Firm Maturity and the Pecking Order Theory

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Abstract

We identify firms according to two life cycle stages, namely growth and maturity, and test the pecking order theory of financing. We find a strong maturity effect, i.e. the pecking order theory describes the financing behavior of mature firms better than growth firms. Our findings show that firm maturity is an alternative proxy for debt capacity. In particular, mature firms are older, more stable and highly profitable with good credit histories. Thus, they naturally have greater debt capacity. After controlling for firm maturity, the pecking order theory describes the financing behavior of firms fairly well.

Key Words: Life Cycle, Pecking Order, Capital Structure
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I. Introduction

There has been recent interest in a firm's life cycle in the finance literature. Firm life cycle stages are distinct and identifiable phases that result from fundamental changes in key internal and/or external factors (Dickinson (2008)). Diamond (1991) suggests that debt financing through intermediaries has a life cycle of its own. On the issue of dividends, DeAngelo, DeAngelo and Stulz (2005) and Bulan, Subramanian and Tanlu (2007) have found that a firm's propensity to pay dividends is a function of which stage a firm is in its life cycle. In particular, they argue that firms that pay dividends are mature firms.

Life cycle theory is particularly pertinent to firms' financing decisions. Fama and French (2005) point out that the profitability and growth characteristics of firms are central to their financing decisions, since valuable growth opportunities indicate how much investment a firm may need and profitability reflects to what extent these investment needs can be funded internally. Life cycle stages encompass variation in a firm's level of knowledge acquisition (about industry structure and cost structure), level of initial investment and re-investment of capital, and adaptability to the competitive environment (Gort and Klepper (1982)). Accordingly, partitioning firms according to their life cycle stage predictably provides differential information about what determines profitability and growth. Dickinson (2008) demonstrates that firm life cycle affects profitability and growth, both cross-sectionally and over time. Anthony and Ramesh (1992) find empirically that stock market reactions to growth and capital expenditure are functions of the life cycle stage. In a direct study of financial life cycle of small private businesses, Berger and Udell (1998) find that firms rely more on debt financing as firms grow from "infancy" to "adolescence", but use less debt as firms become "middle-aged" and "old".

They also report that on average, "smaller" firms have more equity, most of which comes from principal owners; and "larger" firms have more debt through bank loans and trade credit.

This paper complements Berger and Udell's work by investigating the financial life cycle of public firms. In this paper, we study two major life cycle stages, namely, growth stage and maturity stage. We then focus on the pecking order theory of financing proposed by Myers (1984) and Myers and Maljuf (1984). This theory is based on asymmetric information between investors and firm managers. Due to the valuation discount that less-informed investors apply to newly issued securities, firms resort to internal funds first, then debt and equity last to satisfy their financing needs.

The empirical evidence for the pecking order theory has been mixed. Shyam-Sunder and Myers (1999) propose a direct test of the pecking order and find strong support for the theory among a sample of large firms. Frank and Goyal (2003) argue that the Shyam-Sunder and Myers test rejects the pecking order for small public firms. They conclude that this finding is in contrast to the theory since small firms are thought to suffer most from asymmetric information problems and hence, should be the ones following the pecking order. More recent work by Lemmon and Zender (in print) and Agca and Mozumdar (2007) have shown that the Shyam-Sunder and Myers test does not account for a firm's debt capacity, a constraint that is particularly binding for small firms. Once debt capacity constraints are accounted for, they find that the pecking order performs well even for small firms. Leary and Roberts (2010) use a different approach and estimate a two-rung empirical model. They find the pecking order performs poorly for a broad sample of firms.

Using a life cycle stage classification, this paper differentiates between a size effect and a maturity effect. Although there is a positive correlation between firm size and maturity, it is

important to make the distinction between large and mature as well as young and small. The size effect was first documented by Frank and Goyal (2003), who find that large firms fit the pecking order theory better than small firms. We find that this size effect only weakly exists among firms in their growth stage. For firms in their maturity stage, this size effect is not significant. When controlling for a firm's debt capacity, this size effect disappears altogether for firms in either stage, while a maturity effect remains. That is, more mature firms fit the pecking order better than younger firms after firm size is controlled for. Overall, we find that the pecking order theory describes the financing patterns of mature firms better than young firms.

Using a logit regression, we find that a high (or low) probability of being a mature firm is highly correlated with the high (or low) probability of having publicly rated debt outstanding. The latter is used as a proxy for debt capacity in Lemmon and Zender (in print). Our findings show that firm maturity is an alternative proxy for debt capacity that captures more than just access to public debt markets. In particular, mature firms are older, more stable and highly profitable with good credit histories. Thus, they naturally have greater debt capacity than growth firms. Their good credit histories also allow them to borrow significantly from private financial intermediaries, which in some cases may preclude the need to access public debt markets. In fact, we find that mature firms have ample unused debt capacity even when they have relatively high leverage. This indicates that firm maturity is arguably a better proxy for debt capacity than access to public debt. In sum, after controlling for firm maturity, the pecking order theory describes the financing behavior of firms, large or small, fairly well.

This paper is organized as follows: Section II describes the data and sample selection. In Section III, we present our results. Robustness checks are performed in Section IV, while Section V concludes.

II. Data

We construct two samples of firms according to their life cycle stage: firms in their growth stage and firms in their maturity stage. Life cycle stages are naturally linked to firm age. Age is an important factor, but it is not the sole determinant of a firm's life cycle stage. Firm life cycles vary widely across industries (Black (1998)) and within the same industry. Several studies in management and accounting show that firm life cycle is NOT a linear function of firm age and life cycle stages are by no means necessarily connected to each other in a deterministic sequence. Miller and Friesen (1984) identify five life-cycle stages: birth, growth, maturity, revival and decline. They find that firms over lengthy periods often fail to exhibit the common life cycle progression extending from birth to decline. That is, the maturity stage may be followed by decline, revival, or even growth; revival may precede or follow decline and so on. Liu (2008) classifies firms into five life cycle stages using multivariate ranking procedures and finds that about 16% of mature firms move back to growth stages from the current year to the next.

Motivated by these studies, we focus on a snapshot of a firm's history where growth and maturity is more easily determined. We define the growth stage to be the first six-year period after the year of the firm's IPO and the maturity stage to be a consecutive six-year period following a dividend initiation where a firm maintains positive dividends. Miller and Friesen (1984) find that, on average, each stage lasts for six years. Evans (1987) defines firms six years old or younger as young firms and firms seven years or older as old firms. Accordingly, we set the length of each stage to be 6 years. We find similar results using 4, 8, and 10 years for the stage length. Following standard practice, we exclude financial firms (SIC codes 6000-6999) and regulated utilities (SIC codes 4900-4999) and consider only firms that have securities with CRSP share codes 10 or 11.

A. Growth Stage

Our sample is constructed from the universe of firms in the CRSP-COMPUSTAT merged database over the 1970- 2008 period. We define the growth stage to be the first six-year period after the year of the firm's IPO. This definition may not necessarily apply to some firms from a mechanical point of view. For example, Metro-Goldwyn-Mayer Inc, a movie production firm, was founded in 1930 and went public also in 1997. It is "old" enough and mature in many respects. However, the IPO is itself an important financing decision that a firm has to make and in many cases, indicates a significant change in the firm's development over its life cycle. Here, we treat the IPO as an important turning point in a firm's history and as the starting point of the growth stage.

We use flow of funds data to test the pecking order theory. IPO dates are provided by Jay Ritter from 1970 to 1974. IPO dates between 1975 and 2002 are obtained from Loughran and Ritter (2008). When the IPO date is not available, we use the earliest date for which we observe a non-zero/non-missing stock price on the CRSP monthly tapes.

B. Maturity stage

DeAngelo, DeAngelo and Stulz (2006), among others, have found that a firm's propensity to pay dividends is a function of which stage a firm is in its life cycle. Bulan, Subramanian and Tanlu (2007) find that firms that initiate dividends are older and highly profitable, have fewer growth opportunities and are less risky, i.e. mature. Based on this body of work, we identify firms in their maturity stage by their dividend initiation history. We first use the entire Compustat industrial annual database to identify consecutive six-year periods that a firm has positive dividends. We require that such a period should immediately follow at least a year with

zero or missing dividends. This is similar to Baker and Wurgler's (2004) definition of dividend initiations. If a firm issues dividends during the first six years after IPO, we exclude this firm from the sample altogether, i.e. a firm cannot be in the growth and maturity stages at the same time.

C. Firm Characteristics and Comparison of Growth and Maturity Stages

We construct the following variables for our analysis: book leverage, market leverage, net equity issued, net debt issued, financing deficit, tangibility, profitability, retained earnings-to-total equity ratio, R&D, and capital expenditures. We also measure a firm's age to be the number of years from birth, where birth is the earliest year we have a non-missing observation from three datasets: Jay Ritter's incorporation dataset, Compustat, and CRSP. Following Frank and Goyal (2003), we exclude firms with missing book value of assets, firms involved in major mergers (Compustat footnote 1 with value = AB) and a small number of firms that reported format codes (data318) 4, 5, or 6. To reduce the impact of outliers and the most extremely mis-recorded data, all variables are truncated at the top and bottom 0.5 percentiles. Table 1 explains the construction of these variables in detail.

Panel A of Table 2 provides descriptive statistics for each life cycle stage. The sample selection methodology outlined above results in 4890 growth firms and 2211 mature firms. Some interesting patterns emerge. On average, firms in their maturity stage are older, larger, and more profitable than firms in their growth stage. The median firm in the maturity stage is a year older and more than four times[i] larger than the median firm in the growth stage. In terms of profitability, the median ROA (return on asset) for mature firms is 16.33 %, while for growth firms, it is 5.37 %. On the other hand, growth firms experience much more rapid sales growth

(more than twice that of mature firms) and higher market-to-book ratios implying that growth firms have more growth opportunities. These differences are highly significant. The table also shows that R&D expenditure for growth firms is much larger than for mature firms (six times larger), but that capital expenditure is higher for mature firms. This is also consistent with the latter having higher tangible assets. Overall, these patterns conform to our expectations of key firm attributes in these two stages of a firm's life cycle. In terms of financing characteristics, we see that growth firms have larger financing deficits, and they rely more heavily on equity financing rather than debt, consistent with prior work.

In Panel B of Table 2, we provide more detail on the financing characteristics of firms across these two life cycle stages. Frank and Goyal (2003) and Agca and Mozumdar (2007) have both documented a significant size effect in tests of the pecking order. We follow their strategy and divide our sample into quintiles according to firm size. To more effectively control for firm size across the two stages, we use growth firms to pin down size quintiles. We first sort the growth firms into 5 equal quintiles according to their real assets at the beginning of their growth stage. We then allocate mature firms into these *growth-firm quintiles* according to their real assets at the beginning of the maturity stage. Since about half of the mature firms end up in the fifth quintile, we further divide the fifth quintile into two equal parts: 5a and 5b. Except for 5b, the size distributions of the same quintile for these two cohorts match up satisfactorily. The two-sample Kolmogorov-Smirnov test for the equality of the distribution of real assets between the two stages but within the same size quintile does not reject equality for quintiles 1 to 5a.

The panel shows that growth firms have a much greater need for external financing, as expected. The average financing deficit for the smallest growth firms is 51.63 % while that of the smallest mature firms is 8.28 %. Equity makes up a larger proportion of external finance for

growth firms, but this proportion declines as the firm gets larger. In contrast, for mature firms, except for the firms in the smallest size quintile, the reliance on debt is greater than on equity.

On firm performance, the two variables identified by Fama and French (2005) to be central in evaluating firms' financing decisions, growth and profitability, both show extremely different patterns between growth firms and mature firms. The real sales growth rate is about 2 times higher for growth firms than for mature firms on average. It strictly decreases with firm size for growth firms, while it is quite stable for mature firms. We view higher sales growth as indicative of a greater relative value of the firms' growth options versus the costs associated with asymmetric information. On the other hand, profitability monotonically increases with firm size for growth firms but strictly decreases with size for mature firms. In other words, for growth firms getting bigger means getting better in terms of profitability, while for mature firms the opposite is true. This latter finding is largely consistent with the existing literature on the diversification discount. Lang and Stulz (1994) and Berger & Ofek (1995) find that diversification reduces firm value. Firms that choose to diversify are poor performers relative to firms that do not. When firms are still in the growth stage, they usually don't diversify. At this stage, getting bigger means a firm is more capable of surviving market competition. On the other hand, if a firm is in its maturity stage, getting bigger is usually achieved through mergers and acquisitions, which as documented is usually not value-enhancing. Although the profitability of mature firms declines with increasing size, their profitability levels are still higher than those of growth firms. Under the pecking order theory, higher profitability implies that firms will have more internal funds available for financing.

In sum, growth firms' financing characteristics are quite different from mature firms even after controlling for firm size. We expect that the degree of information asymmetry and the

relative value of growth options are functions of both firm size and life-cycle stage. Therefore, we can come to much richer conclusions in tests of the pecking order by accounting for both these factors.

III. Empirical Tests

A. Testing the Pecking Order Theory – Aggregate Data

In this section, we first adopt a test of the pecking order theory proposed by Shyam-Sunder and Myers (1999) given by the following:

$$\Delta Debt_{it} = b0 + b1.\ Deficit_{it} + \varepsilon_{it} \qquad (1)$$

We then follow Lemmon and Zender (in print) by incorporating a quadratic term:

$$\Delta Debt_{it} = b0 + b1.\ Deficit_{it} + b2.\ Deficit_{it}^{2} + \varepsilon_{it} \qquad (2)$$

Where *ΔDebt* is net debt issued and *Deficit* is the financing deficit, i.e. uses of funds minus internal sources of funds, (both scaled by total assets). This deficit is financed with debt and/or equity. If firms follow the pecking order, changes in debt should track changes in the deficit one-for-one. Hence, the expected coefficient on the deficit is 1 (Shyam-Sunder and Myers, 1999). The quadratic specification is used to account for binding debt capacity constraints. If firms are financing their deficit with debt first and issue equity only when they reach their debt capacity, then net debt issued is a concave function of the deficit (as shown by Chirinko and Singha, 2000) and the coefficient on the squared deficit term would be negative. If firms are issuing equity first and if debt is the residual source of financing, then this relationship should be convex and the coefficient on the squared deficit term would be positive. If debt and equity are issued in fixed proportions, the deficit would have no effect on net debt issued.

We first estimate both models across life cycle stages in Table 3. We use pooled ordinary least squares with heteroskedasticity-consistent (robust) standard errors adjusted for clustering by firm. We report the total effect of the deficit, or the *debt-deficit sensitivity*, as the percent change in net debt issued per one percent change in the financing deficit, evaluated at the sample mean. In unreported robustness tests, we have included year effects as well as used firm fixed effects estimation: the results are unchanged and are very similar to those reported here.[ii]

First of all, there is an improvement in the fit of Model (2) over Model (1). Compared to Model (1), the estimated debt-deficit sensitivities in Model (2) are increased by 0.112 and 0.224 for growth and mature firms, respectively. The coefficients on the squared deficit term are significantly negative for both categories, implying that on average, net debt issued is a concave function of the deficit. Secondly, the sensitivities are much higher for mature firms than those for growth firms. Thus, it appears the pecking order describes the financing choices of mature firms better than growth firms, contrary to conventional wisdom. In the next section, we split each life cycle stage into size quintiles to control for the size effect documented by Frank and Goyal (2003).

B. Controlling for Firm Size

To fully control for firm size, we estimate Model (1) for each size quintile in each life cycle stage. The results are presented in Table 4. In this simple model, we do not find strong evidence of the size effect documented by Frank and Goyal (2003) in either stage. Although the debt-deficit sensitivities seemingly increase as firms get larger in both life cycle stages, the Wald Test of the equality of the sensitivities between two adjacent size quintiles shows that the difference is significant only for several size quintiles. In fact, the sensitivity for some larger firms is even

lower than that for smaller firm groups. For instance, the sensitivity of Quintile 5a of maturity stage is 0.342, which is significantly lower than that of Quintile 4 of maturity stage.

In contrast to the weak size effect, a strong "maturity effect" is found: for firms in the same size quintile, the debt-deficit sensitivities of mature firms are always larger than those of growth firms. Since Model (1) does not accurately evaluate the pecking order theory (Chirinko and Singha, 2000), Table 4 is only provided as a benchmark case. To account for a firm's debt capacity, we estimate Model (2) across size quintiles and life cycle stages. The results are given in Table 5. Across all quintiles and stages, the coefficient on the deficit is positive, while the coefficient on the deficit-squared is negative and significant except for the largest quintile of mature firms. This indicates that firms are limited by their debt capacity constraints and they have to resort to issuing equity.

Under Model (2), we find weak evidence of the size effect– but only among firms in the growth stage. For growth firms, the total effect of the deficit and R-squares are increasing in firm size. The smallest quintile has a total effect of 11.5% and an R-square of 0.126 while the largest quintile (5b) has a total effect of 53.5% and an R-square of 0.54. Thus, the pecking order performs "best" for the largest firms in the growth stage. In the maturity stage, the story is quite different. We do not find evidence of this monotonic size effect at all. The total effect ranges from 40.5% to 70.8% and except for the first two quintiles, they are not significantly different from each other at the 10 % level. Thus, once a firm has reached maturity, the size effect ceases to exist. In comparing firms across life cycle stages, we find that the total effect of the deficit is significantly higher for mature firms within each size quintile. For instance, growth firms in quintile 2 have roughly the same size as mature firms in quintile 2. But, their debt-deficit sensitivity is only 17.3% compared to 70.3% of mature firms in the same size quintile.

In sum, we find a weak size effect for growth firms, i.e. the total effect of the deficit is weakly increasing in firm size. For mature firms, we find the total effect of the deficit is similar across all size quintiles, with the exception of quintile 1. Comparing across stages, we find the maturity effect remains, i.e. the total effect of the deficit is significantly larger for mature firms than for growth firms. From these findings we infer that mature firms more closely exhibit financing behavior consistent with the pecking order.

C. Controlling for Bond Ratings

Thus far we have shown that in tests of the pecking order, there is a maturity effect that dominates the size effect. We have also seen that firm size is not necessarily monotonically related to debt capacity constraints. Lemmon and Zender (in print) and Agca and Mozumdar (2007) identify firms with access to public debt markets to further control for debt capacity. The argument is firms with bond ratings have access to low cost debt and this is a good indicator of larger debt capacity. To measure the severity of debt-capacity constraints, Lemmon and Zender use a predicted probability that a firm will have a bond rating.

They show that firms with a high predicted probability of having a bond rating are larger, older, and more profitable and have lower market-to-book ratios, consistent with the characteristics of not only the mature firms in our sample but also the largest growth firms. Thus to a certain extent, our slice of the data presents in a very intuitive way a natural progression in terms of access to public debt. Mature firms are more established and have longer credit histories. The largest growth firms are the oldest firms in their cohort and are quite similar to mature firms in many respects. These are precisely the type of firms we expect to have access to the public debt markets.

In Table 6 we repeat our regressions across life cycle stages for high and low predicted bond ratings cohorts (panel A and panel B, respectively). The sample size is smaller because of data constraints[iii]. If a high probability of having rated debt is indicative of larger debt capacity and being less constrained, then the results in panel A confirm this. The quadratic model performs well for both growth and mature, and small and large firms. The R-squares are high and the total debt-deficit sensitivities are also high. For all mature firms with high predicted bond ratings, the coefficient on the squared deficit term is close to 0 and insignificant (last column of Panel A). This is evidence that this group of firms do not face binding debt capacity constraints. On the other hand, growth firms have a significant negative coefficient for the deficit squared, indicating binding debt capacity constraints remain. Thus, although these firms are likely to have access to the public debt markets, they have larger financing deficits due to their larger demand for external finance. Hence they resort to issuing equity more often. When we look at firms across size quintiles but within the same life-cycle stage, we find that there is no size effect at either stage. That is, large firms do not necessarily fit the pecking order theory better than small firms. However, the maturity effect, though weakened (compared to Table 5), still exists. Controlling for size, most mature firms fit the theory better than growth firms.

Panel B presents the regressions for firms in the low predicted bond ratings cohort or the constrained sample. Again, the panel shows no size effect at either stage, but a strong maturity effect. Moreover, in contrast to panel A, the results are dramatically different between growth and mature firms. We observe low R-squares and low debt-deficit sensitivities for growth firms. The negative coefficient on the squared deficit term indicates that debt capacity constraints are binding for these firms. In stark contrast, mature firms have high debt-deficit sensitivities and high R-squares.

The results for mature firms in the low predicted bond ratings cohort are very similar to those in the high predicted bond ratings cohort. This shows that a low likelihood of having a bond rating is not necessarily an indication that the firm is debt-constrained. More specifically, mature firms are less likely to be constrained by their debt capacity, whether they have access to the public debt markets or not. There are two possible reasons for this result: one, their need for external finance is not that great and hence they rarely reach their debt capacity; or two, even in the presence of large financial deficits, mature firms are also likely to have larger debt capacity because of their credit quality. Firm maturity is essentially a substitute for access to the public debt markets, i.e. among firms that are less likely to issue public debt (either due to firm choice or due to supply-side factors) mature firms still have access to a low cost of debt capital. Evidence from existing work supports this view. For example, Diamond (1989) shows how a good reputation mitigates the adverse selection problem between borrowers and lenders. Thus, mature firms who are more established and have longer credit histories are able to obtain better loan rates compared to their younger firm counterparts. Petersen and Rajan (1995) present evidence of higher absolute borrowing costs for younger firms compared to those of older firms, regardless of the competitive structure of the lending market.

D. Analysis of Maturity Effect

We have documented a dominant maturity effect in the context of the pecking order theory. In this section, we discuss in detail what we believe the maturity effect captures and why it exists.

First and foremost, we have shown that the maturity effect is closely related to debt capacity. Mature firms are older, larger, and more profitable; they have more tangible assets and retained

earnings. Therefore, they naturally have greater debt capacity. To formally test this, we first estimate the correlation between the probability of being a mature firm and the probability of having a bond rating. Lemmon and Zender (in print) argue that the likelihood that a firm can access public debt markets is a useful proxy for debt capacity and firms that are able to issue rated debt most closely conform to the assumptions underlying the pecking order. If the likelihood of being mature is highly correlated with the likelihood of having rated debt and the latter is a valid proxy for debt capacity, then we can argue that firm maturity is an alternative measure of debt capacity. We run a logit regression where the dependent variable equals 1 when a firm is in the maturity stage and 0 when it is in the growth stage. The dependent variables are factors used in the predicted bond rating regression of Lemmon and Zender (in print).

$$1(\text{if stage} = \text{maturity})_{it} = b0 + b1.\ \text{Log}(\text{Assets})_{it-1} + b2.\ \text{Return on Assets}_{it-1} + b3.\ \Delta\text{Tangibility}_{it-1} + b4.\ \text{Market-to-Book}_{it-1} + b5.\ \text{Leverage}_{it-1} + b6.\ \text{Log}(\text{Firm Age})_{it-1} + b7.\ \text{Standard Deviation of Stock Returns}_{i,t-1} + \eta_{it} \quad (3)$$

We estimate the predicted probability of being in the maturity stage for each observation and find that this probability is highly correlated with the predicted probability of having a bond rating. The Pearson correlation coefficient is 0.59.

However, firm maturity must capture more than just access to public debt markets because even after controlling for predicted bond ratings, the maturity effect still remains (Table 6.B). The dynamic pecking order (Myers (1984) and Vishwanath (1993)) predicts that financing decisions made by firms will depend on the current and expected levels of unused debt capacity, leverage, and growth opportunities. To further understand the maturity effect, we split the sample according to high and low leverage. We identify high (low) leverage by comparing the previous year's book leverage ratio to the industry (4-digit SIC) median leverage ratio in the previous

year. Table 7 presents the results. Not surprisingly, we find stronger evidence for the pecking order theory among low leverage firms (Panel B vs. Panel A), which is consistent with the prediction of the dynamic pecking order theory that once firms are close to their debt capacity, they will resort to issuing equity. The interesting fact is that even when the leverage ratios are high, mature firms fit the pecking order fairly well and the maturity effect is still significant.

Lemmon and Zender (in print) argue that the a firm's distance from its debt capacity, which is the key point suggested in the dynamic pecking order, is difficult to measure, and the likelihood of having rated debt is a noisy proxy of this quantity. One possible reason why the maturity effect is consistently significant under various model specifications is that mature firms, big or small, have ample unused debt capacity. Investigating our results further, we calculate Altman Z-scores for our sample firms. The Z-score is a widely used measure of financial distress (see for instance, Graham, Lemmon and Schallheim, 1998). Debt capacity can be deemed as the maximum amount of debt that can be issued without causing financial distress (Myers, 1984). A high Z-score indicates a low probability of being in financial distress and a relatively larger debt capacity. Panel C shows that mature firms have very high Z-scores even when their leverage ratios are high, implying they still have unused debt capacity compared to growth firms.

In sum, we find firm maturity is an alternative proxy for firm debt capacity that captures more than just access to public debt markets. In particular, mature firms are older, more stable and highly profitable with good credit histories. Thus, they naturally have greater debt capacity than growth firms. Their good credit histories also allow them to borrow significantly from private financial intermediaries, which in some cases may preclude the need to access public debt markets. After accounting for firm maturity, the pecking order describes firm financing decisions fairly well.

IV. Robustness Tests

To ensure that our results are being driven by life cycle stages and not simply by our sample selection criteria, we define the growth and maturity stages in alternative ways. First, for growth firms, we limit our original sample to firms with high industry-adjusted growth rates..

Second, we use the ratio of retained earnings to total equity (RE/TE) as a proxy for firm maturity. De Angelo, De Angelo and Stulz (2005) argue that the earned/contributed capital mix is a logical proxy for a firm's life cycle stage because it measures the extent to which a firm is reliant on internal or external capital. Firms with low RE/TE tend to be in the capital infusion stage, whereas firms with high RE/TE tend to be more mature with ample cumulative profits that make them largely self-financing. .

Furthermore, we try various combinations of different stage lengths and different definitions of growth and/or maturity stages. For instance, we use high-sales-growth firms only for the growth stage and firms with high RE/TE only for the maturity stage and assume the length of each stage is 6 years. Our main conclusions still hold with various combinations of growth and maturity stage definitions and stage lengths – the size effect only very weakly exists in the growth stage and mature firms fit the pecking order better than growth firms.

We also include several important factors (Rajan and Zingales, 1995) that have consistently been found to explain a firm's financing decisions in all the regressions. Our results remain the same. Lastly, to further explore the pecking order theory within the framework of firms' life cycles, we estimate the Leary and Roberts (2010) two-rung empirical model for firms in each quintile at each life cycle stage. The results are reported in Table 8. We find no size effect for firms in both stages with regards to debt-equity issuance decisions. We again find a maturity

effect, though weaker than we obtain from using the Lemmon and Zender model in the previous sections, when pitting firms in their growth stage against those in their maturity stage.

V. Conclusion

In this paper, we classify firms into two life cycle stages, namely growth and maturity, and test the pecking order theory of financing proposed by Myers (1984) and Myers and Maljuf (1984). Under Lemmon and Zender (in print) empirical framework, we identify two effects: a (weak) size effect and a (strong) maturity effect. The size effect is such that the pecking order theory better explains the financing decisions of firms as they increase in size. The maturity effect is such that mature firms financing decisions are better explained by the pecking order theory compared to growth firms. We find that this size effect only weakly exists among firms in their growth stage. For firms in their maturity stage, this size effect is not significant. When controlling for a firm's debt capacity, this size effect disappears altogether, while the maturity effect remains.

Overall, we find that the pecking order theory describes the financing patterns of mature firms better than that of younger growth firms. The likelihood of being a mature firm is highly correlated with the likelihood of having access to public debt markets. However, they are different since the maturity effect remains even after access to public debt is accounted for. We find evidence that mature firms have ample unused debt capacity even when they have relatively high leverage. This indicates that firm maturity is an alternative, and arguably, a better proxy for debt capacity than access to public debt.

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Table 1: Key Variable Definitions

Variable:	Definitions and COMPUSTAT annual data item in parenthesis:
Preferred Stock	= Liquidating value(10), if available, else Redemption Value (56) if available, else Carrying Value (130)
Book Equity	= Total Assets (6) – Liabilities (181) + Balance Sheet Deferred Taxes and Investment Tax Credit (35), if available – Preferred Stock
Market Equity	= Stock price (199) times Shares Outstanding (25)
Market-to-Book Ratio	= Market Equity/Book Equity
Book Debt	= Total Assets (6) – Book Equity
Book Leverage	= Book Debt/ Total Assets (6)
Market Leverage	= Book Debt/(Total Assets (6) – Book Equity + Market Equity)
Tobin's Q	= (Market Equity + Total Assets (6) – Common Equity (60))/ Total Assets (6)
$\Delta Equity_t$	= [Sale of Common and Preferred Stock (108) at t – Purchase of Common and Preferred Stock (115) at t]/(Total Assets at t-1)
$\Delta Debt_t$	= [Long-term Debt Issuance (111) at t – Long-term Debt Reduction (114) at t]/(Total Assets at t-1)
$Deficit_t$	$=\Delta Equity_t + \Delta Debt_t$
Tangibility	= Net Property, Plant and Equipment (8) / Total Assets(6)
Profitability	= Earnings Before Interest, Tax and Depreciation (13) / Total Assets(6)
Log Sales	= Natural log of Sales (12), deflated by the Consumer Price Index
Retained Earnings-to-Total Equity Ratio	= Retained Earnings (36)/Common Equity(60)
R&D	= Research and Development Expense (46) /Total Assets (6)
Advertising Expense	= Advertising Expense (45)/ Total Assets(6)
Capital Expenditures	= Capital Expenditures (128)/ Total Assets (6)
Dividends	= Dividend Per Share (26)
Z-score	= [3.3*(data15 + data16 + data18) + data12 + 1.4*data36 + 1.2*(data4 – data5)]/data6

Table 2: Summary Statistics

Panel A reports summary statistics by life cycle stage, namely growth and maturity. The sample period is from 1971-2008. Variables are scaled by total assets unless otherwise noted. For variable definitions, please refer to the appendix. Means and medians of key variables across stages are obtained in two steps. Step 1: Calculate the mean value of a variable in each stage for each firm. Step 2: Calculate the mean and median of the variable mean across all the firms for each stage. The t-test of the difference between means of firms in growth and maturity stages (a) and the Wilcoxon rank-sum test of the difference between medians of firms in growth and maturity stages (b) are performed. Bold font denotes significance at the 10% level or better.

Panel B reports summary statistics by life cycle stage and size (asset) quintile. The quintiles are obtained as follows: First, firms in the growth stage are allocated into 5 equal quintiles according to their real assets at the beginning of the stage. The range of real assets in each quintile in the growth stage determines the corresponding firms in each quintile in the maturity stage. The fifth quintile is divided further into two parts: 5a and 5b. The t-test for the equality of means between the two stages but within the same size quintile is performed. Bold font denotes significance at the 10% level or better.

	Panel A – mean and median – by firm stage				**Panel B – mean – by firm stage and size quintile**											
	Growth Stage		**Maturity Stage**		**Growth Stage**						**Maturity Stage**					
	Mean	**Median**	**Mean**	**Median**	**Q 1**	**Q 2**	**Q 3**	**Q 4**	**Q 5a**	**Q 5b**	**Q 1**	**Q 2**	**Q 3**	**Q 4**	**Q 5a**	**Q 5b**
Age (years)	**12.25**	**7.50**	15.98	8.50	6.47	8.89	12.31	15.02	15.99	21.10	8.12	9.86	11.84	14.50	18.00	19.70
Log(Real Assets)	**17.07**	**17.07**	18.91	18.66	14.88	16.07	17.07	17.92	18.79	20.01	15.30	16.27	17.15	18.06	18.84	20.86
Sales growth rate(%)	**44.16**	**20.57**	11.28	8.44	**74.80**	**51.31**	**35.61**	**31.52**	**30.37**	**26.01**	19.17	9.89	10.24	12.58	13.62	9.92
Market to Book ratio	**2.75**	**1.89**	1.56	1.24	**4.58**	**2.64**	**2.33**	**2.30**	**2.06**	**1.80**	2.21	1.88	1.54	1.45	1.53	1.53
Return on Assets (%)	**-6.91**	**5.37**	17.45	16.33	**-35.41**	**-10.96**	**-0.37**	**3.22**	**8.58**	**9.36**	23.51	21.03	19.36	18.17	16.81	15.36
Tangible Assets (%)	**26.29**	**18.92**	37.32	32.37	25.18	26.95	**24.63**	**24.62**	29.01	**31.15**	22.90	29.22	33.94	34.57	36.49	42.74
Capital expenditure (%)	**7.62**	**5.43**	8.20	6.73	7.41	7.94	**7.51**	**7.54**	8.12	**7.27**	7.12	7.35	8.57	8.62	8.33	8.01
R&D(%)	**13.11**	**7.61**	2.58	1.07	**18.26**	**13.17**	**14.13**	**12.21**	**8.26**	**4.38**	3.79	3.76	2.73	2.25	2.19	2.43
Dividend per share ($)	**0.00**	**0.00**	0.58	0.28	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	0.15	0.45	0.35	0.39	0.66	0.78
Retained earnings to total equity ratio (%)	**-110.50**	**-1.90**	56.50	62.50	**215.87**	**132.76**	**83.24**	**83.07**	**27.40**	**48.08**	47.77	59.68	63.86	59.59	61.22	49.59
Market Leverage (%)	**31.58**	**26.83**	38.90	38.19	**25.15**	**31.61**	**29.90**	**30.12**	**36.50**	**45.70**	19.12	27.86	35.03	39.53	39.45	43.01
Book Leverage (%)	**42.28**	**40.89**	44.61	44.55	**41.48**	**43.18**	38.60	**38.72**	44.50	**54.44**	25.74	35.06	37.90	42.82	45.10	51.12
Δdebt (%)	**4.47**	**0.40**	3.23	1.49	**5.09**	**4.25**	3.45	3.82	**5.34**	**6.16**	2.43	2.17	3.50	3.54	3.88	3.00
Δequity (%)	**22.30**	**6.32**	1.83	0.09	**44.03**	**26.12**	**17.81**	**14.73**	**8.58**	**7.93**	5.41	1.67	1.77	2.05	2.84	1.18
Deficit (%)	**27.70**	**11.29**	5.00	2.26	**51.63**	**30.54**	**21.99**	**18.99**	**14.20**	**15.07**	8.28	3.82	5.04	5.74	6.72	3.99
Number of firms	4890	4890	2211	2211	978	978	978	978	489	489	47	195	337	454	344	863

Table 3. Tests of Pecking order - aggregate – OLS

Model: $\Delta debt_{it} = b0 + b1.\ Deficit_{it} + \varepsilon_{it}$., ---------- (1)

Model: $\Delta debt_{it} = b0 + b1.\ Deficit_{it} + b2.\ Deficit_{it}^2 + \varepsilon_{it.}$, ---------- (2)

where, $\Delta debt_{it}$ refers to new debt issued in t normalized by total assets at the beginning of t ($asset_{t-1}$); $Deficit_{it}$ refers to the financing deficit in t normalized by total assets at t-1. The sample period is from 1971-2008.

All Firms, 1971 - 2008				
	Growth Stage		Maturity Stage	
	M1	*M2*	*M1*	*M2*
Deficit	0.076**	0.196**	0.422**	0.651**
	[0.006]	[0.010]	[0.102]	[0.027]
Deficit^2		-0.014**		-0.047**
		[0.001]		[0.003]
Constant	0.022**	0.004**	0.017**	0.003**
	[0.001]	[0.001]	[0.005]	[0.001]
Debt-deficit sensitivity	0.076	0.188	0.422	0.646
Number of observations	24689	24689	11469	11469
Adjusted R2	0.1	0.18	0.32	0.6

Note: Robust standard errors clustered by firm are reported in brackets.
+, *, ** significant at 10%, 5%, and 1% level respectively.

Table 4. Tests of the Pecking Order over Life Cycle Stages

Equation: $\Delta debt_{it} = b0 + b1.\ Deficit_{it} + \varepsilon_{it.}$, where, $\Delta debt_{it}$ refers to new debt issued in period t scaled by total assets at the beginning of period t ($asset_{t-1}$). $Deficit_{it}$ refers to the financing deficit in period t scaled by total assets at the beginning of period t. The sample period is from 1971-2008. The quintiles are obtained as follows: First, firms in the growth stage are allocated into 5 equal quintiles according to their real assets at the beginning of the stage. The range of real assets in each quintile in the growth stage determines the corresponding firms in each quintile in the maturity stage. The fifth quintile is divided further into two parts: 5a and 5b. The total effect of the deficit is the percent change in net debt issued per one percent change in the deficit (evaluated at the mean value of the deficit in each quintile)

	Growth Stage							Maturity Stage						
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5a	Quintile 5b	All firms	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5a	Quintile 5b	All firms
Deficit	0.055**	0.058**	0.123**	0.113**	0.216**	0.186**	0.076**	0.176**	0.412**	0.558**	0.574**	0.342**	0.725**	0.422**
	[0.008]	[0.011]	[0.021]	[0.024]	[0.074]	[0.070]	[0.006]	[0.015]	[0.070]	[0.070]	[0.055]	[0.110]	[0.029]	[0.102]
Constant	0.020**	0.024**	0.010**	0.016**	0.022**	0.033**	0.022**	0.018**	0.006**	0.006**	0.004	0.029**	0.002+	0.017**
	[0.003]	[0.003]	[0.003]	[0.004]	[0.009]	[0.008]	[0.001]	[0.006]	[0.002]	[0.002]	[0.002]	[0.007]	[0.001]	[0.005]
Observations	5145	5113	4862	4809	2404	2356	24689	262	1057	1779	2358	1781	4226	11469
Adjusted R^2	0.094	0.065	0.157	0.126	0.223	0.209	0.10	0.233	0.381	0.588	0.587	0.123	0.741	0.32

Note: Robust standard errors clustered by firm are reported in brackets. +, *, ** significant at 10%, 5%, and 1% level respectively.

Wald Test of the Equality of the Total Effect of the Deficit Between Stages and within the Same Quintile

Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5a	Quintile 5b	All firms
N/S	c	c	c	a	c	c

Wald Test of the Equality of the Total Effect of the Deficit Between Adjacent Quintiles within the Same Life-Cycle Stage

	Q1 vs. Q2	Q2 vs. Q3	Q3 vs. Q4	Q4 vs. Q5a	Q5a vs. Q5b
Growth	N/S	c	N/S	N/S	N/S
Maturity	c	N/S	N/S	c	c

Note: a, b, c significant at the 10%, 5%, and 1% level respectively. N/S: not significant

Table 5. Tests of the Pecking Order over Life Cycle Stages

Equation: $\Delta debt_{it} = b0 + b1.\ Deficit_{it} + b2.\ Deficit_{it}^2 + \varepsilon_{it.}$, where, $\Delta debt_{it}$ refers to new debt issued in period t scaled by total assets at the beginning of period t ($asset_{t-1}$). $Deficit_{it}$ refers to the financing deficit in period t scaled by total assets at the beginning of period t. The sample period is from 1971-2008. The quintiles are obtained as follows: First, firms in the growth stage are allocated into 5 equal quintiles according to their real assets at the beginning of the stage. The range of real assets in each quintile in the growth stage determines the corresponding firms in each quintile in the maturity stage. The fifth quintile is divided further into two parts: 5a and 5b. The total effect of the deficit is the percent change in net debt issued per one percent change in the deficit (evaluated at the mean value of the deficit in each quintile)

	Growth Stage							Maturity Stage						
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5a	Quintile 5b	All firms	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5a	Quintile 5b	All firms
Deficit	0.123**	0.182**	0.207**	0.246**	0.426**	0.546**	0.196**	0.410*	0.735**	0.693**	0.705**	0.628**	0.707**	0.651**
	[0.015]	[0.020]	[0.024]	[0.029]	[0.047]	[0.049]	[0.010]	[0.162]	[0.057]	[0.053]	[0.041]	[0.078]	[0.031]	[0.027]
$Deficit^2$	-0.007**	-0.015**	-0.013**	-0.020**	-0.035**	-0.046**	-0.014**	-0.027*	-0.459**	-0.101*	-0.126+	-0.048**	0.017	-0.047**
	[0.002]	[0.002]	[0.004]	[0.005]	[0.004]	[0.004]	[0.001]	[0.012]	[0.051]	[0.046]	[0.067]	[0.006]	[0.030]	[0.003]
Constant	0.003	0.003	-0.001	0.001	0.003	0.004	0.004**	0.008+	0.008**	0.003*	0.001	0.003	0.003*	0.003**
	[0.003]	[0.003]	[0.002]	[0.003]	[0.004]	[0.003]	[0.001]	[0.004]	[0.002]	[0.001]	[0.001]	[0.003]	[0.001]	[0.001]
Debt-deficit sensitivity	0.115	0.173	0.202	0.239	0.417	0.535	0.188	0.405	0.703	0.682	0.690	0.622	0.708	0.646
Observations	5145	5113	4862	4809	2404	2356	24689	262	1057	1779	2358	1781	4226	11469
Adjusted R^2	0.126	0.157	0.197	0.208	0.37	0.54	0.18	0.439	0.499	0.61	0.609	0.523	0.742	0.60

Note: Robust standard errors clustered by firm are reported in brackets. +, *, ** significant at 10%, 5%, and 1% level respectively.

Wald Test of the Equality of the Total Effect of the Deficit Between Stages and within the Same Quintile

Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5a	Quintile 5b	All firms
a	c	c	c	b	c	c

Wald Test of the Equality of the Total Effect of the Deficit Between Adjacent Quintiles within the Same Life-Cycle Stage

	Q1 vs. Q2	Q2 vs. Q3	Q3 vs. Q4	Q4 vs. Q5a	Q5a vs. Q5b
Growth	b	N/S	N/S	c	a
Maturity	a	N/S	N/S	N/S	N/S

Note: a, b, c significant at the 10%, 5%, and 1% level respectively. N/S: not significant

Table 6. Tests of the Pecking Order over Life Cycle Stages: Predicted Bond Ratings

Equation: $\Delta debt_{it} = b0 + b1.\ Deficit_{it} + b2.\ Deficit_{it}^2 + \varepsilon_{it.}$, where, $\Delta debt_{it}$ refers to new debt issued in period t scaled by total assets at the beginning of period t ($asset_{t-1}$). $Deficit_{it}$ refers to the financing deficit in period t scaled by total assets at the beginning of period t. The sample period is from 1971-2008. The quintiles are obtained as follows: First, firms in the growth stage are allocated into 5 equal quintiles according to their real assets at the beginning of the stage. The range of real assets in each quintile in the growth stage determines the corresponding firms in each quintile in the maturity stage. The fifth quintile is divided further into two parts: 5a and 5b. The total effect of the deficit is the percent change in net debt issued per one percent change in the deficit evaluated at the mean value of the deficit in each sub-group. Robust standard errors clustered by firm are reported in brackets. +, *, ** significant at 10%, 5%, and 1% level respectively. Panel A(B) reports results for firms with high(low) predicted bond ratings. The predicted bond rating is calculated from a logit model of the likelihood of having rated debt according to Lemmon and Zender (2008).

Panel A: High Predicted Bond Ratings

	Growth Stage					Maturity Stage				
	Quintile 1-3	**Quintile 4**	**Quintile 5a**	**Quintile 5b**	**All firms**	**Quintile 1 - 3**	**Quintile 4**	**Quintile 5a**	**Quintile 5b**	**All firms**
Deficit	0.697**	0.675**	0.625**	0.830**	0.718**	0.857**	0.803**	0.852**	0.738**	0.749**
	[0.065]	[0.044]	[0.048]	[0.033]	[0.007]	[0.145]	[0.052]	[0.041]	[0.038]	[0.009]
$Deficit^2$	-0.119**	-0.049**	0.034	-0.079**	-0.063**	-0.051	-0.124+	-0.384**	0.034	-0.007
	[0.031]	[0.005]	[0.050]	[0.007]	[0.002]	[0.056]	[0.070]	[0.135]	[0.044]	[0.007]
Constant	-0.023**	-0.011**	-0.003	-0.003	-0.007**	-0.014*	-0.001	0.003	0.006**	0.004**
	[0.004]	[0.003]	[0.003]	[0.002]	[0.002]	[0.007]	[0.003]	[0.002]	[0.001]	[0.001]
Total Effect: Deficit	0.663	0.666	0.630	0.819	0.707	0.846	0.788	0.820	0.740	0.748
Observations	804	1442	1457	1906	5609	131	530	785	2922	4368
Adjusted R^2	0.671	0.667	0.618	0.8	0.688	0.833	0.769	0.711	0.779	0.764

Note: Robust standard errors clustered by firm are reported in brackets. +, *, ** significant at 10%, 5%, and 1% level respectively.

Wald Test of the Equality of the Total Effect of the Deficit Between Stages and within the Same Quintile

Quintile 1-3	Quintile 4	Quintile 5a	Quintile 5b	All firms
c	b	c	N/S	N/S

Wald Test of the Equality of the Total Effect of the Deficit Between Adjacent Quintiles within the Same Life-Cycle Stage

	Q1-3 vs. Q4	Q4 vs. Q5a	Q5a vs. Q5b
Growth	N/S	N/S	c
Maturity	N/S	N/S	N/S

Note: a, b, c significant at the 10%, 5%, and 1% level respectively. N/S: not significant

Panel B: Low Predicted Bond Ratings

	Growth Stage							Maturity Stage						
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5a	Quintile 5b	All firms	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5a	Quintile 5b	All firms
Deficit	0.117**	0.214**	0.209**	0.311**	0.390**	0.618**	0.180**	0.925**	0.650**	0.727**	0.542**	0.623**	0.486**	0.691**
	[0.017]	[0.023]	[0.028]	[0.049]	[0.083]	[0.140]	[0.004]	[0.317]	[0.093]	[0.083]	[0.051]	[0.094]	[0.123]	[0.013]
Deficit^2	-0.005*	-0.020**	-0.012**	-0.031*	-0.032	-0.182**	-0.011**	-0.409**	-0.264	-0.132**	0.331**	-0.067	0.357**	-0.141**
	[0.002]	[0.003]	[0.004]	[0.015]	[0.025]	[0.049]	[0.000]	[0.140]	[0.169]	[0.025]	[0.079]	[0.077]	[0.088]	[0.008]
Constant	0.001	-0.004	0	-0.006	0.003	-0.004	0.001	0.001	0.010**	0.005*	0.006**	0.008**	0.005+	0.007**
	[0.003]	[0.003]	[0.002]	[0.004]	[0.006]	[0.009]	[0.002]	[0.007]	[0.003]	[0.002]	[0.002]	[0.002]	[0.003]	[0.001]
Total Effect: Deficit	0.113	0.205	0.205	0.301	0.377	0.497	0.175	0.866	0.640	0.717	0.569	0.617	0.520	0.680
Observations	3940	3873	3444	2719	668	186	14830	70	379	676	802	455	102	2484
Adjusted R^2	0.148	0.194	0.224	0.266	0.334	0.327	0.18	0.592	0.529	0.683	0.694	0.62	0.926	0.611

Note: Robust standard errors clustered by firm are reported in brackets. +, *, ** significant at 10%, 5%, and 1% level respectively.

Wald Test of the Equality of the Total Effect of the Deficit Between Stages and within the Same Quintile

Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5a	Quintile 5b	All firms
c	c	c	c	b	N/S	c

Wald Test of the Equality of the Total Effect of the Deficit Between Adjacent Quintiles within the Same Life-Cycle Stage

	Q1 vs. Q2	Q2 vs. Q3	Q3 vs. Q4	Q4 vs. Q5a	Q5a vs. Q5b
Growth	c	N/S	a	N/S	N/S
Maturity	N/S	N/S	N/S	N/S	N/S

Note: a, b, c significant at the 10%, 5%, and 1% level respectively. N/S: not significant

Table 7. Tests of the Pecking Order over Life Cycle Stages: Leverage and Financial Distress

Equation: $\Delta debt_{it} = b0 + b1.\ Deficit_{it} + b2.\ Deficit_{it}^2 + \varepsilon_{it.}$, where, $\Delta debt_{it}$ refers to new debt issued in period t scaled by total assets at the beginning of period t ($asset_{t-1}$). $Deficit_{it}$ refers to the financing deficit in period t scaled by total assets at the beginning of period t. The sample period is from 1971-2008. The quintiles are obtained as follows: First, firms in the growth stage are allocated into 5 equal quintiles according to their real assets at the beginning of the stage. The range of real assets in each quintile in the growth stage determines the corresponding firms in each quintile in the mature stage. The fifth quintile is divided further into two parts: 5a and 5b. The total effect of the deficit is the percent change in net debt issued per one percent change in the deficit evaluated at the mean value of the deficit in each sub-group. Robust standard errors clustered by firm are reported in brackets. +, *, ** significant at 10%, 5%, and 1% level respectively. Panel A(B) reports results for firms with high(low) book leverage; Panel C reports Altman's Z-score for each group.

Panel A: High Book Leverage (Higher than Industry Median Leverage in year t-1)

	Growth Stage							Maturity Stage						
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5a	Quintile 5b	All firms	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5a	Quintile 5b	All firms
Deficit	0.123**	0.163**	0.196**	0.188**	0.380**	0.527**	0.182**	0.527**	0.756**	0.644**	0.664**	0.619**	0.729**	0.651**
	[0.007]	[0.008]	[0.009]	[0.009]	[0.015]	[0.013]	[0.004]	[0.069]	[0.045]	[0.034]	[0.024]	[0.022]	[0.013]	[0.007]
$Deficit^2$	-0.008**	-0.013**	-0.017**	-0.015**	-0.032**	-0.044**	-0.014**	-0.035**	-0.552**	-0.044*	-0.141**	-0.047**	-0.020*	-0.047**
	[0.001]	[0.001]	[0.001]	[0.001]	[0.002]	[0.001]	[0.000]	[0.005]	[0.064]	[0.022]	[0.016]	[0.002]	[0.008]	[0.001]
Constant	-0.001	0	-0.008+	-0.003	0	0.002	0.001	-0.003	0.005	0.001	-0.006*	-0.002	-0.002	-0.002
	[0.005]	[0.004]	[0.004]	[0.004]	[0.006]	[0.005]	[0.002]	[0.010]	[0.005]	[0.005]	[0.003]	[0.004]	[0.002]	[0.001]
Total Effect: Deficit	0.114	0.154	0.188	0.180	0.370	0.514	0.173	0.512	0.711	0.637	0.644	0.612	0.728	0.645
Observations	3052	3060	2556	2485	1418	1641	14212	75	409	667	1087	884	2589	5711
Adjusted R^2	0.119	0.137	0.163	0.145	0.315	0.52	0.156	0.657	0.468	0.579	0.525	0.47	0.716	0.576

Note: Robust standard errors clustered by firm are reported in brackets. +, *, ** significant at 10%, 5%, and 1% level respectively.

Wald Test of the Equality of the Total Effect of the Deficit Between Stages and within the Same Quintile

Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5a	Quintile 5b	All firms
c	c	c	c	b	c	c

Wald Test of the Equality of the Total Effect of the Deficit Between Adjacent Quintiles within the Same Life-Cycle Stage

	Q1 vs. Q2	Q2 vs. Q3	Q3 vs. Q4	Q4 vs. Q5a	Q5a vs. Q5b
Growth	N/S	N/S	N/S	c	a
Maturity	N/S	N/S	N/S	N/S	N/S

Note: a, b, c significant at the 10%, 5%, and 1% level respectively. N/S: not significant

Panel B: Low Book Leverage (Lower than Industry Median Leverage in year t-1)

	Growth Stage							Maturity Stage						
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5a	Quintile 5b	All firms	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5a	Quintile 5b	All firms
Deficit	0.117**	0.235**	0.241**	0.398**	0.534**	0.651**	0.227**	1.230**	0.744**	0.711**	0.731**	0.772**	0.619**	0.722**
	[0.009]	[0.010]	[0.010]	[0.012]	[0.022]	[0.026]	[0.005]	[0.036]	[0.030]	[0.017]	[0.018]	[0.026]	[0.014]	[0.009]
Deficit^2	-0.004**	-0.022**	-0.006**	-0.026**	-0.037**	-0.032*	-0.014**	-0.538**	-0.439**	-0.131**	-0.054**	-0.201**	0.161**	-0.116**
	[0.001]	[0.001]	[0.001]	[0.002]	[0.005]	[0.014]	[0.001]	[0.019]	[0.031]	[0.009]	[0.015]	[0.024]	[0.011]	[0.006]
Constant	0.008+	0.005	0.005	0	0.005	0.007+	0.008**	0.003	0.009**	0.005**	0.006**	0.006*	0.009**	0.007**
	[0.005]	[0.004]	[0.003]	[0.003]	[0.005]	[0.004]	[0.002]	[0.003]	[0.003]	[0.002]	[0.002]	[0.003]	[0.001]	[0.001]
Total Effect: Deficit	0.114	0.225	0.240	0.392	0.527	0.647	0.222	1.191	0.716	0.701	0.727	0.752	0.628	0.713
Observations	2093	2053	2306	2324	986	715	10477	187	648	1112	1271	897	1637	5752
Adjusted R^2	0.159	0.209	0.339	0.404	0.529	0.676	0.236	0.863	0.538	0.669	0.734	0.643	0.827	0.656

Note: Robust standard errors clustered by firm are reported in brackets. +, *, ** significant at 10%, 5%, and 1% level respectively.

Wald Test of the Equality of the Total Effect of the Deficit Between Stages and within the Same Quintile

Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5a	Quintile 5b	All firms
c	c	c	c	b	N/S	c

Wald Test of the Equality of the Total Effect of the Deficit Between Adjacent Quintiles within the Same Life-Cycle Stage

	Q1 vs. Q2	Q2 vs. Q3	Q3 vs. Q4	Q4 vs. Q5a	Q5a vs. Q5b
Growth	c	N/S	b	N/S	N/S
Maturity	c	N/S	N/S	N/S	a

Note: a, b, c significant at the 10%, 5%, and 1% level respectively. N/S: not significant

Panel C: Z-score

	Growth Stage							Maturity Stage						
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5a	Quintile 5b	All firms	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5a	Quintile 5b	All firms
Low leverage	-3.635	-0.787	0.274	0.345	1.171	0.609	-0.082	2.966	3.244	2.897	2.791	2.582	1.848	2.689
High leverage	-2.482	-0.498	0.632	0.858	1.212	0.374	-0.508	3.304	3.318	3.152	2.923	2.679	1.940	2.664

Table 8. Tests of Pecking order over life-cycle stages – the Leary and Roberts (2010) model

This table presents the prediction accuracy results of Leary and Roberts (2010) model in equations (8) - (11).
Sample construction: we first divide firms in growth stage into 5 equal quintiles according to their assets at the beginning of the stage. We then use the range of real assets in each quintile at the growth stage to get corresponding firms in each quintile in maturity stage. We divide the fifth quintile into two equal parts because more than half firms in maturity stage are in fifth quintile. Regressions are estimated with fixed firm effects. The sample period is 1971-2008.

	Growth Stage							Maturity Stage						
	Quintile 1	**Quintile 2**	**Quintile 3**	**Quintile 4**	**Quintile 5a**	**Quintile 5b**	**All firms**	**Quintile 1**	**Quintile 2**	**Quintile 3**	**Quintile 4**	**Quintile 5a**	**Quintile 5b**	**All firms**
Average correct: First rung[a] (%)	67.51	63.58	66.1	66.11	66.72	62.38	66.15	71.345	75.62	76.215	74.725	68.88	70.265	72.99
Average correct: Second rung[b](%)	45.00	44.98	44.74	44.08	49.165	50.755	44.96	47.02	57.85	50	50	49.145	49.84	50
Average correct: Overall[c](%)	*56.26*	*54.28*	*55.42*	*55.10*	*57.94*	*56.57*	*55.55*	*59.18*	*66.74*	*63.11*	*62.36*	*59.01*	*60.05*	*61.50*
Number of Observations	2773	2424	2117	2082	968	929	11293	135	413	736	998	715	1640	4637

a. "First rung average correct row" presents an equal weighted average of the correct classifications of internal and external financing decisions. For example, if the pecking order correctly classifies 50% (70%) of the observed internal (external) financing decisions, the average correctness of the model is 60%, the average of 50% and 70%.

b. Similarly, "Second rung average correct row" presents an equal weighted average of the correct classifications of debt and equity financing decisions.

The equal weighted average of the first rung and the second rung.

[i] We present logarithm of real assets in the table.

[ii] We also ran the regressions using firms that are in neither growth nor maturity stages. The results are very similar to that of the growth firms. Other than the growth or maturity stages, firms can be in any one of the following stages: revival, stagnant and decline stage. Without identifying exactly which stage the other firms are in, we cannot provide a concrete answer as to why they are different. In this paper, we focus on growth and maturity since the pecking order theory has clear implications for firms in these stages of their life-cycle.

[iii] We have to combine the first three size quintiles due to few observations in these quintiles.