LIQUIDITY AND THE FIRM SIZE-GROWTH NEXUS IN BARBADOS

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Presented at the Annual Review Seminar
Research Department
Central Bank of Barbados
July 27-30, 2009

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ABSTRACT

Provided that there is some convergence in the size of firms over time, one should expect smaller firms to grow faster than their larger counterparts. However, if financial constraints influence the firm's investment decision this could have implications for the potential prospects of the firm. This study examines whether liquidity constraints have influenced firm size and growth dynamics in Barbados. Panel-Gibrat regressions are augmented with proxies for liquidity constraints of the 17 publicly listed firms on the Barbados Stock Exchange (BSE) over the period 1997 to 2007. If liquidity constraints are found to be important, it could suggest that more emphasis should be placed on providing short-term financial support.

***JEL Classification*:** L25; G32; L20

Keywords: *Liquidity; Firm Size; Growth; Caribbean*

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1. Introduction

Firm liquidity relates to the ability of a company to convert assets to cash. Anderson (2002) notes that liquidity is vital in periods of low earnings where the firm is unable to access capital markets and serves as an important buffer to continue normal business operations. Without sufficient liquidity, firms may not be able to take advantage of potentially profitable investment opportunities that in the long-run could impact on firm growth and survival (Bond et al., 2003; Fazzari et al., 1988).

Liquidity constraints could be even more important for more vulnerable firms, i.e. start-ups, small businesses, etc. Oliveira and Fortunato (2006) note that larger companies tend to have easier access to cash flows from internal resources, debt or issuance of equity. Indeed, empirical results provided in the paper suggest that the sensitivity of firm growth to cash flow is greater for smaller and younger firms, implying greater financing constraints for these firms.

Many authors have examined the relationship between firm size and growth (see Simon and Bonini, 1958; Ijiri and Simon, 1964; Lucas, 1967) in an attempt to assess the validity of *Gibrat's Law*. Mansfield (1962) provides a relatively simple statement of Gibrat's Law: "the probability of a given proportionate change in size during a specified period is the same for all firms in a given industry regardless of their size at the beginning of the period." The law therefore suggest that the growth rate of any firm should be independent of its size at the beginning of the period examined. The evidence to date in support of this law has been mixed. Singh and Whittington (1975) find a weak positive relationship between size and growth, while Kumar (1985) reports a mild negative association between these two variables; both examined UK data from different periods. Similarly, Evans (1987) reports a strong negative association between firm growth and firm size for all relevant samples including the entire size distribution of firms; rejecting Gibrat's law for US data. More recent studies including Fagiolo and Luzzi (2004), Oliveira and Fortunato (2006), Macas Nunes and Serrasqueiro (2009) have all rejected Gibrat's Law.

There has been little research concerning financing constraints and firm growth in the Caribbean. The closest study to this one is that by Craigwell et al. (2004). The paper examines three types

of financing constraints: internal finance, debt ceiling and exponential interest costs. The findings suggest that initially young, liquidity constrained firms tend to over-invest in capital, exhausting it over future periods and resulting in slower growth rates. In addition, firms with a debt ceiling experience a fluctuating growth pattern.

The present study contributes to literature on firm growth as it explores the importance of liquidity to firm growth dynamics in the Caribbean. To account for the potential endogeneity between liquidity and firm growth, the paper employs the system GMM estimator. The study also contributes to the literature by explicitly accounting for intervening role that governance could play in the growth dynamics of firms. The findings of this study could be useful for potential investors on the Barbados Stock Exchange, and the Caribbean exchanges in general. In addition, if liquidity constraints are found to be important it could suggest that policymakers should pay greater attention to the liquidity of start-ups and small firms.

The remainder of the paper is structured as follows. Following the introduction, Section 2 of the paper summaries the literature on liquidity constraints and firm growth. Section 3 describes the econometric approach and the data used in the study to assess the impact that firm liquidity has had on the growth dynamics of listed companies in Barbados. Section 4 summaries the empirical results, while Section 5 summarises the main findings as well as provide some policy recommendations.

2. Literature Review

Firm liquidity is particularly important due to information asymmetry. Informational problems, particularly in relation to the capital market, can impact on a firm's financial structure and therefore have important effects on its investment decisions and by extension its future growth prospects (Hoshi et al., 1991). The authors evaluate this hypothesis by dividing the firms into two groups: (1) those affiliated with financial institution and therefore less likely to experience information problems, and; (2) those not affiliated with financial institutions and therefore likely to experience greater problems raising capital. Hoshi et al. (1991) find that investment tends to

be more sensitive to liquidity for the second set of firms than for the first and could suggest that firms that are subject to liquidity constraints may experience problems in terms of financing their investment which could result in lower output and thereby growth.

Hundley et al. (1996) note that many firms rely on internally generated funds to finance their research and development programmes. As a result, firms that are liquidity constrained should engage in a relative smaller amount of research and development and therefore experience slower rates of growth. To evaluate this hypothesis the authors evaluate the relationship between research and development intensity, profits and liquidity for US and Japanese firms. While US firms primarily rely on internally generated funds to finance research and development, due to arm's-length relationships between firms and investors, Japanese firms tend to have close relations with a main bank or a key equity holder. As a result, problems in terms of raising external financing are likely to be less severe. The results suggest that while research and development activity among US companies tends to be related to firm profits and liquidity, the relationship between the three variables was much weaker among Japanese companies.

Liquidity can also influence the survival new or relatively young firms. Holtz-Eakin et al. (1994) evaluate the empirical relationship between liquidity constraints (access to capital) and the survival of enterprises. To evaluate the hypothesis the authors compare the survival rates of individuals with/without substantial personal financial resources under the assumption that relatively high net worth individuals would be able to offset any potential capital constraints. Using inheritances as a proxy for net worth Holtz-Eakin et al. (1994) report that a $150,000 inheritance raises the probability of survival by around 1.3 percentage points and a 20-percentage points rise in sales receipts. Similar results are obtained by Fazzari, Hubbard and Petersen (1988). Carpenter and Petersen (2002) also show, using a database of 1600 small firms, are particularly greater for smaller firms.

Most of the research on financing constraints and firm growth tends to provide evidence on a particular country, particularly the US. It is possible that the growth dynamics of firms can vary across countries due to differences in the legal system, corruption, as well as financial and institutional development. To evaluate this issue, Beck et al. (2005) utilise a database consisting

of 4000 firms from 54 countries to examine the relationship between firm growth and financing constraints. The study finds that small firms tend to be most affected by constraints stemming from financial and legal underdevelopment as well as corruption. The main financial constraints to growth turned out to be difficulties in dealing with banks, collateral requirements, high interest rates, liquidity constraints in the banking system.

Most the recent growth in firms across the world has occurred in the so-called new economy. These firms are important sources of scientific innovation and employment. As a result, Elston (2002) investigates whether the relationships discussed above hold for firms primarily involved in the development and/or application of information or knowledge. The results suggest that while for old economy firms growth tended to be higher amongst larger firms, for the new economy firms growth tended to be higher for smaller firms. In terms of firm age, liquidity tended to moderate the relationship between age and growth: without controlling fro liquidity constraints older firms tended to grow faster than their less mature counterparts. However, once the effects of liquidity are controlled for in the model younger firms tended to grow faster than more mature enterprises.

3. Empirical Approach

3.1 Econometric Approach

Gibrat's law suggest that the size (S) of a firm period t is due to the proportional effect and the size of the firm in period $t-1$:

$$S_t = (1+\theta_t)S_{t-1} \tag{1}$$

where θ is a lognormally distributed error term. Following Nelson and Winter (1982) and Evans (1987) a more general growth equation is employed:

$$S_t = [G(X_t')]^d(1+\theta_t)S_{t-1} \tag{2}$$

where X_t' is a matrix of factors that could potentially impact on the firm size-growth relationship.

After taking logs, one obtains a regression equation of the following form:

$$\frac{\ln S_t - \ln S_{t-1}}{d} = lnG(X_t') + lnS_{t-1} + u_t \qquad (3)$$

where u_t is normally distributed with mean zero and a constant variance.

Following Nelson and Winter (1982), the matrix of potential explanatory factors contains firm age and size. Firm age is assumed to have a non-linear impact on firm growth. As a result, a squared age term variable is included in the regression equation. This allows younger firms experience faster rates of growth than their older counterparts, up to some given threshold.

Firm cash flow as a percentage of sales is also included in the regression equation to capture the effects of liquidity constraints on firm growth. The variable is anticipated to be positively related to firm growth as low cash flow ratios may limit access to external financing as well as hinder the ability of the firm to exploit profitable investment opportunities. Jensen and Ruback (1983) and Fama and Jensen (1983) argue that managers also utilise cash to support short-term sales growth. Given there exists a managerial bias toward sales growth, it is also likely that managers could use cash flows to stimulate short-term sales growth. This effect can be moderated by the governance structure the firm has in place: closely monitored managers are less likely to pursue short-term sales objectives over the long-term growth of the company. To capture the modifying effect of the company's governance structure on growth, governance controls are also added to the regression equation.

The dynamic panel data model outlined above is estimated using the generalised method of moments estimator suggested by Arellano and Bond (1991). The estimator attempts to explicitly account for the correlation between the lagged regressor and the error term. The Arellano-Bond GMM estimator estimates the model in first differences in order to eliminate the country-specific effects.

3.2 Data

The paper uses data on 17 companies listed on the Barbados stock exchange. All data is gathered from the company's annual reports for 1997 to 2007. The dependent variable, firm growth (g*rowth*) is computed as:

$$Growth_{it} = \ln Sales_{it} - \ln Sales_{it-1} \quad (4)$$

Firm size (f*irmsize*) is measured by level of sales in the current period, while firm age (a*ge*) is the number of years since incorporation.

Four cash flow ratios serve as proxies for liquidity constraints. The first two cash flow ratios are obtained by dividing each company's opening cash balance by total sales (*ocash_sales*) and total assets (*ocash_assets*), respectively. Opening cash, obtained from the previous year's balance sheet, provides an indication of the liquid resources available to carryout business activities for that current year. The others ratios being evaluated include free cash flow (*fcf*) which is scaled by total sales (*fcf_sales*) and total assets (*fcf_assets*) as well. *fcf* was calculated by adding depreciation to net income after interest and taxes minus preferred dividends and dividends on common stock. *fcf* differs from *ocash* as it represents the cash that a company is able to generate after expenditures are made that are required to maintain and expand the asset base. The gearing ratio measured by the ratio between the firm's total debt and total assets (*debt*) is also calculated for each listed company.

The governance variables included as instruments in the regressions are: (1) board size; (2) board independence, and; (3) board leadership. Board size (*bsize*) is defined as the number of directors on the Board, Board independence (*peroutsid*) the percentage of the Board composed of outside (non-executive) directors and Board leadership (*ceochair*) as whether the positions of CEO and Chairman are held by the same individual (dummy variable; 1 in the case of CEO duality and 0 otherwise).

Table 1: Descriptive Statistics

Variable	N	Mean	Median	St. Dev.	Kurtosis	Skewness
Firm Characteristics						
Age (years)	187	48.76	36.00	38.53	1.46	0.19
Firm Size ($ millions)	162	212.000	67.546	304.000	8.49	2.27
Growth	157	0.05	0.04	0.16	17.11	-1.34
Debt	154	0.42	0.38	0.23	2.68	0.78
fcf_sales	146	0.13	0.11	0.14	16.95	2.99
fcf_assets	146	0.07	0.07	0.05	3.26	0.13
ocash_sales	154	0.35	0.02	1.19	38.33	5.40
ocash_assets	155	0.03	0.01	0.09	5.41	1.09
Board Structure						
Bsize	139	8.63	9.00	2.29	1.80	0.02
Peroutsid	127	0.76	0.82	0.15	3.89	-1.22
Ceochair	140	0.13	0.00	0.34	5.93	2.22

Table 1 reports summary statistics for firm-specific characteristics and board structure variables for firms listed on the BSE. The mean (median) firm age is 49 years (36 years) and the mean (median) firm size, which is proxied by sales, is US$106 million (US$33.5 million). On average, firm sales of listed companies tend to rise by 5 percent per annum. The growth dynamics of these firms was not, however, normal as the measure of kurtosis (17.11) and skewness (-1.34) were significantly different from those expected from a normally distributed series of growth rates. In terms of indebtedness, for the average company, 40 cents in every dollar of assets is owned to creditors. In terms of the variable of interest liquidity, most companies held about 13 cents per dollar of sales and about 7 cents per dollar of assets.

Descriptive statistics for the Board Structure variables are also presented in Table 1. exhibits the mean (median) board size being 8.63(9). In addition, the mean proportion of non-executive officers is 75.87% and only 13% of the companies on the BSE had a dual relationship between the CEO and Chairman over that period.

The sample of local publicly-listed companies on the BSE consist of 29% manufacturing firms, 24% of financial service providers, 12% each from the retail, utility and conglomerate businesses and 6% each from the tourism and agriculture industries. The average growth of financial firms

over the period under investigation is 16.1% compared to manufacturing firms that experienced firm growth at 4.5%. The only industry that declined over the period was agriculture (-3.6%).

Financial service firms, on average, were largest companies in the database. The average financial firm had sales of US$280.7 million followed closely by the conglomerates with US$274.5 million. In contrast, the smallest company could be found in agriculture (US$3.1 million). Over that period, retail firms were the most liquidity companies: 21 cents of every dollar of assets was held in liquid resources, manufacturing companies held about 11 cents on the dollar while financial and agricultural firms held about 3 cents for every dollar in assets. See Appendix A1 for information on individual firms in the database covering the period 1997-2007.

4. Results

This section presents and interprets the results from estimating the model of firm growth presented in Section 3. Table 2 provides the initial growth regression results: growth is assumed to be a function of firm liquidity. The empirical model is estimated using the two-step system GMM approach with white robust standard errors; the OLS results are provided for comparison purposes.

In regressions (1) of Table 2, both cash flow ratios *fcf_sales* and *ocash_sales* are significantly related to growth (at the 10% level). The positive coefficient on the cash flow variables suggest that firms with more liquid resources have better growth prospects: a 1 percent rise in *fcf* raises growth by 30 percent while a similar rise in the opening cash balance raises growth by 7 percent. To assess the robustness of this result, rather than using sales as the scaling variable firm assets is employed. The results are given in regression (2), however, the results were similar to those obtained when sales is used to scale the variables.

Table 2: Firm Growth and Liquidity (No Control Variables)

	(1)	(2)	(3)	(4)
fcf_sales_{it-1}	0.3292[c]	0.3837[b]	0.6403[a]	0.7207[a]
	(0.0608)	(0.0292)	(0.0000)	(0.0000)
ocash_sales	0.0737[c]	-	-0.3605[a]	-
	(0.0967)	-	(0.0000)	-
ocash_assets	-	0.0693	-	-1.5983[a]
	-	(0.7503)	-	(0.0000)
$growth_{it-1}$	-	-	-0.1505[a]	-0.1622[a]
	-	-	(0.0000)	(0.0000)
Regression	OLS	OLS	GMM	GMM
R-squared	0.0616	0.0412	-	-
w_{JS}	4.1	2.7	13705.5	2696.3
	[0.019]	[0.074]	[0.000]	[0.000]

Notes: Table 2 reports the coefficient estimates and their p-values for four regressions involving the dependent variable *growth*. Note that a, b, and c denote significance at the 1%, 5% and 10% level respectively. R-squared is only recorded for the OLS method. The Wald statistic (w_{JS}) of joint significance of the independent variables (excluding the constant term) is also observed.

Due to the potential simultaneous relationship between liquidity and growth, the robustness of these OLS results is assessed by estimating the model using a system GMM approach. The results are given in columns (3) and (4). The coefficient on *fcf* variable is similar to that obtained with OLS, firms with more funds available after expenditures needed to maintain the asset base tend to have faster rates of growth. In contrast, there was a notable change in the results for the opening cash variable. Rather than enhancing growth, a higher opening cash balance had a negative impact on firm growth. It is possible that this result could imply that firms tend to use opening cash to finance internal operations rather than generate greater growth in terms of sales (see Craigwell et al., 2004).

The results obtained above could have been due to the exclusion of other determinants of firm growth. As a result, the basic regressions estimated in the previous section are augmented with various indicators of firm characteristics. The results are given in Table 3. In regression (1) in Table 3 *Age* is negatively and significantly related to growth, consistent with the findings of Oliveira and Fortunato (2006), which suggest that younger firms grow faster than mature enterprises. The positive coefficient on the age^2 variable, however, suggests that there is a non-linear relationship between age and growth. In essence, the results suggest that initially younger

firms grow at a faster pace than older firms do, but after some time age will have a positive impact on growth. The other control variables, firm size and debt ratio, had a statistically insignificant impact on growth.

In terms of the variables of interest, the findings in relation to the liquidity indicators were similar to those obtained in Table 2. The measure of free cash flow has a positive and statistically significant impact on firm growth while opening cash tend to reduce firm growth. The results were similar when assets are used as the scalar. In Table 4, the governance variables are added to the regression variables as instruments. However, the results did not change appreciably.

Table 3: Firm Growth and Liquidity (with Control Variables)

	(1)	**(2)**	**(3)**	**(4)**
fcf_sales$_{it-1}$	0.3703[b]	0.3697[b]	0.2285[b]	0.2532
	(0.0313)	(0.0305)	(0.0329)	(0.3360)
ocash_sales	0.0243	-	-0.4268[a]	-
	(0.6404)	-	(0.0000)	-
ocash_assets	-	0.1497	-	-1.9556[a]
	-	(0.5809)	-	(0.0000)
age	-0.1691[b]	-0.1726[b]	-0.3281	-0.4257[c]
	(0.0218)	(0.0158)	(0.4573)	(0.0840)
age^2	0.0278[b]	0.0287[b]	0.3026[a]	0.3175[a]
	(0.0188)	(0.0134)	(0.0002)	(0.0000)
firmsize$_{it-1}$	0.0023	0.0013	-0.3724[a]	-0.2577[c]
	(0.8569)	(0.9195)	(0.0000)	(0.0883)
debt_ratio	0.0515	0.0620[c]	-0.0491	-0.0737
	(0.1145)	(0.0888)	(0.2148)	(0.4345)
growth$_{it-1}$	-	-	-0.0885[a]	-0.1062[b]
	-	-	(0.0004)	(0.0113)
Regression	OLS	OLS	GMM	GMM
R-squared	0.1493	0.1499	-	-
w_{JS}	3.5	3.5	224.7	40.1
	[0.0031]	[0.0030]	[0.0000]	[0.0000]

Table 3 reports the coefficient estimates and their p-values for four regressions involving the dependent variable *growth*. Note that a, b, and c denote significance at the 1%, 5% and 10% level respectively. R-squared is only recorded for the OLS method. The Wald statistic (w_{JS}) of joint significance of the independent variables (excluding the constant term) is also observed.

Table 4: Firm Growth and Liquidity (Governance Indicators used as Instruments)

	(1)	(2)	(3)
growth$_{it-1}$	-0.0539[b]	-0.0322	-0.0524[c]
	(0.0157)	(0.3668)	(0.0544)
fcf_sales$_{it-1}$	0.6380[a]	-	-
	(0.0000)	-	-
fcf_assets$_{it-1}$	-	1.6153[a]	1.8544[a]
	-	(0.0000)	(0.0000)
ocash_sales	-0.2944[b]	-0.3094[c]	-
	(0.0475)	(0.0983)	-
ocash_assets	-	-	-0.6295
	-	-	(0.2908)
age	-0.2291	-0.2943	-0.1596[c]
	(0.2765)	(0.2246)	(0.0577)
age^2	0.1672[a]	0.2204[a]	0.2042[a]
	(0.0001)	(0.0000)	(0.0000)
firmsize$_{it-1}$	-0.2566[a]	-0.3502[a]	-0.3161[a]
	(0.0000)	(0.0000)	(0.0000)
debt_ratio	0.1143[a]	0.1008[b]	0.1223[b]
	(0.0034)	(0.0424)	(0.0254)
Regression	GMM	GMM	GMM
w_{JS}	3964.9	1165.4	326.4
	[0.0000]	[0.0000]	[0.0000]

Notes: Table 4 reports the coefficient estimates and their p-values for three regressions involving the dependent variable *growth*. Note that a, b, and c denote significance at the 1%, 5% and 10% level respectively. The Wald statistic (w_{JS}) of joint significance of the independent variables (excluding the constant term) is also observed.

5. Conclusions

Using unbalanced panel data on publicly-listed Barbadian companies over the period 1997 to 2007, this study employs pooled OLS and GMM system estimators to investigate whether liquidity constraints influence firm growth-size dynamics. Two proxies for cash are employed: (1) free cash flow, and; (2) opening cash. The coefficient on *fcf* variable suggest that firms with more funds available after expenditures needed to maintain the asset base tend to have faster rates of growth. In contrast, a higher opening cash balance had a negative impact on firm growth. It is possible that this result could imply that firms tend to use opening cash to finance

internal operations rather than generate greater growth in terms of sales. Craigwell et al. (2004) provide empirical results to suggest that most listed companies in Barbados tend to rely primarily on internal finance, in preference to either debt or equity to finance new investments. If this is the case, free cash flow, which subtracts investments in new assets from cash flow calculations, could be a more accurate reflection of firm liquidity.

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