Firm Growth and Financial Choices in Pennsylvania Firms: An Empirical Study about the Pecking Order Theory

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The Wall Street Journal April 28, 2009 reported market concern about sticky leverage. During the credit crunch of 2008, corporate leverage rose at a faster rate than it did at the peak of the economic boom, even as firms worked hard to reduce borrowing. It proved a significant concern for firms where deleveraging should be the top priority. This problem begs the question of how firms make financing choices in the first place. This paper uses Myers' Pecking Order Theory to examine 250 Pennsylvania companies during the period of 1988 – 2007. Our empirical results support Myers' Pecking Order Theory. The study provides additional empirical support for the Pecking Order Theory while avoiding potential problems of varying state-level tax and regulatory environments.

INTRODUCTION

The Wall Street Journal April 28, 2009 reported market concern about sticky leverage[1]. During the credit crunch of 2008, corporate leverage rose at a faster rate than it did at the peak of the economic boom, even as firms worked hard to reduce borrowing. It proved a significant concern for firms where deleveraging should be the top priority. This problem begs the question of how firms make financing choices in the first place. Are firms' financial choices affected by their operating characteristics? The lessons learned from the recent persistent recession have brought more attention to corporate financial policy.

There are two competing approaches in finance literature that explain corporate financial policies: the Miller and Modigliani (1958, 1963) traditional static trade-off model and the Pecking Order Theory of Myers (1984). The Miller and Modigliani models (henceforth MM) postulated that debt level was determined by the tax shield advantages of debt (since interest payments to bondholders are tax deductible and dividends are not). Krause and Litzenberger (1973) extended MM's work to a trade-off between the various benefits of debt financing versus the potential of financial distress (i.e., bankruptcy risk). Both of these studies are basically concerned with the balancing of lower cost debt with bankruptcy costs in a one-period state-preference framework.

MM's and Krause/Litzenberger's static tradeoff models were challenged by the more behavioral-driven Myers' (1984) Pecking Order Theory. The Pecking Order Theory postulated that firms prefer internal financing to external financing, and debt to equity when external financing is required. Myers' Pecking Order Theory behavioral approach to the debt question suggests that the choice for financing new

assets is the result of potential conflicts of interests between investors and managers, drawing on the agency cost work of Jensen and Meckling (1976).

Investors usually do not have complete information about new issues of financial securities, and managers are hesitant to release all information they possess because of competitive pressures and uncertainty of business prospects. Due to this differing (i.e., asymmetrical) information available to managers versus investors, markets (knowing less than managers) tend to negatively penalize equity issues at the expense of stockholders' interests. The Pecking Order Theory provides an explanation of how firms resolve this dilemma by tending to finance investment using internal funds, bank debt, or public bonds prior to issuing new equity.

Overall, prior studies provided mixed empirical support for the Pecking Order Theory. However, our empirical results show that the Pecking Order Model does explains financial choices of firms over time. The database of our study spans a twenty year period that reflects investment decisions as the result of changes in the firm over time versus the changes in financing available from various sources. Further, our study compared firms across different industries, and shows how industrial characteristics influence firms' financial choices and explains differences in debt ratios across industries.

Our results reveal several interesting points that, we believe, enrich the literature of the Pecking Order Theory as well as general debt theory; especially, it explains the behavior approach in corporate financial policy that reflects the rationale behind *sticky leverage* we observed in the economic recession of 2008 and 2009.

First, our empirical results support the Pecking Order Theory that firms' asset growth is positively related to the change of long term debt and the increase of operating cash flows, but is negatively related to equity growth.

Second, the pattern of the financial choices does vary across different industries that we interpret as the impact of operating characteristics. Equity financing seems a last resort for new capital for all the firms in the test. However, consumer manufacturing industries and retail/wholesale industries tend to utilize debt financing when they are seeking new capital for asset expansion while high tech industries and high tech service industries tend to be self-sufficient, using internal operating cash flows to support their growth.

Third, our study shows a trade-off relationship between debt tax shield and non-debt tax shield[2], which explains the tax determinant in capital structure. Moreover, the choices between debt and non-debt tax shields shed light on the static trade-off theory that firms balance the marginal benefit and marginal cost of debt financing to achieve the optimum capital structure.

Fourth, the financial policies of firms are affected by firms' operating characteristics that support the liquidity assumption[3]. A firm's debt ratio is positively related to tangible asset holdings, asset turnover, and firm size in sales; while it is negatively related to the size of intangible assets. The liquidity assumption observed from our study explains that different risk expectations in assets are determinants of corporate financial policy. The statistically significant negative relation between operating cash flow and the debt ratio revealed in our test confirms our hypothesis that the Pecking Order Theory helps explain firms' financial policies. The larger potential of operating cash flows offsets the needs for external debt financing, supporting the idea that firms prefer internal financing to external financing.

The rest of the paper is organized as follows: Section 2 is a literature review. The data sample, variable definitions and test models are explained in Section 3. Section 4 discusses the empirical results from the test. The conclusion summarizes our findings in Section 5. All the tables are reported after Section 5.

LITERATURE REVIEW

Capital structure theory has long been debated in the finance literature. Miller and Modigliani (1958) originally presented a theoretical approach that postulated that debt has no value for firms in a tax-free world. Later, Miller and Modigliani (1963) showed that corporate tax is an important determinant of capital structure. They suggested the goal of a firm's financial policy is to optimize the balance between

its marginal borrowing cost and marginal borrowing benefit. Thus, there is a tradeoff between the marginal benefit from tax shields from additional debt and marginal cost of possible bankruptcy because of increased financial leverage. This approach has become known as the static trade-off theory or the tax shield theory to capital structure.

Krause and Litzenberger (1973) further explain the trade-off between the various benefits of debt financing versus the potential of financial distress. The benefits of debt included the tax shield of interest (leading to lower after-tax cost of debt) and the reduction of free cash flow. Financial distress includes potential costs of bankruptcy or reorganization and the cost of resolving agency problems between stockholders and bondholders.

The tax shield effect has remained a major tenet of modern finance. The tax shield makes normally cheaper debt even cheaper on an after-tax basis relative to equity. Usually the effective after-tax cost of bonds or loans is calculated by multiplying the actual interest rate by (1- tax rate). Thus, debt financing becomes more attractive to a firm with higher marginal corporate tax rate, at least at first glance. Nevertheless, this decreased cost has to be tempered by the increased risk of being unable to pay back either interest or principle in the future because of possible deterioration of future operating cash flow (so-called potential bankruptcy costs).

This led to the concept of a target debt ratio, or optimal capital structure, which reflects the tradeoff between the benefits and costs of debt financing. An optimal capital structure means the lowest possible cost of capital, and the acceptance of the largest number of projects (based on the economic theory of accepting projects as long as the marginal return on new investments is greater than the marginal cost of the capital used). An optimal capital structure is generally felt to be a complicated process achieved only through continuous adjustments in the long term.

Lemmon, Roberts and Zender (2005) reported that only between 5% and 8% of differences in leverage was due to "traditional determinants such as firm characteristics, industry effects, and "macroeconomics factors". Kayhan and Titman (2007) reported that firms' histories greatly influence capital structure and are persistent over time for as long as ten years. However, over these longer time periods capital structures do tend to move toward target debt levels consistent with the static tradeoff theory.

Auerbach (1985) suggested that firms use both short and long term debt to finance investments, possibly taking advantage of differentials between present rates and estimated future rates to minimize interest costs. This suggests that the change in long term debt as well as changes in equity may not occur in the same time period as the change in assets. Our study incorporated this by adding changes in short term debt as a variable.

Long and Malitz (1983) and Myers (1984) explained that a firm's financial choice depends on the type of assets a firm holds. Their studies found a negative correlation between borrowing and investing in intangible assets (growth through innovation) and a positive correlation of borrowing with purchases of tangible assets (long-term fixed asset expansion). Zantout (1997), on the other hand, provided evidence showing that the relationship between a firm's debt ratios and its research and development could induce abnormal stock returns, which in turn suggested the wealth impact to the shareholders is dependent upon the type of assets a firm held.

Titman and Wessels (1988), Harris and Raviv (1991), and Song (2005) reported evidence that a firm's operating characteristics determine its financial policy, and illustrate how the intricacy of asset structure (tangibility and/or intensity), firm size, non-debt shields, expected future cash flows, and market competitive advantage (uniqueness) affect firms' capital structure.

These studies suggest that firms differ in financing as a result of the type of assets they hold (tangible versus intangible), and the unique characteristics of the firm and its industry. In line with the literature reviewed above, we develop proxies for the variables of tangible and intangible assets, non-tax shield measure, operating cash flow and firm size among firms in different industries to explore the explanation of corporate financial policies.

The finding by MacKay and Phillips (2005) supported that the type of industry is an important determinant of firm's financial policy. They stated that, in competitive industries, a firm's capital

structure depended on its capital-labor ratio, the actions of other firms in the industry, and the result of its relative success within the industry. Miao (2005) developed a competitive equilibrium model of industry dynamics and capital structure, and his test results suggest that firms make financing and investment decisions based on idiosyncratic technology shocks. A recent study by Talberg, Winge, Frydenberg and Westgaard (2008) demonstrated significant differences in the capital structure across five industries. They interpret the differences as caused by different business environments and various industries' experiences, and conclude industry characteristics affect a firm's financial choices. Bulan and Yan (2009) found that the Pecking Order Theory is supported when classifying firms into growth and mature stages.

Myers' Pecking Order Theory (1984) has been one of the most influential theories of corporate capital structure. It suggests firms prefer internal financing to external financing, and debt to equity when external financing is required. Shyam-Sunder and Myers (1999) and Fama and French (2002) suggested the leading alternative to the Pecking Order Theory is the static tradeoff model under which firms determine their debt level by the tradeoff between the costs and benefits of debt financing.

Jensen and Meckling (1976) investigated how contracts between owners (shareholders) and agents (managers) work out differences in rewards to owners and agents. They postulated that owners provide stock options to agents in order to entice agents to act more like owners and take risks. Part of the risk facing agents is the type of financing used. The Pecking Order Theory can be interpreted in terms of the information asymmetric hypothesis developed by Fama and Jensen (1983). Firms' static tradeoff and pecking order choice of corporate leverage both help explain managerial behavior. Shyam-Sunder and Myers (1999) postulated that managers have superior and asymmetrical information about the value of the firm, and this information drives the change of a firm's capital structure. Leary and Roberts (2005) demonstrated that approximately 36% of firm behavior can be explained with the pecking order prediction of issuing debt before equity. They then relaxed the assumption of strict financing hierarchy suggested by the Pecking Order Theory and allowed other considerations, such as trade-off, into their model. They then reported almost an 80% predictive power of their combined model.

Jensen (1976) indicated a positive correlation between profitability and leverage if the market for corporate control (competition of mergers and acquisitions) is effective, and a negative correlation if it is ineffective. On the other hand, Myers (2001) revealed it is not always the case that profit-maximizing firms prefer to have high debt interest tax shields. Studies by Baskin (1989) and Rajan and Zingales (1995) showed an inverse relationship between profitability and leverage, and relate their findings to the agency cost hypothesis. Bharath, Pasquariello and Wu (2009) found that information asymmetry does affect capital structure.

In the Myers' Pecking Order Theory firms would use external financing only after exhausting the available cash. Kayhan and Titman (2003) and Shyam-Sunder and Myers (1999) use operating cash flow as a measure of profitability. Kayhan and Titman (2003) looked at longer time periods of cash flows to assess profitability. As used by Jensen (1976), profitability is the net operating cash flow available to firms for new investment. Hence, profitability, as a measure by operating cash flow, reflects a firm's internal ability to support new investment. It is not only the profits reported in the income statement but also the changes of working capital through time. Operating cash flow represents the total resources available and generated internally for financing potential new investment projects.

It is clear from the literature that Pecking Order managerial behavior in financial choice is at least partially explained by the agency problem, asymmetrical information and cost of capital. It is also clear that a firm's operating characteristics and industrial business environment are important determinants of its capital structure. However, the empirical support for the different theories of capital structure is mixed.

DATA SAMPLE, VARIABLE DEFINITIONS AND TEST MODELS

A total of 250 Pennsylvania firms listed in the COMPUSTAT database were used in the sample. Our data sample includes all Pennsylvania listed firms, except for financial and utility firms, during the period of 1988 – 2007. The purpose of including Pennsylvania firms in the study is two-fold: 1) avoid possible bias due to tax and other potential environmental and legal differences between states, and 2) provide

empirical implications for our regional business community. State tax rate differences may be critical and various structural constraints across states present unique problems that may also affect financing decisions. Pennsylvania companies present a large sample of manufacturing and service firms, with both new and old industries, and are presumably in different stages of their product life cycles.

Our study consists of two parts: first, we investigate firms' financial choices as their assets change over time. Secondly we explore if a firm's financial policy is driven by its operating characteristics, tax trade-off, and profitability.

According to the Pecking Order Theory, we hypothesize that a firm's asset growth is driven by the growth of its operating cash flow, and supported by its long-term debt financing. The variable proxies that reflect both internal and external financing choices are the net cash flow from operating activities, short term loans from commercial banks (notes payable), long term debt, and common equity. Thus, a firm's asset growth is the function of operating cash flow growth, long-term debt growth, short-term debt growth, and equity growth. To incorporate distinctive characteristics of assets among different industries, we also add an industrial control variable that classifies the difference between tangible and intangible asset intensive, and between traditional manufacture/retail industries and high/new tech companies.

Thus, the first hypothesis, H1, is expressed as follows:

$$\begin{aligned}\text{Asset Growth} = f\,(&\text{Operating Cash Flow Growth (+), Long-Term Debt Growth (+),}\\ &\text{Short-Term Debt Growth (+), } \textit{and} \text{ Equity Growth (-),}\\ &\text{with an industrial control variable)}\end{aligned} \tag{1}$$

Where

Asset Growth = $[\text{Asset (t=0)}/\text{Asset (t=-3)}]^{1/3} - 1$;
Operating Cash Flow[4] (OCF) Growth = [OCF (t=0) – OCF (t=-1)] / OCF (t=-1);
Long-Term Debt (LTD) Growth = [LTD (t=0) – LTD (t=-1)] / LTD (t=-1);
Short-Term Debt[5] (STD) Growth = [STD (t=0) – STD (t=-1)] / STD (t=-1);
Equity Growth = $[\text{Common Equity(t=0)}/\text{Common Equity(t=-3)}]^{1/3} - 1$.
Industrial control variable = 1 for manufacturing and retail/whole sale companies and the control variable = 0 for pharmaceutical/chemical, electronic equipment, computer software and service companies, etc.

We define the industrial control variable according to Bulan and Yan (2009) when classifying firms into growth (or high tech) versus mature industries. This differentiation of firms using the Product Life Cycle is due in great part to the differing risks in the assets purchased. It is a misnomer to call new technology firms high tech (a better term might be new-tech) since mature industries are also investing in high tech machines and processes. The real difference is the relative risk of their investments, and thus the uncertainty of expected operating revenues. It reflects the difference between an expansion of known products of mature firms and an exploration of new technology. Moreover, it differentiates the intensity between tangible and intangible assets (machines and inventories vs. patents, copyrights and research and development costs) included in the new investment.

We used a 3-year geometric average growth to measure asset growth and common equity growth to match the time span that is reflected in a firm's capital budgeting and financial decision process. Acquiring a new asset usually takes several years to complete, and thus a year to year calculation base does not well capture the changes of assets. A firm's equity position is relatively static from year to year since seasonal offering or stock repurchasing does not occur annually[6]. Thus, relative to a year-to-year base we use for the growth measure of other variables, a 3-year geometric average growth is able to better capture the changes of assets and equity in both direction and magnitude.

We included short term debt based on the work of Auerbach (1985) who suggested that firms use both short and long term debt to finance investments, possibly taking advantage of differentials between present rates and estimated future rates to minimize interest costs.

We believe industrial characteristics influence a firm's financial policy, as supported by Titman and Wessal (1988), Harris and Raviv (1991) and Song (2005). We then further investigate whether there are patterns of financial choices across different industries, as reported by Talberg, Winge, Frydenberg and Westgaard (2008) and MacKay and Phillips (2005). According to the primary SIC reported in the COMPUSTAT database, we divided the 250 firms into seven different groups as follows:

Group A: Consumer products manufacturing companies
Group B: Pharmaceutical and chemical industry companies
Group C: High tech industry companies including electronic equipment and medical equipment, etc.
Group D: Retail and whole sale companies
Group E: Service companies
Group F: Computer software companies
Group G: Other manufacturing firms.

The hypothesis (1) listed above is then tested again according to the group classifications. We anticipated different patterns of financial choices across different industrial groups if industrial characteristics matters.

In the second part of our study, we explore whether a firm's financial policy is explained by its operating characteristics and tax status. As larger firms tend to borrow more, we used both size of operating cash flow and size of sales as the measures for firm size.

Long and Malitz (1983) and Myers (1984) suggest that a firm's financial choice depends on the type of assets a firm holds and firms holding a large portion of tangible assets in its total assets tend to borrow more. Hence, we define asset turnover, tangible asset ratio and intangible asset ratio as proxies to express a firm's asset characteristics.

The trade-off theory by Modigliani and Miller (1963) suggests that firms balance their financial policy between marginal benefit from tax shields and marginal cost of possible bankruptcy because of increased financial leverage. We further looked into the impact of non-debt tax shield on firms' financial choices, and believe non-debt tax shield (depreciation as non-cash expenses but deductable from taxable income) is a counterpoise to debt tax shield (loan interest expenses), and both non-debt and debt tax shields are proper proxies for measuring the benefit for borrowing. Ultimately, firms balance the benefit of tax shield with the cost of possible bankruptcy associated with debt financing. We measure the relative effect of the non-debt tax shield as the ratio of depreciation to pre-tax income.

The following is the mathematical expression of the second hypothesis, H2, of our test. Similar to the test in part one, we incorporate an industrial control variable in our test:

$$\text{Long-Term Debt Ratio} = f(\text{Asset Turnover (+), Tangible Asset Ratio (+), Intangible Asset Ratio (-), Non-Debt Tax Shield (-), Size (OCF) (+), } \textit{and} \text{ Size (Sales) (+), with an industrial control variable}) \quad (2)$$

Where:

Long-Term Debt Ratio = Long-Term Liabilities / Total Assets
Asset Turnover = Sales / Total Assets
Tangible Asset Ratio = (Inventory + Fixed Asset) / Total Assets
Intangible Asset Ratio = R&D Expenses / Total Assets
Non-Debt Tax Shield = Depreciation / Taxable Income
Size (OCF) = log (OCF)
Size (Sales) = log (Sales)
Industrial control variable = 1 for manufacturing and retail/whole sale companies while the control variable = 0 for pharmaceutical/chemical, electronic equipment, computer software and service companies, etc.

We expected Asset Turnover, Tangible Asset Ratio, Size (OCF) and Size (Sales) to have a positive relationship with the Long-Term Debt Ratio while negative relationships are expected between the Long-Term Debt Ratio and Intangible Asset Ratio, and Long-Term Debt Ratio and Non-Debt Tax Shield.

EMPIRICAL RESULTS

Table 1 reports the regression results that refer to the first hypothesis. The first four linear regressions examine the individual relations between asset growth rate and the hypothesized independent variable(s) that are defined as the financial choices in the test, with an industrial control variable. The last multiple linear regression includes all the aforementioned variables (as is reported in the last panel of the table).

As anticipated, the results are consistent with our expectation. Asset growth is positively related to long term debt growth and operating cash flow growth, and both are statistically significant. Moreover, the magnitudes of the coefficients are different between long term debt growth and operating cash flow growth, suggesting a much large impact of the growth in operating cash flow on the asset growth than the growth of long term debt. The short term debt growth (Notes Payable) seems not to be a significant contributor to the asset growth, as the coefficient is positive but statistically indifferent from zero. Interestingly, it shows a statistically significant negative relation between asset growth and common equity growth, indicating the proportion of equity in firms' capital structure is declining as firms expand their assets. The results shown in the multiple linear regressions are clearly consistent, in both sign and statistical significance at 1% level, with the results reported in the simple linear regressions.

The coefficients of the industrial control variable for all the regression models are not statistically significant, indicating no statistical distinction toward the variable tested across different industries as defined. Thus, the results in Table 1 support the hypothesis (1) that firms' asset growth is driven by the growth of operating cash flow and supported by its long term debt financing. Common equity is the last resort for external financing, and our result indicates firms' equity proportion in the capital structure is declining as firms expand their assets. The empirical results reported in our test, based on Pennsylvania companies, are supportive of the Pecking Order Theory. Firms prefer internal financing to external financing, and debt to equity when external financing is required.

Table 2 reports the empirical test results that examine the different patterns of financial choices across different industrial groups[7]. Panel A of Table 2 presents the regression results by equations while Panel B of Table 2 summarizes the regression results and how they are aligned with the hypothesis tested. Interestingly, none of the groups demonstrate the *identical* pattern as shown in Table 1. However, the individual patterns by industries together manifest the general pattern reported in Table 1.

As Panel B of Table 2 summarizes, Group A, B, and D (consumer products manufacturing companies, pharmaceutical and chemical industry companies, and retail/whole sale companies) show a significantly positive relationship between asset growth and long term debt growth; while no relationship between long term debt growth and asset growth for group C, E, F, and G (high tech industry companies including electronic equipment and medical equipment, service companies, computer software companies, and other manufacturing companies).

Group B, C, and F (Pharmaceutical and chemical industry, electronic equipment and software) show a statistically significant positive relation between asset growth and operating cash flow growth; while the others are positive but not statistically significant. A significant negative relationship between asset growth and common equity growth is only presented for Group A and B (consumer products and pharmaceutical) while the others are not statistically significant. Moreover, there is a positive and significant relationship between asset growth and short term borrowing for Group B and E (pharmaceuticals and service) while all others are positive (Group G, other manufacture, is negative) but not statistically significant.

TABEL 1
ASSET GROWTH VS. FINANCIAL CHOICE FOR ENTIRE SAMPLE

Asset Growth vs. Long-Term Debt Growth: $y_{i,t} = \alpha + \beta x_{1i,t} + \beta_d x_{di,t} + \varepsilon_{i,t}$						
	α	β	β_d			
Coefficient	13.546	0.15135	4.217		*Adj R-Sq*	0.0254
T-Value	4.04	**4.09**	0.81		*F-Value*	**8.93**
P-Value	<0.0001	**<0.0001**	0.4186		*(P-Value)*	**<0.0002**
Asset Growth vs. Short-Term Debt Growth: $y_{i,t} = \alpha + \beta x_{2i,t} + \beta_d x_{di,t} + \varepsilon_{i,t}$						
	α	β	β_d			
Coefficient	13.552	0.0627	5.721		*Adj R-Sq*	-0.0012
T-Value	4.31	0.38	1.09		*F-Value*	0.64
P-Value	<0.0001	0.7077	0.2783		*(P-Value)*	0.5256
Asset Growth vs. Operating Cash Flow Growth: $y_{i,t} = \alpha + \beta x_{3i,t} + \beta_d x_{di,t} + \varepsilon_{i,t}$						
	α	β	β_d			
Coefficient	11.603	16.54	5.256		*Adj R-Sq*	0.0197
T-Value	3.69	**3.61**	1.01		*F-Value*	**7.12**
P-Value	<0.0002	**0.0003**	0.3139		*(P-Value)*	**0.0009**
Asset Growth vs. Equity Growth Rate: $y_{i,t} = \alpha + \beta x_{4i,t} + \beta_d x_{di,t} + \varepsilon_{i,t}$						
	α	β	β_d			
Coefficient	12.453	-0.0143	6.831		*Adj R-Sq*	0.0095
T-Value	3.96	**-2.58**	1.3		*F-Value*	**3.9**
P-Value	<0.0001	**0.0102**	0.1946		*(P-Value)*	**0.0207**
Multiple linear regression with all independent variables:						
$y_{i,t} = \alpha + \beta_1 x_{1i,t} + \beta_2 x_{2i,t} + \beta_3 x_{3i,t} + \beta_4 x_{4i,t} + \beta_d x_{di,t} + e_{i,t}$						
	α	β_1	β_2	β_3	β_4	β_d
Coefficient	10.398	0.138	0.0754	14.413	-0.0138	5.251
T-Value	3.3	**3.74**	0.46	**3.17**	**-2.54**	1.01
P-Value	0.0001	**0.0002**	0.644	**0.0016**	**0.0113**	0.311
					Adj R-Sq	0.0475
					F-Value	**7.07**
					(P-Value)	**<0.0001**

The regression models presented above is based on the empirical model (1) at page 4. The variables in the regression models are defined as follows:

$y_{i,t}$ is a 3-year geometric average asset growth rate for firm i at time t;
$x_{1i,t}$ is an annual long term debt growth rate for firm i at time t;
$x_{2i,t}$ is an annual short term debt growth rate for firm i at time t;
$x_{3i,t}$ is annual operating cash flow growth rate for firm i at time t; and
$x_{4i,t}$ is a 3-year geometirc average common equity growth rate for firm i at time t.
$x_{di,t}$ is the industrial control variable for firm i at time t.

TABLE 2, PANEL A:
ASSET GROWTH VS. FINANCIAL CHOICES BY INDUSTRIAL GROUPS

$y_{i,t} = \alpha + \beta_1 x_{1i,t} + \beta_2 x_{2i,t} + \beta_3 x_{3i,t} + \beta_4 x_{4i,t} + \varepsilon_{i,t}$						
Group A: Comsumer Products Manufacturing Companies (n = 11)						
	α	β_1	β_2	β_3	β_4	F-Value
Coefficient	3.689	7.572	0.411	0.581	-0.0789	
T-Value	2.32	**3.59**	0.94	0.4	**-7.72**	**26.94**
P-Value	0.0238	**0.0006**	0.3488	0.6935	**<0.0001**	**<0.0001**
Group B: Pharmaceutical and Chemical Industry Companies (n = 31)						
	α	β_1	β_2	β_3	β_4	F-Value
Coefficient	8.788	4.041	0.089	26.038	-0.2544	
T-Value	6.17	**2.23**	**1.99**	**3.96**	**-8.89**	**23.94**
P-Value	<0.0001	**0.0281**	**0.0495**	**0.0001**	**<0.0001**	**<0.0001**
Group C: Electronic and Medical Equipment Companies (n = 34)						
	α	β_1	β_2	β_3	β_4	F-Value
Coefficient	13.261	1.434	0.0637	25.957	0.0378	
T-Value	6.55	1.61	0.43	**4.79**	1.05	**10.57**
P-Value	<0.0001	0.109	0.6683	**<0.0001**	0.2948	**<0.0001**
Group D: Retail and Whole Sale Companies (n = 24)						
	α	β_1	β_2	β_3	β_4	F-Value
Coefficient	14.718	0.1675	0.1405	4.843	0.0813	
T-Value	5.34	**11.04**	0.68	0.89	1.17	**38.88**
P-Value	<0.0001	**<0.0001**	0.4989	0.3774	0.2453	**<0.0001**
Group E: Service Companies (n = 58)						
	α	β_1	β_2	β_3	β_4	F-Value
Coefficient	6.841	-19.796	9.433	10.589	0.0524	
T-Value	2.56	-1.39	**2.28**	1.56	0.61	**4.01**
P-Value	0.0337	0.2005	**0.0517**	0.1576	0.5585	**0.045**
Group F: Computer Software Companies (n = 44)						
	α	β_1	β_2	β_3	β_4	F-Value
Coefficient	6.614	-0.229	0.256	82.968	-0.009	
T-Value	0.81	-0.82	0.43	**5.04**	-1.62	**7.45**
P-Value	0.4232	0.4153	0.668	**<0.0001**	0.1095	**<0.0001**
Group G: Other Manufacture Companies (n = 48)						
	α	β_1	β_2	β_3	β_4	F-Value
Coefficient	17.684	0.029	-0.965	14.993	0.039	
T-Value	1.8	0.15	-0.32	0.81	0.34	0.23
P-Value	0.074	0.878	0.749	0.422	0.736	0.920

The variables in the regression model are defined as:

$y_{i,t}$ is a 3-year geometric average asset growth rate for firm i at time t;

$x_{1i,t}$ is an annual long term debt growth rate for firm i at time t;

$x_{2i,t}$ is an annual short term debt growth rate for firm i at time t;

$x_{3i,t}$ is annual operating cash flow growth rate for firm i at time t; and

$x_{4i,t}$ is a 3-year geometirc average common equity growth rate for firm i at time t.

TABLE 2, PANEL B:
SUMMARY OF MULTIPLE LINEAR REGRESSIONS BY GROUP

Group	Long-Term Debt Growth	Short-Term Debt Growth	OCF Growth	Common Equity Growth
A	+***	+	+	-***
B	+**	+**	+***	-***
C	+	+	+***	+
D	+***	+	+	+
E	-	+**	+	+
F	-	+	+***	-
G	+	-	+	+

* is 10% statistical significance; ** is 5% statistical significance; and *** is 1% or less statistical significance.

* Group A; Consumer products manufacturing companies
Group B: Pharmaceutical and chemical industry companies
Group C: High tech industry companies including electronic equipment and medical equipment, etc.
Group D: Retail and whole sale companies
Group E: Service companies
Group F: Computer software companies
Group G: Other manufacturing firms.

The results presented in Table 2 (see above) explain that the patterns of the financial choices vary across industries; however, the general preference is as Pecking Order Theory would predict, and the coefficients are statistically significant at the 5% level or better. Equity financing remains a last resort for new capital for the firms in the test (the coefficients for the industry groups are negative or insignificant). Nevertheless, consumer manufacturing industries and retail/wholesale industries tend to use debt financing when they are seeking new capital for asset expansion. Moreover, high tech industries that possess more intangible assets (electronic and medical equipment, pharmaceutical and chemistry, and computer software) look mainly to internal operating cash flows to support their business expansion. The results in Table 2 indicate that the individual industrial characteristics do influence firm's financial choices. Firms with larger holding of tangible assets and stable business revenues tend to use external financing (debt) to support their asset growth while firms in the high tech industries that are holding larger position of intangible assets with relatively larger variability in revenue rely on internal financing (net operating cash flow).

Combining these different industry patterns, it is clear that the results in Table 2 are in agreement with the general pattern reported in Table 1. There is a positive relationship between asset growth and long term debt growth/operating cash flow growth while a negative relation appears between asset growth and common equity growth. There is also a positive relation between asset growth and short term borrowing for group B (pharmaceutical and chemistry) and Group E (service). Our results, again, confirm the Pecking Order Theory explains firms' financial choices.

TABLE 3
LONG TERM DEBT VS. OPERATING CHARACTERISTICS[8]

Dependent Variable: Long-Term Debt Ratio			
Independent Variable	Equation 1	Equation 2	Equation 3
Intercept			
Coefficient	0.1189	0.01485	0.0229
T-Value	4.72	0.48	0.62
P-Value	<0.0001	0.6342	0.537
Asset Turnover			
Coefficient	0.0222		-0.103
T-Value	**1.77**		-0.77
P-Value	**0.0776**		0.4414
Intangible Asset Ratio			
Coefficient	-0.2998		-0.2728
T-Value	**-2.21**		**-1.97**
P-Value	**0.0277**		**0.0496**
Non Debt Tax Shield			
Coefficient	-0.0031		-0.0031
T-Value	**-1.83**		**-1.91**
P-Value	**0.068**		**0.0561**
Tangible Asset Ratio			
Coefficient	0.144		0.146
T-Value	**3.3**		**3.36**
P-Value	**0.001**		**0.0008**
Size (Operating Cash Flow)			
Coefficient		-0.0567	-0.0571
T-Value		**-6.77**	**-6.36**
P-Value		**<0.0001**	**<0.0001**
Size (Sales)			
Coefficient		0.0635	0.057
T-Value		**6.94**	**5.69**
P-Value		**<0.0001**	**<0.0001**
Industry Control Variable			
Coefficient	0.0215	0.01853	0.0022
T-Value	1.21	1.11	0.12
P-Value	0.2249	0.2681	0.9017
Adj R-Sq	0.0384	0.0524	0.0709
F-Value	**9.8**	**21.3**	**13.02**
(P-Value)	**<0.0001**	**<0.0001**	**<0.0001**

Equation 1: $y_{i,t} = \alpha + \beta_1 x_{1\,i,t} + \beta_2 x_{2\,i,t} + \beta_3 x_{3\,i,t} + \beta_4 x_{4i,t} + \beta_d x_{di,t} + \varepsilon_{I,t}$
where: $y_{i,t}$ *is long term debt ratio for firm i at time t;*

$x_{1i,t}$ *is asset turnover for firm i at time t;*
$x_{2i,t}$ *is intangible asset ratio for firm i at time t;*
$x_{3i,t}$ *is non-debt tax shield for firm i at time t;*
$x_{4i,t}$ *is tangible asset ratio for firm i at time t.*
$x_{di,t}$ *is the industrial control variable for firm i at time t.*

Equation 2: $y_{i,t} = \alpha + \beta_5 x_{5\,i,t} + \beta_6 x_{6\,i,t} + \beta_d x_{di,t} + \varepsilon_{1,t}$
where: $y_{i,t}$ *is long term debt ratio for firm i at time t;*
$x_{5i,t}$ *is size in operating cash flow for firm i at time t;*
$x_{6i,t}$ *is size in sales for firm i at time t.*
$x_{di,t}$ *is the industrial control variable for firm i at time t.*

Equation 3 is the combination for Equation 1 and Equation 2.

The test results for the second hypothesis, whether firms' operating characteristics explain their financial choices, are reported in Table 3 (see above). As is shown in the table, the firm's long term debt ratio (dependent variable) is explained by firm's asset turnover, intangible asset ratio, non-debt tax shield, tangible asset ratio, size in operating cash flow, and size in sales (independent variables), with a control variable of industries.

As shown by the *P-Value* reported in the table, all the coefficients are statistically significant, and again the coefficients of the industrial control variable for all the regressions reported at the table are not statistically significant. It reveals that long term debt is positively related to asset turnover, tangible asset ratio, and size of sales while there are negative relationships between long term debt and intangible asset and size of operating cash flow.

The results provide strong evidence to support the hypothesis (2) and it can be summarized as follows:

1) Larger firms and firms holding a larger portion of tangible assets tend to borrow more, and this finding is in line with the liquidity assumption in the finance literature;
2) The negative relationship between long term debt ratio and non-debt tax shield indicates a tradeoff between debt tax shields and non-debt tax shields. This negative relationship shows non-debt tax shield plays as a counterpoise relative to debt tax shield and reaffirms the role of tax shield in firms' financial choices. Firms trade off debt tax shield and non-debt tax shield in determining their financial policy to optimize the balance between borrowing cost and borrowing benefit; and
3) A negative relationship exists between the long term debt ratio and the size of net cash flow from operating activities. This is consistent with the studies of Baskin (1989) and Rajan and Zingales (1995) that show a negative relation between profitability and financial leverage. Rajan and Zingales explained the negative relation between profitability and financial leverage by the agency cost assumption. We bring this into alignment with the pecking order hypothesis. Firms that have a larger capacity to generate sizable *net* operating cash flows can better support their asset growth and hence are less likely to use external debt financing. Firms tend to prefer internal financing to external financing, and debt to equity when external financing is required.

CONCLUSION

We use the Pecking Order Theory to examine 250 Pennsylvania companies during the period of 1988 to 2007. Our empirical results can be summarized as follows: First, firms' asset growth is positively related to the change of long term debt and the increase of operating cash flow, but there is a negative relationship between asset growth and equity growth. Further, the patterns of the financial choices do vary across different industries. Equity financing remains a last resort for new capital for all the firms/industrial groups in the test; however, consumer manufacturing industries and retail/wholesale industries tend to go to debt financing when they are seeking new capital for asset expansion while high

tech industries and high tech service industries look mainly to internal operating cash flows to support their growth.

Second, our results confirm that the financial choices are affected by firms' operating characteristics. Firms' debt ratio is positively affected by their tangible assets, and firms with larger size tend to borrow more. Firms' financial leverage tends to be negatively related to the holding of intangible assets and non-debt tax shield, reflecting that liquidity and trade-off assumptions influence firms' financial decision. The tradeoff relation between debt tax shield and non-debt tax shield shown by our empirical test illustrates that firms balance the marginal benefit and marginal cost of debt financing to achieve its optimal debt level. The statistically significant negative relation between profitability and financial leverage revealed in our test supports the Pecking Order Theory that the larger the operating earnings, the less the need for external debt financing. It is clear that firms prefer internal financing to external financing, and debt to equity financing.

While our empirical study intends to interpret firms' financial policy with their operating characteristics, dividend policy is not explicitly included. Baskin (1989) estimated the effect of dividends on after-tax income (i.e., the effect on the level of the contributions to retained earnings for a particular period) while our study used the operating cash flow that includes dividends if a firm has an active dividend policy. Dividend policy, nevertheless, has an influence on firm's financial policy since the amount of dividends a company pays reduces the operating cash flow available for new assets. Other things remaining constant, an increase in dividends will hence increase the need for external financing. It would be meaningful to further explore the impact of dividend policy on firms' financial leverage, and that presents an opportunity for future study.

Overall, our results indicate that while the Pecking Order Theory shows consensus in practice, there are different patterns across different industries. A firm's financial choice is driven by its operating characteristics of the firm and the industry. Asset tangibility, operating profitability, operating/firm size and tax structure greatly affect a firm's financial policy. Those determinants reveal the rationale of sound financial policy and support the behavior approach in corporate capital structure.

ENDNOTES

1. The Wall Street Journal article titled *Sticky Leverage*, in the column of Heard on the Street, April 28, 2009 reported at the end of 2008, U.S. nonfinancial companies had average net debt equivalent to 3.5 times earnings before tax, depreciation and amortization, up from 3.1 time at the end of the third quarter of 2007, according to Citigroup. Yet during the credit boom, when debt was freely available, leverage only reached 2.9 times in mid-2007, having risen from 2.5 times over the previous 18 months.

2. Interest costs are tax deductible and hence reduce the tax amount due, which in effect is a subsidy to the firm for using debt. This is often referred to a tax shield, protecting the firm from higher taxes. Depreciation represents recovery of a previous outlay of funds for the investment in fixed assets, and it is non-cash operating expense but also tax deductible. Thus, depreciation reduces a firm's tax bill and provides a non-debt tax shield.

3. A tangible asset, say a lathe, is far more liquid in bankruptcy than intangible assets like the investment in research and development. Hence, firms with more tangible assets are more liquid than firms with more intangible assets.

4. Compustat database defines Operating Cash Flow as Operating Activities – Net Cash Flow (OANCF) as a component of the Statement of Cash Flows. This includes Income before extraordinary Items (which include dividends), Depreciation and Amortization, extraordinary items, sales of PPE, changes in current assets and current liabilities. Dividends reduce the Investing Activities - Net Cash flow. Income taxes and Interest paid are included in Direct Operating Activities.

5. The proxy for Short-Term Debt is Notes Payable in the balance sheet since it is interest-carrying short term loans and changes in Accounts Payable and other Current Liabilities are captured in Operating Cash Flow.

6. Looking at the change in equity year to year is more likely to result in a 0% change ratio that does not capture the variation of common stock.

7. A table of descriptive statistics of the variables as proxies of the financial choices and operating characteristics in the test for the industry groups A to G is attached at the appendix.

8. The results from the simple linear regressions between long-term debt ratio and the proxies of operating characteristics are consistent in statistical significance with the results of the multiple linear regressions presented in the table.

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APPENDIX

TABLE 4
DESCRIPTIVE STATISTICS OF VARIABLES

Group A: Consumer Products Manufacturing Companies (n = 11)				
Variables	Mean	STD	Min	Max
Asset Growth Rate	10.175	20.206	-30.091	140.233
Long-Term Debt Growth	0.466	1.676	-1.000	11.938
Short-Term Debt Growth	0.604	3.229	1.000	27.530
Operating CF Growth	0.142	0.829	-0.852	8.161
Equity Growth Rate	-5.084	120.774	-1160.900	234.353
Asset Turnover Ratio	1.351	0.530	0.417	3.850
Intangible Asset Ratio	0.009	0.005	0.003	0.023
Non Debt Tax Shield	0.012	2.318	-16.520	8.818
Tangible Asset Ratio	0.554	0.212	0.125	0.937
Size (Operating CF)	3.745	2.256	-4.135	7.130
Size (Size)	6.204	1.797	0.589	9.217
Group B: Pharmaceutical and Chemical Companies (n = 31)				
Variables	Mean	STD	Min	Max
Asset Growth Rate	62.661	308.585	-51.006	4004.120
Long-Term Debt Growth	2.886	27.803	-1.000	342.476
Short-Term Debt Growth	2.777	25.805	-1.000	302.177
Operating CF Growth	0.122	0.293	-0.518	1.929
Equity Growth Rate	-35.253	103.581	-924.144	234.393
Asset Turnover Ratio	0.598	0.512	0.000	2.530
Intangible Asset Ratio	0.343	1.647	0.000	29.804
Non Debt Tax Shield	0.189	1.724	-23.333	11.212
Tangible Asset Ratio	0.324	0.245	0.000	0.888
Size (Operating CF)	4.613	1.679	-0.791	7.311
Size (Size)	4.573	3.334	-4.510	9.328

Table 4: Continue

Group C: Electronic and Medical Equipment Companies (n = 34)				
Variables	Mean	STD	Min	Max
Asset Growth Rate	25.371	74.174	-81.091	922.424
Long-Term Debt Growth	3.867	60.668	-1.000	1153.500
Short-Term Debt Growth	1.818	12.013	-1.000	143.090
Operating CF Growth	0.149	0.556	-0.641	6.338
Equity Growth Rate	-42.866	297.129	-3848.930	127.581
Asset Turnover Ratio	0.736	0.473	0.000	2.666
Intangible Asset Ratio	0.160	0.685	0.000	11.278
Non Debt Tax Shield	0.168	2.995	-31.446	25.357
Tangible Asset Ratio	0.394	0.217	0.000	1.000
Size (Operating CF)	3.328	2.114	-6.908	9.082
Size (Size)	4.345	2.708	-6.908	10.338
Group D: Retail and Whole Sales Companies (n = 24)				
Variables	Mean	STD	Min	Max
Asset Growth Rate	23.928	46.233	-42.241	492.677
Long-Term Debt Growth	7.730	98.755	-1.000	1533.570
Short-Term Debt Growth	2.617	12.832	-1.000	103.951
Operating CF Growth	0.189	0.497	-0.928	2.572
Equity Growth Rate	1.461	48.124	-385.341	127.338
Asset Turnover Ratio	1.931	0.927	0.067	6.045
Intangible Asset Ratio	0.007	0.026	0.000	0.225
Non Debt Tax Shield	0.520	3.595	-29.199	32.188
Tangible Asset Ratio	0.527	0.213	0.019	0.966
Size (Operating CF)	3.687	1.970	-3.440	7.331
Size (Size)	6.459	2.050	-0.008	11.099

Table 4: Continue

Group E: Service Companies (n = 58)				
Variables	Mean	STD	Min	Max
Asset Growth Rate	11.110	39.338	-55.846	216.795
Long-Term Debt Growth	0.976	6.257	-1.000	42.503
Short-Term Debt Growth	0.655	2.116	-1.000	7.920
Operating CF Growth	0.086	0.602	-0.746	3.334
Equity Growth Rate	-15.449	62.905	-255.765	49.187
Asset Turnover Ratio	0.720	0.756	0.046	3.748
Intangible Asset Ratio	0.257	0.238	0.000	1.223
Non Debt Tax Shield	-0.025	0.446	-2.134	0.850
Tangible Asset Ratio	0.115	0.127	0.008	0.504
Size (Operating CF)	5.117	2.384	-2.198	7.811
Size (Size)	4.910	3.844	-3.219	9.958
Group F: Computer Software Companies (n = 44)				
Variables	Mean	STD	Min	Max
Asset Growth Rate	59.787	235.658	-69.471	2724.980
Long-Term Debt Growth	14.483	139.813	-1.000	1999.370
Short-Term Debt Growth	9.289	67.549	-1.000	708.333
Operating CF Growth	0.188	0.650	-0.726	5.049
Equity Growth Rate	-130.568	700.802	-7098.860	656.700
Asset Turnover Ratio	1.332	0.962	0.000	6.506
Intangible Asset Ratio	0.164	0.310	0.000	3.164
Non Debt Tax Shield	0.293	3.734	-31.323	64.952
Tangible Asset Ratio	0.236	0.192	0.000	0.863
Size (Operating CF)	2.659	2.379	-4.962	7.201
Size (Size)	4.113	2.772	-6.908	9.216

Table 4: Continue

Group G: Other Manufacturing Companies (n = 84)					
Variables		Mean	STD	Min	Max
Asset Growth Rate		18.058	68.380	-100.000	1299.890
Long-Term Debt Growth		53.790	1089.110	-1.000	24665.670
Short-Term Debt Growth		0.626	3.331	-1.000	34.089
Operating CF Growth		0.164	0.575	-0.862	4.844
Equity Growth Rate		-44.946	443.801	-5328.330	172.295
Asset Turnover Ratio		1.055	0.672	0.000	4.716
Intangible Asset Ratio		0.030	0.043	0.000	0.333
Non Debt Tax Shield		-0.447	15.614	-360.000	75.214
Tangible Asset Ratio		0.532	0.194	0.000	1.000
Size (Operating CF)		3.347	2.010	-3.194	7.769
Size (Size)		5.558	2.222	-3.912	10.642