Chapter 8

Financial market imperfections and investment: an empirical study of rice mills

8.1 Introduction

The theoretical literature points out that financial market imperfections may create financing constraints on firm investment. The degree of financing constraints facing a firm can be studied by examining the extent to which its investment is sensitive to its internal funds, as discussed in Chapter 5. The empirical literature that aims to study the sensitivity of firm investment to internal funds has come up with mixed findings. In this context, it may be interesting to analyse whether or not private rice millers in the MRD encounter financing constraints because the analysis in Chapter 3 suggests that financial market imperfections are prevalent in Vietnam.

This chapter is set up to study the relationship between financial market imperfections and investment of private rice millers in the MRD. In particular, the analyses in this chapter will test the hypothesis that investment of private rice millers in the MRD are constrained by a lack of access to credit. The remainder of this chapter is organised as follows. Section 8.2 discusses patterns of investment financing of private rice millers; this section serves to provide the reader with an overall picture of how private rice millers finance their investment. Section 8.3 discusses the empirical model that we use to test the above-mentioned hypothesis. Section 8.4 explores the effect of financial market imperfections on investment of private rice millers, and Section 8.5 concludes this chapter.

8.2 Patterns of investment financing of private rice millers in the MRD

Table 8.1 displays the patterns of investment financing of private rice millers in the MRD. As shown in this table, private rice millers used both internal and external funds to finance their investments. In 1998 there were 108 rice millers that invested, and 91 out of these 108 rice millers (84.3 per cent) financed investment with own capital only (Line 1). The dominance of the rice millers that used only own capital to finance investment may primarily suggest the existence of difficulties for rice millers in terms of getting access to credit, assuming that they needed more finance than what they had from their own savings. Only six rice millers (5.6 per cent) combined bank loans with own capital to finance investment (Line 2). As few as seven rice millers relied on bank loans only (6.5 per cent). Other combinations of sources of funds (Lines 3, 4, 6, and 7) appear to be negligible.

Table 8.1 Patterns of investment financing of private rice millers, 1998-1999

	Means of financing	1998		1999	
		Number of rice millers observed	*Per cent of total number of rice millers that invested*	*Number of rice millers observed*	*Per cent of total number of rice millers that invested*
1	Own capital only	91	84.3	99	78.0
2	Own capital and banks	6	5.6	10	7.9
3	Own capital and banks and informal lenders	1	0.9	0	0.0
4	Own capital and informal lenders	1	0.9	0	0.0
5	Banks only	7	6.5	11	8.7
6	Moneylenders only	1	0.9	5	3.9
7	Banks and informal lenders	1	0.9	2	1.6
	Total	108	100.0	127	100.0

Source: Own survey in 2000.

In 1999 the patterns of investment financing of private rice millers remained nearly the same. In this year, there were 127 rice millers that invested. An overwhelming number of rice millers (99 out of 127, amounting to 78.0 per cent) used only own capital to finance investment although this figure was somewhat lower as compared to 1998. The number of rice millers that combined own capital and bank loans increased in both absolute and relative terms as compared to 1998; yet, the increase was modest (Line 2). Although the number of rice millers that only used bank loans went up, still a small number of the rice millers financed investment with only bank loans. Moneylenders became more important but remained as a minor source of

funds for the rice millers (Line 6).

In summary, this section reveals that an overwhelming portion of the sample relied on internal funds for their investment. Several other studies on Vietnamese firms also find similar results. For instance, Gates (1995) argues that in Vietnam firm investment depends on internal funds due to the imperfections of the country's financial system. Riedel and Tran (1997) indicate that most of the private enterprises they interviewed had to rely heavily on cash holdings, retained earnings, and credit from informal capital market to finance investment. O'Connor (2000) also divulge that in Vietnam bank loans were an unimportant means of financing investment, implying that internal funds and informal credit were important to Vietnamese firm investment.

According to the theoretical literature (see Chapter 5), if a firm faces difficulties in getting access to external funds, its investment may be sensitive to its internal funds. This is the hypothesis that we are about to test in the next sections using the data set described in Chapter 7.

8.3 Financial market imperfections and investment: model specification

This section and the next one empirically examine the link between financial market imperfections and firm investment by studying the sensitivity of investment to internal funds using information of 202 price rice millers in the MRD.[139] The procedure that we pursue in this empirical study was presented in Section 5.5 of Chapter 5, which can be summarised as follows. First, we estimate a standard accelerator model of investment. Next, we include an internal-funds variable into the standard model in order to test for the existence of financing constraints. Finally, we investigate whether or not the effect of financial market imperfections on investment varies across (groups of) rice millers facing different degrees of financing constraints.

In this empirical study, we use the following specification:

$$I_t = \alpha_1 + \alpha_2 \cdot PRO_{t-1} + \alpha_3 \cdot DSAL_t + \alpha_4 \cdot LOC + \alpha_5 \cdot BOR_{t-1} \qquad (8.1)$$

Specification (8.1) is basically an augmented accelerator model that includes the following variables:

- I_t, *i.e.*, the dependent variable, represents investment spending in 1999 divided by total fixed assets in 1999. We assume that the investment spending in 1999 took place over the year.

[139] We surveyed 210 private rice millers. However, in this chapter we use information of only 202 rice millers because of missing values.

- PRO_{t-1} is the profit that was realised at the end of 1998 divided by total fixed assets in 1999 in order to avoid scale effects. Since PRO_{t-1} is the profit realised at the end of 1998, it can be used as a measure of internal funds for investment in 1999. In this chapter, we use profit instead of cash flow because we do not have information on the depreciation of the RMs.[140] We include this variable based on the argument that investments of financially constrained firms may be sensitive to internal funds and that firms may use lagged profits (as internal funds) to finance current investments.[141] We expect that α_2 is positive and varies across subsamples that exhibit different degrees of financing constraints.
- $DSAL_t$ stands for the growth rate of sales in 1999. The inclusion of this variable is suggested by the accelerator model (see Chapter 5). It is expected that α_3 is positive due to the accelerator effect.
- *LOC* is the location variable, which takes on a value of one if the RM is located in an advantage location and of zero if the RM is located in a disadvantage location. (Subsection 7.3.3 of Chapter 7 provides an exhaustive description of RM location.) As discussed in Chapter 7, location of a RM is related to its investment opportunities. Since those RMs that are based in an advantageous location will have better investment opportunities, we expect that α_4 is positive.
- BOR_{t-1} stands for the amount of money that a rice miller borrowed in 1998 divided by its total fixed assets in 1999. α_6 can be either negative or positive. On the one hand, debt may be positively related to the degree of financing constraints because higher leverage may lead to higher agency cost and a higher external finance premium.[142] Thus, higher debt would lower investment. If this is the case, α_6 should be negative. On the other hand, firms may finance investment using borrowed money. If this line of argument holds, α_6 should be positive.[143]

8.4 Results and discussions

This section embraces the results of several empirical tests of the link between financial market imperfections and firm investment using the data on private rice millers in the MRD (see Chapter 7). In Subsection 8.4.1, we test the sensitivity of investment to internal funds for the entire sample. If the sensitivity is significantly positive, it sug-

[140] Cash flow is profit plus depreciation.
[141] See, *e.g.*, Bilsborrow (1977), Hermes and Lensink (1998), *etc.*
[142] See, *e.g.*, Harris *et al.* (1994).
[143] For instance, Eastwood and Kohli (1999) find that an extra rupee of bank credit extended to an (Indian) small firm in the electrical machinery is estimated to raise its investment by 0.224 rupees.

gests the existence of financing constraints for rice millers. Subsection 8.4.2 applies the same test to those rice millers who applied for loans (*i.e.*, the applicants). Subsections 8.4.3 and 8.4.4 study the variation of the sensitivity of investment to internal funds regarding size and age, respectively. The analysis in the remainder of this chapter employs the ordinary least squares technique.

8.4.1 *Entire sample*

Descriptive statistics of the variables used in this subsection are given in Table 8.2.[144] This table shows that the investment variable (I_t) largely varies across RMs because its standard deviation is relatively large as compared to its mean.[145] A positive skewness of 2.777 means that the investment distribution has a long right tail: many RMs had small investment outlays in 1999. A large number of non-investors, *i.e.*, 78 RMs that did not invest in 1999, may explain the reason why the kurtosis value is so high.

Table 8.2 Descriptive statistics of variables: entire sample

Variables	*Mean*	*St. dev.*	*Skewness*	*Kurtosis*	*Obs.*
I_t	0.144	0.221	2.777	10.1728	202
PRO_{t-1}	0.181	0.154	1.708	2.994	202
$DSAL_t$	0.001	0.072	-0.499	7.318	202
LOC	0.629	0.484	-0.537	-1.729	202
BOR_{t-1}	0.132	0.284	3.530	15.540	202

Source: Own survey in 2000.

In this subsection, we first test the standard model that excludes the internal-funds variable. Column [2] of Table 8.3 reveals that the growth-rate-of-sales variable ($DSAL_t$) has a significant positive coefficient at the 5 per cent level, implying the existence of the accelerator effect in the context of private RMs in the MRD. As we discussed in Chapter 7, location is an important factor that may proxy for investment opportunities of RMs. Thus, in Column [3] we include the location variable (*LOC*). This variable displays a significant coefficient (at the 1 per cent level) with positive sign, implying that those RMs located in better locations may have a higher tendency to invest. The coefficient of the growth-rate-of-sales variable ($DSAL_t$) has a positive sign and is significant at the 1 per cent level.

[144] Table 8.2 shows that the variables are not normally distributed. This may bias the results.
[145] The coefficient of variation of this variable is 1.53.

Table 8.3 Determinants of investment of rice millers: entire sample
Dependent variable: Ratio of investment spending in 1999 to total fixed assets 1999

[1]	[2]	[3]	[4]
Constant	0.1435***	0.0830***	0.0330
	(9.3320)	(3.3551)	(1.1338)
PRO_{t-1}			0.1660*
			(1.7181)
$DSAL_t$	0.5215**	0.5482***	0.4900**
	(2.4500)	(2.6274)	(2.4045)
		0.0962***	0.0954***
LOC		(3.0849)	(3.1091)
BOR_{t-1}			0.1549***
			(2.9624)
N	202	202	202
R^2	0.029	0.073	0.131

Note: * significant at the 10 per cent level; ** significant at the 5 per cent level; and *** significant at the 1 per cent level.
PRO_{t-1} = profit in 1998; $DSAL_t$ = the growth rate of sales in 1999; *LOC* = location; and BOR_{t-1} = borrowing in 1998.

The next step is to test for the existence of financial market imperfections. In Column [4] of Table 8.3, we introduce the internal-funds variable (PRO_{t-1}) in order to test for the existence of financial market imperfections. The internal-funds variable (PRO_{t-1}) has a positive significant coefficient at the 10 per cent level. The growth-rate-of-sales variable ($DSAL_t$) has a significant positive coefficient at the 5 per cent level. The positive coefficient of the location variable (*LOC*) is significant at the 1 per cent levels. The borrowing variable (BOR_{t-1}) has a significant positive coefficient at the 1 per cent level, probably supporting the argument that RMs used the money borrowed in the previous year to finance investment. The results in Column [4] show that investment of RMs is sensitive to internal funds, indicating that RMs may encounter financing constraints.

Table 8.3 also reveals that the R^2 improves considerably as the internal-funds variable (PRO_{t-1}) is included, implying that the internal-funds augmented accelerator model may be better than the standard model in terms of explaining investment of RMs.

8.4.2 *Applicants*

The previous section has shown that investment of rice millers is sensitive to their in-

ternal funds, suggesting the existence of financing constraints for them. However, the sample includes 92 non-applicants, *i.e.*, those rice millers that did not apply for loans. According to our observation during the survey, one of the reasons for not applying for loans might be that these private RMs, especially those having no or small collateral, expected low chances of getting loans while the application procedure was costly (see Subsection 3.2.2 of Chapter 2 and Subsection 7.3.6 of Chapter 7). In this case, the non-applicants face more severe financial constraints. On the other hand, it may be that they did not need additional external funds. If this is true, these rice millers should not be confronted with financing constraints. Since these RMs did not apply for loans, their demand for external funds was not observable. Therefore, in this subsection we redo the test using information from only the applicants, *i.e.*, those rice millers that applied for loans.

The applicant subsample includes 110 rice millers, accounting for 54.5 per cent of the sample's population. The average investment of this group is 0.187 (see Table 8.4), higher than that of the entire sample (see Table 8.2). Although the variation of investment of the applicants is somewhat lower than that of the entire sample, it is still fairly high: the coefficient of variation is 1.44. The investment of the applicants, which has a skewness value of 2.373, also has a long right tail, suggesting that the applicants tended to conduct small investments. This subsample includes 37 rice millers that did not invest at all in 1999, giving rise to the kurtosis value being as high as 6.999.

Table 8.4 Descriptive statistics of variables: applicants

Variables	*Mean*	*St. dev.*	*Skewness*	*Kurtosis*	*Obs.*
I_t	0.187	0.269	2.343	6.999	110
PRO_{t-1}	0.189	0.156	1.570	2.608	110
$DSAL_t$	0.003	0.081	-0.270	5.493	110
LOC	0.582	0.496	-0.336	-1.922	110
BOR_{t-1}	0.242	0.349	2.584	8.268	110

Source: Own survey in 2000.

In this test, we employ the same empirical approach as the one we used in the previous subsection. Table 8.5 shows the findings. In Column [2], we test the standard accelerator investment model, which excludes the internal-funds variable. We find that the growth-rate-of-sales variable ($DSAL_t$) has a positive coefficient significant at the 10 per cent level, implying the existence of the accelerator effect. In Column [3], we include the location variable (*LOC*). This variable exhibits a significant positive coefficient at the 1 per cent level. The inclusion of the location variable does not

change much the magnitude as well as the significance level of the coefficient of the growth-rate-of-sales variable ($DSAL_t$).

Table 8.5 Determinants of investment of the applicants
Dependent variable: Ratio of investment spending in 1999 to total fixed assets 1999

[1]	[2]	[3]	[4]
Constant	0.1857***	0.0913**	0.0198
	(7.3278)	(2.4349)	(0.4215)
PRO_{t-1}			0.2965*
			(1.9046)
$DSAL_{t-1}$	0.5859*	0.6070**	0.5694*
	(1.8558)	(2.0080)	(1.9114)
		0.1620***	0.1504***
LOC		(3.2962)	(3.0833)
BOR_{t-1}			0.0920
			(1.3295)
N	110	110	110
R^2	0.030	0.120	0.168

Note: * significant at the 10 per cent level; ** significant at the 5 per cent level; and *** significant at the 1 per cent level.
PRO_{t-1} = profit in 1998; $DSAL_t$ = change in sales in 1999 as compared to 1998; *LOC* = location; and BOR_{t-1} = borrowing in 1998.

In Column [4], we aim to test the effect of financial market imperfections on RM investment using the augmented accelerator model that includes the internal-funds variable (PRO_{t-1}). We find that the coefficient of the profit-in-1998 variable (PRO_{t-1}) is positive and significant at the 10 per cent level. The coefficient of the growth-rate-of-sale variable ($DSAL_t$) is positive and significant at the 5 per cent level. The location variable (*LOC*) has a significantly positive coefficient at the 1 per cent level. The borrowing variable (BOR_{t-1}) does not have a significant coefficient. Like before, in this subsection R^2 improves when the internal-funds variable (PRO_{t-1}) is included.

The finding in this subsection again suggests the existence of financing constraints for RMs; this also strengthens the finding the previous subsection. Yet, it is possible that the degree of financing constraints differs across (groups of) RMs that have different characteristics, *e.g.*, size and age. In the next subsections, we will examine this hypothesis.

8.4.3 *Size*

As reviewed in Chapter 5, size is among the determinants of firms' access to external funds. Chapter 3 discloses that in Vietnam private enterprises have to pledge collateral when borrowing. Therefore, size may play an essential role to RMs' access to external funds because larger RMs may have more acceptable collateral and may thus be able to borrow more. Moreover, since large RMs tend to be more diversified, *i.e.*, they may engage in more areas of activities, it is more likely for them to use other types of finance, *e.g.*, interfirm credit, to finance (part of) their investment. In addition, thanks to this diversification large RMs tend to have a wider range of clients, who may also act as a source of information for lenders about these RMs. As a result, large RMs should be less financially constrained.

According to Chapter 5, several studies have used size as *a priori* criteria to split firms into different degrees of financing constraints. In this subsection, we apply this approach to both the entire sample and the applicant subsample. We use the mean and the median as criteria to split the (sub)samples:

- We consider those RMs that have a value of total fixed assets (estimated in 1999) smaller than the sample's mean (*i.e.*, VND448 million) as small ones and the rest as large ones.
- Alternatively, we consider those RMs that have a value of total fixed assets larger than the sample's median (*i.e.*, VND350 million) as large ones and the remainder as small ones.

Entire sample

Table 8.6 gives descriptive statistics of the variables used in this test. A striking difference between large and small RMs is that the former experienced a positive growth rate of sales while the latter faced a negative growth rate of sales. Small RMs had a relatively large profit in 1998 as compared to their investment in 1999. As for large firms, their profit in 1998 was not significantly larger than their investment in 1999.

We apply Specification (8.1) to test for the difference in the sensitivity of investment to internal funds across these two groups of RMs. Table 8.7 shows our findings. Although using the mean and the median to partition the sample results in different subsample sizes, the outcomes look alike.

Table 8.6 Descriptive statistics of variables: large and small RMs

Variables	*Mean*	*St. dev.*	*Skewness*	*Kurtosis*	*Obs.*
Sorting criterion: mean					
Large RMs					
I_t	0.138	0.191	1.707	1.989	78
PRO_{t-1}	0.144	0.136	2.020	5.082	78
$DSAL_t$	0.005	0.089	0.036	3.540	78
LOC	0.603	0.493	-0.427	-1.866	78
BOR_{t-1}	0.104	0.232	3.141	9.980	78
Small RMs					
I_t	0.147	0.239	3.061	12.320	124
PRO_{t-1}	0.205	0.161	1.596	2.359	124
$DSAL_t$	-0.002	0.060	-1.689	13.628	124
LOC	0.645	0.480	-0.614	-1.650	124
BOR_{t-1}	0.149	0.312	3.505	15.230	124
Sorting criterion: median					
Large RMs					
I_t	0.139	0.212	2.545	8.140	99
PRO_{t-1}	0.153	0.139	1.820	3.648	99
$DSAL_t$	0.004	0.084	-0.200	4.252	99
LOC	0.606	0.491	-0.441	-1.843	99
BOR_{t-1}	0.096	0.219	3.200	10.650	99
Small RMs					
I_t	0.148	0.230	2.969	3.417	103
PRO_{t-1}	0.209	0.163	1.641	2.996	103
$DSAL_t$	-0.003	0.591	-1.443	14.892	103
LOC	0.650	0.479	-0.641	-1.642	103
BOR_{t-1}	0.166	0.332	3.325	12.890	103

Source: Own survey in 2000.

As for large RMs, the profit-in-1998 and the growth-rate-of-sales variables (PRO_{t-1} and $DSAL_t$, respectively) do not have any significant coefficient (see Columns [2] and [4] of Table 8.7). The only variable that is significant for large RMs is location: the location variable (*LOC*) has a significant positive coefficient at the 10- and the 5 per cent levels in Columns [2] and [4], respectively.

Table 8.7 Determinants of investment: large versus small RMs – entire sample
Dependent variable: Ratio of investment spending in 1999 to total fixed assets 1999

	Sorting criterion: mean [a]		*Sorting criterion: median* [b]	
	Large	*Small*	*Large*	*Small*
[1]	[2]	[3]	[4]	[5]
Constant	0.0991**	-0.0110	0.0735*	-0.0117
	(2.5089)	(-0.2673)	(1.88636)	(-0.2666)
PRO_{t-1}	-0.1800	0.3202**	-0.0146	0.3043**
	(-1.1364)	(2.5672)	(-0.0955)	(2.3791)
$DSAL_t$	0.3123	0.6912**	0.3778	0.7023*
	(1.3063)	(2.0758)	(1.5091)	(1.9751)
	0.0835*	0.1058**	0.0983**	0.1014**
LOC	(1.9380)	(2.5286)	(2.2684)	(2.3081)
BOR_{t-1}	0.1239	0.1754***	0.0704	0.1941***
	(1.3346)	(2.7425)	(0.7247)	(3.0927)
N	78	124	99	103
R^2	0.101	0.187	0.081	0.211

Note: * significant at the 10 per cent level; ** significant at the 5 per cent level; and *** significant at the 1 per cent level.
PRO_{t-1} = profit in 1998; $DSAL_t$ = the growth rate of sales in 1999; *LOC* = location; and BOR_{t-1} = borrowing in 1998.
[a] The sample's mean value of total fixed assets is VND 448 million; [b] the sample's median value of total fixed assets is VND 350 million.

The story is different for small RMs. Investment of small RMs appears to be sensitive to their internal funds, as revealed by Columns [3] and [5] of Table 8.7. Both columns show that the profit-in-1998 variable (PRO_{t-1}) has positive coefficients that are significant at the 5 per cent level. The growth-rate-of-sales variable ($DSAL_t$) has positive coefficients that are significant at the 5 per cent level in Column [5] and at the 10 per cent level in Column [7]. The location and borrowing variables (*LOC* and BOR_{t-1}, respectively) have the same signs and significance levels in both columns. Interestingly, the R^2 is much greater for small RMs than for large RMs.

In sum, the findings in this subsection reveal that investment of small RMs is sensitive to internal funds while investment of large RMs is not. This suggests that small RMs may face financing constraints and large RMs may not.

Applicants

In this subsection, we apply the same test as the one we have performed in the previous subsection. Table 8.8 shows the outcomes. It can be inferred from this table that

investment of large applicants is not sensitive to internal funds, irrespective of the sorting criteria used. The internal-funds variable (PRO_{t-1}) does not have significant coefficients in Columns [2] and [4]. As for these RMs, only the location variable (*LOC*) has a significant coefficient (Columns [2] and [4]).

Table 8.8 Determinants of investment: large versus small RMs applicants
Dependent variable: Ratio of investment spending in 1999 to total fixed assets 1999

	Sorting criterion: mean [a]		*Sorting criterion: median* [b]	
	Large	*Small*	*Large*	*Small*
[1]	[2]	[3]	[4]	[5]
Constant	0.1365**	-0.0707	0.1173*	-0.0900
	(2.2434)	(-1.0672)	(1.8168)	(-1.3494)
PRO_{t-1}	-0.2211	0.6681***	-0.0692	0.6803***
	(-1.0654)	(3.0651)	(-0.3170)	(3.1572)
$DSAL_t$	0.3671	0.6767	0.4522	0.7420
	(1.0671)	(1.4109)	(1.2471)	(1.4348)
LOC	0.1234**	0.1617**	0.1622**	0.1478**
	(1.8706)	(2.4211)	(2.3238)	(2.2134)
BOR_{t-1}	0.0348	0.1150	-0.0485	0.1526*
	(0.2969)	(1.3491)	(-0.3828)	(1.8713)
N	44	66	54	56
R^2	0.134	0.281	0.135	0.322

Note: * significant at the 10 per cent level; ** significant at the 5 per cent level; and *** significant at the 1 per cent level.
PRO_{t-1} = profit in 1998; $DSAL_t$ = the growth rate of sales in 1999; *LOC* = location; and BOR_{t-1} = borrowing in 1998.
[a] The sample's mean value of total fixed assets is VND 448 million; [b] the sample's median value of total fixed assets is VND 350 million.

Regarding small applicants, Columns [3] and [5] show that the internal-funds variable (PRO_{t-1}) has significantly positive coefficients at the 1 per cent level; this outcome means that investment of this type of RMs is sensitive to internal funds. The change-in-sales variable ($DSAL_t$) has no significant coefficient while the location variable (*LOC*) still has significantly positive coefficients at the 5 per cent level (Column [3] and [5]). The borrowing variable (BOR_{t-1}) has a significant coefficient at the 10 per cent level in Column [5] but has no significant coefficient in Column [3]. As was true for Table 8.7, another striking feature of the findings in this subsection is that the R^2 exhibits a large difference with regard to large and small RMs.

In sum, these results appear to support the argument that small RMs may encounter financing constraints while large RMs may not.

An alternative approach to the link between the investment-internal funds sensitivity and firm size

In this subsection, we employ an alternative approach to study the effect of size on the sensitivity of investment to internal funds. This approach is often used in the investment literature, according to Lensink *et al*. (2001). We add an interactive term, *i.e.*, $PRO_{t-1} \times SIZE$ (profit in 1998 multiplied by total fixed assets in 1999) to Specification 8.1 in order to obtain the following specification:

$$I_t = \alpha_1 + \alpha_2 \cdot PRO_{t-1} + \alpha_3 \cdot PRO_{t-1} \times SIZE + \\ + \alpha_4 \cdot DSAL_t + \alpha_5 \cdot LOC + \alpha_6 \cdot BOR_{t-1} \tag{8.2}$$

Differentiating Specification 8.2 with respect to PRO_{t-1} gives:

$$\frac{\partial(I_t)}{\partial(PRO_{t-1})} = \alpha_2 + \alpha_3 \times SIZE \tag{8.3}$$

Expression (8.3) divulges that the sensitivity of investment of a RM to its internal funds depends on its size. If $\alpha_3 > 0$ at a significant level, the larger the RM, the higher the internal funds-investment sensitivity is. If $\alpha_3 < 0$ at a significant level, the larger the RM, the smaller the internal funds-investment sensitivity is. We expect that $\alpha_3 < 0$ since large RMs may be less financing constrained than small ones, as discussed previously. The other variables presented in Specification 8.2 were already defined.[146]

We perform the test for the entire sample as well as for the applicant subsample. The outcome is shown in Table 8.9. As for the entire sample, it can be seen from Column [2] that the coefficient of the profit-in-1998 variable (PRO_{t-1}) is positive and significant at the 5 per cent level. It is interesting that the coefficient of the interactive term, *i.e.*, PRO_{t-1}*$SIZE$, is negative and significant (at the 10 per cent level). This outcome suggests that larger RMs face less financing constraints. The coefficients of the variables that control for investment opportunities, *i.e.*, $DSAL_t$ and LOC, have the expected (positive) signs and both are significant at the 1 per cent level. The borrowing variable (BOR_{t-1}) has a positive coefficient that is significant at the 1 per cent level.

[146] In this subsection, size of a RM is measured by taking the logarithm of its total fixed assets in 1999, in order to avoid the drop-out of size when multiplying it with the profit-in-1998 variable, which is in turn the profit in 1998 divided by total fixed assets.

Table 8.9 Determinants of investment of RMs: size
Dependent variable: Ratio of investment spending in 1999 to total fixed assets 1999

[1]	*Entire sample* [2]	*Applicants subsample* [3]
Constant	0.0391	0.0279
	(1.3413)	(0.6034)
PRO_{t-1}	1.0051**	1.9589**
	(2.1461)	(2.5247)
PRO_{t-1}*SIZE	-0.1540*	-0.2888**
	(-1.8306)	(-2.1855)
$DSAL_{t-1}$	0.5315***	0.5976**
	(2.6073)	(2.0398)
	0.0974***	0.1499***
LOC	(3.1914)	(3.1266)
BOR_{t-1}	0.1536***	0.07247
	(2.9546)	(01.0557)
N	202	110
R^2	0.145	0.205

Note: * significant at the 10 per cent level; ** significant at the 5 per cent level; and *** significant at the 1 per cent level.
PRO_{t-1} = profit in 1998; PRO_{t-1}*SIZE = profit in 1998 multiplied by total assets estimated in 1998; $DSAL_t$ = change in sales in 1999 as compared to 1998; *LOC* = location; and BOR_{t-1} = borrowing in 1998.

Column [3] of Table 8.9 displays the outcome for the applicant subsample. The coefficient of the profit-in-1998 variable (PRO_{t-1}) is positive and significant at the 5 per cent level; its magnitude is greater than that for the entire sample. Consistent with the result for the entire sample, the interactive term, *i.e.*, PRO_{t-1}*SIZE, shows a negative coefficient that is significant at the 1 per cent level; and, the extent of this coefficient is also bigger than that for the entire sample. The coefficients of the growth-rate-of-sales and the borrowing variables ($DSAL_t$ and BOR_{t-1}) are positive and significant at the 1 per cent level. The location variable (*LOC*) has a significant positive coefficient at the 5 per cent level.

8.4.4 *Age*

The literature indicates that old firms may generally be less financially constrained than younger ones because the former may have better and longer relationships with creditors, which improve their access to credit (see Chapter 5). This subsection is

devoted to a test of this hypothesis using the data set described in Chapter 7.

In this subsection, we partition the entire sample into two groups: one group that includes all the RMs set up in 1990 or before (old RMs), and the other that includes the remaining (young RMs). The logic behind this partitioning was discussed in Subsection 7.3.1 of Chapter 7, that is, 1990 was the first year after *doi moi* was intensified.

The old-RM group includes 112 RMs, accounting for 55.4 per cent of the sample's population; the young-RM group (90 RMs) makes up the remaining 44.6 per cent. Table 8.10 gives descriptive statistics of the variables used in this test with regard to these two groups of RMs. This table shows that investment by the young RMs seems to be higher than that by the old ones. The difference in investment by the young and old RMs may be explained by the disparities in the growth rate of sales and the amount of money they borrowed. As revealed by Table 8.10, the old RMs, on average, experienced a decline by 0.5 per cent of their sales in 1999 as compared to 1998 while the young RMs enjoyed a 0.6-per cent rise in sales.[147] It can also be inferred from Table 8.10 that in 1998 the young RMs were able to borrow more than the old RMs.

Table 8.10 Descriptive statistics of variables: old and young RMs

Variables	*Mean*	*St. dev.*	*Skewness*	*Kurtosis*	*Obs.*
			Old RMs		
I_t	0.129	0.202	2.731	10.630	90
PRO_{t-1}	0.170	0.156	1.939	3.789	90
$DSAL_t$	-0.005	0.070	-0.530	9.553	90
LOC	0.611	0.490	-0.464	-1.826	90
BOR_{t-1}	0.117	0.296	3.509	14.180	90
			Young RMs		
I_t	0.156	0.235	2.778	10.640	112
PRO_{t-1}	0.191	0.153	1.566	2.691	112
$DSAL_t$	0.005	0.075	-0.515	6.387	112
LOC	0.643	0.481	-0.604	-1.665	112
BOR_{t-1}	0.143	0.275	3.633	17.950	112

Source: Own survey in 2000.

Table 8.11 shows the outcome of the test. Column [2] divulges that for young RMs the profit-in-1998 variable (PRO_{t-1}) has a positive coefficient but the coefficient is not significant. Investment by the young RMs, according to this column, appears to

[147] RMs experienced both positive and negative growth rates of sales, which cancel out when averaging, so the averages are small.

be correlated with investment opportunities: the coefficient of the growth-rate-of-sales variable ($DSAL_t$) is positive and significant (at the 1 per cent level); likewise, the coefficient of the location variable (*LOC*) is also positive and significant (at the 5 per cent level). The borrowing variable (BOR_{t-1}) has a significant positive coefficient at the 1 per cent level. As for old RMs, Column [3] shows that only the location variable (*LOC*) has a significant coefficient (at the 5 per cent level); all the other variables have no significant coefficient.

In sum, the outcomes emerging from the test in this subsection shows that investments of both young and old private RMs appear not to be sensitive to internal funds. This result suggests that, in the case of RMs in the MRD, age may not be a proper criterion to sort the sample. Age can be a good sorting criterion if old firms have more contacts with banks so that banks can collect more information about them than about young ones. Yet, the young RMs seem to have more frequent contacts with banks than the old ones. For example, in 1998 and 1999 the average number of loan applications is 1.64 times for the young RMs and 1.43 times for the old ones. This is different from what we expect based on the existing literature. This finding may illustrate our argument in Chapter 5 that empirical research should always be aware of "local factors" in the sorting criteria.

Table 8.11 Determinants of investment of RMs: age

Dependent variable: Ratio of investment spending in 1999 to total fixed assets in 1999

[1]	*Young RMs* [2]	*Old RMs* [3]
Constant	0.0183	0.0470
	(0.4477)	(1.1469)
PRO_{t-1}	0.1839	0.0865
	(1.3485)	(0.6313)
$DSAL_t$	0.7413***	0.1957
	(2.7343)	(0.6375)
	0.0926**	0.1051**
LOC	(2.1667)	(2.4355)
BOR_{t-1}	0.2738***	0.0321
	(3.6310)	(0.4454)
R^2	0.215	0.079
N	112	90

Note: * significant at the 10 per cent level; ** significant at the 5 per cent level; and *** significant at the 1 per cent level.
PRO_{t-1} = profit in 1998; $DSAL_t$ = change in sales in 1999 as compared to 1998; *LOC* = location; and BOR_{t-1} = borrowing in 1998.

8.5 Conclusions

This chapter is devoted to an empirical study on the effect of financial market imperfections on investment of private rice millers in the MRD. The empirical study in this chapter lends support to the view that private rice millers have faced financing constraints. More specifically, we estimate an augmented investment equation using the data obtained from the questionnaire on private rice millers in the MRD. The results show that the availability of internal funds has a positive and statistically significant effect on investment of the entire sample, suggesting that private rice millers face financing constraints.

The sample includes those rice millers that did not apply for loans. Since the demand for credit of these rice millers is not observable, we exclude them and investigate the sensitivity of investment of those rice millers that applied for loans to their internal funds. Investment of this group of rice millers also displays a significant sensitivity to internal funds.

This empirical study also applies different approaches to testing the influence of size on the link between financial market imperfections and RM investment. The outcome shows that the degree of financing constraints varies with size: larger RMs seem to be less financially constrained. We proceed by classifying the sample into two subsamples according to age. We find that investment of both young and old RMs is not sensitive to internal funds.