean	SD	p50	p75	p90
1998						
Net Sales	103,361	31589.44	833565.33	3275.00	8591.00	24341.00
Assets	103,364	51341.23	2145180.15	1808.00	4794.00	14513.00
Firm Age	103,364	12.43	12.36	9.00	14.00	28.00
Dividends	103,361	1344.57	92147.92	0.00	20.00	131.00
Debt/Equity	103,214	2.18	24.31	0.08	1.37	4.42
Employees	103,364	16.24	267.90	4.00	7.00	17.00
2024						
Net Sales	110,696	100867.49	2176504.48	7897.00	21565.00	70277.00
Assets	110,697	328163.63	11541204.67	5402.00	17608.00	66097.00
Firm Age	110,697	16.44	14.87	12.00	22.00	35.00
Dividends	110,697	7178.71	263653.30	0.00	300.00	1700.00
Debt/Equity	110,553	1.08	26.78	0.00	0.39	1.72
Employees	110,697	22.64	232.84	5.00	10.00	26.00

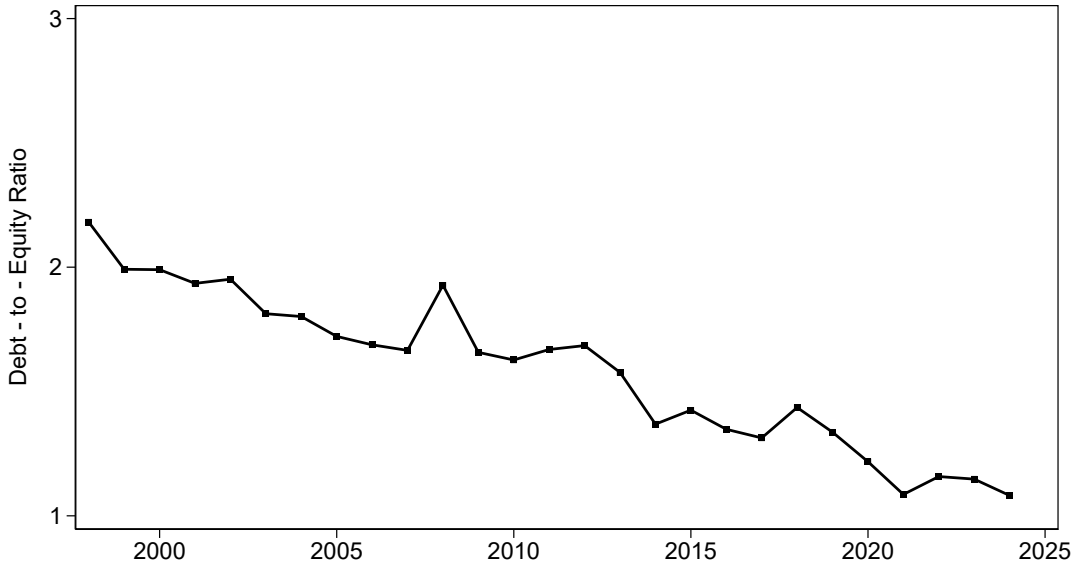
3 Long-run Trend in Debt-to-Equity

The debt-to-equity ratio, defined as current and non-current liabilities to credit institutions divided by total equity, has trended downward over the past two and a half decades. The mean debt-to-equity ratio has fallen by half from 2.18 at the end of 1998 to 1.08 in 2024 (Figure 1). This has occurred at higher percentiles, while the median

[1]That is, assets do not equate equity and liabilities.

has remained at zero (Table 1). Furthermore, the reduction in corporate leverage is independent of firm characteristics such as size and productivity. This general decline in leverage and its implications have received very little to no attention in the literature.

Figure 1: Mean debt-to-equity ratio in Sweden



Note: Mean debt-to-equity ratio for Swedish limited liability corporations between 1998 and 2024. Debt is defined as current and non-current liabilities to credit institutions. A value of 1 indicates that interest-bearing liabilities are equal to total equity on the firm's balance sheet.

The share of total liabilities in corporate financing has steadily declined and is approaching the 50% mark of assets. This is the result of changes in the composition of the financing side of the aggregate balance sheet over time, and corporations now utilize fewer long-term liabilities than before. The share of aggregate non-current liabilities has decreased from 32 to 24 percent, while the equity share has increased from 31.7 to 42.2 percent. Current liabilities have remained faily stable with a share in the 30s.

3.1 Possible explanations

The paper tests several candidate explanations for the decline in the debt-to-equity ratio and rules out most of them. A decomposition shows the trend is not a composition effect, since the within-firm change is large and negative while the between-firm effect is much smaller, indicating firms are changing their financing behavior. Using book-value balance-sheet data, we also rule out a mechanical market-valuation effect, since the pattern holds in book equity, not just market-value-inflated equity. Filtering out firms with fewer than two employees rules out the possibility that a wave of small, single-owner incorporations (following cuts to Sweden's minimum share capital

requirement) is driving the result, and we rule out any group-structure proliferation from unconsolidated holding-company accounting as described above.

This leaves three main explanations still standing: (1) falling corporate tax rates and tightening interest-deduction limits (from Sweden's 2009 rules through the 2019 EU ATAD-driven EBITDA cap), which shrink the debt tax shield; (2) post-GFC bank capital regulation, which may have tightened credit access particularly for smaller, unlisted firms; and (3) sustained retained-earnings growth among closely held firms, shaped by dividend-versus-wage taxation rules for owners of closely held companies. We now build a model to understand how each one affects the debt-to-equity ratio.

4 Partial-equilibrium Dynamic Firm Model

4.1 Technology and labor demand

Firms use a two-factor technology in capital k and labor n and the gross output q is:

$$q = zk^{\alpha}n^{\eta}$$

We assume the production function has decreasing returns to scale with $\alpha_0 + \eta < 1$.

Labor is a static, frictionless input, meaning that, given the level of productivity z, capital k, and wage rate w, the firm chooses labor n every period to maximize profit. Substituting labor demand gives operating profit net of the wage bill,

$$\tilde{\Pi}(z,k;w) = \tilde{z}(z,w)\,k^{\tilde{\alpha}}, \quad \tilde{\alpha} \equiv \frac{\alpha}{1-\eta} \in (0,1), \qquad \tilde{z}(z,w) \equiv (1-\eta)\,\eta^{\frac{\eta}{1-\eta}}\,w^{-\frac{\eta}{1-\eta}}\,z^{\frac{1}{1-\eta}}$$

4.2 Firm problem

The firm problem is characterized by the following Bellman equation:

$$V(e,z;r,w) = \max_{b,e'} \left\{ d(x,e') + \beta \mathbb{E}[V(e',z')|z] \right\},$$

subject to:

$$d(x,e') = \begin{cases} (x-e')(1-\tau_d), & x > e' \\ 0, & x = e' \\ (x-e')(1+\lambda), & x < e' \end{cases},$$

$$x = (1-\delta)k + \tilde{\Pi}(z,k;w) - (1+r)b - T^f,$$

$$T^f = \tau_c \Big[\tilde{\Pi}(z,k;w) - \delta k - \min\{rb,\ \phi\, \tilde{\Pi}(z,k;w)\} \Big]$$

$$0 \le b \le \theta e, \qquad k = e + b$$

Given parameters $(r, w, \tau_c, \phi, \tau_d, \lambda, \theta, \alpha, \eta, \delta, \beta, \rho, \sigma)$, a stationary partial equilibrium is a value function $V(e, z; r, w)$, policy functions $\{k^*, b^*, e'^*\}(e, z; r, w)$, and a distribution Γ^* such that: (1) V solves the Bellman equation given (r, w); (2) $\{k^*, b^*, e'^*\}$ are the associated optimal policies; (3) Γ^* is invariant under the transition operator $\mathcal{Q}$ induced by e'^* and P. With policy function b^* and stationary distribution Γ^* we define:

$$\mathrm{D/E} \equiv \sum_{(e,z)} \frac{b^*(e,z;w)}{e}\, \Gamma^*(e,z),$$

This maps into the firm-level average reported from the micro data we have.

5 Next Steps

Our next steps are threefold. First, we will calibrate the model to Swedish data. Parameters governing technology (α, η, δ) and the exogenous productivity process (ρ, σ) will be estimated directly from firm-level moments in the Serrano Database, while policy parameters (τ_c, ϕ, τ_d, θ) will follow the legislated schedules described above: the corporate tax rate τ_c and the EBITDA-based interest cap ϕ will track statutory changes since 1998, the dividend tax rate τ_d will follow the rules applicable to closely held firms, and the collateral parameter θ will be disciplined by measures of bank capital requirements. The remaining parameters (β, λ) will be set to match the risk-free rate and the average share of external equity issuance in the data. Second, we will solve the model via value function iteration to obtain the policy functions and the stationary distribution, and validate the calibration against untargeted moments, such as heterogeneity in leverage by firm age and size, as shown in the data. Third, we will use the calibrated model to perform comparative statics that isolate the contribution of each channel to the observed decline in the debt-to-equity ratio. We will feed the model the actual paths of τ_c, ϕ, τ_d, and θ over 1998–2024, and compare the resulting change in the stationary debt-to-equity ratio D/E to the one observed in the data. This decomposition will quantify the share of the decline attributable to corporate and dividend taxation, interest deductibility and bank capital requirements, respectively. As a final step, we will embed the firm problem in a general equilibrium setting in which the interest rate r and wage w are determined endogenously to account for equilibrium effects and assess the aggregate and welfare implications of interest deductibility limits and dividend taxation for business tax policy.