

NET WORTH AND INVESTMENT UNDER FINANCIAL LIBERALIZATION: MICROECONOMIC EVIDENCE FROM JAMAICA¹

Using panel data of Jamaican firms between 1986-1997, I investigate whether firms are risk averse in their investment behavior and how financial liberalization (FL) affects their marginal cost of bankruptcy when investing. The results indicate that net worth play a positive and significant role in firms' investment decisions and suggests that firms are risk averse when investing. Low net worth (LNW) firms are sensitive to their net worth both before and after FL. On the other hand, the marginal productivity of capital rather than net worth appears to play a more important role in the investment behavior of high net worth (HNW) firms. There is no evidence that FL increases the marginal cost of bankruptcy of either LNW or HNW firms. The results provide micro evidence suggesting that shocks to firms' net worth affect investment and is a source of output fluctuations.

Keywords: bankruptcy risk, financial liberalization; investment; net worth; panel data; Jamaica;
JEL-Code: E22; E44; G14; O16

1. Introduction

Over the 1970s and 1980s, many countries in Latin America and the Caribbean (LAC) and in the Asian-Pacific (AP) region started to deregulate their financial systems. These financial liberalization (FL) programs were a part of structural adjustment programs (SAPs) in less developed countries (LDCs). The attempts at FL “failed to achieve their intended results, especially in the Southern countries of Latin America (LA) and in the Philippines” (Grabel, 1995, pp. 127). FL in these countries were linked to low levels of productive investment, savings, and growth, increased speculative investments, significant increases in non-performing loans in banks, financial crises, and government bailouts.

McKinnon (1973) and Shaw (1973) proposed the FL thesis in response to the policies of government intervention in the financial system that was prevalent in the 1960s and 1970s. These policies included fixing of interest rates, high reserve requirements, quantitative credit restrictions, and directed credit programs. McKinnon and Shaw, in separate works, attributed these policies for being responsible for low savings, credit rationing, low investment, and low economic growth. These policies were collectively called ‘financial repression.’

The work of McKinnon and Shaw argued that financial repression negatively affected economic development by its impact on the efficiency in the allocation of savings to investment and its impact on the equilibrium level of savings and investment. “In this

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framework, investment suffers not only in quantity but also in terms of quality since bankers do not ration funds according to the marginal productivity of investment but according to their own discretion.” (Arestis and Demetriades, 1999, pp. 442). The policy implications from the McKinnon-Shaw hypothesis are: the removal of interest rate ceilings, the reduction of reserve requirements, and the abolition of directed credit programs.

In contrast to the McKinnon-Shaw hypothesis that assumes perfect information and perfect markets, recent developments have analyzed the financial sector and its impact in the context of asymmetric information (Stiglitz and Weiss, 1981), agency costs (Bernanke and Gertler, 1989), and bankruptcy risk (Greenwald and Stiglitz, 1993). Following these theoretical developments, several studies have appeared over the last decade testing for the presence of capital market imperfections (Fazzari, et al, 1988). This new strand of literature utilizes firm level balance sheet data and emphasizes microeconomic and macroeconomic linkages between firm behavior and the economy.

In light of emphasis on the importance of imperfect information and its implications for investment, this study investigates how the changes following FL affected investment behavior through its impact on net worth. Greenwald and Stiglitz (1993) model show how net worth affects the risk that firms are willing to bear when investing. Under the assumption that net worth is an inverse function of the marginal cost of bankruptcy, firms turn out to be risk averse. The assumption of the risk averse firm implies that FL, contrary to the expected outcome of the McKinnon-Shaw hypothesis, may have a negative impact on investment and could be a source of persistent economic fluctuations.

There is a conspicuous absence of empirical research that treat net worth under financial liberalization. This paper contributes to this evolving literature of imperfect information by using firm level data to analyze the relationship between net worth and investment.

This study tests the hypothesis that firms are risk averse and investigates how FL affects investment behavior. Sample data from 19 Jamaican firms listed on the stock exchange over the period 1986-1997 facilitates testing of whether firms are risk averse and how FL in 1990-1991 (**APPENDIX II**) affected investment behavior.

Section 2 introduces the model that links the net worth of firms to the marginal cost of bankruptcy, and how this affects investment. Section 3 describes the testing strategy and discusses issues concerning the data. Section 4 presents the results of the estimation while Section 6 concludes with a summary and the implications of the results.

2. Marginal cost of bankruptcy and investment

The neoclassical theory of corporate behavior, developed by Modigliani and Miller (1958) posits that if financial markets are perfect, then it will not matter if firms finance investments from internal or external funds because both are perfect substitutes. Firms are not affected by the lack of availability of funds and will invest until the marginal cost of borrowing is equal to the marginal expected rate of return for a particular investment.

Financial markets, however, are not perfect. These imperfections relate to problems of monitoring and screening, and asymmetric information. With these problems, the Modigliani-Miller theorem is no longer valid.

Net worth and the marginal cost of bankruptcy

Greenwald and Stiglitz (1993) formulate a model that explains the factors that affect business cycles. This finance based-model takes firms to be risk averse, in contrast to the traditional neoclassical models where firms are assumed to be risk neutral. Risk aversion occurs because of information problems present in financial markets. Information problems prevent firms from raising enough equity to finance investment. Consequently, they turn to other instruments of raising funds, primarily loans. If the funds generated by the firm's operations is not enough, they could go bankrupt.

The nature of investment is that a lump sum is spent today for uncertain returns in the future. "New investment, thus carries an additional cost, above the interest rate in the neoclassical model, which is the marginal cost of bankruptcy" (Stiglitz, 1998, pp. 5).

The marginal cost of bankruptcy is affected by the firm's net worth. Changes in the marginal cost of bankruptcy is inversely related to investment. A fall in net worth increases the risk exposure of the firm to new investment. Thus, the risk of bankruptcy causes investment to be a concave function of net worth.

The presence of the bankruptcy risk introduces an additional channel where investment is affected by net worth. The presence of bankruptcy risk is a reason for the persistence

of macroeconomic fluctuations, since a negative shock to net worth translates to lower desired inventory investment. Persistence occurs because it takes time to rebuild net worth.

Other contributions to how balance sheets can be a source of output fluctuation include Bernanke and Gertler (1989) who showed how higher entrepreneur net worth reduce agency costs (deadweight losses). The implications of the relationship between entrepreneur net worth and agency costs imply that since net worth is likely to be high during booms and low during recessions, then this introduces investment and general economic fluctuations into an economic setting that does not have these agency costs.

Like the Greenwald and Stiglitz (1993) model, the implications of a firms' balance sheet is considered. However, the reason for the fluctuations differ with Bernanke and Gertler (1989) considering agency costs while Greenwald and Stiglitz (1993) treat the impact of risk.

Financial liberalization and net worth

Financial liberalization induces changes that can have negative effects on net worth. A rise in interest rates can have the effect of lowering the value of fixed assets as well as lowering the value of future earnings, since net worth depends on past as well as future earnings. To the extent that they have redistributive effects, the broader structural adjustment policies, of which FL was one component, can lead to a sharp fall in borrower net worth.

The hypotheses

Formally, the hypotheses to be tested are:

Hypothesis 1: Firms are averse in carrying out new investments and this is affected by the level of their net worth. The proposition that firms are risk averse is reasonable based on the model discussed as well as casual real world observations.

Hypothesis 2: FL increases the elasticity of investment to net worth for all groups of firms. Since FL is expected to lower the net worth of firms, if all other factors remain constant, then the marginal cost of bankruptcy for firms would increase since they would move to a relatively more elastic of the (concave) curve that according to Stiglitz (1998), describes the relationship between investment and net worth.

3. Testing strategy and data issues

The model discussed takes *investment is an increasing concave function of net worth*. This section explains a method to test this proposition.

Testing strategy

The previous discussion suggests that the investment relation is non-linear due to the existence of risk averse firms. Consequently, the investment equation of that should be used is an equation in either a semilogarithmic form or double logarithmic form. The double logarithmic form has the advantage that the coefficients derived are interpreted as elasticities. This will enable information about the nature of the non-linearity of the investment equation to be determined.

The equation estimated is a variation of the form used by Laeven (2000) who defines a relationship between investment and present value of future financial factors, the present value of future marginal profits, and lagged investment. Lagged investment is added to the model to due the dependence of present investment on past investment in imperfect markets.

Expressed in double logarithmic form, the basic investment equation is:

$$\log \left(\frac{I_{it}}{K_{it-1}} \right) = \beta_0 + \beta_1 \log \frac{I_{it-1}}{K_{it-1}} + \beta_2 \log \frac{S_{it-1}}{K_{it-1}} + \beta_3 \log \frac{NW_{it-1}}{K_{it-1}} + f_i + \epsilon_{it}$$

Gilchrist and Himmelberg (1998) show that the marginal profitability of fixed capital under certain conditions is equal to the ratio of sales to capital $\left(\frac{S_{it-1}}{K_{it-1}} \right)$. This definition is used as a proxy for MPK. The proxy used for the present value of future financial resources (net worth) is lagged net worth as a ratio of lagged capital stock, defined as $\left(\frac{NW_{it-1}}{K_{it-1}} \right)$. The investment also includes a variable to capture firm specific fixed effects. Time effects were ignored since following Green (2000) “If one of “n” or “T” is small and the other is large, it would be simpler to treat the smaller set as an ordinary set of variables and apply the one way fixed effects model defined by the larger set”(Green, 2000, pp. 565). This reason for this approach is that the loss in terms of degrees of freedom are often not justified.

In order to account for and examine the impact of FL, the basic investment equation is ammended to include FL dummy variables (see **Table 2** for details on the variables) .

The dummy variables included account for expected shifts in the equation as well as changes in the coefficients. The estimated equation is:

$$\log\left(\frac{I_{it}}{K_{it-1}}\right) = \beta_0 + \beta_1 \log\left(\frac{I_{it-1}}{K_{it-1}}\right) + \beta_2 \log\left(\frac{S_{it-1}}{K_{it-1}}\right) + \beta_3 \log\left(\frac{NW_{it-1}}{K_{it-1}}\right) + \beta_4 D + \beta_5 D \log\left(\frac{I_{it-1}}{K_{it-1}}\right) + \beta_6 D \log\left(\frac{S_{it-1}}{K_{it-1}}\right) + \beta_7 D \log\left(\frac{NW_{it-1}}{K_{it-1}}\right) + f_{it}$$

The firms are divided into two groups: low net worth (LNW) firms and high net worth (HNW) firms. The regression is run on both groups. If firms in the market are on average risk averse, the expected result is that the coefficient of LNW firms is higher than that HNW firms.

Data

Table 1: Variables

Variable	Definition
$\log I_{it} / K_{it-1}$	DEPENDENT VARIABLE: Firm investment
$\log I_{it-1} / K_{it-1}$	Lagged investment /Lagged fixed assets
$\log S_{it-1} / K_{it-1}$	Lagged sales/lagged fixed assets (proxy for MPK)
$\log NW_{it-1} / K_{it-1}$	Lagged net worth/lagged fixed assets
D	FL dummy variable
$D * \log I_{it-1} / K_{it-1}$	FL dummy interaction with past investment
$D * \log S_{it-1} / K_{it-1}$	FL dummy interaction with MPK proxy
$D * \log NW_{it-1} / K_{it-1}$	FL dummy interaction with net worth

The data employed is derived from the financial statements listed on the Jamaica Stock Exchange from 1986 to 1997. The companies cover a range of sectors including the manufacturing, trading, and other service sectors (APPENDIX I). The data covers 19 firms listed on the stock exchange over the period 1986 to 1997. One firm was eliminated since it had negative net worth.

This study uses the calendar year for the

estimations. Some the financial years for some companies did not coincide with the

calendar year. Assuming all transactions occur evenly over the period, the figures for the calendar year were calculated.

The definition of net worth employed is net worth is the sum of the current value of fixed assets and liquid assets.

Two issues that arise from the firms used in the sample are number of firms covered in the estimations and their sectoral coverage. The 19 firms (**APPENDIX I**) covers the majority of non-financial firms listed on the Jamaican Stock Exchange over the period covered. Further, the firms cover manufacturing, trading, and service related sectors. Thus, the sample is representative of the listed firms.

Net worth before and after FL: a comparison

As discussed in Section 2, there is reason to believe that FL may negatively affect net worth. **Table 2** presents a simple comparison of average net worth before and after FL for various groups of firms.

Table 2: Net Worth/Fixed Assets Ratio before and after financial liberalization

	5 years pre-FL	5 years post-FL	4 years pre-FL	4 years post-FL	3 years pre-FL	3 years post-FL
ALL FIRMS	1.83	1.79	1.86	1.81	1.85	1.82
LNW FIRMS	1.31	1.23	1.32	1.25	1.31	1.27
HNW FIRMS	2.54	2.57	2.60	2.59	2.60	2.58

The ratios fell for the “all firms” category in the post-FL period. This was also true for LNW firms, which on average experience falling NW ratio. Though falling marginally in the 3-year and 4 year comparison, the 5-year comparison (*the period used in the estimation*) shows the NW ratio slightly higher in the post-FL period.

5. Results

Are firms risk averse?

Table 3 presents the regression results for all the firms in the sample as well as LNW and HNW firms. The coefficients are as expected, all positive. The net worth coefficient for LNW firms is larger than that of HNW firms. This suggests that investment is concave in net worth. The coefficient of net worth for HNW firms was insignificant, so this casts some doubt about the validity of the comparison.

Table 3: Results

Sample	All firms	LNW Firms	HNW Firms
Constant	-0.778* (-5.43)	-0.655* (-3.46)	-1.288* (-5.16)
$\log I_{it+} / K_{it-1}$	0.323* (3.44)	0.420* (3.09)	0.183 (1.44)
$\log S_{it+} / K_{it-1}$	0.260*** (1.93)	0.114 (0.65)	0.569** (2.28)
$\log NW_{it+} / K_{it-1}$	0.838** (2.56)	1.347** (2.38)	0.313 (0.58)
<i>D</i>	0.330** (2.39)	0.392** (2.02)	0.179 (0.75)
<i>D</i> * $\log I_{it+} / K_{it-1}$	0.378* (3.25)	0.387** (2.27)	0.271 (1.60)
<i>D</i> * $\log S_{it+} / K_{it-1}$	-0.006 (-0.05)	0.009 (0.05)	-0.089 (-0.40)
<i>D</i> * $\log NW_{it+} / K_{it-1}$	-0.126 (-0.40)	-0.786 (-1.15)	0.308 (0.68)
Adjusted R-squared	0.77	0.76	0.58
Observations	190	110	80
* 1% significance ** 5% significance *** 10% significance (t-statistics in parenthesis)			

However, a test of equality of the coefficients in the equations for the LNW and HNW firms rejected the null hypothesis of equality between the coefficients at 1% level of significance. Further, at relatively higher levels of net worth, it is reasonable to expect the firms would be less concerned about becoming the risk of being bankrupt and more concerned the returns to capital (MPK). For HNW firms, the

coefficient of the proxy for MPK ($\log S_{it+} / K_{it-1}$) is positive and significant. Thus, from the results, the hypothesis of risk averse firm is accepted.

The fit of the investment equation for the ‘all firms’ group is quite good with all coefficients having the expected positive signs and significant. The ‘all firms’ group appears to have been most responsive to changes in net worth in their investment behavior.

LNW firms were most concerned about their level of net worth in investing. The investment of LNW firms was elastic to changes in net worth. Though the response was inelastic, LNW firms also responded positively to previous year’s investment. However, the MPK was not important.

The FL dummy variable, D, is positive and significant for all firms and for LNW firms, but is insignificant for HNW firms. This indicates that LNW firms responded favorably to FL.

The net worth FL interaction dummy is negative for all firms and NWL firms. However, the results are not significant. The result for the HNW group has the expected coefficient sign but again, the result is not significant.

The results seem to suggest that FL did not increase the marginal cost of bankruptcy to the firms.

6. Conclusion and implications

This exploratory study tested the proposition that firms in Jamaica are risk averse. Net worth was important in the investment decisions for LNW firms while the MPK was most important for HNW firms. These contrasting observations for the different groups imply that the marginal cost of bankruptcy was much smaller for HNW firms, allowing them to make investment decision on the basis of the return to capital.

FL did not appear to have increased the marginal cost of bankruptcy for the firms examined.

The notion of the risk averse firm is consistent with the expected outcome of theoretical model by Greenwald and Stiglitz (1993) that explain how economic shocks to borrower net worth affects investment and is a source of output fluctuations.

Accepting this hypothesis is an indicator that firms are risk averse and is a first step in explaining why an economic shock can lead to persistent fluctuations in investment and output. Greenwald and Stiglitz (1993) explain this impact in two ways. Firms in general due to information problems cannot freely access the equity market for investment and thus they are forced to take out loans. Greater leverage increases the probability and marginal cost of bankruptcy. Thus, negative shocks to net worth will cause investment and output to decrease.

A second explanation is if investment is taken as current expenditure that provides returns over several periods, the relative price uncertainty of the current expenditure will probably be greater in the current period than in the next period output. A shock that leads to a fall in net worth. Given the current uncertainty, the probability of

bankruptcy and the marginal cost of bankruptcy increases leading to a disproportionate cut back in investment.

APPENDIX I SAMPLE FIRMS

FIRM	SECTOR
CARIBBEAN CEMENT COMPANY LIMITED	MANUFACTURING
CARRERAS GROUP LIMITED	MANUFACTURING
CARIBBEAN METAL PRODUCTS LIMITED	MANUFACTURING
DESNOES AND GEDDES LIMITED	MANUFACTURING
GOODYEAR JAMAICA LIMITED	MANUFACTURING
JAMAICA FLOUR MILLS LIMITED	MANUFACTURING
SALADA FOODS LIMITED	MANUFACTURING
SEPROD LIMITED	MANUFACTURING
GLEANER COMPANY LIMITED	COMMUNICATIONS
RADIO JAMAIA LIMITED	COMMUNICATIONS
MONTEGO BAY FREEPORT LIMITED	TOURISM
JAMAICA PEGASUS LIMITED	TOURISM
COURTS JAMAICA LIMITED	TRADING
HARDWARE & LUMBER LIMITED	TRADING
GRACE KENNEDY & COMPANY LIMITED	CONGLOMERATE
JAMAICA PRODUCERS GROUP	CONGLOMERATE
LASCELLES DE MERCADO LIMITED	CONGLOMERATE
PAN JAM INVESTMENTS LIMITED	CONGLOMERATE
JAMACA LIVESTOCK ASSOCIATION	SERVICES

APPENDIX II FL POLICY CHANGES IN JAMAICA: 1990-1991

Before FL	After FL
1. Restrictions on banks operating foreign currency accounts	1. Commercial banks authorized to operate foreign currency accounts (August 1, 1990)
2. Exchange rate fixed by the government	2. Commercial banks set their own exchange rate (September 17, 1990)
3. Banks not allowed to trade foreign currency with each other	3. Inter-bank trading of foreign currency introduced
4. Deposit rate fixed by the government	4. Commercial banks set their own rates (October 1, 1990)
5. Ceilings on loans set by the government	5. Ceilings on loans removed (January 1, 1991)
6. Limits on foreign exchange	6. Limits on foreign exchange

lending by commercial banks	commercial bank lending removed (May 9, 1991)
7. Foreign investors need government permission to lend to Jamaican business	7. Foreign investors do not require government approval to lend to Jamaican businesses (August 22, 1991)
8. Foreign investors need government permission to buy Jamaican equity and shares in Jamaican companies	8. Foreign investors do not need government permission to buy Jamaican equity or shares in Jamaican companies (August 22, 1991)
9. Exporters and earners of foreign exchange required to sell it to the government	9. Exporters and earners of foreign currency free to hold it however and wherever they want to (September 25, 1991)

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