Investment of Rice Mills in Vietnam

The Role of Financial Market Imperfections and Uncertainty

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List of abbreviations

ADB	Asian Development Bank
AFTA	ASEAN Free Trade Area
ASEAN	Association of South East Asian Nations
CMEA	Council of Mutual Economic Assistance
DRV	Democratic Republic of Vietnam
ERP	Effective Rate of Protection
EU	European Union
FDI	Foreign Direct Investment
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Products
HCMC	Ho Chi Minh City
IMF	International Monetary Fund
JSB	Joint-Stock Commercial Bank
MRD	Mekong River Delta
NPV	Net Present Value
OECD	Organisation for Economic Cooperation and Development
QR	Quantitative Restriction
RM	Rice Mill
ROSCA	Rotating Savings and Credit Association
SBV	State Bank of Vietnam
SME	Small- and Medium-Sized Enterprise
SOE	State-Owned Enterprise
SOFC	State-Owned Food Company
SPD	Subjective Probability Distribution
US	United States
USD	US Dollar
VND	Vietnam *Dong*
WAAC	Weighted Average Cost of Capital
WTO	World Trade Organisation

PART ONE

Introduction and background

Chapter 1

Introduction

1.1 Introduction

In 1986 Vietnam started a transition process from a centrally-planned economy to a market-oriented one with the launching of a programme of economic reform (*doi moi*). One of the aims of this transition process was to promote the private sector. The motivation underlying this aim was the recognition that central planning fostering only state and collective ownerships failed to work and that the private sector may play an important role in boosting investment and spurring economic growth.

Doi moi, which allows private ownership and activity, among other things, led to a surge of the share of the private sector in Vietnam's GDP. Starting from a nearly zero base at the outset of *doi moi*, in 1997 the private sector accounted for 37.7 per cent of Vietnam's GDP (Vietnam Statistical Yearbook 2001). However, the share of the private sector started to fall as *doi moi* became stalled. In 2000 the private sector made up just 35.7 per cent of Vietnam's GDP (Vietnam Statistical Yearbook 2001), decreasing by two per cent as compared to 1997.

The drop of the share of the private sector in Vietnam's GDP may result from inadequate private-sector investment. Table 1.1 reveals that private-sector investment in Vietnam made up a relatively small portion of total investment outlays compared to state-sector investment. Moreover, this portion tends to decline. If private-sector investment continues to be inadequate, Vietnam's economy will remain dominated by inefficient state-owned enterprises (SOEs). As a result, economic growth will be hampered. This poses an important question: what is the cause the inadequacy of private-sector investment in Vietnam?

Table 1.1 Vietnam: investment share by ownership, 1995-2001 (in per cent)

Ownership	1995	1996	1997	1998	1999	2000	2001
State	42.0	49.1	49.4	55.5	58.7	57.5	58.1
Private	27.6	24.9	22.6	23.7	24.0	23.8	23.6
Foreign	30.4	26.0	28.0	20.8	17.3	18.7	18.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Vietnam Statistical Yearbook 2001.

This dissertation aims to contribute to answering this question by studying the factors that affect investment of Vietnamese private enterprises. It will focus on a particular industry, *i.e.*, the rice-milling industry, which serves to convert paddy into rice. This industry is selected for two reasons. First, it plays a key role in the production process of one of the most important commodities in Vietnam, *i.e.*, rice – the principal staple of more than 75 million Vietnamese; furthermore, rice is among the top export items of Vietnam. Second, it is widely observed that in Vietnam rice milling is done by a large number of small rice mills (RMs) using obsolete, inefficient machinery. This indicates that firm investment in this industry may have been inadequate. IFPRI (1996), a comprehensive study of the Vietnamese rice market, finds that investment in the rice-milling industry in Vietnam was remarkable in some first years of the 1990s, but this has declined later on.

What is the cause of the inadequacy of firm investment in the rice-milling industry in Vietnam? Answers to this question are still unknown because relevant information seems to be scarce. According to the literature, among the factors affecting firm investment financial market imperfections and uncertainty emerge as the most important ones. These factors appear to be relevant in the context of Vietnamese private enterprises, as will be discussed briefly below and more carefully later in this dissertation.

Financial imperfections. In Vietnam financial imperfections result from the underdevelopment of the financial system. The Vietnamese formal financial system has been dominated by a few large state-owned commercial banks. These banks have given SOEs privileged access to their credit according to directives of the government. In addition, due to poor experiences with market-based financial transactions and insufficient information about private enterprises, they tend to impose credit rationing upon private enterprises and/or to maintain stringent collateral requirements, which are difficult for private enterprises to fulfil, in order to secure their loans. Other actors of the Vietnamese formal financial system are either weak (like domestic joint-stock commercial banks) or unfamiliar with private domestic enterprises (like foreign banks). Informal financial agents and mechanisms (such as moneylenders, rotating savings and credit associations, *etc*.) face resource con-

straints, *i.e.*, they do not have much money to offer, thus being less able to finance investment. All this is believed to lead to limited access to credit for Vietnamese private enterprises in general and for private RMs in particular.

Uncertainty. In general, uncertainty is embedded in market volatility. As for Vietnamese private rice millers,[1] the uncertainty stemming from market volatility is exacerbated by the lack of market information that they encounter. In Vietnam information channels are poorly developed. This deficiency limits access of private rice millers to market information. Other barriers restricting their access to market information that is available add to the problem. One of the barriers concerns language; poor capability in terms of using foreign languages may make private rice millers unable to understand information that is not expressed in Vietnamese. Another barrier is related to the cost of using information; in Vietnam the cost of using the information appears to be prohibitively high. Finally, it is likely that private rice millers may neither digest nor effectively use statistical data, if they manage to acquire, because of their insufficient schooling. All this means that private rice millers in the MRD may be faced with severe uncertainty.

Assuming the presence of financial market imperfections and uncertainty, *we hypothesize that financial market imperfections and uncertainty negatively affect investment of private RMs in Vietnam*.

In the empirical part of this dissertation, we will test this hypothesis using firm-level data of private RMs. Private RMs play an overwhelming role in the rice-milling industry terms of production: they processed more than 90 per cent of the amount of milled rice produced in Vietnam (see Table 4.1 of Chapter 4). The private RMs covered in the empirical part of this dissertation were selected from the Mekong River Delta (MRD), the rice bowl of Vietnam. The MRD consists of twelve provinces in the South of Vietnam (see the maps at the end of this chapter). It is endowed with a favourable climate and very fertile soil, which help to sustain its importance in Vietnam's agriculture, especially in rice production (see Table 1.2). Due to this importance, the Delta has attracted a lot of private RMs, making it a proper region for studying the rice-milling industry.[2]

[1] In this dissertation, the term "rice miller" is used to refer to an individual who own a RM.

[2] IFPRI (1996) mentions that more than 80 per cent of RMs this study surveyed were located in the MRD.

Table 1.2 The Mekong River Delta, Vietnam

Criteria	*MRD*	*Vietnam*	*MRD/Vietnam* (*per cent*)
Area (km^2)	39,559	330,991	12
Population (as of April 1st, 1999)	16,131,984	76,327,900	21
Gross agricultural output in 1999 (VND bill.)	38,700.5	102,932.9	38
Rice production in 1999 (tons)	16,294,700	31,393,800	52

Source: Vietnam Statistical Yearbook 2000.

1.2 Outline of the dissertation

This dissertation continues with Chapter 2, reviewing the changes in the economic system in Vietnam since the reunification of the country in 1976. This chapter starts with an overview of the transition of Vietnam's economic system from central planning to market mechanism, including the economic reforms (*doi moi*) initiated in the late 1980s. It then discusses the agricultural reforms that have unleashed this sector's potential and have thus led to a substantial increase in the supply of paddy, especially in the MRD. This chapter also covers the international trade aspect of *doi moi*, which shapes the link between international and domestic markets. In the case of rice this means, *e.g.*, that increasing openness to the international rice market has led to fluctuations in domestic rice prices that create uncertainty for private rice millers in Vietnam.

Chapter 3 analyses the financial system in Vietnam so as to reveal that access to credit for Vietnamese private enterprises is poor. Several formal financial intermediaries (such as state-owned commercial banks, foreign banks, domestic joint-stock commercial banks, *etc*.) are investigated in this chapter. Vietnam's stock market is also covered. In addition, this chapter analyses the informal financial sector in Vietnam, including moneylenders, rotating savings and credit associations (ROSCAs), *etc*. Finally, it discusses Vietnamese government policies *vis-à-vis* the financial system and characterizes the Vietnamese financial system in a comparative context.

Chapter 4 introduces the rice-milling industry in the MRD. It discusses the emergence of the rice-milling industry in the MRD alongside *doi moi* and the information problem that private rice millers have faced. This chapter is important in terms of helping to draw an overall picture of the industry and giving an insight into the causes and the nature of the uncertainty confronting private rice millers in the MRD.

Chapters 2-4 suggest that the underdevelopment of Vietnam's financial sys-

tem and the uncertainty with respect to output demand and prices may be main obstacles to the development of the rice-milling industry in the MRD. This suggestion serves as a background to Chapters 5-9, which cover the main focus of the dissertation.

The focus of this dissertation commences with Chapter 5, which is devoted to a survey of the literature on the link between financial market imperfections and firm investment. This chapter discusses the theoretical literature on financial market imperfections, asymmetric information, and credit rationing. Afterwards, it explains the link between financial market imperfections and firm investment. Finally, this chapter discusses the investment models that have been used to study this link and summarizes the empirical evidence.

Chapter 6 surveys the literature on the relationship between uncertainty and firm investment. This chapter prepares for the empirical study on the investment-uncertainty relationship in the context of private RMs in Chapter 9. The literature on the relationship between uncertainty and firm investment is extensive. This chapter is selective with respect to discussing the literature in the sense that it only contains two relevant elements: the real options approach to investment and the empirical evidence on the relationship between uncertainty and firm investment.

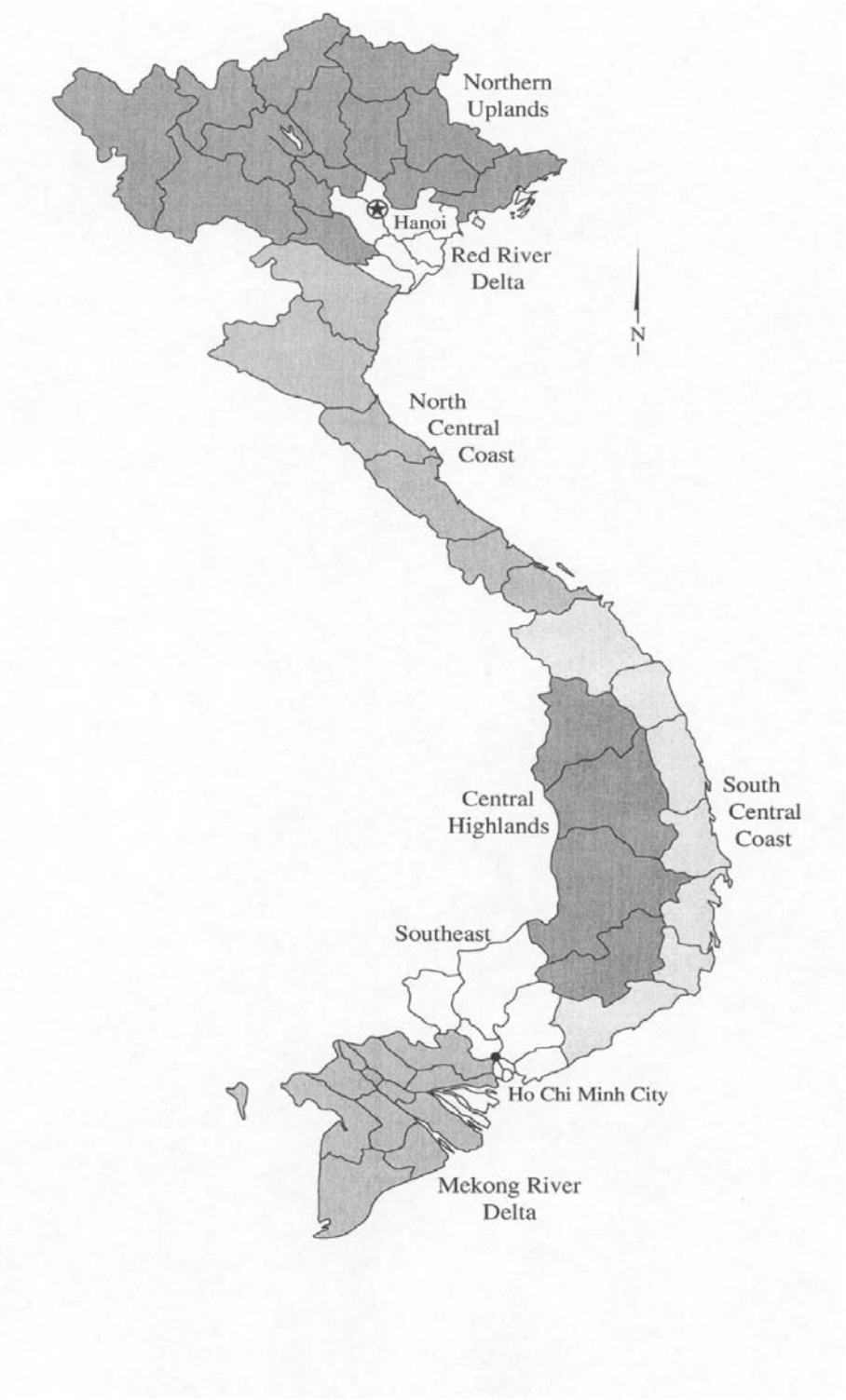
Chapter 7 presents the data set we use in the empirical study of this dissertation. This chapter describes the variables that we use later, such as fixed assets, age, profit, borrowing activities, investment outlays and projections, sales, the expected growth rate of sales, the degree of competition, the degree of physical capital irreversibility, *etc*. By doing so, this chapter may also provide an in-depth picture of the rice-milling industry in the MRD.

Since the empirical literature has shown the relationship between financial market imperfections and firm investment elsewhere, this dissertation will empirically investigate whether or not such a relationship exists for private RMs in the MRD. Chapter 8 is devoted to this purpose.

Chapter 9 empirically studies the investment-uncertainty relationship in the context of RMs in the MRD. This chapter first measures the uncertainty and the irreversibility facing RMs and then discusses our empirical results.

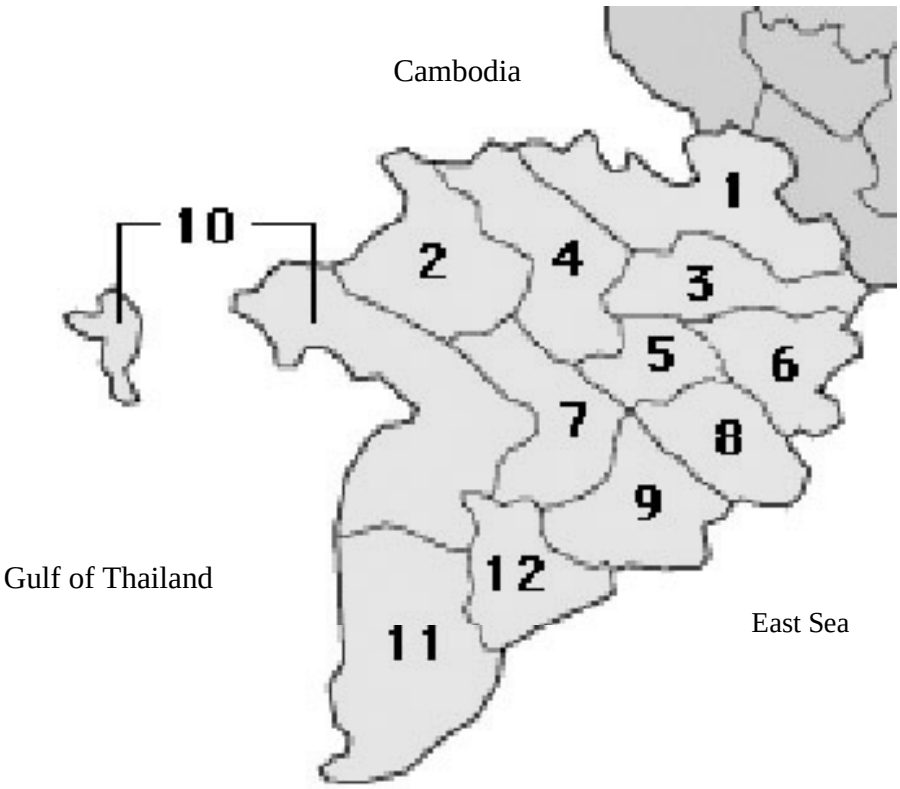
Finally, Chapter 10 draws some conclusions based on the outcomes of the empirical study and presents some recommendations that may help to enhance investment in the rice-milling industry. This chapter also tries to provide some topics for future research.

Map 1.1 Vietnam



Source: Minot and Goletti (2000).

Map 1.2 The Mekong River Delta, Vietnam



1. Longan; 2. Angiang; 3. Tiengiang; 4. Dongthap; 5. Vinhlong; 6. Bentre; 7. Cantho; 8. Travinh; 9. Soctrang; 10. Kiengiang; 11. Camau; and 12. Baclieu.

Source: http://www.worldbank.org.

Chapter 2

Economic reforms in Vietnam

2.1 Introduction

This chapter is devoted to giving an overview of the reforms in the economic system in Vietnam since 1976, the year of reunification. Since the second half of the 1980s, the reforms have amounted to achieving a transition process from the centrally-planned economy, which Vietnam pursued before that date, to a market economy. This chapter concentrates on the aspects of the transition process that are important in view of the central theme of this dissertation, to wit the problem of Vietnamese private rice millers in financing their investments in an uncertain environment.

This chapter starts with a sketch of the transition process in general (Section 2.2); this section also discusses the reforms of state-owned enterprises as well as the development of private enterprises in Vietnam. Section 2.3 examines the agricultural reforms that have unleashed this sector's potential and have lead to a substantial increase in the supply of rice, especially in the MRD. Section 2.4 covers the international-trade aspect of the reform process, which is important in the context of this dissertation, because trade policy shapes the link between international markets and domestic markets. In the case of rice, this means, *e.g.*, that increasing openness to the international rice market may lead to fluctuations in domestic rice prices, which account for part of the uncertainty facing private rice millers. Section 2.5 concludes this chapter.

2.2 An overview of the economic transition in Vietnam

2.2.1 *Economic reforms in Vietnam in general*

In 1976 the Vietnamese government started imposing central planning upon the South with the launching of the 1976-1980 Five-Year Plan; the North adopted central planning in the 1950s after defeating the French. Fforde and De Vylder (1996) characterized the economic system of this period as the DRV model, where DRV stands for Democratic Republic of Vietnam, the official name of North Vietnam from 1945 to 1976. The basis of the DRV model is Soviet-style central planning focussing on heavy industry and collectivisation of agriculture, wherein state organs play a leading role in the economy through physical output targeting, allocating resources to production units, and taking care of the distribution of products to consumers and other production units. The DRV model was, however, not a complete copy of the Soviet model because the Soviet model is based on a strong state, whereas the state in Vietnam in this period appeared to be a weak one (Fforde and De Vylder, 1996). Amendments of the Soviet-type economic system became necessary already in the 1960s in the North due to increasing sectoral imbalances and growing divergences between official prices and prices in free markets (dual pricing system).[3]

The DRV model came under serious strain in the late 1970s when the political and economic isolation of Vietnam in the period of the military intervention in Cambodia and bad harvests because of bad weather added to the longer-standing problems in the functioning of the model. The state organs were no longer capable of supplying inputs to the economy and food to the people. In the 1978-1979 period, this situation led to the start of a process of "reform from below" (Fforde and De Vylder, 1996; Webster and Taussig, 1999),[4] which means that individuals, agricultural cooperatives, and SOEs were developing alternative ways of getting access to resources; this was tacitly allowed by the authorities. The failure of the authorities to effectively manage the centralised economic system showed up in considerable differences between official prices and prices in free markets that stimulated fence-breaking activities.

After the crisis of the late 1970s, the government broke off economic liberalisation and at the same time attempted to re-centralise economic management. Fforde and De Vylder (1996) used the expression "hard reform socialism" to characterize this episode. The approach of this period was well exemplified by the Three-Plan System governing the state-owned industry (Decree 25 CP), which was

[3] In those free markets, prices were basically determined by supply and demand (Gates, 2000).
[4] The reform-from-below process is also referred to as fence-breaking (*pha rao*).

launched in January 1981. Under this plan, a state-owned factory had to have a single plan with three elements. The most important element, called "Plan A", refers to the production using the inputs provided by the state, the output of which had to be supplied to the state; this type of production was supposed to have absolute priority over any other element. The other two elements, "Plan B" (free disposal of products that the factory was established to produce) and "Plan C" (production of minor products that resulted from the factory's own attempts at diversification), were also legalised (Fforde and De Vylder, 1996).

The hard-reform-socialism approach was not able to save the system of central planning. The structural tensions of the DRV model in the form of divergences between official and free-market prices resurged, taking extreme proportions in the 1986 hyperinflation (Fforde and De Vylder, 1996; Le, 1996). Another cause of the hyperinflation was the policy package of September 1985, through which the authorities increased official prices and wages and introduced a new *dong*.[5] The main adverse impact of this policy package fell upon SOEs as their cash holdings were wiped out because of higher input prices and labour costs. The indispensable subsidies to SOEs from the state budget lead to a substantial state budget deficit that could only be financed by printing money, which strongly contributes to the pre-existing inflationary tendencies.

Attempts to overcome the serious inflationary and budgetary problems and the underlying structural weaknesses caused the Sixth Party Congress of the Communist Party of Vietnam (December 1986) to abandon the hard-reform-socialism approach in favour of a policy package aimed at establishing a market economy. This policy package is often referred to as economic reform (*doi moi*). *Doi moi*, which dismantled central planning, liberalised trade, promoted private activities, *etc*., was meant to generate incentives for people to work harder and more efficiently (Che *et al*., 2002).

The December 1986 measures were followed by other measures aimed at establishing a market economy. Among other things, in 1987 the inter-provincial trade barriers were abolished. In the same year, Law on Foreign Direct Investment (FDI), intending to attract FDI, was passed. All in all, during 1987-1988 the central controls over FDI, land, foreign trade, banking, SOEs, private and household enterprises, and the agricultural sector started to ease. Notwithstanding the measures taken, the dual pricing system remained.

In March 1989, the government intensified *doi moi* with the launching of comprehensive reforms that marked the most decisive step towards addressing the structural economic problems. The reforms dismantled the agricultural cooperatives

[5] *Dong* is the currency of Vietnam. The new *dong* replaced the previous *dong* on a one-to-ten basis (McCarty, 2001).

and returned land to farming households. Commodity prices were liberalised by abolishing the state prices for most consumer goods, thus terminating the dual pricing system. Private enterprises were given more room to operate. Investment and trade regimes were liberalised, contributing to a rapid increase in rice exports (see Table 2.5). Real interest rates were brought to positive levels. Credit ceilings were imposed on SOEs. The multiple exchange rate system was unified in combination with a devaluation of the *dong*.[6] The reforms also aimed to reduce budget deficits by restraining expenditures, reducing subsidies to SOEs, and restructuring the tax system (IMF, 1998; McCarty, 2001). The reforms revived the economy: inflation dropped considerably, and GDP grew by around 8 per cent in 1989 (see Table 2.1).

Table 2.1 Vietnam: some economic indicators, 1985-2000

Year	*Annual GDP growth rate (per cent)*	*Annual consumer price inflation rate*
1985	3.8	*na*
1986	2.8	487.0
1987	3.6	317.0
1988	5.1	311.0
1989	8.0	35.0
1990	4.5	67.0
1991	6.1	68.0
1992	8.6	18.0
1993	8.1	5.0
1994	8.8	14.4
1995	9.5	17.1
1996	9.3	5.7
1997	8.8	3.2
1998	5.8	7.3
1999	4.8	4.1
2000	6.8	-1.7

Source: Fforde and De Vylder (1996); Gates (2000); Statistical Year Book 2000; Vietnam Economic Review No. 9, 2000; IMF (1998); IMF (2000); IFPRI (1996); Che *et al*. (2002); IMF (2002b).

Note: *na*: not available.

In a longer-term perspective, the reform measures of the 1986-1989 period, together with the country's strategic location in the midst of the fastest growing re-

[6] At that time, the *dong* was devalued by 97 per cent, to USD1 = VND3,971. Since 1989 the official exchange rate has followed closely the movements of the parallel market with a small premium on the official rate. Since 1994 the official and parallel market rates have been almost equal (Gates, 2000).

gion of the world, led Vietnam to rapid economic growth, especially between 1992 and 1997 (Table 2.1). Vietnam's growth performance in this period was remarkable in that, different from may other transition economies, there was no recessionary "J-curve effect" accompanying the transition (Fforde and De Vylder, 1996).

It is not easy to situate Vietnam's transition policies in terms of the usual distinction between a Big Bang and a gradualist approach. Gates (2000) argues that the approach was different in different stages: the 1987-1988 period can be characterized as gradualism, followed by the 1989-1991 period of bold Big-Bang-like reforms; afterwards, the 1992-1994 period is considered to contain "tinkering" reforms.

Since 1998 Vietnam's economic growth has slowed-down (Table 2.1). This might be due to the Asian economic crisis of 1997/1998, through the channels of FDI and exports. In 1997 FDI in Vietnam diminished dramatically: total new FDI of USD 4.5 billion in 1997 was about half of the record of USD 8.6 billion in 1996 (Riedel, 1999).[7] Exports faltered; the fall in exports was attributable to the collapse of regional markets, which accounted for some two-thirds of Vietnam's total exports, and to large devaluations of the currencies of the countries hit by the crisis. The slowing-down of the economy was also a consequence of structural weaknesses: the economy still largely relies on inefficient state-owned commercial banks and SOEs while competitive private enterprises are nearly absent (IMF Survey, January 28th, 2002). Table 2.2 gives an overview of the shares of the state-owned and non-state sectors in Vietnam's GDP. This table reveals that the share of the state-owned sector in Vietnam's GDP did not decline;[8] this is in contrast to the experiences of most other transition economies (IMF, 1998). According to Table 2.2, the non-state sector has accounted for a relatively substantial share of Vietnam's GDP. If the shares of farming households and foreign firms in Vietnam were subtracted from the share of the non-state sector in Vietnam's GDP, it would be revealed that domestic private enterprises alone have made up a much smaller share of Vietnam's GDP. This means that domestic private enterprises have played an unimportant role in Vietnam's economy. The reform of state-owned enterprises and the development of private enterprises in Vietnam are to be analysed in the subsequent subsections, which will help to explain the above-mentioned observations.

[7] Since two-thirds of the FDI in the 1991-1998 period was directed to joint ventures between foreign investors and SOEs, the fall of FDI has deteriorated the financial condition of the latter, thereby adversely affecting their capability to repay their debts to banks, mainly state-owned commercial banks (O'Connor, 2000).

[8] The reasons for this fact will be discussed in Subsection 2.2.2 below.

Table 2.2 Vietnam: shares of the state-owned and non-state sectors in GDP, 1989-2000

Year	*State-owned sector* (*per cent*)	*Non-state sector* (*per cent*)
1989	33.2	66.8
1990	32.3	67.7
1991	33.2	66.8
1992	34.3	65.7
1993	35.4	64.6
1994	36.7	63.3
1995	40.2	59.8
1996	39.9	60.1
1997	40.5	59.5
1998	40.0	60.0
1999	38.7	63.1
2000	39.0	61.0

Source: Computed from Dodsworth *et al*. (1996) for 1989-1994 (at 1989 constant prices) and from IMF (2002b) for 1995-2000 (at current prices).

2.2.2 *State-owned enterprises* (*SOEs*) *in Vietnam*

Since 1986 Vietnam has taken several measures to reform SOEs. The most decisive reforms of SOEs took place during the 1988-1992 period.[9] An important outcome of these reforms is that the number of SOEs was reduced from 12,000 in 1988 to 6,000 in 1992 after being merged and/or consolidated. Another outcome is the improvements in their financial performance. For instance, net transfers from SOEs to the budget increased from zero in 1988 to 12 per cent of GDP in 1994; net credit flows from commercial banks to SOEs fell from 9 per cent of GDP in 1998 to about 2 per cent in 1993-1994 (IMF, 1995; IMF, 1998). Since 1994 the reform progress has been delayed because the government has remained in favour of a leading role for SOEs (IMF, 1998; IMF, 2002a), as it ideologically sustains a socialist-oriented mixed economy operated on market principles. This contributes to explaining why the share of the state-owned sector in Vietnam's GDP has increased (Table 2.2). A substantial part of the increase in the share of the state-owned sector in GDP reflects the government policy of encouraging foreign investors to form joint ventures with SOEs (IMF, 1998; IMF, 2002b). According to O'Connor (2000), two-thirds of the FDI in the 1991-1998 period was directed (by the government) into joint ventures with SOEs.

[9] These reforms are discussed in several studies on Vietnam, see, *e.g.*, IMF (1998), Dodsworth *et al*. (1996).

In Vietnam SOEs are still at an advantage as compared to private enterprises in terms of access to credit, land use rights, trade protection, *etc.* Despite these advantages, since the end-1997 their performance has deteriorated: inventories have built up due to the plunge in domestic as well as in foreign demand; their contributions to the state budget have decreased; overdue loans to the banking system have risen to a very high level because the banking system has continued to finance their production (IMF, 1998; IMF, 1999), but around one-half of the number of SOEs were only loss-making or marginally profitable (IMF, 2001).

Aiming to tackle the poor financial conditions and the inefficiency of SOEs, the government took on a five-year SOE reform plan in March 2001 (IMF, 2002a). According to this plan, 1,800 out of more than 5,500 SOEs will be subject to enterprise-specific reform measures, mostly through equitisation (1,440), divestiture (140), or liquidation/closure (220). An additional 200 SOEs will be merged or consolidated. This reform plan still continues but at a slow pace.

2.2.3 *Private enterprises in Vietnam*

After the reunification of the country in 1976, the government started nationalisation or collectivisation of all relatively big private companies in the South. A limited number of smaller companies were not brought under full influence of the government but instead re-categorised as state-private joint ventures,[10] in which state organs played a dominant role (Webster and Taussig, 1999). Prior to *doi moi*, the informal private sector was disallowed and unrecorded (IMF, 2002b). Yet, Freeman (1996) maintains that the informal private sector operating outside the government's control sustained Vietnam during the difficult years between 1976 and 1986. The start of *doi moi* signalled the government's fiat of private economic activities, thus stimulating the expansion of the private sector.

In 1988 the government officially recognised the long-term importance of the private sector and guaranteed its existence as part of a multi-component economy. In 1990 the Enterprise Law was promulgated, providing a legal infrastructure for the private sector. In 1992 the new Constitution reaffirmed the legality of the private sector's standing in the multi-component economy (Webster and Taussig, 1999). Subsequently, the number of private enterprises increased substantially. For instance, the number of private enterprises grew by 60 per cent in 1994 and 41 per cent in 1995 (Webster and Taussig, 1999). Despite this, private enterprises in Vietnam are still obstructed by constraints in terms of access to market, access to bank credit, among other things (IMF, 2002b), which may have held back its growth. In

[10] These joint ventures were called "*xi nghiep cong tu hop doanh*."

1998 the number of private enterprises increased by only 4 per cent (Nguyen, H.D., 2000).

In response to the economic downturn since 1997, the government issued a new Enterprise Law on January 1st, 2000. This new law is aimed at easing business entry for private enterprises by lifting the business licensing requirements, therefore making the establishment of private enterprises considerably easier (IMF, 2002b); business registration costs was cut significantly; the approval process was shortened from 1-2 months to 10 days. As a result, around 26,000 small- and medium-sized enterprises (SMEs) were registered in the period from January 2000 to August 2001 (IMF, 2002b).

2.3 The agricultural economic reforms

2.3.1 *The collective regime* (1976-1980)

During the 1976-1980 period, the Vietnamese government pursued a collective regime. Under this regime, agricultural production took place in compulsory cooperatives that were supposed to control 95 per cent of agricultural land. All production and distribution decisions were made by the state. After harvest the state took out a portion of the output as a lump-sum tax; the surplus over own consumption was forcefully sold to the state at a low price, around 20-30 per cent of that in free markets. The distribution of the output of agricultural cooperatives was based on work points.[11] Private trade in agricultural products was officially banned. Farming households could only use the remaining 5 per cent of land for the breeding of pigs and chickens and for vegetable production; private trade in these products was allowed but restricted to local markets.

During the collective regime, rice production was marked with stagnation, especially in 1977 and 1978 (see Table 2.3). Although the year of 1979 witnessed a recovery of rice production, rice production in this year did not reach the 1976 level. This situation forced Vietnam to import a large amount of rice so as to meet the domestic demand (Che *et al*., 2002). Since the collective regime was seen as unworkable, farmers in the South, especially those in the MRD, resisted collectivisation (Webster and Taussig, 1999). Therefore, by the end of the 1970s the MRD

[11] The work-point system works as follows. A working day that a member of a cooperative spent working for the cooperative is counted as one work point. At the end of a certain period the work points of all members are added up. Total production will be divided by the total number of work points to compute the average value of one work point. Each member will receive an amount of output equal to the number of work points he/she has received multiplied by the average value of one work point.

remained largely uncollectivised (McCarty, 2001). In 1978 only 0.2 per cent of farming households in the MRD joined cooperatives; this figure increased to 1.8 per cent in 1979 (Tran, 1998). These figures mean that the collective regime then failed, particularly in the MRD, because few real agricultural cooperatives were established during this period.

The inadequate functioning of the collective regime made reforms in the agricultural sector indispensable. According to Che *et al*. (2002), the agricultural economic reforms in Vietnam have passed through two main stages: (i) the output-contracting regime (1981-1987) and (ii) market liberalisation (1988-present), with the latter being more effective than the former in terms of boosting agricultural growth.

Table 2.3 Vietnam: rice production, 1976-2000

Year	*Amount* (1,000 *tons*)	*Annual growth rate* (*per cent*)	*Year*	*Amount* (1,000 *tons*)	*Annual growth rate* (*per cent*)
1976	11,827	*na*	1989	18,996	11.7
1977	10,597	-10.4	1990	19,225	1.2
1978	9,789	-7.6	1991	19,622	2.1
1979	11,363	16.1	1992	21,590	10.0
1980	11,647	2.5	1993	22,837	5.8
1981	12,415	6.6	1994	23,528	3.0
1982	14,390	15.9	1995	24,964	6.1
1983	14,743	2.5	1996	26,379	5.7
1984	15,506	5.2	1997	27,533	4.4
1985	15,875	2.4	1998	29,146	5.9
1986	16,003	0.8	1999	31,394	7.7
1987	15,103	-5.6	2000	32,554	4.0
1988	17,000	12.6			

Source: Nguyen (1996); Che *et al*. (2002).
Note: na: not available.

2.3.2 *The output-contracting regime* (1981-1987)

In order to improve the poor performance of the collective regime in the previous period, the government introduced the output-contracting regime with the issuing of Directive 100 CT/TW in January 1981. Under this regime, land was allocated to farming households, which were supposed to organise sowing, seedling, transplanting, maintenance, and harvesting; remaining operations (such as processing and distributing) were still carried out by cooperatives. A quota on output was set for farming households. They were allowed to retain the amount that exceeded the quota and could sell it either to the state or in free markets (Nguyen, 1996; Che *et*

al., 2002).

Directive 100 CT/TW was a success although it gave farming households only a limited control over the production and the distribution of rice. During the 1981-1986 period, rice production increased remarkably by 28.9 per cent, from 12.4 million tons to 16 million tons (see Table 2.3). For the first time, food production grew faster than population, leading to an increase in average food production per capita from 273 kilogram in 1981 to 304 in 1985 (IFPRI, 1996). The achievements obtained between 1981 and 1986, however, were not sustained. Production stagnated, eventually precipitating the food crisis in 1987 when bad weather came (Fforde and De Vylder, 1996).

2.3.3 *Market liberalisation* (1988 - *present*)

Further economic reforms to overcome the stagnation of food production in 1987 were needed. This led to the market liberalisation starting with Resolution 10, which became effective in 1988. This resolution is the first tentative move towards private property rights. It defined farming households as autonomous economic units and allowed them to own machines, buffaloes, oxen, and agricultural instruments. In addition, farming households were entitled to purchase, sell, and transfer means of production. Collectivised land was returned to farming households for a long-term use, ranging from 15 to 50 years depending on the type of crops grown. Farming households were also allowed to keep 40 per cent of the contracted output, which could then be sold in free markets. The fact that Resolution 10 brought most aspects of the management of production to individual farming households and provided them with incentives to work harder is likely to be an important factor behind the substantial increase in rice production in 1988 and 1989 (Table 2.3). Pingali and Xuan (1992) argue that the incentives of farming households contributed largely to the increase in the average paddy yield.[12]

Although successes were achieved, problems remained. The rice market was still controlled by the government. The fragmentation of land into small plots, particularly in the North, caused difficulties in mechanisation, irrigation, specialisation, and product procurement. Rural unemployment was high. Rural industry remained poor, failing to absorb redundant rural labour. Agro-product processing capacity fell behind agricultural production. Poor rural infrastructure jeopardised the sustainability of the reforms. The rural economic structure was still biased towards rice and food (IFPRI, 1996).

[12] More generally, Nghiem and Coelli (2002) emphasize that the incentives of managers and workers in farms and factors have had a great impact on the economic performance of Vietnam during the *doi-moi* period.

Because of the shortcomings of the previous reforms, Resolution 5-HNTW was set forth in 1993. This resolution reaffirmed the autonomous role of farming households and entrusted them with the right of long-term land use. It also accepted the rights to exchange, transfer, lease, inherit, and mortgage land; this encouraged investment in land reclamation, replenishment, and improvement so as to multiply seasonal crops. Resolution 5-HNTW also focussed on the issue of rural development, including rural industry. The private sector was encouraged alongside renovating SOEs. As a result of Resolution 5-HNTW, rice production soared (see Table 2.3); this trend has sustained. In 2000 rice production was more than double that in 1986, the year when *doi moi* was initiated. Nowadays, farming households operate in free markets.

In sum, the economic reforms in the agricultural sector have given farming households more autonomy and proper incentives, thereby encouraging them to work harder and to invest in their land and crops. This has resulted in an enormous increase in rice production, which has secured the food need of the Vietnamese and contributed largely to rice exports of the country.

2.4 External trade liberalisation and developments in exports

In this section, attention will first be paid to the developments in the foreign-trade regime of Vietnam in general and in Vietnamese exports in particular. Afterwards, this section will concentrate on the changes in the trade regime regarding the rice sector and the developments in rice exports. Concerning the international trade aspect, developments on the export side, especially in the rice sector, are the factor of interest in the context of this dissertation. This explains why little explicit attention will be paid to the effects of the trade reforms on Vietnamese imports.

2.4.1 *External trade liberalisation in general and developments in exports*

The DRV model of central planning stressed autarchic growth and ignored the export sector (Fforde and De Vylder, 1996), meaning that opportunities for international trade on the basis of Vietnam's comparative advantage were not exploited. In 1978 Vietnam opened up the economy to its partners of the trade grouping of communist countries, the Council of Mutual Economic Assistance (CMEA), of which Vietnam was a member.[13] In the mid-1980s, CMEA-partners accounted for some 80 per cent of Vietnam's foreign trade, with the Soviet Union being by far the most

[13] For an insight into the functioning of the CMEA see, *e.g.*, Csaba (1986), Lanjouw (1995).

most important trade partner within this group.[14] The collapse of the CMEA created an extreme difficulty for Vietnam's foreign trade, which was already weak, and hence forced Vietnam to find other trading partners.

Liberalisation of international trade became part of the transition process in Vietnam. Apart from opening-up export markets, trade liberalisation contributes to creating a market economy by allowing competitive forces coming from abroad. At the same time, the internal price structure in the country will become aligned with the price structure in the international market (Williamson, 1991). To achieve this, first of all it is necessary to abolish quantitative restrictions (QRs) on imports, which cut the link between international and domestic prices. Trade liberalisation therefore should start with a first phase of elimination of QRs and replacement them with import tariffs. In the second phase, tariffs should then be reduced (Williamson, 1991). Vietnam introduced import tariffs, along with export taxes, in 1987 (IMF, 2002a). The government has, however, been slow in eliminating QRs on imports. More generally, among transition economies, liberalising international trade in Vietnam has been sluggish, especially on the import side. During much of the 1990s, there still was a rather high degree of trade restrictiveness (IMF, 2002a). In fact, Vietnam has followed a policy of import substitution aimed at protecting inefficient, loss-making SOEs (Gates, 2000).

On the export side, the pre-reform institutional arrangement was the trade monopoly of the state that was applied in the DRV-model. Exports were based on annual plans. A problem of this centralised arrangement was the lack of proper incentives. Gradually, incentives to stimulate exports were brought into the trade regime. In 1980 an export bonus system was introduced. By fulfilling export targets, exporters earned bonuses of 2 to 3 per cent of the value of exports; higher bonuses were possible in case exports exceeded targets. Direct contacts between domestic producing units and foreign clients became possible in some cases (IMF, 1981). Shortly afterwards, the latter reforms were reversed, however, in the framework of the hard-reform-socialism approach (Fforde and De Vylder, 1996), which was discussed earlier in this chapter.

After a period during which phases of decentralisation and re-centralisation took turns, major reforms in the export regime came in when *doi moi* was launched in 1986. In December 1987 a new system of trade taxation was introduced, bringing market-oriented elements into trade policy. The maximum export-tax rate was 10 per cent (IMF, 1988). In June 1989 the export regime was changed in that exporters were allowed to select any export-import company for their business activities and were no longer tied to a specific company under the annual planning sys-

[14] For a better understanding of the role of the Soviet Union in this trade grouping, see, *e.g.*, Dietz (1986).

tem. Certain producers were allowed to obtain foreign trading rights and to engage in direct business contacts with foreign companies (IMF, 1990). Like in the case of QRs on imports, Vietnam has also been rather slow in abolishing QRs on exports in the form of export quotas. For instance, the export quota on rice lasted until 2001 before it was terminated (IMF, 2002a).

The international-trade reforms seem to have contributed to the rapid growth of exports in the 1993-1997 period, with the average annual growth rate being more than 30 per cent over this period (see Table 2.4).

The Asian financial crisis erupting in 1997 caused a decline of prices of Vietnam's export commodities because of the declining demand from the crisis-hit countries. At the same time, Vietnam's exports lost competitiveness as the *dong* appreciated in real effective terms. As a result, export growth plummeted: in 1998 exports grew at only 2.4 per cent (see Table 2.4).

The reform of international trade in Vietnam got a new momentum with the issuing of Decree 57 in July 1998. This decree effectively extended the right to export unrestricted goods to all domestic enterprises (IMF, 2000a), thus infringing the international trade monopoly of a small number of SOEs. In 1999-2000 exports rebounded (Table 2.4), as the Asian region began to recover from the crisis and as exports to the European Union grew fast; in 1999 non-oil exports to the European Union grew by 24.8 per cent, accounting for as much as 48.5 per cent of the total increase in non-oil exports (World Bank, 2000b).

In April 2001, with a view of providing a more stable export-import environment, the government announced the five-year (2001-2005) import-export regime. This regime was contrary to those applied in the previous years, when only annual changes of the import-export regime were announced (IMF, 2002a). The new approach provided a scheme for eliminating quantitative restrictions, tariff reductions, and other trade measures.

Table 2.4 Vietnam: export revenue and growth, 1993-2000

	1993-1997 *average*	1998	1999-2000 *average*
Annual export revenue (USD million)	5,744	9,365	12,995
Annual growth (per cent)	30.1	2.4	24.2

Source: IMF, 2002a (Table IV.2).

In October 2001, the United States passed legislation implementing the milestone bilateral trade agreement with Vietnam, which has eased the access of Vietnam's products to this huge market and marked an important step for Vietnam

towards WTO accession. In the meantime, preparations have been made to reach bilateral trade agreements with other WTO members, to align existing bilateral agreements and modify Vietnam's laws so as to meet WTO standards.

Developments in Vietnam's foreign trade will also increasingly undergo the influence of its membership of AFTA, which started in 1996.[15] Under AFTA, tariffs on 97 per cent of tariff lines will be reduced to at most 20 per cent by 2003 and 0-5 per cent by 2006 (IMF, 2002a). In turn, Vietnam will benefit from the tariff reductions of its AFTA partners.

2.4.2 *The trade regime in the rice sector and developments in rice exports*

After a number of years being a net importer of food, Vietnam exported around 1.4 million tons of rice in 1989 and has since then remained one of the leading rice exporters. This remarkable turnaround is largely attributable to the reforms that took place in the agricultural sector (see Subsection 2.3) and the opening-up to international trade as well (See Subsection 2.4.1.).

Despite the liberalisation measures related to rice exports, Vietnam's trade policy *vis-à-vis* processed rice remained negative in the sense that it led to a negative Effective Rate of Protection (Fukase and Martin, 1999).[16] The ERP for processed rice, amounting to minus 22.5 per cent, can be explained by the import tariffs on pesticides and fertilisers and the large share that these inputs have in the costs of paddy production. According to Nguyen (1996), pesticides and fertilisers made up around 65 per cent of the variable costs of rice farmers. In addition, the rice export sector in Vietnam can be characterized as (i) being largely variable, in terms of both quantity and value of rice exports (Table 2.5 below) and (ii) still being dominated by state-owned food companies (SOFCs).

The variability in rice exports

Table 2.5 shows a great variability in rice exports of Vietnam, in terms of both quantity and value. According to this table, the coefficient of variation of the quantity of rice exported was 45 per cent, and that of the value of rice exports was 51 per cent. This variability is attributable to the instability of the world rice market

[15] AFTA stands for ASEAN Free Trade Area. ASEAN's membership nowadays further includes Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, and Thailand.

[16] The Effective Rate of Protection (ERP) measures the change in the value added in a certain sector that results from tariffs on the product of the sector and tariffs on intermediate inputs.

and, to a lesser extent, Vietnam's government policies on food security.

The variability in Vietnam's rice exports partly stems from a distinctive instability of the world rice market (IFPRI, 1996; Minot, 1998). There are at least two sources that cause the instability of the world rice market.

Table 2.5 Vietnam: rice exports, 1989-2000

Year	*Quantity*		*Value*	
	Amount (1,000 *tones*)	*Annual growth rate* (*per cent*)	*Amount* (*USD million*)	*Annual growth rate* (*per cent*)
1989	1,372	*na*	310.2	*na*
1990	1,478	7.7	275.4	-11.2
1991	1,016	-31.0	229.9	-16.5
1992	1,953	92.0	405.1	76.2
1993	1,649	-15.6	335.7	-17.1
1994	1,962	19.0	420.9	25.4
1995	2,025	3.2	538.8	28.0
1996	3,047	50.5	868.4	61.2
1997	3,682	20.8	891.3	2.6
1998	3,793	3.0	1,006.0	12.9
1999	4,550	20.0	1,035.0	2.9
2000	3,477	-23.6	668.0	-35.5

Source: http://www.saigonnet.vn.
Note: na: not available.

First, the instability of the world rice market stems from the disturbances in the demand of rice-importing countries. According to IFPRI (1996), these disturbances result from economic sources (*e.g.*, Japan's negotiations in the framework of GATT to open-up its domestic rice market) or nature adversity (*e.g.*, the El Niño typhoon in Indonesia). To illustrate the quantitative significance of both examples: (i) Japan increased its import volume of rice from 11 thousand tons in 1990 to around 2.5 million tons in 1994 because of the negotiations in the GATT framework, and (ii) Indonesia imported only 22 thousand tons of rice in 1993 but had to import as much as 6 million tons in 1998 due to the impact of the El Niño-related drought during 1997-1998 (World Bank, 2000b). Second, the instability in the world rice market may also originate from rice-exporting countries. Although rice is produced in a number of countries, more than 90 per cent of rice production concentrates in Asia. This regional concentration of rice production exposes the world rice market to weather shocks that usually hit many countries in the region at the same time.

The above-mentioned disturbances of demand for and supply of rice may lead to substantial volatilities of rice prices in the world rice market. This is be-

cause both demand for and supply of agricultural products in general, in which rice is an example, can be characterized as inelastic, especially in the short run (Ghosh *et al*., 1987; Lanjouw, 1995). If demand for and supply of rice are inelastic, any shift of either demand or supply or both will result in substantial volatilities of rice prices.

The variability in Vietnam's rice exports is also a result of the government's policy with respect to food security. IFPRI (1996) indicated that the amount of rice actually exported was below the amount that could have been exported even if the government maintained a reasonable domestic rice consumption of 1,425 calories per person per day. Despite this, the government has still limited rice exports by adjusting rice export quota's every year. In addition, from time to time the government has imposed bans on rice exports. For instance, in the second half of 1998 the government limited rice exports because of the concerns over domestic stocks being short (Reuters, June 2nd, 1998;[17] Dow Jones, June 16th, 1998).[18] In November 2001, the government ordered rice exporters in the main rice-growing region to stop offering new rice export contracts after seeing domestic rice reserves falling (BBC News, November 21st, 2001).[19] Such unpredictable bans have created adverse consequences. Foreign buyers have encountered an absence of a clear set of policy rules that are followed consistently; they then lose confidence. This lost confidence may be one of the reasons for the discount at which Vietnam's rice has been sold in the world rice market compared to rice of the same quality from Thailand.

In sum, the rice export sector of Vietnam has encountered a great variability in terms of both quantity and value. It is very likely that this variability influences the demand for and the price of rice in the domestic rice market because more than 35 per cent of the total amount of milled rice produced in Vietnam is exported (Minot and Goletti, 2000), and the domestic demand for milled rice appears to be stable.

Limited access of private rice millers to foreign markets

In 1989 Vietnam had its first experience with rice exports. During the 1989-1990 period, only state-owned food companies (SOFCs) were allowed to export rice.[20] In

[17] *Source*: http://www.reuters.com.
[18] *Source*: http://icsea.or.id.
[19] *Source*: http://news.bbc.co.uk.
[20] State-owned food companies in Vietnam belong to two General Food Companies. The Northern Food Company (often referred to as Vinafood 1) is supposed to oversee all the provincial SOFCs in the North of the country down to Thuathien-Hue province, and The Southern Food Company No.2 (Vinafood 2) to oversee the SOFCs in the South of the country.

the 1991-1993 period, the government imposed restrictions on rice exports by reducing the number of SOFCs allowed to export rice in order to mitigate frictions among them. In 1992 the total number of rice exporters was 40, mostly in the South. Subsequently, the number of rice exporters was further reduced. In 1996 the number of rice exporters was 16. In 1998 there was an important change in the government's policy with regard to the rice export sector: in this year private rice millers were allowed to apply for rice export quotas (Prime Ministerial Decision 12/TTg in January 1998), provided that they (i) have had previous experiences in rice trading; (ii) possess sufficient milling and storage facilities; (iii) are able to supply at least 5,000 tons per shipment; and (iv) are financially sound. In fact, only a handful of private rice millers in the country were immediately able to meet these stringent requirements. In 1999 there were only four non-state rice exporters out of the total of 37 rice exporters.[21]

As a result of having a history of privileged access to foreign markets, to information, as well as to cheap bank loans,[22] SOFCs have largely dominated the rice export sector of Vietnam (Minot and Goletti, 2000). This would mean that private RMs have limited direct access to foreign rice markets. Indeed, there is evidence that private RMs have played a minor role in the rice export sector. For instance, in 1999 Vinhphat Company was granted rights to export 6,000 tons of rice, and Thanhhoa Company received a rice export quota of 5,000 tons in 1999 (Wall Street Journal, April 16th, 1999). Although these companies are the biggest private RMs of the country, the quotas they received were as tiny as around 0.2 per cent of total 4,550 thousand tons of rice exported in 1999. The peripheral role of private RMs in the rice export sector is also mentioned in some other studies on rice markets in Vietnam. IFPRI (1996) emphasizes the important link between private RMs and SOFCs in the rice circuit in the MRD in the sense that most of private RMs sell their output through SOFCs. Nielsen (2002) uncovers that private RMs in Vietnam have been working as subcontractors to SOFCs.

In 2001 the quota requirement on rice exports was abolished and anyone entitled to export food and agriculture-related goods can export rice freely (IMF, 2002a). However, having lived long in such an unfavourable condition private RMs may not be sufficiently prepared to trade internationally. Private RMs virtually do not have direct interactions with foreign traders but rather through SOFCs.

[21] These four non-state food companies are Thotnot Food Processing Enterprise Ltd. (Cantho province), Thanhhoa (Tiengiang province), LADF Company (Longan province), and Vinhphat (Ho Chi Minh City).

[22] SOFCs often receive cheap, or even interest-free, credit from the state-owned banks, especially to acquire the so-called buffer stocks (*Source*: htttp://www.fpt.vn).

2.5 Conclusions

The economic crisis in the central-planning era urged the Vietnamese government to reform the economy. The Vietnamese economic reform (*doi moi*), which was initiated in 1986, appears to have contributed largely to the country's economic growth, especially during the 1989-1997 period. It is remarkable that Vietnam did not experience the recessionary J-curve effect that characterized a number of other transition countries. Since 1998 economic growth in Vietnam has slowed down due to the Asian financial crisis in 1997/1998 and the structural weakness of the economy, with the latter being a more important and lingering factor. The structural weakness of Vietnam's economy is because, despite *doi moi*, SOEs retained a privileged position of SOEs *vis-à-vis* private enterprises.

The reforms in the agricultural sector have created incentives for people to increase rice production, among other products, leading an ample paddy surplus. The surplus, together with the international-trade reform, has facilitated the growth of rice exports of Vietnam. Although the rice export industry was successful in exporting a substantial amount of rice, it has been vulnerable to the instability of the world rice market. In addition, the position of SOFCs is still dominant, and few private rice millers are able to directly participate in the rice export industry.

Chapter 3

The financial system in Vietnam

3.1 Introduction

A well-functioning financial system is likely to contribute to economic growth by mobilising financial resources and allocating them to the most efficient uses (King and Levine, 1993; Levine, 1997). In this chapter, the functioning of the financial system in Vietnam will be examined from this perspective. More specifically, access of Vietnamese private enterprises, like the private RMs in the MRD on which this dissertation concentrates, to external finance will be the central subject. This chapter will try to explain why Vietnamese private enterprises, which appear to be more efficient than SOEs, have limited access to external finance, especially to bank credit.

The remainder of this chapter is structured as follows. First, the formal financial system in Vietnam, consisting of state-owned commercial banks, foreign banks, domestic joint-stock commercial banks, stock market, *etc*., will be analysed in Section 3.2. Section 3.3 explores the informal financial sector, which includes moneylenders and rotating savings and credit associations (ROSCAs). Section 3.4 deals with the government policies *vis-à-vis* the financial system. Section 3.5 presents a characterization of the financial system in Vietnam. Finally, conclusions are formulated in Section 3.6.

3.2 The formal financial system in Vietnam

3.2.1 *An overview*

Until 1988 the financial system in Vietnam only consisted of the State Bank of Vietnam (SBV), which had several affiliates aimed at distributing credit to SOEs and other entities under directives of the central plan and handling deposits of these SOEs and entities (O'Connor, 2000). In 1988-1989 the government initiated the banking reforms that transformed the then monobank system into a two-tier banking system, meaning that the SBV restricted itself to acting as the central bank, and its commercial banking activities were taken over by four sector-specialised state-owned commercial banks.[23] In 1990 the rules on the sectoral specialisation of these banks were removed (IMF, 1998).

During the 1990s, the government stimulated the entry of new players into the financial sector. This policy led to a substantial, sharp increase in the number of representative offices and branches of foreign banks and the so-called joint-stock commercial banks as well. Joint ventures between foreign banks and state-owned commercial banks were also established, but the services they offered were strictly circumscribed.[24] Non-bank financial institutions, such as finance and insurance companies, have come to exist as well, but they are unimportant in terms of financing firms.[25] The stock market, established as recently as in July 2001, is still in its infancy. The components of the financial system in Vietnam, as of June 2001, are presented in Box 3.1.

Box 3.1 shows that Vietnam has a number of commercial banks, few non-bank financial institutions, and a newly-established stock market. This box, together with the fact that banks have accounted for 85-90 per cent of financial intermediation (O'Connor, 2000), suggests that Vietnam has a bank-based financial system. The size of the Vietnamese banking sector, measured by the M2-to-GDP ratio, has increased (Table 3.1). Despite this, bank credits appear to be an unimportant source of finance because the domestic-bank-credit-to-GDP ratio in Vietnam has been low. In 2000 this

[23] These state-owned commercial banks are: Bank for Foreign Trade (Vietcombank), Industrial and Commercial Bank (Incombank), Bank for Agriculture and Rural Development (BARD), and Bank for Investment and Development. Nowadays, there are another two state-owned commercial banks, the Housing Development Bank for the MRD and the Bank for the Poor (see Box 3.1). As a matter of fact, these two state-owned banks are policy-oriented ones. Therefore, we do not include them in our later discussions.

[24] Due to the circumscriptions these banks do not offer credits to private enterprises. This is the reason why we do not refer to them in our discussion any further.

[25] Because finance and insurance companies were not important, we do not include them in our discussion.

ratio stood at 34.9 per cent (see Table 3.1) while in the same year it was 63.6 per cent in Indonesia, 63.1 per cent in the Philippines, 79.2 per cent in Singapore, 100.4 per cent in Malaysia, and 111.4 per cent in Thailand (ADB, 2002).

Box 3.1 Components of the Vietnamese financial system, as of June 2001

Formal financial system:

- Six state-owned commercial banks: Bank for Foreign Trade (Vietcombank) with 32 municipal and provincial branches; Industrial and Commercial Bank (Incombank) with 68 municipal and provincial branches; Bank for Agriculture and Rural Development (BARD) with 86 municipal provincial branches; Bank for Investment and Development with 64 municipal and provincial branches; Housing Development Bank for the Mekong River Delta; and the Bank for the Poor.
- 31 branches and representative offices of foreign banks;
- Four foreign joint-venture banks;
- 43 domestic joint-stock commercial banks;
- 959 people's credit funds and cooperatives;
- Few finance and insurance companies; and
- One stock exchange, established in July 2000 in Ho Chi Minh City.

Informal financial system:

- Moneylenders, relative and friends; and
- Rotating savings and credit associations (ROSCAs).

Source: World Bank (2002a).

In the following, we will analyse the relevant components of the formal financial system in Vietnam, *i.e.*, state-owned commercial banks, foreign banks, joint-stock commercial banks, and the stock market, so as to identify the difficulties of Vietnamese private enterprises in terms of access to external finance.

Table 3.1 Vietnam: some financial indicators, 1986-2000

Year	*M2/GDP* (*per cent*)	*Domestic credit/GDP* (*per cent*)	*Year*	*M2/GDP* (*per cent*)	*Domestic credit/GDP* (*per cent*)
1986	18.7	25.5	1994	24.0	21.2
1987	16.4	18.5	1995	23.0	20.6
1988	16.7	17.0	1996	23.7	20.3
1989	26.4	23.9	1997	26.0	21.3
1990	27.1	23.7	1998	28.3	22.4
1991	26.4	18.4	1999	35.7	22.4
1992	24.6	15.5	2000	50.2	34.9
1993	23.0	19.3			

Source: Computed from Asian Development Bank, *Key Indicators of Developing Asian and Pacific Countries* (2002); World Bank, *Vietnam Development Report* 2002, Table 4.1.

3.2.2 *State-owned commercial banks*

State-owned commercial banks have dominated Vietnam's financial system. As of December 2001, they held 75 per cent of total bank assets, the foreign bank branches and joint venture banks made up 18 per cent, and the joint-stock commercial banks represented 7 per cent (The Banker, June 2002). Table 3.2 shows that the state-owned commercial banks accounted for 68-83 per cent of total outstanding loans during the 1994-2000 period. More than half of the credit from the state-owned commercial banks was extended to SOEs (Table 3.3). If the amount of credit extended to farming households were subtracted from that to the non-state sector, the resulting amount would have revealed that only a small share of the credit from the state-owned commercial banks was given to non-farm private enterprises (Webster, 1999). There are at least three factors that can explain why non-farm private enterprises in Vietnam did not receive much of the credit from the state-owned commercial banks: (i) the government-directed lending in favour of SOEs, (ii) the information problem of the banks regarding private enterprises, and (iii) the cumbersome lending procedure and collateral requirement (Webster, 1999).

Table 3.2 Vietnam: sources of formal credit, 1994-2000

Year	*Total bank credit*		*Credit extended by state-owned commercial banks*		*Credit extended by non-state commercial banks*	
	Amount (VND billion)	*Per cent*	*Amount (VND billion)*	*Per cent*	*Amount (VND billion)*	*Per cent*
1994	33,345	100	27,610	82.8	5,735	17.2
1995	42,277	100	33,647	79.6	8,630	20.4
1996	50,751	100	38,320	75.5	12,431	24.5
1997	62,201	100	48,042	77.2	14,159	22.8
1998	72,597	100	59,087	81.4	13,510	18.6
1999	112,730	100	76,559	67.9	36,171	32.1
2000	155,720	100	114,193	73.3	41,527	26.7

Source: IMF (1998); IMF (2000); IMF (2002a).

Government-directed lending to SOEs

The government has been decisive in the allocation of the credit from the state-owned commercial banks. The banks are required to allocate a substantial share of their credit to SOEs at concessionary interest rates and without collateral (The Banker, October 1992; The Banker, January 1996; Dinh, 1997; IMF, 1998; Moreno *et al.*, 1999; The Banker, June 1999; O'Connor, 2000; Gates, 2000; IMF, 2002a) as a matter of policy rather than because the loans are profitable. This policy reflects the fact that the

government has remained in favour of a leading role for SOEs (see Chapter 2). The overriding importance of the policy lending has, among other things, brought into the banks' loan portfolios a high share of non-performing loans (IMF, 2002b) because SOEs have usually failed to honour loan repayment obligations (O'Connor, 2000). As of November 2001, non-performing loans made up 11.8 per cent of the total outstanding loans of the state-owned commercial banks, and 60 per cent of the non-performing loans were due to SOEs.[26]

Table 3.3 Vietnam: distribution of bank credit, 1994-1998*

Year	*Credit extended by state-owned commercial banks to:*				*Credit extended by non-state commercial banks to:*			
	SOEs		*Non-SOEs*		*SOEs*		*Non-SOEs*	
	Amount	*Per cent*	*Amount*	*Per cent*	*Amount*	*Per cent*	*Amount*	*Per cent*
1994	18,604	67.4	9,006	32.6	2,400	41.8	3,335	58.2
1995	20,855	62.0	12,792	38.0	3,224	37.3	5,406	62.6
1996	22,030	57.5	16,290	42.5	4,780	38.4	7,651	61.6
1997	26,625	55.4	21,417	44.6	4,597	32.5	9,562	67.5
1998	34,218	57.9	24,869	42.1	3,858	28.6	9,652	71.4

Source: IMF (1998); IMF (2000).
Note: * More recent data broken down by type of borrowers from each sector of the banking system are unavailable (IMF, 2002b).

Since the state-owned commercial banks play an important role in the banking system as well as in the economy, the government recurrently bails them out when they get in trouble (soft budget constraints).[27] The government refinances the banks by using general revenues, by selling government bonds to the public, or by printing money (Perkins, 2001). This is likely to lead to moral hazard problem because the bailing-out taking place irrespective of whether or not the banks adjust their behaviour would mean that they continue to make bad loans to SOEs. The credit from the state-owned banks then becomes an instrument to help inefficient SOEs to survive. Any financial deterioration of SOEs will thus create difficulties for the banks, but it may also induce the banks to give more credit to SOEs because they cannot get back the previous loans if those SOEs fail.[28] Berglof and Roland (1998) argue that soft budget constraints of banks lead to soft budget constraints of SOEs. This phenomenon is also

[26] *Source*: Saigon Economic Times, November 15th, 2001.
[27] Soft budget constraints refer to "a situation in which a state-owned enterprise manages to survive even though it has made persistent losses, because time and again the state rushes to its aids" (Kornai, 2001).
[28] This means that private enterprises, which are more efficient than SOEs, may receive only a small portion of the credit from the state-owned commercial banks.

documented in other studies, *e.g.*, Kornai (2001), Lizal and Svejnar (2001). Therefore, bank reforms and SOE reforms have to be undertaken jointly (Van Wijnbergen, 1997).

Although the government has directed a substantial fraction of the credit from the state-owned commercial banks to SOEs, there was still some credit from these banks that private enterprises could apply for. Unfortunately, for many private enterprises access to this residual credit is restrained by the information problem that discourages the banks from lending to them.

Information problem of state-owned banks with respect to private enterprises

Since Vietnamese private enterprises, particularly small ones, often do not have bookkeeping (O'Connor, 2000; Nguyen D.N., 2002), it is difficult for them to communicate information to the banks and also difficult for the banks to acquire information about them. Moreover, although the banks have branches all over the country (see Box 3.1), these branches are mainly based in large cities or provincial towns, implying that they are substantially distant from private enterprises, especially those situated in rural areas. This adds to their lack of knowledge and information about private enterprises.[29] In addition, the state-owned commercial banks' officials may be misinformed about private enterprises because the media often reported the latter's frauds, bankruptcies, and misconducts (Webster, 1999).

This information problem may be mitigated if the banks are willing to obtain information about private enterprises. As discussed earlier, due to soft budget constraints the state-owned commercial banks do not seem to have incentives to do so. In addition, since the policy lending and soft budget constraints lead to a dearth of crucial banking skills regarding, *e.g.*, risk identification and management that are essential in lending to private enterprises, the banks appear to be unable to analyse the information about private enterprises, if available. This adds to the information problem of the banks with respect to private enterprises.

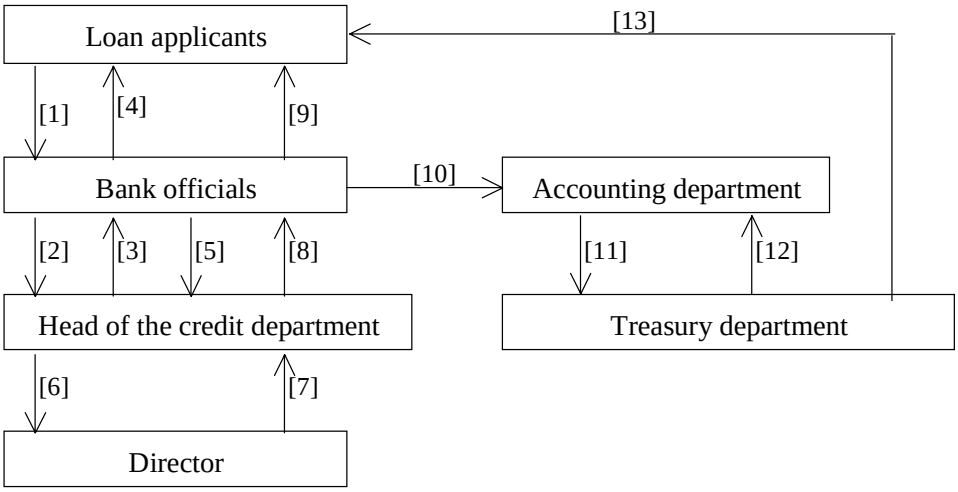
Lending procedure and collateral requirement

The lending procedure maintained by the state-owned commercial banks is shown in

[29] Petersen and Rajan (2002) argue that the use of computers and other communication equipment will help to get information about borrowers available for lenders at a distance, making distance less important for lenders in terms of gathering information about borrowers. This argument may not hold for Vietnamese private enterprises because impersonal communicating between them and the banks is still unusual.

Chart 3.1. This procedure is mainly applied to private borrowers. The aim of this procedure is to select creditworthy borrowers. Unfortunately, this cumbersome procedure, coupled with the presence of unskilled and unmotivated bank officials, turns out to be an obstacle for private borrowers.

Chart 3.1 Lending procedure in Vietnam



Note: [**1**] Bank officials receive loan application forms from the applicant; [**2**] After receiving loan application forms, bank officials report to the head of the credit department; [**3**] The head of the credit department assigns a bank official to examine the loan application forms to see if it is filled in properly; [**4**] The assigned bank official appraises the applicant, mainly based on collateral; [**5**] The assigned bank official informs the head of the credit department about the applicant; [**6**] The head of the credit department assesses the information and reports it to the director of the bank; [**7**] Director of the bank decides on the loan and informs the head of the credit department; [**8**] The head of credit department informs the assigned bank official about the decision; [**9**] The assigned bank officer informs the applicant; [**10**], [**11**], [**12**] Internal information among the bank's specialised departments; and [**13**] The treasury department disburses loans to the applicant, if accepted.

Source: Adapted from Mai (2001).

There were usually long delays between the submission of loan applications and the rendering of loan decisions by bank officials. Tran (1999) reveals that the delays were sometimes as longs as 35 days. Entrepreneurs also reported that the lending procedure required too much unnecessary documentation. As a result, borrowers incur high transaction and opportunity costs, making credit from the state-owned commercial banks even more expensive than that from informal lenders (Nguyen *et al.*, 2001). This helps to explain the phenomenon that in Vietnam many private enterprises do not

even apply for bank loans.[30] Nguyen H.D. (2000) finds that around 20 per cent of private enterprises in Vietnam were reluctant to apply for loans from commercial banks.

In Vietnam, private enterprises are required to collateralise assets for loans whereas SOEs are exempted from this. Collateral requirements make it more costly for the banks to lend to private enterprises as compared to SOEs because the banks have to spend resources to assess the collateral. More importantly, the absence of regulation to enforce credit contracts and to support the sale of collateralised assets in case of default adds to the reluctance of the banks in giving loans to private enterprises, even if the loans are secured with collateral.[31]

In Vietnam, unlike immovable assets (land and buildings), movable assets (such as inventories, equipment, *etc*.) are often not accepted as collateral. While land is the principal concern of banks, as many as 90 per cent of land users do not have use-right certificates.[32] Resolution 11/2000/HQ-CP stipulates that the total value of collateral plus own capital (equity) of an enterprise must be at least 30 per cent of the amount of loans it applies for. This requirement does not seem to be very strict. Yet, banks often undervalue the collateralised assets, thus reducing the amount of money that enterprises can borrow.

In early December 2000, the SBV finalised a decree that allows all credit institutions to make unsecured, or collateral-free, loans.[33] From the perspective of enterprises, this policy will help them to get better access to bank credit. Yet, the feasibility of this policy largely depends on the improvements in banking skills as well as in contract enforcement. Both may take time before being realised adequately.

In sum, due to the policy lending, the information problem and the cumbersome lending procedure, the credit from the state-owned commercial banks in Vietnam have been allocated mainly to SOEs, leaving private enterprises with limited access to that credit.

3.2.3 *Foreign banks*

Perceiving the benefits of foreign banks to the economy, the Vietnamese government has stimulated the entry of foreign banks into the domestic financial sector. In 1991 it started to permit the establishment of foreign banks' branches. Foreign banks benefit the economy in several manners:

30 *Source*: http://www.fpt.vn.
31 *Source*: http://www.fpt.vn.
32 *Source*: *Dien Dan Doanh Nghiep* (Business Forum), December 3rd, 2001.
33 This policy may lead banks in Vietnam to higher risks if the regulation and financial information transparency are not improved properly.

- they may bring modern banking technology and management expertise into the domestic financial market;
- they may trigger competition in the market, thereby improving its efficiency;
- the presence of foreign banks may promote foreign investment; and so on.

Since foreign banks viewed Vietnam as a country with a high growth potential, they came into the country in substantial numbers in the early 1990s. For instance, in August 1993 there were 28 foreign banks operating in Vietnam, and this figure stood at 39 in June 1994 (The Banker, June 1994).

Initially, the regulation surrounding foreign banks' activities was restrictive. For instance, foreign bank branches were given licenses for only 20 years. They were required to have a minimum local capitalisation of USD15 million (The Banker, February 1992). They were allowed to take *dong* deposits, but only up to an equivalent of USD 1.5 million (The Banker, January 1993). Foreign banks were not allowed to lend more than 10 per cent of their capital to a single project (The Banker, January 1993). In June 1993 the SBV removed this loan cap. It also removed the requirement that loans to the ten largest borrowers must not exceed 30 per cent of a bank's total loans (The Banker, November 1993). On October 1st, 1998, the SBV imposed a rule that limited commercial banks, both foreign and domestic, to maximum loans to single customers equivalent to 15 per cent of their registered capital. Since the foreign bank branches in Vietnam have registered capital of between USD15 and 20 million, this would mean that they were allowed to lend USD2.25-3.0 million per customer at maximum.

Since the financial crisis that dragged over Southeast Asia, foreign banks in Vietnam have suppressed lending. In 1997 the outstanding loans of foreign banks accounted for as much as 28 per cent of total outstanding loans of the whole banking system; this share dropped to around 25.7 per cent in 1999 (Nguyen and Nguyen, 2002) and to 15 per cent as of November 2002 (Saigon Economic Times, November 28th, 2002). The number of foreign bank branches has also declined. According to The Banker (June 1999), 19 foreign bank branches ceased operation in 1998. In June 2002 the number of foreign bank branches and joint-venture banks operating in Vietnam was 27.[34]

Berger *et al*. (2001) argue that foreign banks are generally less likely to lend to small enterprises than domestic banks. This argument seems to be applicable to foreign banks in Vietnam. First, foreign banks are usually headquartered at a distance from small enterprises, especially those located in rural areas. In Vietnam, foreign banks mainly concentrate in Hanoi and Ho Chi Minh City. Second, since foreign banks operate in unfamiliar environments with different languages, cultures, supervisory and regulatory structures, *etc*., it may be difficult and costly for them to gather

[34] *Source*: http://www.ivietnam.com.

and process information about small enterprises. Specifically, private enterprises in Vietnam were not allowed to collateralise land to get loans from foreign banks. This may discourage foreign banks from lending to them.[35] According to Dinh (1997), foreign banks in Vietnam have primarily been involved in highly specialised areas of trade finance. They have also lent to or through Vietnamese banks and to large domestic SOEs (The Banker, January 1997), but not to private enterprises.

3.2.4 *Joint-stock commercial banks* (*JSBs*)

Joint-stock commercial banks are private banks established using money pooled by shareholders. In the course of the banking reforms, especially since the mid-1990s, a number of JSBs have been established. There are three factors that can explain the rapid expansion of JSBs (O'Connor, 2000). Firstly and most importantly, it was due to the more liberal regulations permitting non-state banks to enter the financial sector in association with an increasing demand for credit. Secondly, the state-owned commercial banks have become more risk-averse as "the government attempts to hold them accountable for their loan losses" (O'Connor, 2000), especially after some fraud-related scandals with the involvement of those banks;[36] consequently, they restrict their lending activities, thus leaving room for other banks to operate. The third factor, which may be least important, regards the desire of some SOEs to secure their own sources of finance by setting up JSBs.

In fact, many JSBs were set up out of the ailing credit cooperatives in the early 1990s, which brought these JSBs an enormous amount of bad debts right at the outset (see Box 3.2 below). Some other JSBs were founded by families or groups of related

[35] This restriction was removed in November 2001 (Vietnam Investment Review No.525, November 5th-11th, 2001).

[36] The scandals include bankrupt companies such as Epco-Minh Phung and Tamexco. Epco-Minh Phung was a Ho Chi Minh City (HCMC)-based big private textile and property group. Executives from Epco-Minh Phung, together with a number of government officials and bankers, were accused of offences ranging from fraud to misappropriating state assets. The losses of USD280 million caused by the scam were mainly borne by state-owned commercial banks on loans used for land speculation. Those defendants consisted of bank executives like Pham Nhat Hong (Deputy Director of the HCMC Branch of the Industrial and Commerce Bank of Vietnam – Incomebank) and Nguyen Ngoc Bich (Deputy Director of the HCMC Branch of the Bank for Foreign Trade of Vietnam – Vietcombank).
Tamexco was a state-owned trading company in HCMC. Its director, Pham Huy Phuoc, was convicted of siphoning off USD26 million of state money from the company. The corruption concerned fraudulent land deals at inflated prices, transactions that got crucial assistance from officials at the Bank for Foreign Trade of Vietnam (Vietcombank).

SOEs, which act as influential shareholders (The Banker, January 1993; IMF, 1998; Le, 2000; O'Connor, 2000).

Box 3.2 Crash of the credit cooperatives in the early 1990s

In the late 1980s, due to the absence of proper legal framework, credit cooperatives, *i.e.*, collectively-owned credit institutions that accepted deposits and made loans to borrowers, mushroomed. In 1990 there were around 300 credit cooperatives holding deposits of VND400 billions, equivalent to USD100 million (Fforde and De Vylder, 1996). Many of the credit cooperatives attracted deposits by offering very high interest rates, sometimes up to 15 per cent per month (Fforde and De Vylder, 1996), but they could not lend at all because no investment could have profit rates comparable with the interest rates these credit cooperatives offered (Vo, 2001). The interest-rate bubbles then burst because many of the cooperatives could not stand the loss. In 1990 a number of credit cooperatives collapsed with billions VND of unpaid deposits. Some bad ones were closed by the government. This panicked people. They rushed to withdraw money, causing many other credit cooperatives to go bankrupt. Only few urban credit cooperatives survived the crisis, but they suffered from serious lack of confidence, deposit withdrawals, and debt. This crisis was thought to lead to a downfall of more than 2,000 small private enterprises (Fforde and De Vylder, 1996). After this crash, the government imposed minimum reserve requirements on credit institutions and started other regulatory reforms (Dinh, 1997).

JSBs in Vietnam appear to be undercapitalised. In 1998 as much as 70 per cent of the number of JSBs failed to meet the minimal chartered capital requirement, VND65 billion for urban JSBs and a mere VND2 billion for rural ones.[37] Although capital of these banks has recently increased,[38] they remain small: more than 40 JSBs held only around 7 per cent of total assets of the banking system as compared to 75 per cent by just four state-owned commercial banks (see Subsection 3.2.2).

Most of the JSBs have performed poorly (Le, 2000). Poor management is the major cause of the problem; in the 1990s many JSBs that were engaged in financing property deals with letters of credit (L/C) failed afterwards because the property market suffered a dramatic downturn (IMF, 1998; The Banker, June 1998). Moreover, the interests of the influential shareholders have dominated the credit-allocating policies of the JSBs, leading to over-extensions of credit to related parties, *i.e.*, individual borrowers or influential shareholders including SOEs (IMF, 1998; Le, 2000; O'Connor, 2000; World Bank, 2000a; Saigon Times Daily, No. 1589, December 31st, 2001).[39] The management of JSBs also committed themselves to fraudulent activities. For in-

[37] *Source*: Saigon Times Daily, No. 1589, December 31st, 2001.

[38] *Source*: Saigon Times Daily, No. 1589, December 31st, 2001.

[39] Table 3.3 shows that credit from non-state commercial banks to SOEs accounted for around 29 to 42 per cent of the total credit given by these banks between 1994 and 1998.

stance, in the late 1990s some JSBs opened L/Cs for importers but did not make payments.

The SBV has taken action on consolidating the failing JSBs. In 1998 six JSBs were placed under special care of the SBV, and 14 were viewed as problematic and in need of being restructured (Le, 2000). In 1999 the SBV increased the minimum amount of chartered capital of various types of banks and credit institutions. Those JSBs that had chartered capital lower than the minimum were forced to raise capital or to merge with other banks. In the last few years, eight JSBs were merged, reducing the total number of JSBs from 51 to 43. Another four banks will undergo the same process this year.[40] All the mergers to date have occurred between domestic JSBs and at the discretion of the SBV.[41] The SBV also revoked operating licenses of some JSBs with chronically poor performance. After consolidation, JSBs appear to be better (The Banker, June 2002).

In summary, JSBs in Vietnam appear to be small and weak. Consequently, although the JSBs are supposed to be a source of finance for private enterprises, their financial contribution to the private sector of the country remains limited. This once again hints at limited access to external finance for private enterprises**.**

3.2.5 *Stock market*

Vietnam's stock market was established as recently as in July 2000 in Ho Chi Minh City, the commercial hub of the country. Shares issued by companies and bonds issued by the government and by the Bank for Investment and Development of Vietnam are traded in this market. As of February 2003, there were 21 companies listed on Vietnam's stock market;[42] four kinds of government bonds, one kind of treasury bonds, and two kinds of bonds issued by the Bank for Investment and Development are also traded in the market. Shares issued by companies have accounted for more than 90 per cent of total value of stocks traded in this market. Stock prices appear to be highly volatile. The VN-index, which measures prices of the stocks traded in Vietnam's stock market, increased up to its peak of 571.04 points on June 25th, 2001; afterwards, it dropped to 203.12 points on October 5th, 2001 and rebounded to 265.03 points on November 2nd, 2001; eventually, it fell again to 164.61 points on February 28th, 2003.

Before June 25th, 2001, the demand for shares was higher than the supply of shares because there were only five companies issuing a small number of shares, and

[40] S*ource*: Saigon Times Daily, No. 1618, February 18th, 2002.

[41] The World Bank (http://www.worldbank.org.vn) refers to several mergers and acquisitions between JSBs taking place at the end of 2001.

[42] These companies are former state-owned companies that were equitised.

60-70 per cent of these shares were not traded (Vietnam Economic Times Supplement 2001).[43] Therefore, stock prices went up. After that, due to the administrative controls over the market (such as the limit on the amount of stocks that an individual is allowed to buy,[44] the stock price fluctuation band of 2 per cent, and the price ceiling, *etc*.) stock prices started to drop. This drop was intensified by the so-called herd behaviour, or herding, which means that as stock prices fell, many investors sold them out, making stock prices to fall further. After October 5th, 2001, stock prices recovered because investors might see better chances of success as newly listed companies started trading their shares in the market, and existing companies issued new shares. However, this recovery lasted for only one month, up to November 2nd, 2001. Afterwards, stock prices fell again due to this increase in stock supply and again herding.

Since the stock market is only a source of finance for big firms, it is not helpful to private enterprises, which are often small and not qualified to be listed.

3.2.6 *Summary*

Since the late 1980s, the Vietnamese formal financial system has experienced major reforms. The reforms have encouraged the presence of several types of banks and financial institutions. Despite this, state-owned commercial banks still dominate the financial system. These banks appear to be in favour of making loans to SOEs as a matter of government policy. The entry of foreign banks and domestic JSBs has broadened the scope of the domestic financial sector. Yet, foreign banks may not be acquainted with domestic private enterprises. Moreover, JSBs remain relatively small and undercapitalised. Finally, Vietnam's stock market is still young. As a result, private enterprises have poor access to formal external finance.

3.3 The informal financial sector in Vietnam

Due to such a poor access to formal external finance, private enterprises in Vietnam have to seek credit from the informal financial sector. Informal credit includes that from professional moneylenders, relatives and friends. It also comes from the so-called rotating savings and credit associations (ROSCAs), which enable individuals to jointly collect and distribute personal savings.

In developing countries, informal financial sectors exist mainly because of the

[43] The untraded shares are those held by the government and members of management boards of the companies (Vietnam Economic Times Supplement 2001).

[44] The government set a limit that allows a single investor buy only up to 5.000 shares in one transaction (http://www.fpt.vn).

underdevelopment of the formal financial sectors.[45] Like these countries, Vietnam has a relatively large informal financial sector. It is, however, difficult to exactly measure the size of this sector in terms of financial services provided. The informal financial sector in Vietnam was estimated to make up around 60-70 per cent of credits given in the early 1990s (Far Eastern Economic Review, March 4th, 1993). The Asian Banker (April 1996) points out that 35 per cent of total value of financial transactions took place outside the banking system. According to information from the Global Development Research Centre,[46] a 1990 survey by Vietnam's Ministry of Agriculture and Rural Development discovers that between 68 and 94 per cent of farming households borrowed in informal credit markets. This source of information also reveals that around 73 per cent of total loans of rural households were obtained from informal sources, of which professional moneylenders accounted for around 33 per cent and relatives and friends for around 40 per cent. According to IMF (1999), only one-fourth of total savings was held in the banking system, and around 25 per cent of broad money was in form of cash balances kept outside banks.[47] O'Connor (2000) pinpoints that in Vietnam a significant part of savings has been held in non-liquid assets or in USD outside the banking system.

3.3.1 *Moneylenders*

Moneylenders, including professional moneylenders, relatives and friends, are among the sources of credit in Vietnam. Moneylenders may satisfy part of the excess demand for credit resulting from the underdevelopment of the formal financial system.

In general, an advantage of moneylenders is the fact that they are part of their clients' communities because moneylenders are usually wealthy families who live in the communities or villages where their clients reside. Local information about clients is a by-product of moneylenders being part of their clients' communities. Intimate knowledge about clients enables moneylenders to mitigate the problems of adverse selection and moral hazard.[48] Being proximate to clients also helps moneylenders to exercise proper monitoring, thereby being able to take the right actions to stop imprudent activities of borrowers and/or to recover loans when the borrowers are still sol-

[45] According to Montiel *et al*. (1993), in developing countries the informal financial sector supplies between 30 and 75 per cent of total credits provided.

[46] *Source*: http://www.gdrc.org.

[47] This information seems to match with the fact that only four per cent of those eligible to open a bank account actually have one (EIU, 1999).

[48] Adverse selection, to be discussed at a greater length in Chapter 5, means that due to asymmetric information lenders may select risky borrowers. Moral hazard refers to the situation where, after a loan is supplied, the borrower may take actions that reduce the possibility of repayment.

vent. As a result, moneylenders often do not need collateral but mutual trust, which is created through long and/or close relationships between them and borrowers. It may be that the degree of (mutual) trust also determines interest rates. In many cases, informal credit is tied to other activities, such as the provision of labour and the sale of output, so as to overcome information problems (Floro and Ray, 1997).[49] These features appear to apply to moneylenders in Vietnam.

In Vietnam, interest rates charged by moneylenders are substantially higher than those charged by commercial banks. Tran (1998) finds that monthly interest rates charged by moneylenders were 4.14 per cent on average as compared to 2.11 per cent per month maintained by state-owned commercial banks. According to SEBA (1999), monthly interest rates charged by moneylenders were around 6 per cent. Hill (2000) uncovers that in Vietnam interest rates charged by informal lenders were around 3-4 times the interest rates charged by commercial banks.

Due to such high interest rates, borrowers may resort to moneylenders only for temporary shortages of capital or for immediate consumption needs. According to the Global Development Research Centre,[50] in Vietnam the rural poor mainly borrowed from moneylenders to meet their emergency consumption needs such as those related to illness, funeral or wedding. There were also those who borrowed from moneylenders to repay the loans they borrowed from commercial banks in order to maintain credit relationships with the banks, which charge much lower interest rates than moneylenders do.

In Vietnam, moneylenders seem to be able to borrow from commercial banks on the basis of collateral and relend the money they borrowed to end borrowers. The profit earned by moneylenders with this activity is the spread between the interest rates they charge to clients and the interest rates they pay to banks. The profits made in this way may be substantial (Nugent, 1996).

Although moneylenders are a source of finance, they do not seem to be important in terms of financing investment for two reasons. First, moneylenders may face

[49] A moneylender can at the same time show up in several guises (Bell, 1990). For instance, a moneylender could be a village trader, whereby allowing himself to create market interlinkages. Market interlinkages indicate the process of contracting between two parties that relates to two or more market exchanges (Yotopoulos and Floro, 1992). The market exchanges may consist of one related to credit and the other to commodity or labour. Delinquents of spot transactions on the commodity (or labour) are judged by moneylenders as a signal of failing to honour credit repayments in the future. Threats of disrupting commodity and credit transactions are usually used as an enforcement device by moneylenders.
All this indicates the differences between moneylenders and commercial banks in the way they deal with information asymmetry. Whereas moneylenders rely on trust or market interlinkages, commercial banks use formal procedures like application forms, collateral, *etc*. to screen and monitor borrowers and to enforce repayment.

[50] *Source*: http://www.gdrc.org.

resource constraints, *i.e.*, they often do not have much money to lend. In addition, informal lending is illegal in the view of the government, making moneylenders reluctant to give as much money as what investment often requires. The observation that moneylenders are not an important source of investment financing appears to be supported by some empirical sources. A survey conducted by the Saigon Marketing Group in 1998 shows that only 14.2 per cent of the sample, which included entrepreneurs, borrowed from moneylenders.[51] Our survey (to be discussed in Chapter 7) reveals that as few as 18 out of total 210 rice mills surveyed (around 9 per cent) borrowed from moneylenders (see Table 7.2 of Chapter 7). Houghton (2000) argues that moneylenders are almost never used by those who need larger funds for capital investments.

3.3.2 *Rotating savings and credit associations* (*ROSCAs*)

In general, ROSCA refers to a setting in which a group of individuals who know and trust each other meet on a regular basis to place a fixed amount of money in a kitty; the kitty will then be allocated to a particular group member at each meeting. Who wins the kitty is decided on the basis of the bidding principle: the one who bids higher, *i.e.*, pledging higher contributions, will receive the kitty first. This type of ROSCA is called a bidding ROSCA. There is another type of ROSCA, called random ROSCA, where the winning of the kitty is decided by random drawing of a lot but not by pledging higher contributions (Besley *et al*., 1993). The setting continues until every group member receives the kitty once. The earlier a member wins the kitty, the higher (implicit) interest rates he/she has to pay; those members who lean to the end of the circle are interest recipients. ROSCAs bring borrowers and savers together, with early winners of the kitty being borrowers and the late ones being savers (Callier, 1990; Levenson and Besley, 1996). In Vietnam ROSCAs present themselves in the form of *huis*.

Huis are a way of circumventing the difficulties in getting access to other sources of external finance. *Huis* may fill in at least part of the gap between the supply of credit (by commercial banks and other sources of finance) and the demand for credit of individuals and private enterprises. In some cases, the money *huis* agglomerated also came from foreign individuals. Freeman (1996) reveals that some *huis* in Cholon (China town of Ho Chi Minh City) drew capital from Hong Kong and Taiwan. *Huis* have sometimes managed to amass quite a substantial amount of savings of several millions of dollars.

Since *huis* are part of the informal financial sector, they are not legally pro-

[51] *Source*: Saigon Marketing Weekly No.3, January 16th, 1999.

tected. This means that the members may encounter high risks. Given the lack of legal protection, there have been problems around *huis* recently. Although their aim was to raise capital for financing business activities, in several instances *huis* turned into dangerous financial pyramids in which members of a given *hui* borrowed money and invest it at higher rates in other *huis* where the newly acquired money was used to pay interest on old loans. This led to serious financial scandals, even with the involvement of foreign individuals.[52]

According to an estimate, around 60 per cent of credit in the urban areas was provided by *huis*.[53] However, *huis* do not appear in our survey, indicating that they might not be an important financing source of private rice millers in the MRD. This may be because it is too risky for private rice millers to participate in *huis*.

3.3.3 *Summary*

Like other developing countries, in Vietnam an informal financial sector (including moneylenders, ROSCAs, *etc*.) exists. The informal financial sector may fill in part of the credit gap left by commercial banks. However, due to resource constraints and illegality, moneylenders are not important in terms of financing firm investment, which usually requires a large amount of money. *Huis*, the Vietnamese version of ROSCAs, are important in some cases; yet, they are subject to defaults, making them very risky as a source of financing firm investment.

3.4 Government policy *vis-à-vis* the financial sector

3.4.1 *Regulation concerning banking*

Vietnam's government has promulgated a number of laws and provisions to enhance the soundness of the credit institutions and to stimulate the provision of credit to the most productive sectors. In this subsection, we focus on those aspects of the laws and provisions that influence the access of borrowers, particularly private enterprises, to credit from financial institutions.

The first two fundamental banking codes (the Ordinance on the State Bank and the Ordinance on Banks, and Credit Cooperatives and Finance Companies) came into force on October 1st, 1990. These ordinances marked a crucial step towards institutionalising banking operations and a new structure of the banking system. These ordinances were replaced by the Law on Credit Institutions, which took effect on Oc-

52 *Source*: Vietnam Investment Review, 1998.
53 *Source*: Far Eastern Economic Review, March 4th, 1993.

tober 1st, 1998. This law provides a wide range of products that credit institutions are allowed to offer, ranging from the traditional financial products to funds management and insurance services. It has provisions to ensure the safety of the activities of the credit institutions, including capital norms, restrictions on asset/liability management, deposit insurance, and limits on credit institutions' investment in real estate.

According to the new law, a credit institution is allowed to lend to a single client an amount up to 15 per cent of its own capital (equity), instead of 10 per cent as previously ruled by the Ordinance on Banks, Credit Cooperatives and Finance Companies. Since the level of own capital (equity) of commercial banks in Vietnam is normally low, this rule in facts limits the amount of money that an individual firm can borrow.[54] As part of the financial sector policy, regulations aiming to enhance loan procedures of commercial banks have also been implemented. For instance, the feasibility study of investment projects must go into banks' credit decisions. This is expected to improve efficiency and transparency, to contribute to commercialising banks' behaviour, and to limit the accumulation of bad loans into banks' balance sheets. The SBV issued Decision No. 415, effective on January 1st, 2000, requiring commercial banks in Vietnam to provide information about their clients to the SBV on a regular basis. Specifically, this decision stipulates that commercial banks have to give details about a client to the SBV within three days after a "credit relationship" is established; commercial banks also have to provide the SBV with the details on financial health (derived from balance sheet data) of their clients on quarterly basis. These measures are important in terms of enhancing the prudential supervision of the SBV on commercial banks. Yet, they are likely to further suppress the limited access to credit for private enterprises, if they are effective, since private enterprises often do not have bookkeeping, from which their financial health can be observed. However, it is likely that these measures are not effective because the government seems to fail to enforce them.

In sum, the SBV has attempted to improve the soundness of the commercial banks by setting limits on loans given to single borrowers and tightening of the requirements on information transparency. These measures seem to crowd out private enterprises because private enterprises usually do not have good financial records.

[54] Due to difficulties in enforcing prudential regulations, this rule could be easily circumvented, especially by joint-stock commercial banks, which have often lent excessively to shareholders (Oh, 2000).

3.4.2 *Monetary policy*

Monetary policy covers a central bank's actions to influence the cost and the availability of money and credit. Thus, it serves as a means of helping to promote national economic goals. Two instruments of monetary policy that central banks normally use are interest-rate policies and reserve requirements. While interest-rate policies affect the cost of credit, reserve requirements determine the availability of credit. Both, therefore, play an important role with respect to access to credit of firms.

Interest-rate policy

Until 1993 the SBV maintained a lending interest rate differentiation regarding borrowers (households had to pay higher interest rates than economic entities) and sectors (economic entities in agricultural and industrial sectors were charged lower interest rates than those in commercial and services sectors) (Vo, 2001). In 1993 the SBV abolished this differentiation.

In the early years of *doi moi*, deposit interest rates were higher than lending interest rates. For instance, in March 1989 the spread between the interest rates on industrial loans and the three-month household deposit rates was minus 1.5 per cent, and it reached minus 3.3 per cent by the end of the year. This spread has become positive since December 1992 when deposit rates fell below lending rates (IMF, 1994; IMF, 1995a; Dodsworth *et al*., 1996).

Until March 1989 the official interest rates had been low, and the real interest rates had been negative. In March 1989 the nominal interest rates on three-month deposits of households were doubled, from 6 to 12 per cent, leading the real interest rates to a positive level of 4.7 per cent (Gates, 2000). As inflation has declined, the government became concerned that the real lending rates were becoming too high, and have thus cut the lending interest rates several times since 1995 (see Table 3.4).

Up to August 2000, the SBV maintained an interest-rate ceiling mechanism. According to this mechanism, formal credit institutions were not allowed to lend at interest rates higher than the ceilings. On August 5th, 2000, the SBV replaced the ceiling mechanism with the base interest-rate mechanism regarding domestic currency-based lending. Under this mechanism, the SBV sets a base lending rate and margins above this rate to serve as limits for the lending interest rates charged by banks. This new mechanism provides adequate flexibility to credit institutions and should help to enhance firms' access to credit (IMF, 2002a) because credit institutions may be more inclined to grant loans if they are able to price loans according to credit risks. At the same time, the government also adopted a market interest rate mechanism as for foreign currency-based lending activities; the interest on dollar deposits is now based on

the SIBOR, *i.e.*, Singapore Interbank Offered Rate.

Table 3.4 Vietnam: lending interest rates on fixed capital (medium term) (per cent per month; in December), 1990-2001

Years	*Interest rates*	*Years*	*Interest rates*
1990	0.8	1996	1.4
1991	0.8	1997	1.2
1992	1.8	1998	1.3
1993	1.2	1999	1.0
1994	1.7	2000	0.9
1995	1.7	2001	0.9

Source: IMF (1994, 1995a, 1996, 1998, 2000, and 2002).

Reserve requirements

Reserve requirements are an instrument used by central banks to manage the availability of credit. Therefore, reserve requirements will affect the amount of credit that firms in an economy can receive. The SBV has at its disposal the instrument of reserve requirements, but this instrument has not been actively employed as a tool of monetary management because it is not enforced; several state-owned commercial banks had reserve deposits far below the required minimum. Until February 1994, the SBV maintained a formal reserve requirement ratio of 10 per cent of all deposits. On March 1st, 1994, the SBV introduced new reserve ratios for both domestic and foreign currency deposits: 7 per cent for time and savings deposits and 13 per cent for demand deposits. In 1995 the reserve ratio of 10 per cent was applied to all types of deposit, except for domestic currency deposits with a maturity of over 1 year (IMF, 1998). In February 1999 the SBV reduced the reserve requirement ratio of 10 per cent to 7 per cent for short-term deposits. Since May 2001 the reserve requirement ratio was further reduced to 3 per cent (Table 3.5). The reductions in reserve requirement ratio imply the government's intention to relax credit supply in order to encourage firm investment.

Table 3.5 Vietnam: reserve requirement ratio on *dong* deposits (per cent)

Time	*Reserve requirement ratio*	*Time*	*Reserve requirement ratio*
March 1994	13	June 1999	6
1995	10	July 1999	5
February 1999	7	May 2001	3

Source: IMF (1994); Vietnam Economic Times Supplement 2001.

3.5 Characterization of the Vietnamese financial system

This section aims to provide a characterization of the Vietnamese financial system in terms of the properties that are usually discussed while describing financial systems. Wherever possible, comparisons are made with other economies in the region and/or other transition economies.

Previous parts of this chapter have made clear that, in terms of the type of financial intermediation, the Vietnamese financial system should be characterized as a bank-based, as opposed to a market-based, financial system. By itself, this does not mean anything about the stage of development of the financial sector. As explained by Allen and Gale (1995), there is no consensus about whether a market-based financial system or a bank-based financial system is more advanced. Yet, evidence on transition economies suggests that the financial systems of the most successful countries among a group of twelve transition countries are strongly dominated by banks (Berglof and Bolton, 2002).

Although Vietnam has a bank-based financial system, the quantity and quality of its banks are inadequate. Concerning the quantity of banks, the characterization by the World Bank that Vietnam is an underbanked country still seems to be valid, even if there has been an increase in the number of banks in the period since the time this report appeared. The nature of Vietnam as an underbanked country is shown by the figures in Table 3.6. The M2-to-GDP ratio, the most usual measure of the size of the banking sector, was much lower in Vietnam than in other Asian countries. In terms of the deposits-to-GDP ratio, the gap was even greater. In addition, the high currency-to-deposit ratio implies that Vietnam is an economy where cash payments remain predominant. On the basis of these figures, Vietnam can be described as a country with shallow finance.[55]

Table 3.6 Vietnam: financial deepening, end-1997 (per cent)

Countries	*M2/GDP*	*Deposit/GDP*	*Currency/deposit*
Vietnam	27.6	10.0	42.7
Japan	143.8	103.7	11.8
Singapore	93.1	85.0	9.5
South Korea	48.3	46.8	7.8
China	119.6	88.5	15.1
Thailand	89.9	82.8	8.4
Indonesia	57.0	40.8	12.1
Malaysia	116.9	100.5	8.5

Source: Oh (2000).

[55] See, *e.g.*, Kitchen (1986) for this terminology.

Qualitatively, commercial banks in Vietnam should be exemplified as fragile (Oh, 2000). They have a high level of non-performing loans. The foreign banking community estimated that in 1999 non-performing loans accounted for 20 per cent of the total outstanding loans of the whole banking system (Oh, 2000). The high share of non-performing loans is to an important extent a result of the loans that state-owned commercial banks have to grant to SOEs as part of the policy of directed lending, as discussed in Subsection 3.2.2.

The quality as well as the quantity of Vietnamese banks may be seen as having suffered from government policies that can be categorised as financial repression.[56] The directed lending to SOEs dealt with before is part of this phenomenon; so are the interest rate controls characterizing Vietnam's monetary policy. Another element is formed by the reserve requirements on commercial banks. It can be seen from Table 3.5 that the reserve ratio in Vietnam was more than 10 per cent in the early 1990s, as compared to five and three per cent in South Korea and Thailand, respectively. The situation seems to improve as the reserve requirement ratio has gone down.

Finally, the underdevelopment of the Vietnamese financial system in terms of the quantity and quality of banks will at least partly be responsible for the low resource mobilisation in the country, reflected in the relatively low gross domestic savings rate (see Table 3.7). Although the saving rate has increased, it was still low as compared to those in many other Asian countries.

Table 3.7 Gross domestic savings by country (per cent of GDP), 1993-2000

Countries	1993	1994	1995	1996	1997	1998	1999	2000
Vietnam	17.4	16.9	17.0	16.7	17.7	21.5	24.6	27.0
China	41.5	42.2	41.9	41.4	42.6	40.8	39.5	38.9
Indonesia	32.5	32.2	30.6	30.2	31.0	26.5	19.5	25.2
South Korea	35.4	36.5	36.8	35.2	34.5	34.4	33.5	32.6
Malaysia	37.7	38.8	39.5	42.6	43.8	48.7	47.3	46.7
Myanmar	11.4	11.7	13.4	14.0	14.6	11.8	13.0	11.1
Philippines	15.2	17.0	16.8	18.8	19.2	12.4	14.3	16.7
Singapore	46.3	48.8	51.0	51.2	51.8	50.8	48.8	49.3
Taiwan	27.0	25.8	25.6	25.1	24.7	26.0	26.1	25.2
Thailand	35.6	36.0	33.6	33.7	31.0	35.2	32.9	32.9

Source: Oh (2000); computed from Asian Development Bank, *Key Indicators of Developing Asian and Pacific Countries* (2002).

[56] See, *e.g.*, Kitchen (1986) for this terminology.

3.6 Conclusions

Vietnam's government has undertaken a number of reforms towards the financial system. The reforms have led to a diversification of the financial system. However, the Vietnamese financial system is still underdeveloped, and finance remains relatively shallow. The reforms created four large state-owned commercial banks, which are oriented to providing credit to SOEs according to directives of the government. In addition, these banks may not be able to solve the problem of information asymmetry between them and private enterprises. Therefore, they tend to maintain a stringent lending procedure and require collateral, which limit access of private enterprises to their credit.

Although foreign banks have operated in Vietnam, costly acquisition of information about private enterprises due to different cultures, supervisory/regulatory structures, *etc*. has barred them from lending to these enterprises. As a result, they have lent to or through state-owned commercial banks or to SOEs. Joint-stock commercial banks seem to be the weakest actor in the banking sector. Due to small capital base, high ratios of non-performing loans and liquidity problems, joint-stock commercial banks in Vietnam are not very helpful to private enterprises. Finally, Vietnam's stock market is young, and only few large companies issued their securities in this market.

In Vietnam an informal financial sector exists, filling in part of the credit gap left by the formal financial system. The size of this sector, albeit difficult to measure exactly, seems to be considerable. The informal financial agents have for most of the time extended consumption credits but not credit for productive purposes because they may face resource constraints and are illegal.

In the course of the financial reforms, the SBV has issued laws and provisions to enhance the soundness of the country's banks. These laws and provisions help to secure of the loans given by formal credit institutions and improve their financial transparency. The SBV also reduced lending rates as well as reserve requirements. All in all, the Vietnamese financial system is ill equipped to finance private enterprises like private RMs in the MRD. The possibility of banks to finance private enterprises is limited by government policies and regulation that partly work out as financial repression.

Chapter 4

The rice-milling industry in the Mekong River Delta

4.1 **Introduction**

This chapter is aimed at providing the reader with a general picture of the rice-milling industry in the MRD and giving insights into some specific aspects of the industry that are relevant in the framework of this dissertation, especially regarding the uncertainty facing private rice millers. As discussed in Chapter 2, Vietnamese enterprises, especially private ones, have responded positively to the opportunities created by *doi moi*. A visible response can be seen in the rice-milling industry in the MRD, the rice bowl of Vietnam. In a short period, *i.e.*, only one year, from 1988 to 1989, this industry, accompanied by a strong demand for Vietnam's rice from foreign markets, helped to transform Vietnam from a net food importer into a rice exporter. Despite this, private RMs that play an important role in this industry remain at a distinct disadvantage, not only in terms of access to external finance, as discussed in Chapter 3, but also in terms of access to foreign markets (see Chapter 2) as well as access to market information.

The rest of this chapter is structured as follows. Section 4.2 gives a description of paddy grain and discusses the technical aspects of the rice-milling process. Section 4.3 describes relevant aspects of the milling technology applied in the MRD. Section 4.4 discusses the emergence of private RMs in the MRD and the uncertainty facing them. Section 4.5 concludes the chapter.

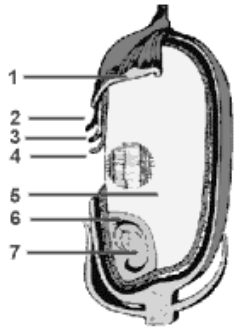
4.2 Paddy grain, the rice-milling process, and loss in milling

4.2.1 *Paddy grain*

Picture 4.1 depicts a paddy grain. Paddy grain basically consists of a husk (or hull) and a grain of brown rice. Brown rice consists of a bran layer (including pericarp, seed coat, and aleurone layer), a germ and scutellum connected on the ventral side of the grain, and an edible portion or endosperm.

Basically, paddy grain is not suitable for eating. It becomes edible only if the husk and the bran are removed.[57] The removal of the husk and the bran can be done in the milling process, which will be described as follows.

Picture 4.1 Paddy grain



1 Husk or hull
Brown rice, including
2 Pericarp
3 Seed coat
4 Aleurone layer
5 Endosperm
6 Scutellum
7 Germ

Source: http://www.buhler.ch.

4.2.2 *The rice-milling process, loss in milling, and rice-milling techniques*

The rice-milling process

Rice milling involves the removal of the husk and the bran layer to produce the edible portion for consumption. Rice-milling process embraces two basic operations. One operation is the removal of the husk to produce brown rice; this operation is called dehusking (or dehulling). The other operation is the removal of the bran layer from brown rice to produce polished (or white) rice; this operation is called polishing or whitening. Milling also removes the germ and a portion of the endosperm as broken kernels and powdery materials.

[57] It may be better, in terms of nutrition, if the bran is not removed. However, in most cases consumers prefer white rice, *i.e.*, rice with the bran being removed, because white rice may have better smell and taste.

Output of a milling process comprises one main product, *i.e.*, milled rice (or the edible portion) and several by-products, *i.e.*, the husk, the germ, the bran layer and the broken kernels.[58] Rice milling results in loss the extent of which depends on the milling technique chosen.

Loss in milling

Loss in milling is an important determinant of the efficiency of a rice mill. Loss in milling is quantitative as well as qualitative by nature. Quantitative (or physical) loss is manifested by a low milling recovery rate;[59] qualitative loss is manifested by a low rate of head rice recovery or a high percentage of broken grains in the milled product.[60] In order to reduce loss in milling, the rice-milling operations, *i.e.*, dehusking and whitening, should be accomplished with care to prevent excessive breakage of the kernel. Loss in milling depends on the milling technique applied, among other factors. Differently stated, better milling techniques may result in lower loss in milling, as will be discussed below.

Rice-milling techniques

The rice-milling process can be done using different milling techniques. Rice-milling techniques range from a simple form like pestle and mortar to very sophisticated, expensive multiple-pass milling machines. All these forms of milling techniques have existed in Vietnam; some of them have been extinguished.

Pestle and mortar

This process is a manual form of milling. Mortar and pestle (see Picture 4.2) are used by farmers and usually operated by female members of the family. In this process, the milling is done through the impact and friction acting among the paddy kernels. The grain is dehusked and whitened every time when it is pounded in the mortar by the pestle. This process is highly inefficient for two main reasons. First, it is very labori-

[58] Among these by-products, the husk can be used as an energy generating material; the germ, the bran layer, and the broken kernels can be used to feed animals.

[59] Recovery rate, also referred to as conversion rate, is the percentage of the quantity of rice recovered to the quantity of paddy fed into the milling process. For example, if 70 kilograms of rice are recovered out of 100 kilograms of paddy, the recover rate will be 70 per cent.

[60] Head rice is unbroken rice.

ous and time-consuming. Second, the excessive impact and pressure result in high breakage of milled rice (qualitative loss). At first, farmers in remote areas did not mind the loss because of the low volumes of paddy milled and the absence of better alternative techniques to mill paddy. Pestle and mortar have not been used to mill paddy since the time machine-led machinery appeared. Nowadays, people bring paddy to rice mills to reduce workload.

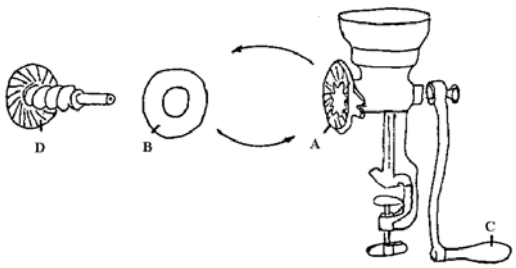
Picture 4.2 Pestle and mortar

Source: http://www.fairtradeonline.com.

Steel huller

Steel hullers (see Picture 4.3), also referred to as Engleberg steel hullers, are more efficient than pestle and mortar. A rotating steel roller inside a screen cylinder provides pressure and friction among the grains, simultaneously dehusking and polishing of the kernels. Thus, the impact force in steel hullers is absent. Nowadays, hand-operated steel hullers are rarely observable in the MRD.

Picture 4.3 Hand-operated steel rice huller



Note: (A) – stationary disk;
(B) – rubber disk;
(C) – handle; and
(D) – rotating disk with auger.

Source: http://agronomy.ucdavis.edu.

Under-runner disk sheller (or disc sheller)

Under-runner disk shellers, often referred to as disc shellers, consist of two horizontal iron discs partly coated with abrasive layers (see Picture 4.4). One disc is stationary and the other rotates. The distance between the two disks can be adjusted to suit the size of paddy grain. Paddy is fed into the centre of the machine and moves outwards by centrifugal force. Paddy is evenly distributed over the surface of the rotating disc. Under the centrifugal pressure and friction of the disc, most of the paddy grains are dehusked.

The main advantage of disc shellers is its operational simplicity and low running cost since the abrasive coating can easily be remade at the site with inexpensive materials. Its main disadvantage is the high level of grain breakage and the abrasions caused to the outer bran layer. Under-runner disk shellers are still popular in the MRD.

Picture 4.4 Under-runner disk sheller

Source: http://agronomy.ucdavis.edu.

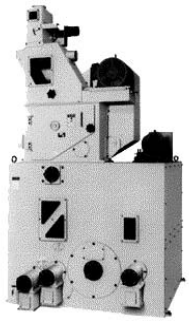
Rubber roll paddy husker

Rubber roll paddy huskers (see Picture 4.5), also referred to as hullers or shellers, significantly reduce grain breakage. Rubber roll paddy huskers consist of two rubber rolls rotating in opposite directions at different speeds. One roll moves about 25 per cent faster than the other. The difference in speed subjects paddy grains falling between the rolls to a shearing action that strips off the husk.

Compared to disc shellers, rubber roll huskers are at an advantage in the sense that they reduce grain breakage and the risk of damaging the grain. They do not remove the germ, and hence sieving the resulting rice is not necessary. Their hulling efficiency is high. The main disadvantage is the cost of replacing the rubber rolls. This disadvantage is offset, however, by the reduction of breakage and the increase of total rice overturn. Rubber roll paddy huskers are most popular in the MRD in these days,

according to our observation during the survey.

Picture 4.5 Rubber roll paddy husker



Source: http://www.satake-usa.com/aspirated.html.

Multiple-pass milling machines

A large capacity multiple-pass machine RM uses different machines for each processing step: cleaning, dehusking, separating, bran removing, and grading. These processes are integrated into one system by bucket elevators linking machine to machine to accomplish each stage of processing to the end where output in the form of polished rice comes out. A modern multiple-pass milling machine uses about one-half to two-thirds of the electric power of a steel huller operating at the same capacity. Modern multiple-pass machines result in much lower loss in milling.

Modern multiple-pass machines are known in Vietnam. However, they are few and mainly owned by foreign companies (such as Satake Factory in Ho Chi Minh City) or by joint-venture enterprises between foreign and state-owned food companies (like Toyo Dragon Factory in Cantho). Most of private rice millers cannot afford buying such expensive machines.

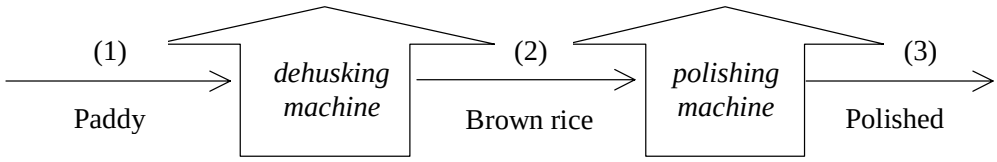
4.3 The rice-milling technology in the MRD in practice

As we have seen in Subsection 4.2.2, there is a wide range of rice-milling techniques. An appropriate choice of rice-milling technique should be right in terms of investment costs and technical efficiency (loss in milling). In principle, more costly techniques in terms of investment cost per ton of milling capacity tend to be more efficient in terms of generating lower loss, both quantitatively and qualitatively. Cheaper milling tech-

niques have advantages in terms of needing smaller investments but at the same time result in high milling losses.

As discussed in Chapter 2, *doi moi* has brought about chances for Vietnam's rice to be exported. Given the then existing rice-milling technology that was only able to produce rice for domestic consumption, the milled rice did not meet export standards. Private rice millers in Vietnam, especially those in the MRD who produce most of export rice of the country, were under pressure of improving the quality of their output. Those rice millers that already had rice-milling factories established might found it wasteful to demolish the existing factories to build up new ones. Therefore, they tend to set up polishers separately to only polish rice to export. Those rice millers that started from scratch might have insufficient capital to set up factories that can perform both milling and polishing functions.[61] They thus opt for either milling or polishing function. This way of investing helps to explain the existence of the so-called "two-system" milling process in the MRD, which is illustrated in Chart 4.1.

Chart 4.1 The "two-system" rice-milling process



Note: (1) Paddy is fed into dehusking machines in order to get brown rice; (2) brown rice is taken out of dehusking machines and is then fed again into polishing machines to get polished rice; and (3) polished rice comes out of polishing machines.

As discussed earlier, multiple-pass milling machines use different machines for each processing step such as cleaning, dehusking, separating, bran removing, and grading. These steps are integrated into one system by bucket elevators. We characterize this process as "one-system" process, which is usual in other countries. A basic difference between the "two-system" process and the "one-system" one is that in the "two-system" process milling and polishing are done in two separate systems. More specifically, in the "two-system" process the output of the dehusking operation in the form of brown rice is taken out of the dehusking machine and is fed again into the polishing machine in order to get white rice (see Chart 4.1). As a result of this, the "two-system" process leads to higher losses, making it much less efficient than the "one-

[61] According to our survey, as much as 88.6 per cent of the sample's population used only own savings to set up new RMs.

system" one.

In addition to the existence of the "two-system" process, the backward technology that rice millers have used adds to the inefficiency, in terms of loss, of the rice-milling industry in the MRD. Since it is often expensive for entrepreneurs to import rice-milling equipment, they have to use domestically manufactured equipment, which can be characterized by backward technology. In general, according to Harvie (2001) a majority of Vietnamese enterprises have used obsolete technology that may be three or four generations behind the world's average level. This finding appears to hold for the rice-milling industry in the MRD.

As a result of the "two-system" process and the backward rice-milling technology, the rice-milling industry in the MRD is regarded as inefficient mainly because of high loss. A good milling technique is able to yield 67 kilograms of milled rice out of 100 kilograms of paddy, of which 52 kilograms are head rice.[62] In Vietnam a normal private RM is, on average, only able to yield 60-66 kilograms of milled rice out of 100 kilograms of paddy, of which only 40-48 kilograms are head rice. More specifically, only 33 kilograms of milled rice that qualifies for export can be obtained from 100 kilograms of paddy if the paddy goes through the two-system process.[63] This figure hints at a huge loss as several million tons of rice have been milled every year in Vietnam (see Table 4.1). This loss may be avoided by, *e.g.*, adopting better rice-milling technology.

4.4 A profile of private RMs in the MRD

4.4.1 *An overview of the emergence of private RMs in the MRD*

Historically, paddy production in the MRD usually exceeds the consumption at the farming household level, leading to a marketable paddy surplus. This induces some farmers to try to market their own surplus. Since it is often not efficient to market the individual surplus separately, the farmers collect a larger quantity of produce from other households before trading it. In many cases, those farmers who persistently succeed in trading paddy transform themselves into traders. Traders usually start by trading a relatively small volume of produce. As time passes, they may manage to handle a larger volume thanks to accumulated capital, more customers, and better market knowledge. When the conditions become ripe, traders specialise: some act as assemblers; some others become wholesalers, retailers, or rice millers.

Prior to *doi moi*, the Vietnamese government forbade private-sector activity. However, being unable to supply food to everybody, especially to those living in rural

62 *Source*: http://www.buhlergroup.com.
63 *Source*: Vietnam Information Book, April 1999.

areas, the government allowed private RMs to mill rice for home consumption. During this period, private RMs did exist (see Subsection 7.3.1 of Chapter 7). These private RMs were of a very small size; the then prevailing rice-milling technology was backward; the maintenance and the repair of factories were accomplished by the owners themselves. The private RMs simply functioned as providers of milling services to households, mainly in rural areas, and received service charges in return. They were not engaged in trading for their own account because the government banned private trade (see Section 2.3 of Chapter 2).

Doi moi, which abolished the bans on private trade, returned land to farming households, and liberalised commodity prices, *etc*. gave farming households proper incentives to increase the production of paddy, among other products (see Chapter 2), thus raising the demand for milling services. At the same time, the international trade liberalisation that brought about opportunities for Vietnam's rice to be exported (see Chapter 2) pushed-up the demand for milled rice, which also required milling services. As a result of these factors, a substantial number of private RMs were established. Aggregate data concerning the number of establishments of private RMs over time since the start of *doi moi* are not officially recorded. Our survey, to be described in detail in Chapter 7, reveals that 162 out of 210 private RMs we surveyed (71.1 per cent) were established between 1989 and 1999, indicating that during this period the number of private RMs increased substantially.

In 1999 the MRD had 7,454 RMs of which 626 RMs (8.4 per cent) were state-owned; the remaining (91.6 per cent) were privately owned.[64] Table 4.1 provides further information about the rice-milling industry in Vietnam. This table divulges an overwhelming role of private RMs in this industry in terms of the amount of rice processed. In every year from 1995 to 2000, private RMs processed more than 90 per cent of the total amount of milled rice produced in Vietnam.

In sum, the surplus in paddy production provides the *raison d'être* for the rice-milling industry in the MRD to come to fore. Prior to *doi moi*, there were only few private RMs. The RMs mainly provided milling services to rural households and did not trade their output for their own account. Since the start of *doi moi*, a substantial number of private RMs have been established in response to the opportunities *doi moi* has created. Private RMs have since then occupied a prominent position in the rice-milling industry in the MRD.

[64] *Source*: Vietnam Economic Times, April 5th, 2000.

Table 4.1 Vietnam: shares of state-owned and private RMs in the rice-milling industry, 1995-2000*

Year	*Total*		*State-owned RMs*		*Private RMs*	
	Quantity (1,000 *tons*)	*Per cent*	*Quantity* (1,000 *tons*)	*Per cent of total*	*Quantity* (1,000 *tons*)	*Per cent of total*
1995	15,294	100	584	3.8	14,710	96.2
1997	18,800	100	529	2.8	18,271	97.2
1998	19,202	100	1,208	6.3	17,994	93.7
1999	21,802	100	1,150	5.3	20,652	94.7
2000	22,200	100	1,200	5.4	21,000	94.6

Source: Vietnam Statistical Yearbook 2000.
Note: * No information was available for 1996 and for the years before 1995.

4.4.2 *Uncertainty regarding future market developments facing private rice millers*

This subsection is devoted to defining uncertainty and arguing that the instability of the world rice market which influences the domestic rice market (see Chapter 2), accompanied by a lack of information, leads to private rice millers in the MRD being uncertain about the future developments of the markets in which they sell their output.

In this dissertation, we assume that the decision maker can subjectively assign probabilities to the distribution of the future values of the uncertainty variable in question.[65] The survey we conducted in 2000 (see Chapter 7) helps to confirm this assumption: the respondents were able to fill in the probability distribution formulated in the questionnaire. By assigning probabilities to the distribution of the future values of the uncertainty variable, the decision maker creates a subjective probability distribution that picks up the uncertainty facing him/her.[66]

The information about the random variable that the decision-maker has can influence the subjective probability distribution since it helps (s)he to improve him/her judgement about the random variable. Anderson (2003) contends that information can influence a subjective probability distribution because (i) the dispersion of the subjective distribution may diminish as information is accumulated, (ii) information may shift the location of the subjective probability distribution, or information may lead to an adjustment of the subjective mean. The more (less) information about the random variable that the decision-maker has, the lower (higher) the degree of the uncertainty

[65] This is usually referred to as classical uncertainty.

[66] The subjective probability distribution of a discrete random variable is a list of probabilities associated with each of its possible values; the probabilities sum to unity and are formed based on an individual's personal judgement about how likely a particular value of the random variable is to occur.

facing him/her. To conclude, information accumulation may help to reduce the uncertainty about the random variable.

The instability of the world rice market (see Chapter 2) is likely to be the main factor that causes the uncertainty facing private rice millers in the MRD. This is because the instability makes it difficult for private rice millers to make good judgements of the trend of the future development of the market. The uncertainty caused by the instability of the world rice market appears to be exacerbated by the fact that private rice millers do not have sufficient market information. Despite *doi moi*, Vietnam still does not have a good mechanism that can provide private rice millers with key market information. As a matter of fact, there are few sources of up-to-date, high-quality information within Vietnam. This deficiency creates difficulties for private rice millers in terms of access to market information. They often have to obtain information through media (*e.g.*, newspapers, radio, or television) or through personal contacts. Media usually provide occasional information only, which may not be useful for making investment decisions. Personal contacts are established with friends and relatives living overseas or acquaintances made at trade fairs or during private trips; the information acquired in this way is often *ad hoc* and hence may be able to accommodate spot transactions.

In Vietnam, those private rice millers who are active in searching for information can contact public organisations like the Vietnam Chamber of Commerce and Industry and other trade associations to that end. At the same time, however, it is very likely that private rice millers may neither digest nor effectively use the statistical data and general information from these sources, even if they manage to acquire it, because of their low level of schooling, among other factors. Illustratively, the average number of years of schooling of 210 private rice millers we interviewed was approximately nine, equivalent to last year of secondary school; only 13 rice millers out of 210 (6.2 per cent) had a university degree.[67]

Another source of information for private rice millers is state-owned food companies (SOFCs). Like other SOEs, SOFCs, which are important in the linkage between foreign and domestic rice markets, often have priority access to valuable information from their line ministries. Relevant information from governmental agencies (such as Vinafood 1 and Vinafood 2, see Subsection 2.4.2) is mainly directed to SOFCs. In addition, foreign buyers who come to Vietnam to find partners often end up at governmental agencies and will then be introduced to SOFCs. Yet, SOFCs may be unwilling to share the information they have obtained with private rice millers because doing so would expose themselves to competition threats from private rice millers, especially since private rice millers are also allowed to directly export rice nowa-

[67] The education system in Vietnam is structured as follows: (i) primary school: grades 1-5, (ii) secondary school: grades 6-9, (iii) high school: grades 10-12, and (iv) university: four to six years to get bachelor degree, two years to get master degree, and four years to get doctor degree.

days.

There are also other barriers that restrict access of private rice millers to market information that is available. One of the barriers concerns language. Poor capability in terms of using foreign languages appears to make private rice millers unable to understand the information that is not expressed in Vietnamese. Another barrier regards the cost of using information. Generally, information about foreign markets is often expensive, and only few private enterprises in Vietnam can afford buying it (Webster, 1999). Knight and Liesch (2002) confirm that resource constraints preclude small- and medium-sized enterprises from obtaining information about international markets. In particular, internet, an important source of information nowadays, seems to be unaffordable for private rice millers because of high service charges of 2 USD cents for each minute on line (Harvie, 2001).

As we have seen, private rice millers in the MRD are uncertain about the future development of the markets for their output. Whether or not private rice millers are affected by the uncertainty has not been obvious yet. The uncertainty may not matter if private rice millers can reduce the adverse effects of the fluctuations in the markets by holding rice in inventory, synchronising the purchase of paddy (input) and the selling of rice (output), adjusting paddy or rice price or both, and so on. Yet, it may not be feasible for private rice millers to do so for some reasons.

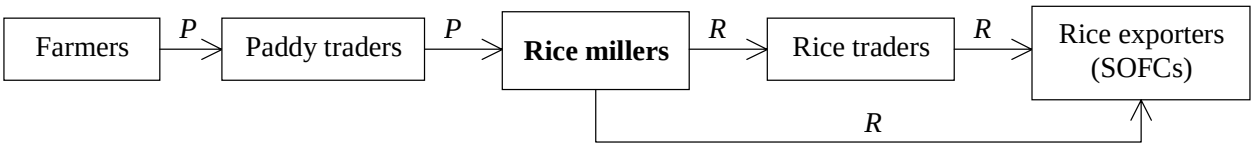
In principle, a private rice miller is supposed to be able to reduce the adverse effects of market fluctuations by holding rice in inventory because the inventory will enable the rice miller to sell the rice at favourable prices and to meet unexpected demand (or to avoid stock-outs). Unfortunately, milled rice is a kind of product that cannot be stored for long. Pest infestation due to insects, rodents, and birds are a real threat if milled rice is stored over a month.[68] If private rice millers store rice, they normally do not apply any pest control measures because of the harmful effects of the chemical pesticides. If infested milled rice is remilled (or whitened), around 10 per cent of the rice by weight will be lost. This problem sharply increases with larger volume of stocks and prolonged storages.[69] All this helps to explain that using inventory as a buffer stock to cope with market fluctuations may not be very practical for private rice millers in Vietnam.

Adverse effects of market fluctuations can also be mitigated if rice millers are able to synchronise the purchase of input and the selling of output. Since the production of rice millers often takes time, the purchase of input usually has to take place before the selling of output. In order to make the synchronisation possible, rice millers have to know the time of the selling of output beforehand. This seems to be difficult because rice millers are not well informed about the output markets, as we have discussed earlier.

[68] *Source*: http://www.fao.org.
[69] *Source*: http://www.fao.org.

Another way for private rice millers to overcome the adverse effects of market fluctuations is to adjust input or output price or both. Private rice millers in the MRD may find it difficult to adjust the prices because they have weaker market powers as compared to their partners. The weak market powers of private rice millers can be explained by referring to their position in the rice-milling channel. Chart 4.2 presents a simplified rice-marketing channel in the MRD;[70] it only reveals important flows of paddy and rice with respect to the magnitude of the flows. This chart suggests that there are strong links between private rice millers and paddy traders as well as between private rice millers and rice traders and rice exporters (SOFCs). IFPRI (1996) finds that paddy traders are the main suppliers of private rice millers, and rice traders, together with SOFCs, are the principal customers of private rice millers.

Chart 4.2 A simplified rice-marketing channel in the MRD



Source: Adapted from IFPRI (1996), Minot and Goletti (2000).
Note: *P* stands for paddy and *R* for (milled) rice.

Paddy traders normally have contacts with a number of both farmers and rice millers because they are mobile conciliators between farmers and rice millers. This gives traders in-depth knowledge of cropping patterns and the production traditions of farmers as well as makes it easier and less costly for them to find suppliers (farmers) and customers (rice millers). In contrast, most private rice millers do not have this advantage, implying that they have to depend on paddy traders for input. As a result, rice millers may be captured by some paddy traders.[71] If this is the case, it is understandable that rice millers may be less able to change the input price. To give an example, the owner of Rach Sung RM in Cantho province explicitly mentioned to us that he normally did not ask his suppliers to lower paddy prices when the market prices exhibit small drops because, according to him, doing this would bring him the risk of

[70] A comprehensive description of the rice-marketing channel in Vietnam can be found in Minot and Goletti (2000).

[71] This is similar to the so-called "lock-in" mentioned in McMillan and Woodruff (1999). McMillan and Woodruff (1999) also argue that the customer is locked into the relationship because it would have high costs of search for other suppliers, among other reasons.

losing the suppliers.

As for rice markets, it may be difficult for those private rice millers who sell output directly to SOFCs to change the price they charge to SOFCs because (i) there are few SOFCs, (ii) SOFCs have dominated the rice export sector of Vietnam, and (iii) SOFCs have to follow the prices in the world rice market. Those private rice millers who sell output to rice trader are also in a weak position because, like paddy traders, thanks to their mobility rice traders often have contacts with a wide range of private rice millers, which enables them to have lower costs in finding partners.

In sum, insufficient market information makes it difficult for private rice millers in the MRD to form expectations about the development of the markets in which they sell their output, thereby exacerbating the uncertainty stemming from the instability of the world rice market. At the same time, private rice millers are less able to avoid the adverse effects of market fluctuations. Therefore, the uncertainty does matter for them while making investment decisions. Table 7.6 of Chapter 7 reveals that the private rice millers we surveyed consider unanticipated changes in the output market as important factors affecting their investment decisions. Yet, as we will discuss in Chapters 6 and 9, the effect of the uncertainty on investment of private rice millers in the MRD varies depending on the degree of uncertainty, the degree of irreversibility, the degree of competition, and size.

4.5 Conclusions

Basically, paddy grain is not suitable for eating. In order to make paddy grain edible, the husk and the bran should be removed. The removal of the husk and the bran is done by RMs using different techniques. In the MRD, the rice-milling industry, including both state-owned and private RMs, has developed on the basis of the excess supply of paddy and the trade liberalisation created by *doi moi*, among others. Despite *doi moi*, private RMs, which account for a substantial portion of rice produced in the MRD, have faced difficulties in terms of access to market information. The difficulties, together with the instability of the world rice market, results in the fact that private RMs are uncertain about the future development of the markets in which they sell their output. The uncertainty, in association with limited access to credit of private enterprises in Vietnam revealed in Chapter 3, is likely to make private rice millers in the MRD unwilling to adopt advanced rice-milling technology.

PART TWO

Literature review

Chapter 5

Financial market imperfections and investment

5.1 Introduction

Finance is important for firms to take up investment opportunities. Therefore, if finance is inadequate, investment will be held back. Firms usually have to get at least part of their financing from financial markets. It is often reported that firms in developing countries, especially small- and medium-sized ones, face difficulties in getting financing because of financial market imperfections resulting from the underdevelopment of the financial systems. This also appears to be the case for private enterprises in Vietnam, as pointed out in Chapter 3. This chapter aims to review the literature on the relationship between financial market imperfections and firm investment in order to provide a theoretical background for the empirical study on this issue in Chapter 8.

The remainder of this chapter proceeds as follows. Section 5.2 discusses the theoretical literature on financial market imperfections, asymmetric information, and credit rationing. Section 5.3 is devoted to exploring the link between financial market imperfections and firm investment. The empirical investment models that have been used to study this link are discussed in Section 5.4. Section 5.5 surveys the empirical evidence. Section 5.6 concludes this chapter.

5.2 Financial market imperfections, asymmetric information, and credit rationing

A firm can finance its investment projects using internal and/or external funds. Inter-

nal funds result from cash flows of the firm. External funds come from various borrowing sources as well as from issuing shares. According to the neoclassical theory of firm investment, since financial markets are perfect, *i.e.*, there are neither transaction nor information costs, internal and external funds are perfect substitutes in terms of financing investment; and, firms have access to unlimited sources of funds. Therefore, firm investments should not be constrained by any lack of funds (Modigliani and Miller, 1958). However, this hypothesis fails in the presence of asymmetric information. Indeed, financial markets are normally imperfect in the sense that external funds suppliers encounter asymmetric information, *i.e.*, they have less information about the profitability and risks of investment projects than firms have. Information is important in firm financing transactions, since firms receive capital today and only provide returns on the capital in the future.

As for credit markets, asymmetric information may lead to credit rationing, as discussed in Stiglitz and Weiss (1981), among others.[72] In a spot market, the supplier of a commodity receives a rate of return exactly equal to its price. In a credit market, the price, *i.e.*, the interest rate charged on the loan, is different from the expected return to lenders, *e.g.*, banks. This is because the expected return to banks also depends on the repayment probability of borrowers. As will be explained below, the interest rate affects this repayment probability and, hence, the expected return to banks through the channel of adverse selection and moral hazard (or adverse incentive). Adverse selection means that, due to asymmetric information, lenders may select risky borrowers, the "lemons".[73] Moral hazard refers to the situation where, after a loan is supplied, the borrower may take actions that reduce the probability of repayment.

According to Stiglitz and Weiss, there are two effects of an increase in interest rates on the expected return to the bank. The usual direct effect is that as interest rates rise, the expected return to the bank increases accordingly, other things being equal. Yet, there is a so-called adverse selection effect that works in the opposite direction. Stiglitz and Weiss show that if a lender raises interest rates, the pool of applicants increasingly contains high-return, high-risk projects. This is because those borrowers who are willing to pay high interest rates usually have high-return, high-risk projects.

[72] Myers and Majluf (1984) identify the problem of asymmetric information in equity financing. Myers and Majluf reveal that since shareholders are less well informed about the firm than its manager, they will demand a return premium to purchase the firm's shares in order to offset the possible losses originating from financing "lemons" (see Footnote 2). The premium is referred to as costs of information asymmetry.

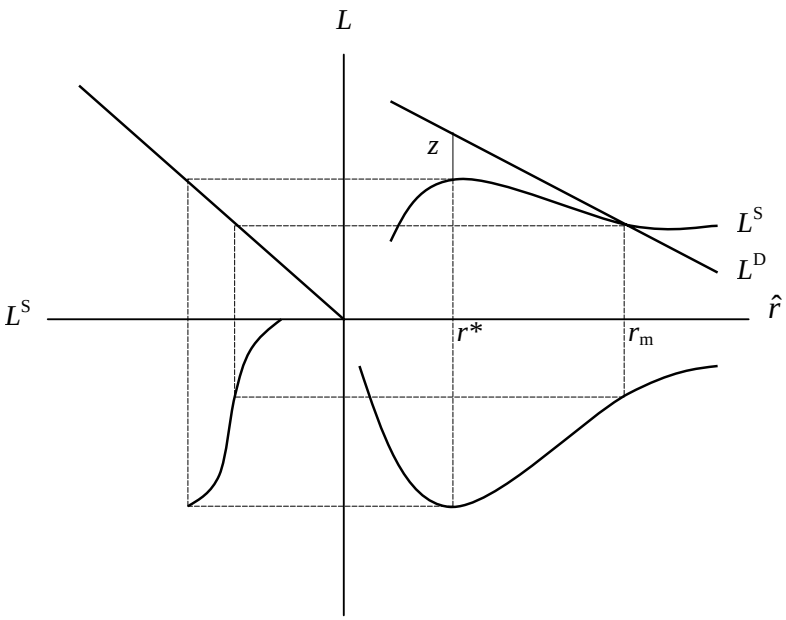
[73] The "lemons" problem was introduced in Akerlof (1970). This problem arises from the fact that the buyer of a used good does not have the same information about the quality of the good as the seller does, so the buyer is willing to pay only an average price for it. The owners of above-average quality goods will then leave the market because the average price is too low for them. This leaves the market with a supply of only less-than-average quality goods, which are called "lemons."

At the same time, borrowers with low-return, low-risk projects will drop out of the applicant pool because they may be unable and/or unwilling to pay high interest rates, given their low rates of return in case of success. Due to the adverse selection effect, the pool of applicants will have a lower repayment probability and, thus, the expected return to the bank declines as interest rates rise.

In addition, an increase in interest rates may also adversely change the behaviour of borrowers (moral hazard or adverse incentive). Stiglitz and Weiss show that an increase in interest rates raises the relative attractiveness of riskier projects. This is because, according to Stiglitz and Weiss, the increase of interest rates will lower the expected return to the borrower from lower-risk, lower-return projects by more than it lowers the expected return from higher-risk, higher-return projects. Consequently, raising interest rates may induce borrowers to take riskier projects. This will bring down the expected returns to the bank.

If the interest rate is low, the direct positive effect of an increase in interest rate may outweigh the adverse-selection and moral-hazard effects. Therefore, the expected return to banks increases as the interest rate increases up to a certain level. However, as the interest rate goes beyond this level, the expected return to banks will decrease because the adverse-selection and moral hazard effects may dominate. As a result, banks have an incentive to ration credit instead of raising interest rates in response to excess demand for funds. The mechanism of credit rationing is demonstrated in Figure 5.1, which is also taken from Stiglitz and Weiss (1981).

Figure 5.1 Determination of a bank's equilibrium interest rate



Source: Stiglitz and Weiss (1981).

Figure 5.1 illustrates a credit rationing equilibrium. Since the demand for loans is a decreasing function of $\hat{r}$, *i.e.*, the interest rate charged by the bank, the loan demand curve (L^D) is downward sloping (see the upper right quadrant). In the upper right quadrant, the supply of loans (L^S) as a function of $\hat{r}$ is also plotted. The shape of the supply curve (L^S) derives from the relationship between the expected return to the bank ($\bar{\rho}$) and the interest rate charged by the bank ($\hat{r}$) as shown in the lower right quadrant. The relationship between $\bar{\rho}$ and $\hat{r}$ is affected by adverse selection and moral hazard, in addition to the direct effect of increases in interest rates on the expected return to the bank: $\bar{\rho}$ increases as $\hat{r}$ increases up to r^* and decreases as $\bar{\rho}$ exceeds r^*. The supply of loans (L^S) is positively related to $\bar{\rho}$ (see the upper right quadrant; in the lower left quadrant, the supporting relationship between $\bar{\rho}$ and L^S is depicted). At r^*, the supply of loans is largest.

As shown in this figure, the demand for funds at r^*, *i.e.*, the interest rate maximising the expected return to the bank, exceeds the supply of funds at r^*. The excess demand for funds is measured by z. Any individual bank that raises its interest rate beyond r^* will lower its expected return. Therefore, although at r^* there is an excess demand for funds, no bank would raise the interest rate to eliminate the excess demand. As a result, credit is rationed. At r_m, the demand for funds equals the supply of funds; however, r_m is not an equilibrium interest rate because the bank could receive the highest expected return by charging r^* rather than r_m.

In general, banks would relax credit rationing if borrowers put up collateral. There may be two reasons for this. First, collateral may reduce losses for banks in the event of default because banks can seize the collateral if borrowers default. Second, collateral may give borrowers an incentive to avoid intentional default because borrowers will lose the collateral if they default, thus diminishing lending risks for banks. Both may increase the expected return to banks, thereby inducing banks to relax credit rationing.

Bester (1985) elaborates on the idea of why credit rationing may not occur if borrowers put up collateral. According to Bester, no credit rationing would occur if banks simultaneously decide upon interest rates and collateral requirements of their credit offers. Bester divulges that if the preference of borrowers depends on their risk type, borrowers of low risks are more inclined to accept credit contracts that entail higher collateral requirements and lower interest rates than borrowers of higher risk (self-selection mechanism). This is because the former may perceive that they face a lower probability of losing collateral (than the latter) and that they can also benefit from lower interest rates. If there are enough banks that offer different credit contracts, borrowers who are denied the loan that they prefer will apply for other loans or at other banks. As a result, no credit rationing would arise.

There are some reasons that the above-mentioned arguments about the role of

collateral may not hold in practice. First, writing a number of loan contracts involving different amounts of interest rates and collateral may be too costly for banks, refraining them from doing that. Second, the arguments implicitly assume that banks are able to assess the true value of collateral and are able to enforce the credit contracts in which collateral is pledged. This assumption may be violated if the regulation system is rudimentary, *e.g.*, property rights are not clearly defined or credit contracts are not enforceable. In these cases, even when a borrower has put up collateral, he/she may still take up high-risk projects. This is possible because the borrower knows that the lender is unable to seize the collateral in case of default. Regulation deficiency may also allow borrowers to pledge pseudo collateral; this is a problem that originates from the regulation failures in verifying true property ownership. Therefore, in a rudimentary regulation system credit rationing may remain pronounced, even when collateral is pledged. This phenomenon can be observed in Vietnam. For instance, as will be discussed in Chapter 7, although private rice millers in Vietnam pledged collateral in accordance with the requests of banks, many of them were able to borrow only part of the amount of money they applied for or were denied access to credit.

In summary, asymmetric information that characterises credit markets may lead to credit rationing. The basic intuition of Stiglitz and Weiss (1981) is that moderate increases of the interest rate would elicit a higher supply of funds; however, further increases of the interest rate will worsen the quality of the applicant pool, thus reducing the expected return to the bank. As a result, the bank rations credit instead of raising the interest rate. Collateral can contribute to relaxing credit rationing. However, this contribution may be impeded if it is costly for banks to write a number of loan contracts involving different amounts of interest rates and collateral or if the regulation system is rudimentary.

If credit rationing is prevalent, firms cannot borrow as much as they wish or may even be denied access to credit. It is likely that firms need credit for their investment and if they are credit-rationed, they may have to rely on internal funds to finance their investment. As a result, their investment would be sensitive to the amount of internal funds. This topic is to be explored in Section 5.3 below.

5.3 Firm investment under financial market imperfections

If financial markets are perfect, firms are indifferent with respect to sources of funds for their investment. Otherwise, firms are concerned about how to finance their investment because different financing sources have different costs. The pecking order theory states that firms have an ordering in preferences regarding sources of invest-

ment funds (Myers, 1984).[74] This theory argues that firms prefer internal funds to external funds because external funds are more expensive (due to asymmetric information, agency costs, and transaction costs.)[75] If firms need external funds after exhausting internal funds, they will start with the least risky (cheapest) security, *i.e.*, debt. Hybrids (like convertibles) follow debt in the pecking order. Equity is ultimately below as the last resort. Firms are in favour of debt over equity because debt has lower information cost than equity (Myers, 1984; Myers and Majluf, 1984).

Figure 5.2 depicts the investment and financing equilibrium of an individual firm in a given period based on the credit rationing and pecking order theories and taking into account transaction costs. It also assumes perfect divisibility of investments. This figure is an extended version of the graphical model developed by Hubbard (1998). Given the empirical scope of this dissertation, Figure 5.2 refers to firms that only borrow in formal credit markets (represented by commercial banks) and informal credit markets (represented by informal lenders such as moneylenders, relatives and friends); the firms under consideration do not have access to external equity.

In figure 5.2 the *d* schedule represents the demand (of the firm) for funds,[76] assuming that investments are homogenous in terms of risk.[77] This schedule is a smoothed investment opportunity schedule (IOS) presented by, *e.g.*, Weston *et al*. (1996). The location of the *d* schedule depends on the firm's investment opportunities. If the firm has few and relatively low-return investment opportunities, the *d* schedule should be located close to the origin *O*; then, its investment may be totally financed using internal funds. If the firm has more (and high-return) investment opportunities, the *d* schedule shifts outwards. Then, its investment may be also financed from banks and informal lenders. This schedule is downward-sloping because of the diminishing marginal investment returns. That is, the firm starts with the most profitable investment, and when further expanding its investment it will have to turn to projects with lower rates of return. Differently stated, if the cost of funds is higher, the demand for funds becomes less.

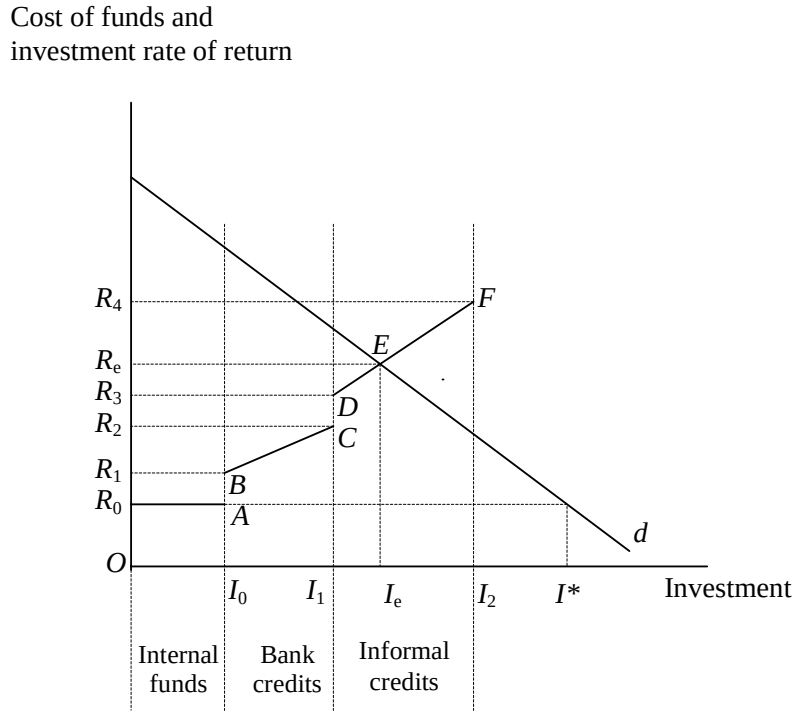
[74] The existence of a pecking order in firm financing behaviour is also referred to as the existence of a financing hierarchy.

[75] See, *e.g.*, Bond and Meghir (1994), Bernanke *et al*. (1996), Schiantarelli (1996), Kapdapakkam *et al*. (1998), Hubbard (1998), Eastwood and Kohli (1999), Agung (2000), Gelos and Werner (2002).

[76] This is also called the investment demand curve.

[77] This assumption is likely to hold in the case of our sample, which consists of only RMs of the rice-milling industry in the MRD.

Figure 5.2 Supply of and demand for funds



Source: Adapted from Hubbard (1998).

The discontinuous schedule R_0ABCDF represents the supply of funds.[78] Portion R_0A, which represents internal funds, is horizontal starting from R_0 because internal funds have a constant shadow cost (R_0).[79] According to the pecking order theory, once internal funds exhaust, the firm resorts to bank credit, which may be more costly because of the information asymmetry and transaction costs.[80] The cost of bank credit

[78] The supply-of-funds schedule R_0ABCDF is a marginal cost-of-funds schedule that should be based on the weighted-average-cost-of-capital. However, this pattern is similar to that of the marginal cost of the incremental source of funds (assuming no tax advantage on the cost of credit). Therefore, we use the latter to simplify the explanation.

[79] See Carpenter and Petersen (2002).

[80] As a matter of fact, there is no literature explicitly explaining why internal funds are cheaper than external funds. It is possible that internal funds bear higher risks than bank credits because internal funds are left over after paying bank credits; therefore, internal funds may have higher costs than bank credits; this is characterised by the so-called "financial risk premium". If the tax advantage of bank credits (*i.e.*, interest-rate payment is subtracted from tax payment) is considered, it is more likely that the costs of bank credits are lower than those of internal equity. Yet, tax discount is absent in the case of private RMs, making this issue irrelevant for them. It is also

is reflected in the jump of the supply-of-funds schedule R_0ABCDF from point A to point B. Portion BC of the funds supply curve, plotting the cost of bank credit, is upward sloping since as the demand for credit goes up, banks will raise the interest rate up to a certain level (say, R_2) and ration credit afterwards, as explained in Stiglitz and Weiss (1981). A similar behaviour applies to credit from informal lenders in the sense that they first raise interest rates (up to R_4) and ration credit eventually. Therefore, portion DF is also upward sloping and terminates at point F. This portion shows that informal lenders charge interest rates that are higher than that charged by commercial banks.[81] This is because these moneylenders may have to deal with higher-risk borrowers who are refused by banks; in addition, they have higher transaction as well as information-search costs. The expensiveness of the credit from these informal lenders shows up in the jump of the supply curve of funds from point C to point D.

In the neoclassical framework with perfect financial markets, the firm can have unlimited access to funds for investment at R_0, which supports an investment up to I^*. Given the imperfections of financial markets, investment by the firm is only I_e, which is smaller than I^*. This means that investment of the firm is constrained due to financial market imperfections.

Figure 5.2, following the pecking order and credit rationing theories, illustrates that a firm can finance its investment using, first, internal funds and, then, external funds. As for external funds, the firm prefers credit from formal lenders (banks) to that from informal lenders (moneylenders, relatives, and friends). This figure shows that the firm can finance a level of investment up to I_0 with its internal funds. If the firm's maximum demand for investment funds is less than or equal to I_0, it will not borrow at all.[82] Otherwise, it will need external funds. For any level of interest rates between R_0 and R_1, the firm cannot obtain external funds at all, because no external funds are available at such interest rates. Consequently, its investment remains at the level of its internal funds, *i.e.*, I_0. An increase in the internal funds (*i.e.*, increasing the length of portion R_0A) will shift point A rightwards, thereby enhancing the firm's investment. Therefore, it is apparent that investment is sensitive to internal funds.

Suppose the firm accepts the interest rates between R_1 and R_2. It can then borrow at increasing interest rates and finance its investment up to I_1.[83] Due to credit rationing, credit from banks stops at point C. As a result, the firm's investment will end

likely that in Vietnam information and transaction costs dominate the financial risk premium because the Vietnamese financial markets are underdeveloped (see Chapter 3). All this explains why in Figure 5.2 we show that internal funds have lower costs than bank credits.

81 In the empirical study of this dissertation, we group moneylenders, relatives and friends together, which implies that they all charge similar interest rates. Webster and Taussig (1999) indicate that in Vietnam these informal agents charge the same interest rates.

82 We call this firm a non-applicant (see Chapter 7).

83 According to this figure, the firm may accept these interest rates because the rate of return to its investment projects is still higher than the interest rates.

up at I_1. In this case, one can see that the firm's investment is again sensitive to its internal funds because an increase in the internal funds (*i.e.*, increasing the length of portion R_0A) will shift point C rightwards, thereby enhancing the firm's investment.

For any level of interest rates between R_2 and R_3, the firm could acquire neither credit from banks nor from the informal market. If this firm needs more funds for investment, it has to borrow from informal lenders at increasing interest rates between R_3 and R_4, which are assumed to be higher than the interest rates charged by banks, as discussed earlier. Like banks, informal lenders also ration credit to avoid a decline in their expected return.[84] Figure 5.2 shows that the firm's investment stands at I_e using three sources of funds: internal funds, bank credit and loans from the informal lenders. Also in this case, using the same arguments as in the previous paragraph, one can demonstrate that the firm's investment is sensitive to internal funds.

In summary, due to the external finance premium and credit rationing a firm's investment is sensitive to its internal funds, as we have just discussed.

5.4 Empirical investment models

This section is devoted to a selective survey of the investment models used to study firm investment under financial market imperfections.[85] It will discuss two widely used types of investment models, *i.e.*, the accelerator model and Tobin's Q model.[86] The standard versions of these models, which assume perfect financial markets, are examined in Subsection 5.4.1. In order to study the impact of financial market imperfections on firm investment, these models are augmented by adding a variable that measures internal funds. The augmented versions of the two models are discussed in Subsection 5.4.2.

[84] Informal lenders may also ration credit because they face resource constraints.

[85] A comprehensive review of investment models can be found in Lensink *et al*. (2001). This review also covers the so-called Vector AutoRegressive (VAR) Models, which we have omitted from our review.

[86] There are models/approaches to firm investment other than the accelerator and Tobin's Q models. For instance, in the general model of corporate finance, firms make investment decisions based on the net present value (NPV) rule. This rule states that an investment project should be accepted if the present value of its expected future cash flows, which is usually estimated using a risk-adjusted weighted average cost of capital as the discount rate, is larger than its investment cost. Although the NPV rule is valuable for firm investment decisions, it is not appropriate for the empirical study that we aim to conduct, given the nature of our data set. Also, the NPV rule cannot easily incorporate the impact of financial market imperfections and financing constraints, particularly not in empirical applications. Therefore, we focus on the models referred to at the onset of Section 5.4.

5.4.1 *The standard investment models*

The accelerator model

One of the pioneering models explaining investment behaviour of firms is the accelerator model, which is based on the so-called accelerator principle. The accelerator principle states that investment of a firm is proportionally related to the change in the demand for its output:

$$I_t \equiv \Delta K_t = \alpha \cdot \Delta Y_t \tag{5.1}$$

where: I = investment; $\Delta K_t = K_t - K_{t-1}$ = change in capital stock; $\Delta Y_t = Y_t - Y_{t-1}$ = change in demand for output; t = time index; Δ = the difference operator; and α = a positive factor.

Equation (5.1) indicates that investment of a firm is driven by the change in demand for its output. This equation also implies that investment adjusts immediately to the change in demand for output. However, it is likely that investment lags behind the change in demand for output because (i) since the change in demand may be considered to be transitory in nature, the firm may not immediately adjust its capital stocks to the change in the demand for their output in one period but rather to that in several periods; (ii) there may be lags either in the investment decisions and/or in the implementation of these decisions; and (iii) there may still be excess capacity that allows the firm to increase output without investment (Eisner, 1960). Based on these arguments, Eisner develops a model that takes account of lagged changes of sales, which reads as follows:

$$\frac{I_{it}}{K_{i(t-\tau)}} = a_i + \sum_{n=1}^{t} b_{i(t-n+1)} \left(\frac{\Delta S_{i(t-n+1)}}{S_{i(t-\tau)}} \right) + \varepsilon_{it} \tag{5.2}$$

where: I = investment; K = capital stock; $\Delta S_{i(t-n+1)} = S_{i(t-n+1)} - S_{i(t-n)}$ = change in sales; i = firm index; t = time index; ε = error index; $0 \le \tau \le t$, empirical studies often set $\tau = 1$; and a, b = coefficients. This model indicates that investment of a firm is determined by the changes in its sales in several previous periods.

Tobin's Q model

In the 1960s James Tobin proposed a relationship between the rate of investment and

the ratio of the market value of an additional unit of capital goods to its replacement cost. This ratio is known as the marginal Tobin's *Q*. The relationship proposed by Tobin maintains that if the market valuation of invested capital held by a firm exceeds the cost of capital on the open market, the firm should increase its value by investing. Under the assumption that financial markets are perfect and that the firm takes both current and lagged values of *Q* into account, the relationship between investment and Tobin's *Q* can be expressed as:

$$\frac{I_{it}}{K_{i(t-1)}} = a_i + \sum_{n=1}^{t} b_{i(t-n+1)} Q_{i(t-n+1)} + \varepsilon_{it} \tag{5.3}$$

where: I = investment; Q = marginal Tobin's Q-ratio; ε = disturbance term; i = firm index; t = time index; and a, b = coefficients. Equation (5.3) shows that firm investment only depends on investment opportunities, which are in this model proxied by Q.

5.4.2 *Internal funds-augmented investment models*

The augmented accelerator model

The recognition of the effect of financial market imperfections on firm investment suggests that internal funds should be accounted for when estimating firm investment. Therefore, the "lagged" accelerator model is augmented by adding a measure of internal funds. The augmented accelerator model reads:

$$\frac{I_{it}}{K_{i(t-1)}} = a_i + \sum_{n=1}^{t} b_{i(t-n+1)} \frac{\Delta S_{i(t-n+1)}}{S_{i(t-n)}} + \sum_{n=1}^{t} c_{i(t-n)} \frac{CF_{i(t-n)}}{K_{i(t-1)}} + \varepsilon_{it} \tag{5.4}$$

where: I = investment; K = capital stock; ΔS = change in sales; CF = the level of cash flows, which is used as a proxy for the level of available internal funds; ε = disturbance term; i = firm index; t = time index; and a, b, c = coefficients.[87] In Equation (5.4), lagged cash flows are included because firms may use lagged cash flows as internal funds to finance their investment.

If financial markets are perfect or financial constraints are absent, coefficient c of Equation (5.4) should be zero; otherwise, coefficient c should be positive and sta-

[87] Note that, related to Equation (5.2), parameter τ has been set equal to one in Equation (5.4).

tistically significant, meaning that investment is positively sensitive to internal funds, as explained in Section 5.3. Kaplan and Zingales (1997) also derive an equation that helps to explain this argument. Consider a firm that chooses the level of investment, *I*, to maximise profits. Its investment can be financed either with its internal funds (*W*) or external funds (*E*). The return to an investment is given by production function *F*(*I*), where $F_1 > 0$ and $F_{11} < 0$. Let *C*(*E*,*k*) be the additional cost of external funds with *E* being the amount of external funds raised and *k* being the wedge between costs of external and internal funds.[88] Then, the maximisation problem reads:

$$\text{Max } \{F(I) - C(E,k) - I\}, \text{ such that } I = W + E. \tag{5.5}$$

Assume that *C*(*E*,*k*) is convex in *I*, that is, $C_1 > 0$ and $C_{11} > 0$. The first-order condition of this problem is as follows:

$$F_1(I) - C_1(E,k) - 1 = 0 \text{ or } F_1(I) - C_1(I - W, k) - 1 = 0$$

Rearranging of this equation gives:

$$F_1(I) = 1 + C_1(I - W, k)$$

Taking derivative of the first-order condition with respect to *I*, we get:

$$F_{11} = C_{11}\left(1 - \frac{dW}{dI}\right) \Rightarrow \frac{F_{11}}{C_{11}} = 1 - \frac{dW}{dI} \Rightarrow \frac{dW}{dI} = 1 - \frac{F_{11}}{C_{11}} = \frac{C_{11} - F_{11}}{C_{11}}.$$

The effect of the availability of internal funds on investment is shown as follows:

$$\frac{dI}{dW} = \frac{C_{11}}{C_{11} - F_{11}}, \tag{5.6}$$

where C_{11} is the slope of the supply curve for external funds and F_{11} is the slope of the investment demand curve.[89] Since it is assumed that $C_{11} > 0$ and $F_{11} < 0$, $\frac{dI}{dW}$ is accordingly positive, implying that in imperfect financial markets investment *(I)* is posi-

[88] The *k* is also called external finance premium.

[89] In Kaplan and Zingales (1997), the supply curve of external funds is assumed to be continuous whereas in Section 5.3 it is a discontinuous one.

tively sensitive to internal funds *(W)*.

In a perfect financial market world, since the costs of internal and external funds are the same ($C = 0$ and hence $C_{11} = 0$) and the firm is supposed to have access to an unlimited amount of external funds (see Section 5.2), investment of the firm is not sensitive to its internal funds. If the financial market is imperfect, the additional cost of external funds increases at an ever-increasing rate (*i.e.*, $C_1 > 0$ and $C_{11} > 0$). Therefore, an increase (decrease) in internal funds will lower (raise) the cost of funds that the firm uses to invest, thereby increasing (decreasing) its investment. This means that investment of the firm is positively correlated with its internal funds.

Moreover, since the degree of financial constraints may vary across firms of different characteristics (an issue that will be explained later in this chapter), coefficient *c* may also be found to vary across different groups of *a priori* classified firms according to the degree of financial constraints they face.

An advantage of the augmented accelerator model is that it consists of variables that are observable. However, although this model is fairly standard in the investment literature, it is subject to criticism. First, the change in sales (ΔS) and the level of cash flows (*CF*) may be correlated because an increase in sales may lead to an increase in cash flows. As a result, the simultaneous inclusion of both variables may reduce their explanatory powers. Second, cash flows may also proxy for investment opportunities because the level of cash flows is likely to hold information about future investment opportunities. For instance, if firms with higher cash flows are more profitable, which is likely to be the case, their investment would be positively responsive to cash flows, even though they encounter no financial constraints. If so, the investment-internal funds sensitivity does not necessarily need to be interpreted only as an indication of financial constraints.

Despite these criticisms, a number of empirical studies have used the level of cash flows as a proxy for the change in net worth (from internal funds) because cash flows are virtually the only measure available for many firms. In fact, the augmented accelerator model is among the most successful empirical ones in the sense that it better explains the behaviour of firm investment, according to Fazzari *et al*. (1988).

Augmented Tobin's Q model

In order to measure the effect of imperfect financial markets, the standard Tobin's *Q* model is adjusted to include the level of cash flows, *i.e.*, a proxy for internal funds. The augmented Tobin's *Q* model reads as follows:

$$\frac{I_{it}}{K_{i(t-1)}} = a_i + \sum_{n=1}^{t} b_{i(t-n+1)} Q_{i(t-n+1)} + \sum_{n=1}^{t} c_{i(t-n)} \frac{CF_{i(t-n)}}{K_{i(t-1)}} + \varepsilon_{it} \tag{5.5}$$

where: I = investment; K = capital stock; Q = marginal Q-ratio, CF = the level of cash flows; ε = disturbance term; i = firm index; t = time index; and a, b, c = coefficients. As explained above, if financial constraints are absent, coefficient c of Equation (5.5) should be zero; otherwise, coefficient c should be positive and statistically significant.

A shortcoming of the Tobin's Q model, which limits its use in empirical studies, is that marginal Q, which best controls for investment opportunities, cannot be observed or calculated in many cases. In particular, this variable is absent in those economies where stock markets do not exist. Moreover, the Tobin's Q model cannot be used to test for the financial constraints facing non-listed firms, which are likely to confront the most severe asymmetric information, even when stock markets do exist. Since it is difficult to measure marginal Q, empirical studies have to use average Q to replace marginal Q. However, average Q, which is the ratio of the market value of existing capital to its replacement cost, may be a poor proxy for marginal Q.[90] If average Q cannot control for investment opportunities, the significance of cash flows will reflect the fact that it contains information about future profitability (Schiantarelli, 1996). In this case the significance of cash flows cannot be interpreted as representing financial constraints.[91]

5.4.3 *Summary*

By adding an internal-funds variable to the standard accelerator and Tobin's Q models, economists have developed the augmented accelerator and Tobin's Q models, which are suitable for testing the argument that if financial markets are imperfect, firm investment may be sensitive to internal funds.

[90] According to Hayashi (1982), only if the firm is a price-taker with constant returns to scale in both production and installation functions, marginal Q is equal to average Q.

[91] An alternative to study financial constraints facing firms that is based on the same underlying model used to derive the augmented Tobin's Q model is to estimate an Euler equation. The main advantage of the Euler equation approach is that it does not rely on Q. Therefore, this approach seems to be appealing to use for studying the investment behaviour of firms in developing countries, where stock markets are not well developed or are absent. Although this approach has a number of other advantages, it is also subject to some serious disadvantages (see, *e.g.*, Lensink *et al*., 2001), making it less often used in studying financial constraints facing firms as compared to the augmented accelerator and Tobin's Q models.

5.5 Empirical evidence

This section will review the empirical evidence on firm investment in the presence of financial market imperfections. This section only refers to those empirical studies that focus on firms in developing and transition countries because the financial markets in these countries may have similar characteristics with that of Vietnam. As a matter of fact, the number of such empirical studies is relatively limited.

The strategy that the empirical work on firm investment under financial market imperfections often pursues is: (i) to identify an *a priori* proxy for (the supposed degree of) financial constraints and then use this proxy to sort the firms in question into groups of different degrees of financial constraints and (ii) to compare the investment-internal funds sensitivities across these groups of firms based on the outcomes of the tests using the augmented version of the accelerator or Tobin's *Q* model.[92] The investment-internal funds sensitivity should be greater for (groups of) firms facing higher degrees of financial constraints.[93] The sorting criteria that the empirical studies have used are:

- size (*e.g.*, Athey and Laumas, 1994; Gertler and Gilchrist, 1994; Harris *et al*., 1994; Van Ees and Garretsen, 1994; Gilchrist and Himmelberg, 1995; Hermes, 1995; Jaramillio *et al*., 1996; Hermes and Lensink, 1998; Kadapakkam *et al*., 1998; Athey and Reeser, 2000; Agung, 2000; Budina *et al*., 2000; Driffield and Pal, 2001; Gelos and Werner, 2002; Laeve, 2002; *etc*.);
- age (*e.g.*, Schaller, 1993; Van Ees and Garretsen, 1994; Chirinko and Schaller, 1995; Hermes, 1995; Jaramillo *et al*., 1996; Hermes and Lensink, 1998; *etc*.);
- membership of business/financial groups (*e.g.*, Hoshi *et al*., 1991; Schaller, 1993; Chirinko and Schaller, 1995; Agung, 2000; Perotti and Gelfer, 2001);
- the presence of bond ratings (*e.g.*, Whited, 1992; Gilchrist and Himmelberg, 1995);
- the degree of shareholder concentration (*e.g.*, Oliner and Rudebusch, 1992; Schaller, 1993);
- dividend payout ratio (*e.g.*, Fazzari *et al*., 1988; Bond and Meghir, 1994; Van Ees and Garretsen, 1994; Hubbard *et al*., 1995; Calomiris and Hubbard, 1995; Gilchrist and Himmelberg, 1995); and so on.

Since the last four criteria are not relevant for the firms that we will investigate later in our empirical part (see Chapters 7-9), we leave these criteria out of our discussion. We only discuss the results of the empirical studies that use firm size and age, the criteria also employed in our empirical study, to *a priori* sort firms. Appendi-

[92] This strategy was initiated by Fazzari *et al*. (1988) and has been used by a large number of subsequent empirical studies.

[93] In the literature, there has been a debate about the feasibility of this approach to studying financial constraints. See Appendix 5.3 to this chapter for a summary of this debate.

ces 5.1 and 5.2 at the end of this chapter summarises the findings of these studies.

Size

Since lending and monitoring costs have economies of scale (Bernanke and Gilchrist, 1996), it is cheaper (for lenders) to lend to larger firms, which tend to apply for larger loans, as compared to smaller ones. Therefore, large firms should have better access to loans than small ones. Larger firms may also have better access to credit because they usually have more acceptable collateral. In addition, larger firms may have better track records, which may help to diminish information asymmetry and improve their access to credit. Moreover, in so far as size of a firm is related to its possibility to be listed on stock markets large listed firms may emit more inside information to lenders through the stock markets in which they operate. Hence, it may be logical to believe that large firms are less financially constrained than small ones.[94]

Several empirical studies have used firm size to *a priori* sort firms into groups of different degrees of financial constraints. Some of these studies find that financial constraints are less severe for larger firms than for smaller ones while some others do not. In the following survey, we will group these studies together: those that confirm and those that do not confirm the theory using size.

Harris *et al*. (1994) use ordinary least squares (OLS) and the generalised method of moments (GMM) estimators to study financial constraints facing 523 Indonesian firms. Both estimators come up with similar results, *i.e*., the coefficient of the cash flow variable is larger and significant for small firms while it is smaller and insignificant for large firms. The results suggest that small firms are financially constrained and large firms may not.

Jaramillo *et al*. (1996) use the Euler equation approach to investigate the effect of financial market imperfections on investment for 420 Ecuadorian manufacturing firms during the period of 1983-1988. This study finds that the investment behaviour of small firms is well described by a model in which interest costs are an increasing function of the debt-capital ratio and the constraint on their leverage is binding. At the same time, the model fails to hold for large firms. The results suggest the existence of significant financial market imperfections (in terms of increasing costs of borrowing

[94] Yet, this argument may be refuted. For instance, large firms often have more diversified ownership, which makes the principal-agent problem more severe, limiting their possibility to borrow (Schiantarelli, 1996; Lensink *et al*., 2001). If larger firms were able to borrow more, their leverage would be higher, if other liabilities are unchanged. Since leverage is related to agency cost and, thus, the external finance premium, lenders are less willing to lend to firms of high leverage, thereby placing large firms at a disadvantage in terms of access to credit (Harris *et al*., 1994; Jaramillo *et al*.,1996; Schiantarelli, 1996; Agung, 2000).

and ceiling on leverage) for small firms but not for large firms.

Budina *et al*. (2000) use a data set of 1,003 Bulgarian industrial firms for the period of 1993-1996. Estimating a simple augmented accelerator model, Budina *et al*. find that cash flows have a significant and positive effect on investment by the entire sample. After leaving out those firms that have negative cash flows,[95] the cash flow variable still displays a significantly positive coefficient, which is a bit higher than that for the entire sample. Using the number of employees as a measure of size, Budina *et al*. further divide the sample into small and large firms.[96] They discover that the cash flow coefficient is positive and significant for the small firms while it is insignificant for the larger firms. This finding is in line with the argument that small firms are financially constrained and large firms are not. Budina *et al*. provide an interesting explanation of this finding in that the large firms, formerly SOEs, have enjoyed soft-budget constraints. Soft-budget constraints help the large firms to get easy access to external funds while leaving the small ones struggling with information asymmetry that plagues their access to credit.

Gelos and Werner (2002) examine how financial liberalisation affects fixed investment in Mexico using establishment-level data of the manufacturing sector of the country. Based on the number of employees, Gelos and Werner divide 1,046 Mexican firms into four size categories (very small, small, medium, and large). They use both OLS and GMM methods to perform the examination. The OLS method shows that cash flows are significantly correlated with investment for all the four size categories; yet, this does not hold for large firms according to the GMM method. More generally, they find that the coefficient of the cash flow variable decreases with firm size.

The above-mentioned studies find evidence that investment by larger firms is less sensitive to internal funds than that by small firms, which supports the argument that larger firms are less financially constrained than small ones, or that investment by large firms is not sensitive to internal funds while investment by small firms is. Quite a few other studies come up with mixed or opposite findings, as will be reviewed below.

Athey and Laumas (1994), using firm-level information from 256 Indian manufacturing firms listed on the stock exchanges in India between 1978 and 1986, find that internal funds are less important for smaller firms than for larger ones. Athey and Reeser (2000) employ firm-level data from 142 Indian listed manufacturing firms; the finding by Athey and Reeser (2000) is to a certain extent identical to that of

[95] Budina *et al*. (2000) argue that there should be no relationship between cash flows and investment by the firms that have negative cash flows, simply because the firms are unable to finance their investment with negative cash flows.

[96] A problem of this study is that the distribution of firms according to size group is not even; there were 818 firms classified as small and only 185 firms as large.

Athey and Laumas (1994). The findings of both studies may be influenced by a specific feature of Indian industrial policy. According to this policy, small firms were beneficiaries of the selective policy (maintained by Indian government) aiming at promoting them. This makes firm size no longer a plausible criterion to *a priori* segment the selected firms in accordance with the degree of financial constraint they encounter, because, due to the policy, small firms become less financially constrained than larger ones. The findings are in fact consistent with the argument that the more financially constrained the firm is, the more sensitive its investment is to its internal funds.[97]

Hermes (1995), aiming to test if the Chilean financial reforms succeeded in reducing financial market imperfections, uses firm-level data of 86 Chilean firms over the period of 1982-1992. He finds that investment by the firms in the sample is sensitive to internal funds, implying the existence of financial constraints. Hermes also finds that the coefficient of the internal funds variable is significant and larger for small firms than for large firms; however, the difference between the two coefficients is not significant. This finding is similar to that found by Hermes and Lensink (1998), who employed a data set obtained from the balance sheets of 70 Chilean firms over the 1983-1992 period.

Agung (2000) applies an augmented Tobin's *Q* model to 132 Indonesian non-financial companies listed on the Jakarta Stock Exchange during 1993-1997. He finds that the coefficient of the cash flow variable is large, positive and significant for the entire sample. However, Agung discovers that smaller firms have a smaller investment-internal funds sensitivity as compared to large firms. According to Agung, this may be because of "a selection bias in favour of picking only the best of small firms."

Driffield and Pal (2001) study 900 listed non-financial companies over the period of 1989-1997 (with 5,310 observations) in four East Asian countries, *i.e.*, Indonesia, Korea, Malaysia and Thailand. They find mixed results in which the Malaysian case seems to support the argument that small firms are more financially constrained than larger ones, while Thai firms show the reverse.

In sum, the empirical evidence shows that firm size can be a good indication of the degree of financial constraints. However, in certain circumstances the role of size as an indicator of financial constraints is probably overwhelmed by other factors, *e.g.*, government policies in the case of India. In these circumstances, empirical studies should look for other criteria to *a priori* sort firms.

[97] This provides a general warning that the sorting criteria may have "local" components, which may run counter the standard argument formulated in the literature.

Age

As for age, it is usually argued that banks should have better information about older (more mature) firms due to longer relationships and repeated contacts. According to Berger and Udell (1998), banks garner information about borrowers over time through repayment history, periodic submissions of financial statements, renegotiations, managerial or personal visits, on-going monitoring of borrowers, *etc*. In addition, older firms may have accumulated more assets, which could be pledged as collateral for loans, thereby facilitating their access to external funds. Older firms may also have more experience with lenders, which helps these firms to find better ways to obtain credit from lenders. Therefore, older firms should be less financially constrained because they may have better access to credit. Several empirical studies use firm age to *a priori* classify firms; the findings of these studies are relatively unanimous. However, the number of empirical studies that focus on firms in developing countries is quite limited, according to our best understanding.

Hermes (1995) finds that the coefficient of the internal funds variable is significantly larger for young Chilean than for old ones, implying that the former is more financially constrained than latter ones. This finding is again confirmed by a similar finding by Hermes and Lensink (1998). Jaramillo *et al*. (1996) also study the variation of financial constraints with respect to firm age. They find the existence of significant financial market imperfections for young but not for old firms.

Summary

Firm size and age have been popularly used by empirical studies to *a priori* classify firms according to the degree of financial constraints they face. Whereas the empirical studies that rely on the size criterion find mixed results, those studies employing the age criterion generally find that firms facing higher degrees of financial constraints have higher investment-internal funds sensitivities.

5.6 Conclusions

This chapter has reviewed the literature focussing on firm investment in the presence of financial market imperfections. It has shown that in imperfect financial markets with asymmetric information external funds may be more expensive than internal funds. Due to asymmetric information external funds suppliers ration credit given to borrowers instead of raising interest rates so as to avoid the decline of their expected return as interest rates increase. Since external funds are more expensive than internal

funds, firms have to follow a financing hierarchy in which cheaper funds are preferable to more expensive ones and internal funds are the most preferable one. As a result, firm investment is sensitive to internal funds. According to the theoretical literature, firms having higher investment-internal funds sensitivities are considered as more financially constrained.

A paramount volume of the empirical literature has used the augmented accelerator model and the augmented Tobin's *Q* model to study the existence of financial market imperfections. Empirical studies on this topic *a priori* sort firms into groups of different degrees of financial constraints using several sorting criteria. Among these criteria, firm size and age are most widely used. The empirical studies that use size criterion come up with mixed findings, whereas the findings of those empirical studies that use age are relatively unanimous. Although there are criticisms about the augmented accelerator model, this model fits best to our data set. Therefore, we use this model in the empirical study in Chapter 8.

Appendix 5.1 **Summary of the results of empirical studies on firm investment under financial market imperfections - sorting criteria: size**

Study (by year)	*Country*	*Results on the sensitivity of investment to internal funds*
Athey and Laumas (1994)	India	Whole sample: positive and significant; small firms: insignificant; large firms: positive and significant.
Harris *et al*. (1994)	Indonesia	Larger firms: insignificant; smaller firms: positive and significant.
Hermes (1995)	Chile	Whole sample: positive and significant; the difference in the sensitivity between two groups of firms is not significant.
Jaramillo *et al*. (1996)	Ecuador	Existence of significant capital market imperfections for small firms but not for large firms
Hermes and Lensink (1998)	Chile	Entire sample: positive and significant; larger for large firms but the difference in the coefficients is not significant.
Agung (2000)	Indonesia	Whole sample: positive and significant; larger firms: higher investment-cash flows sensitivities; smaller firms: lower sensitivities.
Athey and Reeser (2000)	India	Whole sample: positive and significant; very large, well-known firms: insignificant; larger firms: positive and significant; smaller firms: insignificant
Budina *et al*. (2000)	Bulgaria	Whole sample: positive and significant; smaller for large firms than for small firms
Driffield and Pal (2001)	Indonesia, Korea, Malaysia and Thailand	Indonesia: positive and significant for both large and small firms. Korea: positive and significant for large firms; negative and significant for small firms. Malaysia: negative and insignificant for large firms; positive and significant for small firms. Thailand: Positive and significant for large firms; positive and insignificant for small firms.
Gelos and Werner (2002)	Mexico	Whole sample: positive and significant. The coefficient of the cash flow variable decreases with firm size.

Appendix 5.2 **Summary of the results of empirical studies on firm investment under financial market imperfections - sorting criteria: age**

Study (by year)	*Country*	*Results on the sensitivity of investment to internal funds*
Hermes (1995)	Chile	Larger for young firms than for old firms
Hermes and Lensink (1998)	Chile	Entire sample: positive and significant; large for younger firms than for older ones.
Jaramillo *et al*. (1996)	Ecuador	Existence of significant capital market imperfections for young firms but not for old firms

Appendix 5.3 **Investment-internal funds sensitivities as an indicator of financial constraints: a criticism**

As discussed previously, several empirical studies have employed the *a priori* firm classification approach initiated by Fazzari *et al*. (1988) to investigate financial constraints facing firms. These studies suggest that investments of firms that are more financially constrained are more sensitive to internal funds than those firms that are less financially constrained. In other words, according to these studies higher investment-cash flow sensitivities indicate greater financial constraints. Kaplan and Zingales (1997) argue that investment-internal funds sensitivity is an irrefutable indication of financial constraints, but the magnitude of the sensitivity does not necessarily increase with the degree of financial constraints.[98] Fazzari *et al*. (2000), defending the approach, disagree with Kaplan and Zingales. In the following, we summarise the criticism of Kaplan and Zingales (1997) as well as the arguments by Fazzari *et al.* (2000).

According to Kaplan and Zingales (1997), since researchers investigate the variation of investment-internal funds sensitivities across (groups of) firms of different levels of *W*, it should be shown that $\frac{d^2I}{dW^2}$ is positive. Kaplan and Zingales contend that it is generally difficult to prove that $\frac{d^2I}{dW^2} > 0$. Therefore, they conclude that there is no strong theoretical reason for investment-internal funds sensitivities to increase monotonically with the degree of financial constraints.

Kaplan and Zingales, to illustrate their argument, combine qualitative information (such as managerial statements) with quantitative information (such as cash stock, cash flows, unused line of credit, and leverage) obtained from company annual reports to divide 49 firms having low dividend payouts, which are part of a larger sample used by Fazzari *et al*. (1988), into five categories: (i) not financially constrained (NFC), (ii) likely not financially constrained (LNFC); (iii) possibly financially constrained (PFC); (iv) likely financially constrained (LFC); and (iv) financially constrained (FC). They find that the "financially constrained" group has the lowest investment-internal funds sensitivity of the three groups. Based on these results, Kaplan and Zingales argue that investment-internal funds sensitivities do not provide useful evidence of financial constraints.

Fazzari *et al*. (2000) maintain that the criticism of Kaplan and Zingales is irrelevant because researchers do not use the level of internal funds (*W*) to classify firms. In addition, according to Fazzari *et al*., the empirical methodology that Kaplan and Zingales use to *a priori* classify the sample seems to be problematic, making their

[98] This is supported by Cleary (1999).

finding unconvincing. The first problem is that the size of the sample adopted by Kaplan and Zingales, which consists of only 49 firms, does not seem to be well supportive of their classification because such a small sample may lack heterogeneity.

The second problem concerns the information that Kaplan and Zingales use to *a priori* sort the sample. As for qualitative information, Kaplan and Zingales rely on the information from Securities and Exchange Commission Regulation S-K to obtain the managerial statements regarding financial constraints. This regulation, according to Fazzari *et al*. (2000), does not coerce firms to disclose financial constraints; thus, using this information may not be persuasive enough. As for quantitative information, Kaplan and Zingales contend that since both the cash flow and the cash stock positions for NFC and LNFC firm-years are so large as compared to fixed investment,[99] these firms should not be financially constrained. Arguing this way would mean that Kaplan and Zingales are not aware of the fact that firms use these financing sources not only for fixed investment but also for inventories and account receivables. Fazzari *et al*. (2000) recompute these ratios with regard to total investment instead of fixed capital as done by Kaplan and Zingales. They find that these ratios are much lower and argue that, based on these ratios, it is possible that these firms are financially constrained. They should rather be classified as financially constrained. Moreover, according to Fazzari *et al*. (2000), using leverage, cash stock, and unused line of credit as proxies for the degree of financial constraints, as Kaplan and Zingales do, may be impropriate. Firms have low debt maybe because they are not able to borrow, meaning that they are financially constrained. Large cash stock and unused lines of credit can also be indications of financial constraints: financially constrained firms may reserve large cash stock and unused lines of credit in order to protect themselves from being unable to undertake profitable investment projects.

Fazzari *et al*. (2000) strongly believe that the *a priori* firm classification approach is feasible to be used in investigating financial constraints facing firms. This explains why a number of studies have used this approach. However, one should take the criticism of Kaplan and Zingales into account.

[99] Kaplan and Zingales compute such ratios as cash flows per capital, cash flows minus investment per capital.

Chapter 6

Investment under uncertainty

6.1 Introduction

Firms are generally uncertain about the future. The uncertainty about the future is likely to affect investment decisions of firms. The theoretical literature on the relationship between uncertainty and firm investment is extensive and contains different points of view: greater uncertainty can lead to either less or more investment. Neither is the empirical literature conclusive about the sign of the relationship between uncertainty and firm investment. Yet, most of the empirical studies have found adverse effects of uncertainty on firm investment.

This chapter is set up to survey the literature on firm investment under uncertainty. It serves to provide a background to our empirical study of the investment-uncertainty relationship in the context of private RMs in the MRD (see Chapter 9). The rest of this chapter is organised as follows. Section 6.2 is devoted to discussing the real options approach to investment, which implies that firms are flexible with respect to their investment decisions. Section 6.3 investigates the empirical evidence on the relationship between uncertainty and firm investment. Section 6.4 concludes this chapter.

6.2 The real options approach to investment

The theoretical literature on the relationship between uncertainty and firm investment has a relatively long history and includes two main strands of theory: the traditional theory and the real options approach to investment. The traditional theory contains two types of models: one type that does not take account of adjustment costs of in-

vestment and the other that does; adjustment costs are the costs involved in the purchase, the instalment, and the resell of capital goods.[100] In this section, we will discuss briefly the traditional models and will pay more attention to the real options approach to investment.

6.2.1 *A brief overview of the traditional models*

The traditional models on uncertainty and firm behaviour that exclude adjustment costs mainly study the effect of uncertainty on the optimal output/input level of firms rather than on investment. These models include Sandmo (1971), Leland (1972), Holthausen (1976), McKenna (1986), *etc.* According to these models, if a firm can instantly and costlessly adjust its capital stock (*i.e.*, adjustment costs is absent), its investment decision is fundamentally a static decision in which the marginal product of capital is equal to the user cost of capital. This outcome is similar to the net present value (NPV) rule. The NPV rule maintains that an investment project should be accepted if the present value of its expected future cash flows, which is usually estimated using the weighted average cost of capital (WACC) as the discount rate, is larger than its investment cost. The discount rate should be considered as a function of the uncertainty facing the firm or its investment projects; therefore, this discount rate has to be adjusted to account for uncertainty. The risk-adjusted NPV rule suggests that an increase in cash-flow uncertainty, with constant expected cash flow levels, will lead to a decreasing investment level (because of decreasing net present values of investment projects).

The traditional investment models without adjustment costs take for granted the assumption that firms can instantly and costlessly adjust to their optimal capital stock. This assumption may not be very realistic because it is normally costly for firms to adjust their capital stock to optimal levels. Thus, adjustment costs should be accounted for. There are models that include adjustment costs like Hartman (1972), Pindyck (1982), Abel (1983), among others. These models, assuming that the uncertainty variable follows a Wiener process,[101] derive diagrams or expressions for the optimal rate of investment. Since the optimal rates of investment derived by these models include the uncertainty variable, it is possible to use them to study the effect of uncertainty on firm investment.

The traditional investment theory is useful in studying the effect of uncertainty on the optimal level of output/input as well as on firm investment. Yet, due to poor performances of the empirical studies that follow this theory, it has been reconsidered.

[100] For a comprehensive discussion about adjustment costs, see, *e.g.*, Lensink *et al*. (2001).

[101] The Wiener process, also known as Brownian motion, is a method to simulate the volatility of a random variable. This process will be discussed in more detail in Section 6.3 of this chapter.

In the course of reconsidering this theory researchers came up with the real options approach to investment. This approach argues that firms may be flexible with respect to their investment decisions, as will be discussed below.

6.2.2 *Background of the real options approach to investment*

The real options approach to investment maintains that making a real investment decision is similar to exercising a financial option and that investment opportunities may include options for future follow-up decisions. In particular with respect to irreversible investment in the face of uncertainty, the following features apply:

- First, part or all of the investment cost is sunk.
- Second, economic environments are volatile and uncertain. Under such conditions, firms do not know which direction the economic environments will develop. However, because information evolves gradually, firms will learn more about the future as time passes.
- Finally, since investment opportunities may generally not disappear if they are not taken immediately, these opportunities represent options that need not be exercised immediately.

The following subsections will review the most common real options, without restricting ourselves yet to the case of irreversible investment. This case will be considered later in Subsection 6.2.4.

6.2.3 *A description of the real options*

The real options that a firm can use is of different types, such as the option to wait, the option to alter the scale of operation (*i.e.*, to expand or to contract), the option to abandon, the option to switch input/output, the option to grow, *etc*. (Trigeogis, 1996). The specific nature of the investment opportunity determines the types of real options that may be involved.

A firm that contemplates an investment opportunity holds an investment option analogous to an American financial call option.[102] A financial call option is a right but not an obligation to buy a financial asset at a preset price, *i.e.*, the strike or exercise price. The cost of the investment (the current purchase price of the physical capital) is akin to the exercise price of the financial call option. If the firm decides to invest, it will exercise the investment option. Given the fact that the investment decision can be postponed, it can equally be maintained that the investment opportunity in-

[102] For a more detailed discussion of the similarities between an investment opportunity and a call option, see, *e.g.*, Trigeogis (1996), Luehrman (1998).

cludes an option to wait. If the firm decides to invest, it kills the option to wait, consequently giving up the possibility to wait for more precise upcoming information.

A firm that has invested, *i.e.*, not having exercised or having killed the option to wait, may be able to abandon later by reselling the invested capital in second-hand markets. In this case, the firm holds a real (investment) option identical to an American financial put option. A financial put option is a right but not an obligation to sell a financial asset at a preset price, the strike or exercise price. The resale price of the invested capital is analogous to the exercise price of the put option. Unlike a standard financial asset, the invested capital is susceptible to some problems that may reduce the possibility to resell it as well as its resale price. The first problem stems from specificity. Since the installed investment may not be usable for any other purpose, it cannot be resold at its purchase price (minus depreciation) but probably at a lower price. Second, once the capital is installed, it is considered as used. Therefore, the reselling of the installed capital will be subject to a "lemons" problem.[103] In this case, the "lemons" problem implies that the buyer does not have the same information about the quality of the installed as the owner does, so the buyer is willing to pay only an average price for it. The owner of the installed capital has to accept the offered price or withdraw from the market. The owners of above-average quality goods will then leave the market, since the average price of the good in the market is too low for them. This leaves the market with a supply of only less-than-average quality goods. The third problem concerns the efficiency of second-hand markets for the invested capital. If the markets do not function well, it may be difficult for firms to resell their invested capital, or the invested capital can only be resold at a price lower than what it deserves.

A firm that has invested can also alter, *i.e.*, expand or contract, the scale of operation later. The firm would expand the scale of operation if the market conditions improve. This possibility is equivalent to an option to expand. The expandability involves a call option. If the market conditions become unfavourable, the firm would contract the scale of operation by, *e.g.*, halting part of the production. This possibility resembles the option to contract, analogous to a financial put option. Afterwards, if the market conditions recover, the firm can reactivate the halted part of the production, implying the existence of another call option.[104]

A firm that has invested to produce a certain type of products or to use a certain type of inputs can later switch to other products or inputs of which prices turn out

[103] This problem was introduced in Akerlof (1970). See also Section 5.2 of Chapter 5.

[104] This is characterised as compound option (Panayi and Trigeorgis, 1998; Hull, 2000). Compound options are those options whose exercise brings forth additional options as well as generating cash flows (Panayi and Trigeorgis, 1998). According to Hull (2000), there are four main types of compound options: a call on a call, a put on a call, a call on a put, and a put on a put. The one described above is a call on a put.

to be more favourable for the firm. This option (to switch) resembles a financial call option. Since this option allows firms to retain the invested capital, it may be valuable if the purchase price of the investment capital is increasing.

Real options are embedded in many decisions of the firm, particularly investment decisions. Each option has benefits and costs. In general, the benefits of a real option result from its ability to help the firm to limit the adverse effects of the downturn side and to make use of the advantages of the upturn side of an economic development. The costs of a real option includes the profits forego in case the firm adopts the option. If the benefits of exercising an option are larger than the costs, the firm should exercise the option.

As we have just discussed, firms have to deal with a collection of real options of which some are extinguished or generated after an alternative has been selected. Therefore, in order to make proper investment decisions firms have to balance the benefits against the costs of this collection, which does not seem to be straightforward.

6.2.4 *Real options and firm investment*

This subsection will try to explain how the real options affect firm investment and explore the net effect of the real options collection on firm investment. It will argue that the net effect may be ambiguous because the real options collection comprises options that have different, even opposing, effects on firm investment.

A fundamental question to start with is whether under uncertainty firms wait or invest immediately when a valuable investment opportunity appears. It is likely that firms will opt for waiting; in other words, they will keep the investment option alive. Keeping the investment option alive, or exercising the option to wait, is valuable. The value derives from two sources, according to Luehrman (1998). The first source is the time value of money on the deferred expenditure (to acquire the investment) that would have been incurred if not waiting, assuming that investment is constant. Second, waiting enables firms to take part in good outcomes (if things improve) and precludes them from being involved in bad outcomes. Moreover, McDonald and Siegel (1986) show that the higher the degree of uncertainty, the higher the value of the option to wait. The positive relation between the degree uncertainty and the value of the option to wait is due to the asymmetry in this option's net payoffs. This asymmetry works as follows.[105] Under higher uncertainty, it is possible that the underlying variable (*e.g.*, output demand or price) rises up to high levels, so the net payoff from

[105] In general, this argument refers to the basic relationship between the value of a call option and the uncertainty (volatility) of a option's underlying asset: the option value is positively related to this uncertainty.

exercising the option to wait becomes larger. If the underlying variable falls, one can lose (when killing the option) only what has been paid for the option. Therefore, uncertainty will have a negative effect on investment through the channel of the option to wait.

The negative effect of the option to wait on investment may change if the option to abandon comes in. The option to abandon brings about extra benefits because it allows firms to abandon or reverse the investment so as to reduce the adverse effects of a downturn. Hence, this option encourages current investments. Yet, the effect of this option on investment depends on the degree of reversibility. The degree of reversibility of an investment is conditional on its specificity, the "lemons" problem, and the functioning of the second-hand markets, as discussed previously in Subsection 6.2.3. If the investment is totally reversible, *e.g.*, the resale price of the investment is equal to its purchase price, the option to wait may not be effective. If the investment is not totally reversible, the investment behaviour of firms depends on both the possibility to resell the invested capital and its resale price, two elements of an investment's irreversibility.[106]

The killing of the option to wait, or exercising the option to invest, makes the option to expand available to firms. Since the option to expand enables firms to further invest later if the future turns out to be more favourable, it may discourage the current investments. Given the presence of the option to expand, firms need to decide on how much to invest now and in the future. As for this type of investment decision, the price of investment capital is a concern. If the future purchase price of the investment capital, *i.e.*, the future exercise price, is to increase over time, firms may invest more now and may not expand in the future. Otherwise, they would invest less now and expand later. However, the timing of the future expansion and the future purchase price are usually unknown to firms when making investment decisions. This element complicates the modelling of the investment behaviour of firms.

The option to contract production is also created after the option to wait has been killed. Unlike the option to expand, this option is valuable only if a downturn occurs because it helps firms to escape the losses resulting from the variable costs of production. For instance, if its output price goes down, firms can close part or all of their production lines. The option to contract in turn brings in the option to reactivate.

It can be inferred from the above discussion that the net effect of the collection of real options on firm investment may be ambiguous. Theoretical models have been developed to reveal the net effect of this collection on firm investment. Among them is Abel *et al*. (1996). Abel *et al*. consider a partially irreversible investment with its resale price being less than its purchase price. They also allow for a limited expandability by assuming that the purchase price of physical capital is to increase over

[106] In Chapter 9, we will use these two elements of irreversibility to construct our irreversibility variable.

time. This assumption implies an additional opportunity cost of waiting apart from the foregone profits, which reduces the value of the option to wait. This model introduces two sorts of real options: call and put. The call options include an option to wait and an option to expand. The put option includes an option to abandon (or disinvest). Given the presence of these options, uncertainty affects investment in two opposite directions. Uncertainty negatively affects investment because it increases the value of the call options; investing means losing (part of) the value the call options. In contrast, uncertainty positively affects investment because it raises the value of the put option; investing means "activating" the valuable put option. Abel *et al*. conclude that the net effect of uncertainty on investment is ambiguous, depending on the degree of irreversibility (represented by the resale price of the investment capital) and the expandability. The higher the degree of irreversibility and expandability, the stronger the negative effect of uncertainty on investments is.

6.2.5 *Some further considerations*

The discussions in the previous subsections provide a good background for our empirical study. However, in our opinion some further considerations that are also relevant for studying the investment-uncertainty relationship should be addressed.

In the standard real options approach to investment under uncertainty, it is assumed that the firm makes investment decisions regardless of competitive interactions. In practice, competition can affect the investment-uncertainty relationship. According to Caballero (1991), imperfect competition may intensify the negative investment-uncertainty relationship. A monopolistic firm may easily postpone its investment because the investment opportunity is always available for it to take. This argument, probably to a lesser extent, may also be applicable to an oligopolistic firm. In contrast, if a firm operating in a competitive environment waits too long, its competitors will seize the investment opportunity. Therefore, the firm has to invest quickly in order to preempt the rivals (Abel and Eberly, 1994; Lambrecht and Perraudin, 2003). In this case, the value of the option to wait becomes less (Grenadier, 2002).[107] As a result, competition reduces the adverse effect of uncertainty on firm investment.

Firm size may be another aspect that should be considered when studying the uncertainty-investment relationship. Small firms may have inadequate managerial ex-

[107] Grenadier (2002) shows that if competition is severe enough to force the firm to invest immediately (*e.g.*, if the number of firms in the industry is huge), the value of the option to wait will become zero, and the NPV rule will apply. Luehrman (1998) also argues that when the final decision on a investment project can no longer be deferred, the project's option value and NPV will be the same.

pertise that limits their ability to reduce adverse effects of possible changes. This would suggest that investment of small firms is likely to be more adversely affected by uncertainty. In contrast, Joaquin and Khanna (2001) assume that firms are able to abandon investment at a cost that is increasing with size. This assumption may be reasonable to the extent that larger firms tend to have greater abandonment costs regarding individual investment projects.[108] If abandonment costs are increasing with firm size, similar investment projects may be deemed as more irreversible by larger firms than by smaller ones. Therefore, uncertainty, through the channel of irreversibility, may more negatively affect investment by larger firms than that by smaller firms. Thus, the effect of firm size on the uncertainty-investment relationship appears to be ambiguous according to these arguments. This leaves room to study this issue in the case of Vietnam.

6.2.6 *Summary*

The real options approach to investment improves the understanding of firm investment under uncertainty. Nonetheless, this approach has shown an ambiguous sign of the relationship between uncertainty and firm investment: greater uncertainty can lead to either less or more investment. Such an ambiguity invites empirical studies. As revealed by the theoretical work, irreversibility, competition, and firm size are among the important factors affecting the investment-uncertainty relationship that empirical studies should take into account. We will examine the evidence found by empirical studies on the investment-uncertainty relationship in Section 6.3 below.

6.3 **Empirical evidence**

This section discusses the evidence emerging from the empirical studies on firm investment under uncertainty. Since it is not possible to discuss all the relevant studies, we just focus on those that concentrate on the factors that are theoretically assumed to affect the investment-uncertainty relationship, *i.e.*, irreversibility, competition, and firm size.[109] A summary of the findings of these empirical studies is also given in Appendices 6.1-6.4 at the end of this chapter.

In general, the empirical evidence appears to endorse adverse effects of uncertainty on firm investment. For instance, Driver *et al.* (1996) convey that the most common result is that demand uncertainty discourages firm investment, especially in the presence of irreversibility. This result, according to Driver *et al.*, is more obvious

[108] This assumption is supported by Weiss (1990).
[109] Even with this restriction, the list of studies to be discussed below may not be exhaustive.

if competition is imperfect. Bo (2001) reports that 18 out of 21 studies, which she is aware of, find negative relationships between uncertainty and firm investment.

6.3.1 *Uncertainty measurement*

In studying the effect of uncertainty on firm investment, an important issue is how to measure uncertainty because uncertainty is generally unobservable. Several methods to measure uncertainty have been applied.[110]

A popular method to measure uncertainty is to use the variance of the unpredictable part of the stochastic variable. This method follows three steps: (i) constructing a forecasting equation for the underlying variable, (ii) estimating the forecasting equation to obtain the unpredictable part of the fluctuations of the variable, which is called the estimated residuals, and (iii) computing the variance or standard deviation of the estimated residuals and use it/them as an uncertainty measure for the variable under consideration (Bo, 2001). This method has been applied by, *e.g.*, Aizenman and Marion (1993, 1999), Ghosal and Loungani (1996, 2000), among others.

Another method to measure uncertainty is to employ the variance estimated from the geometric Brownian motion, which is also referred to as Wiener process. This method is used to simulate the volatility of a time-dependent variable. For a project value V that follows a geometric Brownian motion, the stochastic equation for its variation with time t is as follows:

$$dV_t = \alpha V_t dt + \sigma V_t dz,$$

where: dz is an increment process with zero mean and unit variance, α is the drift, and σ is the volatility of V_t. In this equation, the first term of the right-hand side $(\alpha V_t dt)$ is the expectation (trend) term and the second term $(\sigma V_t dz)$ is the variation term (deviation from the tendency or term of uncertainty). Empirically, σ is used to measure uncertainty. This stochastic process is commonly applied in option pricing theory (see, *e.g.*, Hull, 2000).

Empirical work also uses the Autoregressive Conditional Heteroskedasticity (ARCH) model to measure uncertainty. ARCH is a time series modelling technique that uses past variances and past variance forecasts to forecast future variances. Several studies, *e.g.*, Huizinga (1993), Episcopos (1995), Price (1996), use this model to measure uncertainty.

[110] Lensink *et al*. (2001) provide a detailed and comprehensive survey of the methods.

An interesting method to measure uncertainty is to compute the variance or the standard deviation of an underlying variable using expectation data collected through surveys. An appealing feature of this method is that the data contain the decision-maker's perception of uncertainty conditional on his/her own information, meaning that the uncertainty measure should be correlated with the investment plan. In order to apply this method, an important assumption required is that the future outcomes should be described by a subjective probability distribution (SPD). This method is used by a number of studies, *e.g.*, Pattillo (1998), Guiso and Parigi (1999), Lensink *et al*. (2000).

In Pattillo (1998), firm owners were asked for their one-year and three-year expectations about the demand for their firms' output. The owners were requested to assign probabilities, which sum to 100, to a distribution that contains a variety of possible percentage changes in the demand. The distribution, called subjective probability distribution (SPD), looks like the one presented in Table 6.1.[111] Pattillo computes the subjective variance of the expected demand out of this information and uses this variable (scaled by the previous period's capital stock) as a measure of uncertainty.[112]

Table 6.1 Subjective probability distribution (SPD)

Intervals	*By what per cent do you expect demand for your product to grow next year?*	*By what per cent do you expect demand for your product to grow in the next 3 years?*
Increase		
More than 30 per cent		
20 to 30 per cent		
10 to 20 per cent		
0 to 10 per cent		
No change		
Decrease		
0 to 10 per cent		
10 to 20 per cent		
20-30 per cent		
More than 30 per cent		
Total points (should add to 100)		

Source: Pattillo (1998).

[111] A definition of subjective probability distribution is given in Subsection 4.4.2 of Chapter 4.

[112] Appendix 9.1 at the end of Chapter 9 will show how to compute the subjective variance of the expected demand out of the information presented in Table 6.1.

Guiso and Parigi (1999) use the information provided by the Survey of Investment in Manufacturing (SIM) and the Company Accounts Data Service (CADS), which reports the SPD of the evolution of the future demand for each individual firm's output. From this information, Guiso and Parigi compute and use both the standard deviation of the expected demand and the variance of the expected growth rate of demand (scaled by the capital stock) as measures of uncertainty.

Lensink *et al*. (2000) carried out a survey over Dutch non-listed firms, which enables to record firms' subjective perception of future sales. By this survey, information about the SPD was obtained. Lensink *et al*. compute the coefficient of variation of the expected sales and use this as a measure of uncertainty.

As we have seen, several methods have been used to measure uncertainty. The choice of which method to use largely depends on the nature of data. Our empirical study on the relationship between uncertainty and firm investment in Chapter 9 will employ the method in which the variance and the standard deviation of an underlying variable are used as measures of uncertainty; the information about the underlying variable was collected through a survey (see Chapter 7).

6.3.2 *Uncertainty measures and the investment-uncertainty relationship*

Empirical studies have employed the aforementioned methods to construct uncertainty variables using different underlying variables. Leahy and Whited (1996) study the investment of 600 U.S. manufacturing firms over the period of 1981-1987. Using the variance of the firms' daily stock returns to measure uncertainty, Leahy and Whited show that uncertainty has a negative effect on investment of the firms in the sample.

Driver *et al*. (1996) use the data coming from the PIMS database to compute market share volatility and use it as a proxy of demand uncertainty.[113] In this study, the market share volatility of a company is defined as the summed absolute value of the differences between the proportionate time change in its own share, share of competitor *A*, and share of competitor *B*.[114] Driver *et al*. find that the demand uncertainty

[113] The PIMS (Profit Impact of Market Strategy) of the Strategic Planning Institute is a large scale study designed to measure the relationship between business actions and business results. The project was initiated and developed at the General Electric Co. from the mid-1960s and expanded upon at the Management Science Institute at Harvard in the early 1970s; since 1975 the Strategic Planning Institute has continued the development and application of the PIMS research. The PIMS database is described in Buzzell and Gale (1987).

[114] The formula used by Driver *et al*. to compute the market share volatility reads as follows: $abs(dif(SO\text{-}SA)) + abs(dif(SO\text{-}SB)) + abs(dif(SA\text{-}SB))$, where *abs* and *dif* stand for absolute value and difference, respectively; and *SO*, *SA*, *SB* for natural logs of market share of the company, competitor *A*, and competitor *B*, respectively.

variable has a negative effect on the firms' investment.

Bell and Campa (1997) study the effect of different uncertainty variables (such as exchange rates, input prices, and product demand) on firm investment (including greenfield investments and capacity expansions) in the chemical sector in the United States and the European Union.[115] In order to measure exchange rate uncertainty, Bell and Campa use the average level of the IMF trade-weighted exchange rate index. The exchange rate uncertainty variable is defined as the standard deviation of the monthly change in the logarithm of the exchange rate index. Input price uncertainty is measured by the standard deviation of the monthly change in the logarithm of the real oil price. Finally, the product demand uncertainty variable is measured by the standard deviation of the monthly change in the logarithm of the index of world chemical production (national industrial production) for the global (national) specification. Bell and Campa find that the effect of uncertainty on capacity investment varies across these three uncertainty variables. The input price and product demand uncertainty variables have no significant effect on investment for both the United States and the European Union, whereas the exchange rate uncertainty variable has a significant negative effect on investment by chemical manufacturers in the European Union.

Ogawa and Suzuki (2000) empirically analyse the effect of uncertainty on investment of 389 Japanese manufacturing firms over the period of 1970-1993.[116] These firms are listed on the Tokyo Stock Exchange. They use the conditional standard deviation of the growth of sales as a measure of uncertainty. Ogawa and Suzuki use three statistical methods to construct the conditional standard deviation of the growth rate of real sales: the ARCH model, the rolling regression model, and the conventional way of computing the standard deviation. Ogawa and Suzuki find that uncertainty has a negative effect on investment if the uncertainty variable is constructed using the conventional standard deviation measure and the ARCH model.

The empirical studies reviewed in this subsection appear to lend support to the argument that uncertainty may have negative effects on firm investment. However, as mentioned in Subsection 6.2.5, irreversibility, competition, and firm size may play a role in explaining the uncertainty-investment relationship. Therefore, these factors should be considered while studying this relationship. In the following subsections, we discuss the results of the empirical studies that take these factors into account.

[115] According to Bell and Campa, "greenfield investments include plants situated where the company has not previously undertaken chemical processing, where the company has maintained a chemical complex but not previously produced the chemical, or where the company has previously produced the chemical but has added a new plant. Capacity expansions include increasing yields through technological changes, production bottleneck removals and new train or line additions to en existing plant."

[116] Information about these firms is extracted from a database provided by the Japan Development Bank.

6.3.3 *The investment-uncertainty relationship and irreversibility*

Irreversibility may play an important role in generating negative effects of uncertainty on firm investment. If investment is perfectly reversible, *e.g.*, resale price being equal to purchase price, it should not be negatively affected by uncertainty because firms will not have an incentive to wait. Differently stated, the option to wait is valuable if investment is irreversible. In the empirical studies exploring the nexus between irreversibility and the investment-uncertainty relationship, different proxies for irreversibility are used.

In Bell and Campa (1997), investments in the chemical sectors in the United States and the European Union are split up into greenfield investment and capacity expansion. Since greenfield investment may have a higher sunk cost, it is assumed to be subject to a higher degree of irreversibility as compared to capacity expansion investment. Bell and Campa find that the negative effect of uncertainty, measured by the volatility of exchange rates, is significant for the greenfield investment but insignificant for the capacity expansion.

Goel and Ram (1999) examine investments in different sectors with different degrees of irreversibility: producer durables, residential real estate, and non-residential real estate. Goel and Ram argue that investment in residential real estate may be least irreversible because there may be good markets for residential real estate; investment in machinery and equipment, which constitute the major component of producer durables, seems to be more irreversible since such investment is likely to be firm-specific and/or industry-specific; non-residental real estate may be more irreversible than residental real estate but less irreversible than producer durables because non-residental real estate is firm-specific and/or industry specific only to some extent. Goel and Ram use the five-year moving standard deviation of inflation as a measure of uncertainty and find evidence of a stronger adverse effect of uncertainty on investment by firms in the sectors that have higher degrees of irreversibility.

Goel and Ram (2001) make a distinction between R&D and non-R&D investments with regard to the degree of irreversibility. They argue that R&D investment is subject to a higher degree of irreversibility. Using similar uncertainty variables as in Goel and Ram (1999), Goel and Ram find that a higher degree of irreversibility renders a sharper adverse effect of uncertainty on R&D investment than on non-R&D investment in OECD countries.

Bo (2001) aims to study whether or not firms wait because of uncertainty using information on 77 Dutch firms during the period of 1984-1997. A variable called “wait”, equal to the difference between the threshold and the observed values of profit, is applied. This variable is assumed to be negatively correlated with investment of the firms. Bo uses asset liquidity and the rate of depreciation of capital goods as

indicators of irreversibility.[117] She interacts the irreversibility variables with the variable "wait" to study the association between irreversibility and the delay of investment. Bo finds that the variable "wait" has a significant, negative effect on investment and that the interaction term has a positive coefficient, but the coefficient is not significant when asset liquidity is applied. The same result is found when the rate of depreciation is used.

In order to proxy for irreversibility, Ogawa and Suzuki (2000) create an irreversibility variable that takes on a value of one if the firm belongs to the materials industry group and zero if the firm is in the machinery industry group.[118] They then interact this dummy variable with the uncertainty variable (*i.e.*, the conditional standard deviation of the growth rate of real sales) and find that this interaction term is negative and significant if the uncertainty variable is constructed using the rolling regressions and the ARCH models. This result would imply that investment is more sensitive to uncertainty for the materials industry group. Ogawa and Suzuki argue that irreversibility also depends on types of shock facing the firm (*i.e.*, aggregate, industry-wide or firm-specific). Firms may find it easier to resell capital goods if shocks are firm-specific than if shocks are aggregate or industry-wide because if aggregate or industry-wide shocks occur, no firm in the industry would risk buying capital goods. Therefore, uncertainty stemming from firm-specific shocks may have less negative effects on investment than that originating from aggregate or industry-wide shocks. Ogawa and Suzuki decompose demand uncertainty into three components: aggregate, industry-wide, and firm-specific. The aggregate uncertainty is represented by the standard deviation of the rate of change on monthly yen-dollar exchange rate for five years; as for the industry-wide uncertainty, the standard deviation of the rate of change on the production index by industry is employed; and the firm-specific uncertainty is given by the residual of the regression relating individual uncertainty to aggregate and industry-wide uncertainty. Ogawa and Suzuki find that aggregate and industry-wide uncertainties exhibit significantly negative effects on investment. Moreover, the absolute values of the coefficient of the aggregate and industry-wide uncertainty are much larger than that of the firm-specific uncertainty. This finding may again confirm the importance of irreversibility in generating negative investment-uncertainty relationships.

[117] According to Bo, asset liquidity may indicate irreversibility because firms that encounter difficulties in reselling their capital goods should hold more liquid assets. However, one can also argue that a firm has higher level of liquidity because it may have difficulties in getting access to credit. If so, liquidity may not say much about irreversibility. As for the rate of depreciation of capital goods, the argument is that the higher the rate of depreciation, the faster the sunk costs embedded in capital goods erode, thereby reducing irreversibility.

[118] It is not clear from Ogawa and Suzuki why irreversibility is more severe in the materials industry group than in the machinery industry group.

Irreversibility can also be examined by looking at second-hand markets for capital goods, as discussed earlier in Subsections 6.2.2 and 6.2.3. Pattillo (1998), based on a panel data of 200 Ghanaian manufacturing firms over the period of 1994-1995 collected by Ghana Survey,[119] calculates and uses the scaled subjective variance of the expected demand as a measure of uncertainty (discussed above). She finds that the coefficient of the uncertainty variable is not significant for the whole sample if the irreversibility variable (*i.e.*, the ratio of the real resale value of the capital stock to its real replacement cost) is not included. With the presence of the irreversibility variable, the variance of the expected demand, *i.e*., the uncertainty variable, has a negative and significant coefficient.

Guiso and Parigi (1999) use the standard deviation of the expected demand and the variance of the expected rate of growth of demand (scaled by the stock of capital) as measures of uncertainty. They find that demand uncertainty has a significantly negative effect on the sample's investment. Guiso and Parigi (1999) use two proxies for irreversibility: (i) the degree of the access to the second-hand market for installed capital, and (ii) the co-movement with respect to sales of firms in the industry (*i.e.*, the degree of cyclical correlation of firms within an industry).

As for the degree of the access to the second-hand markets for machinery, Guiso and Parigi formulate four alternatives in their questionnaire that reflect an increasing degree of irreversibility of machinery: (i) it can be sold easily without incurring significant losses with respect to its value in use, (ii) it can be sold, but it requires some time to find a buyer, and losses are incurred, (iii) it takes a long time to find a buyer, and one can only be found if the selling drops considerably below value in use, and (iv) there is essentially no second-hand market at all. Based on the information obtained from the questionnaire using this formulation, Guiso and Parigi split the sample into two groups of firms: less and more irreversibility.

Guiso and Parigi base their second proxy for irreversibility on co-movement of sales, *i.e.*, the degree of cyclical correlation of the sales of firms within an industry, and on the argument that a firm's asset reversibility depends on the amount of cash held by other firms in the same industry, which is proposed by Shleifer and Vishny (1992). Shleifer and Vishny argue that if the industry experiences a downturn and if firms in that industry hold small amount of cash, it is difficult for a firm to resell its capital good, leading to high irreversibility for that firm. It can be reasoned that asset illiquidity (or irreversibility) is more prevalent in those industries plagued by common shocks (having high co-movements) than those facing idiosyncratic (firm-specific) shocks (having low co-movement).[120] Based on the information ac-

[119] The Ghana Survey derives from the Regional Programme on Enterprise Development (RPED) organised by the World Bank and from the Ghana Manufacturing Enterprise Survey funded by the U.K government.

[120] This argument seems to be similar to those of Goel and Ram (2001), Ogawa and Suzuki (2000).

quired from the CADS, Guiso and Parigi construct an irreversibility variable for each firm: $w_{jt} = \frac{x_{jt} - \bar{x}_j}{s_j}$, with x_{jt} being the first difference of the log of the firm's sales in year *t*, $\bar{x}_j$ the sample mean of x_{jt}, and s_j its standard deviation. Then, firms are grouped into 44 sectors for which w_{jt} is regressed based on a set of year dummies; w_{jt} is used as a measure of aggregate shocks. Sectors that have a higher level of aggregate shocks should exhibit higher R^2 resulting from the regressions. Next, firms are classified as having low or high irreversibility if the R^2 is below or above the median. Using both irreversibility variables, Guiso and Parigi find that the higher the degree of irreversibility, the greater the negative relationship between uncertainty and investment.

In short, the empirical studies have revealed that irreversibility appears to accentuate the adverse effect of uncertainty on firm investment regardless of how it is measured. This may be because if irreversibility is prevalent, it is difficult for firms to get rid of the investments if the economic condition deteriorates, thereby inducing them to postpone investment.

6.3.4 *The investment-uncertainty relationship and competition*

As argued in Section 6.2.4, competition may induce firms to invest quickly in order to preempt investment by existing or potential rivals. Therefore, investment by firms facing strong competition may be less negatively affected by uncertainty. Some empirical studies have worked on this argument.

Ghosal and Loungani (1996) study the effect of price uncertainty on industry-level investment using information from U.S. manufacturing industries. They use a four-firm seller concentration ratio to measure the degree of product competition and to partition 254 industries. Ghosal and Loungani do not find strong effect of price uncertainty for the entire sample. Yet, they find a negative effect of uncertainty on investment for more competitive industries but not for less competitive ones.

Guiso and Parigi (1999) compute and use profit margins on unit price as a proxy of firms' market power. They consider firms with a profit margin above (below) the mean (or median) profit margins of the industry as having more (less) monopoly power. Guiso and Parigi find that the uncertainty variable (*i.e.*, the standard deviation of the expected demand) has negative coefficients for all cases. The coefficient of the uncertainty variable is much smaller (in absolute value) for firms that have low mar-

ket power.[121] This finding appears to support the argument that competition may reduce the negative effect of uncertainty on investment.

6.3.5 *The investment-uncertainty relationship and firm size*

Ghosal and Loungani (2000) study the effect of profit uncertainty on industry-level investment over 330 industries. Based on the information obtained from Gray and Bartlesman (1991) as well as from the Small Business Administration report, Ghosal and Loungani divide the sample into two size groups: small and large. They find that greater uncertainty (about future profits) lowers investment for the full sample of industries. Ghosal and Loungani also discover that the negative effect of profit uncertainty on investment is stronger for the industries that are more dominated by smaller firms.

Lensink *et al*. (2000) aim to examine whether the uncertainty-investment relationship depends on firm size. They use the number of employees to measure firm size. Lensink *et al*. find that uncertainty has a positive effect on investment of small firms, and this relationship is negative for large firms. The explanations for this finding, according to Lensink *et al*., are: both small and large firms in the sample do not appear to be financially constrained, and sunk costs are much higher for large firms than for small Dutch firms.

6.4 Conclusions

There are two theoretical strands that address the effect of uncertainty on firm investment. One strand is the traditional theory on investment under uncertainty and the other is the real options approach to investment. The traditional theory is helpful in explaining the optimal choice of input and output as well as optimal investment. However, this theory does not seem to be very successful in explaining the investment behaviour of firms because it does not consider the fact that firms have flexibility regarding their investment decisions. The real options approach to investment emerges to account for this fact.

In view of the real options approach to investment, making investment decisions resembles exercising financial options, which has both benefits and costs. In fact, firms have to deal with a collection of real options that derive from the invest-

[121] The results of their study are indifferent with regard to the choice of the splitting criterion, *i.e.*, mean or median profit margins.

ment opportunity. The interaction among these options makes the net effect of uncertainty on investment ambiguous.

The theoretical models developed based on the viewpoint of the real options approach attempt to embrace the effects of both uncertainty and irreversibility on investment. These models find that uncertainty affects firm investment through the real options channel. The dimension of the relationship between uncertainty and investment can be clarified theoretically if the option to wait is introduced. The inclusion of more options complicates the relationship. The net effect of uncertainty on investment can be either positive or negative depending on the value of the real options. The survey of the existing models suggests that, given the presence of irreversibility, uncertainty reduces investment while competition increases it. Moreover, uncertainty may have different effects firm investment depending on firm size.

Given such ambiguous theoretical relationships, empirical work is helpful in understanding true relationships between uncertainty and firm investment. Empirical studies have been carried out to reveal this relationship. Although the empirical models find mixed results, most of them appear to lend support to adverse effects of uncertainty on firm investment given the presence of irreversibility. The adverse effects of uncertainty on investment may be reduced under competition. Firm size may also contribute to shaping the investment-uncertainty relationship; however, the link is less clear, based on the available empirical evidence.

To conclude the theoretical review, it should be mentioned that the possible interaction between uncertainty and financial market imperfections has not been explored. Uncertainty may have an indirect effect on firm investment through its effect on the degree of financial constraint facing the firm, an effect channelled by the mechanism of information asymmetry. The discussions in Chapters 5 and 6 mean that the effects of financial market imperfections and uncertainty on investment will be examined separately in the empirical part of this dissertation.

Appendix 6.1 **Summary of the results of empirical studies on firm investment under uncertainty**

Study (by year)	*Country*	*Uncertainty measures*	*Signs of the coefficient of the uncertainty variable*
Leahy and Whited (1996)	U.S	Variance of firms' daily stock returns	Negative
Driver *et al*. (1996)	U.S	Market share volatility	Negative
Bell and Campa (1997)	U.S and E.U	Standard deviation of the monthly changes in the logarithm of the exchange rate index	Negative for the E.U but not for the U.S
		Standard deviation of the monthly changes in the logarithm of the real oil price	Not significant
		Standard deviation of the monthly changes in the logarithm of the index of world chemical production	Not significant
Guiso and Parigi (1999)	Italy	Standard deviation of expected demand	Negative
		Variance of the expected rate of growth of demand	Negative
Ogawa and Suzuki (2000)	Japan	Standard deviation of the growth rate of real sales	Negative

Appendix 6.2 **Summary of the results of empirical studies on the uncertainty-investment relationship: the role of irreversibility**

Study (by year)	*Country*	*Irreversibility proxies/distinctions*	*Signs of the coefficient of the uncertainty variable*
Bell and Campa (1997)	U.S and E.U	Greenfield investments: higher irreversibility Capacity expansions: lower irreversibility	Negative for greenfield investments but not for capacity expansions
Pattillo (1998)	Ghana	Ratio of the resale value of capital stock to its real replacement cost	Negative if the irreversibility variable is included
Guiso and Parigi (1999)	Italy	Degree of the access to the second-hand market for installed capital Co-movement	The higher degree of irreversibility, the greater the negative relationship between uncertainty and investment
Ogawa and Suzuki (2000)	Japan	Materials industry group versus machinery industry group Aggregate, industry-wide and firm-specific shocks	Investment more sensitive to uncertainty for the materials industry group. Aggregate and industry-wide uncertainty has much stronger negative effects on investment than firm-specific uncertainty does.
Goel and Ram (2001)	OECD countries	R&D investment: high irreversibility Non-R&D investment: low irreversibility	Uncertainty has stronger negative effects on R&D investment than on non-R&D investment
Bo (2001)	Netherlands	Asset liquidity Rate of depreciation	No significant coefficients

Appendix 6.3 **Summary of the results of empirical studies on the uncertainty-investment relationship: the role of competition**

Study (by year)	*Country*	*Competition proxies/distinctions*	*Signs of the uncertainty coefficient*
Ghosal and Loungani (1996)	U.S	Four-firm seller concentration ratio	Negative effect of uncertainty on investment for more competitive industry
Guiso and Parigi (1999)	Italy	Profit margins on unit price	The negative effect of uncertainty on investment is lower for firms having low market power

Appendix 6.4 **Summary of the results of empirical studies on the uncertainty-investment relationship: the role of firm size**

Study (by year)	*Country*	*Size proxies/distinctions*	*Signs of the uncertainty coefficient*
Ghosal and Loungani (2000)	U.S	Small and large	Negative for industries dominated by small firms
Lensink *et al*. (2000)	Netherlands	Number of employees	Positive for small firms, and negative for large firms

PART THREE

Statistical description and empirical study

Chapter 7

An overall description of the sample

7.1 Introduction

As mentioned in Chapter 1, this dissertation is aimed at studying the effects of financial market imperfections and market uncertainty on firm investment. The literature reviewed in Chapters 5 and 6 indicates that studying these issues requires the availability of several variables at the firm level. Most of the studies addressing these issues have made use of the data provided by specialised agencies.[122] In Vietnam, such data are either absent or incomplete. Therefore, the empirical study of this dissertation had to create and use its own data set.

In 2000 we conducted a survey among 210 private RMs in eight provinces of the MRD. This survey assists in creating a set of firm-level data that covers the variables indicated in the literature as important to studying the above-mentioned issues. These variables include the value of total fixed assets, age, profit, borrowing activities, investment outlays and projections, sales, the expected growth rate of future sales, *etc*. The data set also reveals the degree of physical capital irreversibility and the degree of competition that are hypothesised to affect the uncertainty-investment relationship (see Chapter 6). The availability of these variables enables us to carry out our empirical study on the effects of financial market imperfections and uncertainty on investment of private RMs in the MRD. This chapter serves to describe the data set used to carry out the empirical study in Chapters 8 and 9. In addition, it may also provide an in-depth picture of the rice-milling industry in the MRD.

[122] For instance, COMPUSTAT has been used extensively in many studies of U.S. firms (see, *e.g.*, Fazzari *et al*., 1988; Kaplan and Zingles, 1997; Lamont, 1997).

The remainder of this chapter is structured as follows. The survey that we conducted in 2000 is described in Section 7.2. Section 7.3 gives a general statistical description of the sample; this section plays a central role in the chapter. Section 7.4 analyses the factors perceived by private rice millers as important to their investment decisions. Section 7.5 concludes this chapter.

7.2 The survey

7.2.1 *Preparing the questionnaire*

We build our empirical study upon a survey of 210 private RMs in the MRD conducted in 2000. The survey's backbone is an extensive questionnaire.[123] In order to develop the questionnaire, we conducted several pilot surveys. The pilot surveys helped to select relevant questions and eliminate irrelevant ones.

We first talked with some private rice millers with whom we have had relatively long and good personal relationships in order to check if the questions formulated were proper to be asked and, moreover, to get an overview of the activities of rice millers. Irrelevant questions were eliminated or modified after the talks, and at the same time several new and relevant questions were added. Afterwards, we conducted a pilot survey of 27 RMs to see what kind of information we would receive. We found that the information was not as good as we expected. Therefore, we revised the questionnaire again and used this revised questionnaire to carry out the last round of the survey, which served to obtain the data set that we use in the empirical study in Chapters 8 and 9.

The survey was aimed at RMs' owners; the questionnaire was conducted only if the owners were available to answer; we did not accept anyone else other than the owners. Where possible, numerical cardinal estimates of the addressed issues were used (such as the value of fixed assets, profit, investment outlays and projections, the amount of money borrowed, *etc*.) In the questionnaire, numerical ordinal estimates were also used (such as ranking of importance, anticipations about the future, *etc*.).

7.2.2 *Sample selection*

The sample was selected randomly. In particular, we went to the sites selected beforehand and approached all private RMs we caught by sight and asked if their owners were willing to co-operate. If the reply was "yes", we started conducting the questionnaire. If they said "no", we excused ourselves and proceeded to the next one.

[123] The questionnaire is attached at the end of this dissertation.

Some of the approached rice millers did not accept us. Common reasons why the approached rice millers did not accept us were that they wanted to keep information undisclosed, or they were busy, or they did not feel comfortable being asked about their business.[124]

Eight out of twelve provinces in the MRD were selected (see the maps at the end of Chapter 1). Among the four provinces that were not included in the survey, three, *i.e.*, Bentre, Travinh, and Camau, are coastal provinces, which are less involved in the rice business. In addition, the number of private RMs in these provinces is limited, so it was difficult and costly to find them. Therefore, we left these provinces out because of cost efficiency. The last one, namely Longan province, has a market more unified with that of Ho Chi Minh City than with the MRD.

7.2.3 *Interviewers*

We sent interviewers to RMs to ask them directly for information. The interviewers were selected among students at the School of Economics and Business Administration of Cantho University, Vietnam. An important criterion for students to be selected is that they had knowledge of rice-milling operations. Moreover, they should have done surveys previously.

We trained the selected students prior to conducting the questionnaire. Since conducting the questionnaire was difficult and called for patience, unmotivated interviewers spontaneously dropped out from the very first round of the surveying process. Thus, only motivated and properly trained interviewers remained. The selected students also felt responsible for data quality because we informed them about the importance of the data to be collected. All this appeared to be important in improving the data quality.

While interviewing, we used daily-spoken language that is understandable to the respondents. In the case that respondents had to choose among different possibilities, we used show cards in order to help them to better perceive the issues under consideration, thereby making the responses more precise.

7.2.4 *Respondents' perception bias*

Although we prepared the questionnaire carefully, the data collected can be affected by some perception bias of the respondents. First, private rice millers usually do not keep standard accounting books and good business records. Therefore, when asked for

[124] One may think that, due to this fact, the sample is biased in the sense that it includes only successful rice millers because those rice millers who refused to cooperate might not do well. However, there is no indication that it is the case.

information about past activities they had to recall what already happened; thus, the estimates or figures they provided may not perfectly reflect the actual activities. They also had a tendency to repeat the phrase "*more or less the same as this (or a certain) year*" to the questions that asked for cardinal numbers like past profits, the amount and price of paddy or brown rice bought or sold, *etc*. Second, private rice millers generally have poor access to market information, making forecasting the future more difficult for them. Thus, the respondents tended to provide approximate values. In order to make it easier for the respondents, in the questions asking for future forecasts we set up categories (such as from 1 to 5 per cent, 6 to 10 per cent, *etc*.). They could then indicate the category they thought to be most suitable.

In summary, we realise that the information collected using the questionnaire may at times not be precise. This should be taken into account while interpreting the empirical results. However, at the same time we feel confident that the answers of the respondents do reflect the characteristics of RMs in a sufficient way that warrants us to do empirical analyses because cross-checking the data during and after the survey did not reveal any extremely incorrect or impossible answers.

7.3 A statistical description of the sample

This section describes the sample with respect to such aspects as age, size, location, sales, profit, borrowing, and investment. Table 7.1 provides general information about these variables.

Table 7.1 A statistical description of the sample

Variables	*Min.*	*Mean*	*Median*	*Max.*	*St. dev.*	*Obs.*
Age*	0.0	8.7	8.0	29	6.2	210
Size*	40	447	350	2,100	356	210
Location*	0.0	0.6	1	1	0.5	210
Sales per *FA* in 1998**	0.120	0.770	0.557	2.317	0.623	203
Sales per *FA* in 1999	0.07	1.054	0.94	3.297	0.733	210
Profit per *FA* in 1998	-0.03	0.182	0.142	0.750	0.152	210
Profit per *FA* in 1999	-0.26	0.143	0.113	0.700	0.128	210
Borrowing per *FA* in 1998	0.0	0.130	0.0	0.769	0.214	208
Borrowing per *FA* in 1999	0.0	0.112	0.0	1.818	0.212	210
Investment per *FA* in 1998	0.0	0.138	0.047	0.923	0.197	210
Investment per *FA* in 1999	0.0	0.139	0.063	1.528	0.218	210
Planned investment per 1999 *FA*	0.0	0.078	0.04	0.600	0.118	210

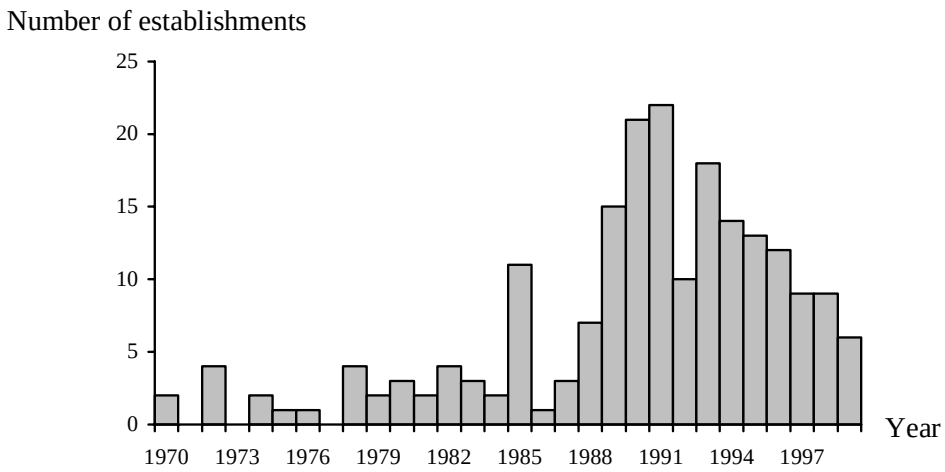
Source: Own survey in 2000.
Note: * Definitions of age, size, and location are given in Subsections 7.3.1, 7.3.2, and 7.3.3, respectively; ** *FA* stands for total fixed assets.

7.3.1 *Age*

We define age of a RM as the number of years counting from the year of its establishment up to 1999. According to Table 7.1, the sample's average age is 8.7 years (standard deviation: 6.2). The oldest RM was established in 1970 (*i.e.*, 29 years old), and the youngest RMs were established in 1999.

Figure 7.1 plots the distribution of private RM establishments by year. According to this figure, a number of private RMs were established and operated before *doi moi* was implemented in 1986. This finding points out a deviation of Vietnam from other transition countries, particularly those in Eastern Europe, where private enterprises started to develop only after these countries adopted market mechanism (see, *e.g.*, Budina *et al.*, 2000). It also reflects the fact that Vietnam did not strictly apply the Soviet model, which absolutely rules out the private sector (see Chapter 2) and supports the argument in Chapter 4 that before *doi moi* being unable to supply food to everybody the government allowed private RMs to mill rice for home consumption.

Figure 7.1 Distribution of private RM establishments by year



Source: Own survey in 2000.

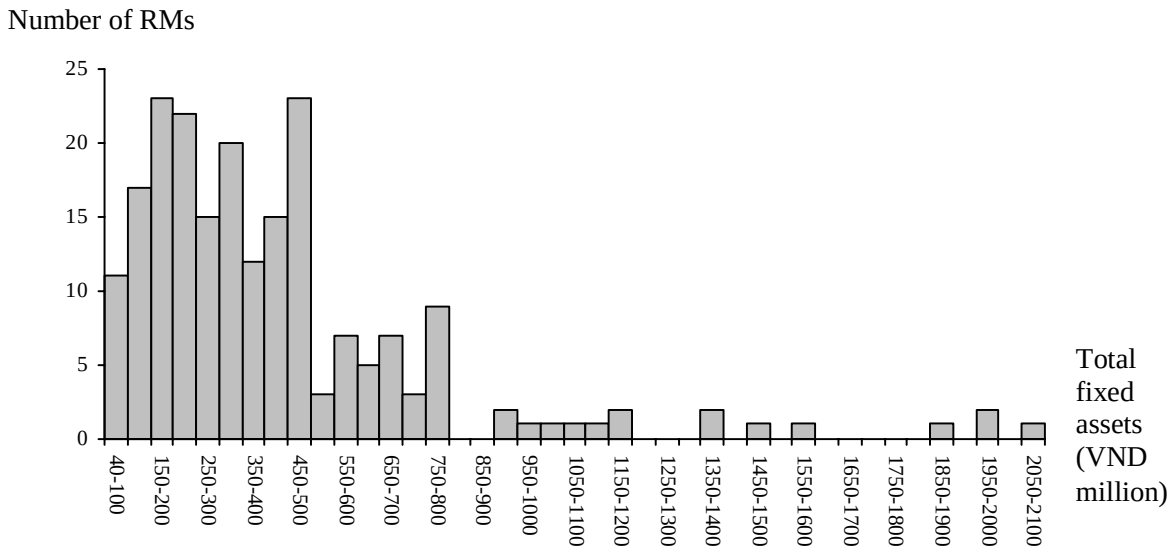
According to Figure 7.1, private RMs in the MRD are relatively young; the data set reveals that around 74.8 per cent of the sample's population was established between 1989 and 1999. The number of private RM establishments reached its peak in 1990-1991 and started to decrease afterwards. The substantial increase in the number of private RM establishments in 1990-1991 might be a result of the government's

recognition of the role of the private sector and of the Company Law issued in 1990, as we discussed in Chapter 2 (Subsection 2.5.2). This increase might also be due to the fact that in 1989 Vietnam started to export rice, therefore pushing up the demand for and the price of milled rice and encouraging the establishment of private RMs.

7.3.2 *Size*

In this dissertation, we use the value of total fixed assets in 1999 of a RM as the measure of its size.[125] As presented in Table 7.1, the average value of total fixed assets in 1999 of the sample is VND 447 million (standard deviation: 356), equivalent to USD 30,658.[126] The largest RM in the sample has a value of total fixed assets of VND 2,100 million (USD144,033) and the smallest of VND 40 million (USD2,744). Figure 7.2 depicts the distribution of the sample by size. This figure illustrates that the sample is dominated by small RMs because the distribution has a relatively long right tail.

Figure 7.2 Distribution of the sample by size



Source: Own survey in 2000.

[125] Since RMs in the MRD have a large number of seasonal (temporary) workers, the number of workers may not be a proper indicator of their size.

[126] According to http://www.laodong.com.vn, as of December 2000 the exchange rate between VND and USD was 14,580 VND/USD.

7.3.3 *Location*

The sample was drawn randomly from private RMs operating in eight provinces of the MRD. This sample's distribution over provinces is as follows: 29 RMs in Angiang province (13.8 per cent of the sample's population), 31 in Baclieu (14.8), 22 in Cantho (10.5), 30 in Dongthap (14.3), 15 in Kiengiang (7.2), 21 in Soctrang (10.0), 50 in Tiengiang (24.3), and 12 in Vinhlong (5.1).[127]

In the MRD, there are four rice-milling centres: Thotnot district (located in Cantho province), Chomoi district (Angiang province), Sadec town (Dongthap province), and Caibe district (Tiengiang province). These provinces are located nearby either Cantho or Saigon seaport, giving private RMs in these districts an advantage in terms of shorter distances to the seaports and of lower transportation costs. Moreover, private RMs in these provinces may receive a stronger demand for their output compared to those in the other provinces because these provinces have attracted state-owned food companies.[128] A quote from Cantho News (March 5th, 1999) may provide an idea about the attraction of one of these centres: "… all the state-owned food companies in the South are present in Thotnot to prepare themselves for signing contracts with private RMs …".[129] In contrast, those RMs located in the other provinces (*i.e.*, Baclieu, Soctrang, Kiengiang, and Vinhlong) may face a disadvantage as compared to the former.

Our sample includes 131 private RMs located in Cantho, Angiang, Dongthap, and Tiengiang provinces, accounting for 62.4 per cent of the sample's population. Based on the discussion given in the previous paragraph, we consider these RMs as having an advantageous location. Thus, these RMs are assigned a dummy location variable taking a value of one. In the sample, the number of private RMs located in Baclieu, Soctrang, Kiengiang, and Vinhlong provinces, which have a disadvantageous location, is 79 and make up the remaining 37.6 per cent of the sample's population. These RMs are assigned a dummy location variable taking a value of zero. This location variable will be used later in Chapter 8 as a proxy for the investment opportunity of private rice millers.

[127] The distribution of the sample over the provinces is not even because it depends on the possibility to find and get RMs to answer the questionnaire.

[128] As discussed in Chapter 4, the link between state-owned food companies and private RMs is important for both state-owned food companies and private RMs.

[129] Also according this source of information, Thonot district has 35 private RMs supplying rice to state-owned food companies and traders all over the MRD. In 1995, the district produced around 300.000 tons of export-qualified rice, representing around 15 per cent of total amount of rice exported by the country in that year. In 1996, it produced around 400.000 tons of rice and in 1997 more than 500.000 tons.

7.3.4 *Sales*

Sales of a RM is defined as the income from the sale of milled rice and by-products processed by the RM itself and/or from milling services it provides. Information about sales of RMs was collected through Question 8 of the questionnaire, which asked the respondents to give values of sales in 1998 and 1999 regarding every activity (*i.e.*, milling, polishing, own milled rice trading, and own by-products trading).

Table 7.1 reveals that the average sales per unit of fixed assets in 1998 of the sample is 0.770 (standard deviation: 0.623). The average sales per unit of fixed assets in 1999 is 1.054 (standard deviation: 0.733). This information implies that the average sales of private RMs significantly increased from 1998 to 1999.[130] Table 2.5 of Chapter 2 shows a substantial increase in the quantity of rice exported from 1998 to 1999, *i.e.*, from 3,793 thousand tons to 4,550 thousand tons, because of a substantial increase in the demand for Vietnam's rice from Indonesia due to a bad harvest (World Bank, 2000b); this may help to explain the increase in the average sales of private RMs.

7.3.5 *Profit*

Profit of a RM (in a given year) is its sales (defined above) minus the costs involved. Profits in 1998 and 1999 of every RM were recorded in Question 13. Since profit is a sensitive issue and is an important information to our empirical study, we have Question 14, which asked the respondents to specify profit expressed as a percentage of sales, in order to cross-check the information obtained using Question 13. The information collected using these two questions appears to be consistent.

Table 7.1 shows that the average value of profit per unit of fixed assets of the sample in 1998 is 0.182 (standard deviation: 0.152); the corresponding figure in 1999 is 0.143 (standard deviation: 0.128). The average value of profit of the sample significantly decreased from 1998 to 1999.[131] This decrease in the average profit of the sample may be due to a drop of rice prices in Vietnam, from VND 3,411 per kilogram on average in 1998 to VND 3,162 per kilogram in 1999, *i.e.*, by 7.3 per cent.[132]

7.3.6 *Borrowing*

As shown in Table 7.1, the average amount of money that a RM borrowed in 1998

[130] *t*-value = 4.27.
[131] *t*-value = -2.84.
[132] We obtained this information from the Vietnamese Government Committee for Pricing.

divided by the total fixed assets in 1998 is 0.130 (standard deviation: 0.214). This figure in 1999 is 0.112 (standard deviation: 0.212). In 1998 there were 76 RMs that borrowed, accounting for around 36.2 per cent of the sample's population, and as many as 134 RMs (63.8 per cent) did not borrow at all. In 1999 the number of RMs that borrowed is 84, *i.e.*, increasing by 10.5 per cent as compared to 1998 and accounting for around 40 per cent of the total sample; the number of RMs that did not to borrow remained high with 126 RMs, accounting for 60 per cent of the sample's population. Such a large number of RMs that did not borrow may indicate their difficulty in access to credit.

The data set reveals that, in 1999, 112 out of the 210 surveyed RMs (53.3 per cent) applied for credit; the number of RMs that did not apply for credit was 98, accounting for the remaining 46.7 per cent of the sample's population. Our survey does not report the reasons why several RMs of the sample did not apply for loans. Yet, according to our observation during the survey one of the reasons for not applying for loans is that private RMs, especially those having no or small collateral, might expect low chances of getting loans while the application procedure was costly (see Subsection 3.2.2 of Chapter 3). Of course, it may also be because they did not need external funds.

As described in Chapter 3, in Vietnam formal and informal financial markets coexist and charge different interest rates. The data set reveals that the average interest rate charged by the commercial banks was 1.2 per cent per month whereas the average interest rate charged by the informal lenders was around 2.8 per cent per month. This finding is in line with those of the studies mentioned in Chapter 3.

As shown in Table 7.2, private RMs borrowed from both banks and informal lenders. Banks appear to be more important to RMs as compared to moneylenders. In 1998, 58 out of 76 borrowers (76.3 per cent) resorted only to commercial banks for credit; five RMs (6.6 per cent) relied only on informal lenders; and 13 RMs (17.1 per cent) borrowed from both commercial banks and informal lenders. The borrowing picture changed a bit from 1998 to 1999; yet, the nature of RMs' borrowing remains the same. In 1999, 67 out of 84 borrowers (79.8 per cent) only borrowed from commercial banks; six RMs (7.1 per cent) chose only informal lenders; and 11 RMs resorted to both commercial banks and informal lenders.

In sum, the overview in this subsection reveals that commercial banks are more important than informal lenders in terms of financing private RMs. It also shows that a large portion of the sample did not apply for loans or did not have access to external funds. This finding lends support to the argument in Chapter 3 that access to external funds for private firms in Vietnam is limited.

Table 7.2 Actual borrowing of private RMs

Category	1998		1999	
	Number of RMs observed	*Per cent of the sample's population*	*Number of RMs observed*	*Per cent of the sample's population*
Non-borrowers	134	63.8	126	60.0
Borrowers	76	36.2	84	40.0
Banks only	58	27.6	67	31.9
Informal lenders only	5	2.4	6	2.9
Banks and informal lenders	13	6.2	11	5.2
Total	210	100.0	210	100.0

Source: Own survey in 2000.

7.3.7 *Investment*

In this dissertation, (fixed) investment of a RM is defined to include all of its expenditures amounting to VND5 million or more spent on its rice-milling factory that includes six categories, *i.e.*, milling machine, polisher, dryer, building, warehouses, and transportation means. This definition is in accordance with the accounting rule in Vietnam, which considers an asset having a value of VND 5 million or higher and lasting longer than one year as a fixed asset. The data set reveals that around 78 per cent of the investment expenditure in 1999 was spent on milling and polishing machinery. The data set does not include inventories because the respondents failed to report information about the expenditures on inventories.

Past investment

Investments in 1998 and 1999 decomposed into six investment categories were collected using Questions 9 and 10, respectively. Table 7.1 shows that the average investment per unit of total fixed assets in 1998 of the sample was 0.138 (standard deviation: 0.197). There were 102 RMs, accounting for around 48.6 per cent of the sample's population, that did not invest at all and 108 RMs that invested (52.4 per cent). As presented in Table 7.3, the average investment per unit of fixed assets in 1998 for the investors, *i.e.*, those RMs who invested, was 0.359 (standard deviation: 0.508).

In 1999 the average investment per unit of fixed assets of the sample was 0.139 (standard deviation: 0.218). In 1999 there were 83 RMs (39.5 per cent of the sample's population) that did not invest at all and 127 RMs that invested, accounting for the remaining 60.5 per cent of the sample. The average investment per unit of fixed assets in 1999 for the investors was 0.230 (standard deviation: 0.241).

The information provided in Table 7.3 also reveals changes in the investment behaviour of the sample. From 1998 to 1999, the number of RMs that invested increased from 108 to 127, *i.e.*, by around 17.6 per cent. As for the whole sample, the average investment per unit of fixed assets remained nearly unchanged from 1998 to 1999, *i.e.*, 0.138 versus 0.139. Yet, as for the investors the investment per unit of fixed assets in 1999, as compared with that in 1998, exhibited a significant drop, from 0.359 to 0.230 or by 36 per cent. One of the reasons for this change may be that the rice market in Vietnam was highly fluctuating in 1998.

Table 7.3 Past investments by private RMs in 1998 and 1999

	Variables	1998	1999
1	Total number of RMs surveyed	210	210
a	Number of RMs that invested	108	127
b	Number of RMs that did not invest	102	83
2	Average investment per fixed assets for the sample	0.138	0.139
	(standard deviation)	(0.197)	(0.218)
3	Average investment per unit of fixed assets for the	0.359	0.230
	investors (standard deviation)	(0.508)	(0.241)

Source: Own survey in 2000.

Planned investment

The questionnaire has two questions (*i.e.*, Questions 11 and 12) aiming to acquire information about planned investment by the sample in two consecutive years 2000 and 2001.[133] For every year, we recorded planned investment for each RM in case it could borrow and in case it could not borrow. In a particular year, planned investment of a certain RM in case it could borrow is expected to be different from that if it could not borrow because of two reasons: (i) the RM can use (part of) the amount of money borrowed to invest, and (ii) lenders are expected to bear part of the risks facing the investment projects, encouraging the RM to invest.

The information shown in Table 7.4 appears to be supportive of the arguments in the previous paragraph. In 2000 the number of RMs that planned to invest was 82 and 62 if RMs are able and not able to borrow, respectively. More interestingly, the average planned investment for 2000 is 0.100 (standard deviation: 0.202) if able to borrow; this figure significantly reduces to 0.058 (standard deviation: 0.125) if not

[133] Initially, we aimed to acquire information on planned investment for a longer term. Unfortunately, the respondents were not able to provide this information because they do not seem to have a planning horizon that is longer than two years.

able to borrow.[134] In 2001 the picture seemed to be similar. The number of RMs that planned to invest falls from 55 (if able to borrow) to 38 (if not able to borrow), *i.e.*, by around 31 per cent. The average planned investment in 2001, if able to borrow, was 0.078 (standard deviation: 0.189); this figure was 0.040, if not able to borrow, exhibiting a significant drop.[135]

A similar result would emerge as for those RMs which planned to invest. In 2000 the average investment per unit of fixed assets (in 1999) changes from 0.255 if able to borrow to 0.195 if not able to borrow. This change amounts to a significant fall.[136] In 2001, the average investment per unit of fixed assets (in 1999) was 0.297 and 0.223 if able and not able to borrow. The difference between these two figures is significant.[137] The results shown in Table 7.4 may suggest that access to credit is an important determinant of investment of RMs.

Tables 7.3 and 7.4 also show that planned investment is considerably smaller than past investment. This may be because of risk aversion and/or increasing uncertainty of the RMs, making it difficult to plan investment ahead of time, especially when information is lacking.

Table 7.4 Planned investments for 2000 and 2001

	Variables	2000		2001	
		Able to borrow	*Unable to borrow*	*Able to borrow*	*Unable to borrow*
1	Total number of RMs observed	210	210	210	210
2	Number of RMs that planned to invest	82	62	55	38
3	Number of RMs that planned not to invest	128	148	155	172
4	Average planned investment per unit of fixed assets (in 1999) for the entire sample (standard deviation)	0.100 (0.202)	0.058 (0.125)	0.078 (0.189)	0.040 (0.114)
5	Average planned investment per unit of fixed assets (in 1999) for the RMs that planned to invest (standard deviation)	0.255 (0.256)	0.195 (0.165)	0.297 (0.267)	0.223 (0.177)

Source: Own survey in 2000.

7.4 Factors affecting investment decisions of private rice millers

The effects of financial market imperfections and uncertainty on firm investment, as reviewed in Chapters 5 and 6, have attracted a huge volume of literature. The litera-

[134] *t*-value = 2.56.
[135] *t*-value = 2.45.
[136] *t*-value = -2.85.
[137] *t*-value = -3.34.

ture has inspired us to investigate of the effects of these factors on investment in the context of private rice millers in the MRD. Before doing this, we like to reveal the perception of private rice millers towards the importance of financial market imperfections- and uncertainty-related factors to their investment decisions in order to be sure about the relevance of these factors.

We developed a device that helps to grasp the perception of private rice millers towards the importance of these two factors. Question 15 of the questionnaire asked: "*Please indicate the importance of the following factors to your investment decisions.*" This question lists eleven factors that belong to two categories, *i.e.*, financial market imperfections and market uncertainty. Each factor was assigned importance ranking points formulated as follows: (1) = unimportant, (2) = not so important, and (3) = important.[138] Almost all the respondents reported their perception of the importance of the listed factors to their investment decisions regarding milling machinery, *i.e.*, the principal element of a RM. We then calculated the average of the ranking points that the respondents assigned to each factor and use them to learn about the importance of the factors. Table 7.5 reveals this information about nine relevant factors that appear to be the most important.

Table 7.5 Importance of the factors affecting investment decisions of rice millers

No.	*Factors*	*Average ranking point*
A	*Financial market imperfections*	
1	Access to bank loans	2.4
2	Interest rate charged by banks	2.0
3	Collateral for bank loans	2.6
B	*Uncertainty*	
6	Unanticipated changes in output demand	2.9
7	Unanticipated changes in output prices	2.7
8	Unanticipated changes in sales	2.9
9	Unanticipated changes in future prices of milling and polishing	2.8
10	Unanticipated changes in input supply	2.4
11	Unanticipated changes in input price	2.5

Source: Own survey in 2000.

Table 7.6 shows that access to bank loans (Factor 1) appears to be important. Interest rates charged by banks (Factor 2) were perceived as being less important than access to bank loans. The requirement on collateral (Factor 3) was considered by private rice millers as more important than the other two factors. This is understandable

[138] Since it was difficult for the respondents to differentiate between the qualifications "important" and "very important" that we had used originally (see the questionnaire), we group these two categories into one named "important".

because, according to the survey, 100 per cent of bank loans to private rice millers have to be secured by collateral.

Table 7.6 suggests that although the factors related to financial market imperfections are perceived relevant for the private rice millers' investment decisions, they seem to be less important than market uncertainty. As for market uncertainty, it is obvious that the effect of uncertainty on investment decisions of rice millers is the important. Since most of the RMs have limited market power, any fluctuation on markets may be perceived to have a strong influence on their investment decisions. Among the uncertainty factors, those related to the demand side, *e.g.*, unanticipated changes in output demand, in output prices, in sales, *etc*., were perceived as more important than those related to the input side, such as changes in input supply and in input prices.

7.5 Conclusions

This chapter provides a descriptive statistics of the sample, which covers 210 private RMs in the MRD. The chapter helps to reveal the overall picture of the rice-milling industry in the MRD. It was shown that the rice-milling industry responded positively to *doi moi*: a large portion of the sample was established shortly after *doi moi* was launched. The rice-milling industry appears to be dominated by small RMs, which may be a consequence of their poor access to credit and uncertainty. This chapter uncovers that only around half of the sample applied for credit, and a bit more than half of them were successful in getting credit. This means that private RMs have financed most of their investment using internal funds. If internal funds play such an important role in financing investment of private RMs, it should be revealed that their investment is empirically sensitive to internal funds. In addition, the uncertainty with regard to the demand side was also perceived by private RMs as an important factor affecting their investment decisions.

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 in-vested*
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:

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

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.

- $PRO_{t\text{-}1}$ 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 $PRO_{t\text{-}1}$ 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.
- $BOR_{t\text{-}1}$ 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)
$PRO_{t\text{-}1}$			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)
$BOR_{t\text{-}1}$			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.
$PRO_{t\text{-}1}$ = profit in 1998; $DSAL_t$ = the growth rate of sales in 1999; *LOC* = location; and $BOR_{t\text{-}1}$ = 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 ($PRO_{t\text{-}1}$) in order to test for the existence of financial market imperfections. The internal-funds variable ($PRO_{t\text{-}1}$) 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 ($BOR_{t\text{-}1}$) 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 ($PRO_{t\text{-}1}$) 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)
	0.1234**	0.1617**	0.1622**	0.1478**
LOC	(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:

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

Differentiating Specification 8.2 with respect to $PRO_{t\text{-}1}$ 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 ($PRO_{t\text{-}1}$) is positive and significant at the 5 per cent level. It is interesting that the coefficient of the interactive term, *i.e.*, $PRO_{t\text{-}1}$*$SIZE$, 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 ($BOR_{t\text{-}1}$) 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.

Chapter 9

Investment under uncertainty: an empirical study of rice mills

9.1 Introduction

As revealed in the theoretical literature, uncertainty is likely to affect firm investment through the channel of real options (see Chapter 6). However, the sign of the investment-uncertainty relationship appears to be theoretically ambiguous: greater uncertainty can lead to either less or more investment. Therefore, in order to understand the relationship between uncertainty and firm investment in a particular setting, empirical studies are needed. As a matter of fact, only few empirical studies on this topic have been done. In particular, empirical studies that concentrate on firm investment under uncertainty in developing and transition countries are even more scant, according to our best knowledge. Thus, this empirical study, which aims to examine the relationship between uncertainty and firm investment in the context of private RMs in the MRD, can be seen as a useful contribution to the literature. It may also help to improve the understanding of the investment behaviour of RMs under uncertainty and provide explanations for the observation that in Vietnam rice milling is done by a number of small RMs using obsolete, inefficient machinery (Chapter 1).

This chapter is structured as follows. An overview of the empirical study and the data set is given in Section 9.2. Sections 9.3 and 9.4 focus on the measurement of uncertainty and irreversibility, respectively; these subsections help to create uncertainty and irreversibility variables for the empirical study in this chapter. Section 9.5 discusses our empirical findings. Finally, Section 9.6 concludes the chapter.

9.2 An overview of the empirical study and the data set

There are four aspects of the empirical study in this chapter that are worth mentioning. First, this empirical study uses firm-level data. Firm-level data enable the measurement of idiosyncratic (perceived) uncertainty that may be more important to firm investment decisions than aggregate uncertainty (see, *e.g.*, Guiso and Parigi, 1999).

Second, the literature, as reviewed in Chapter 6, indicates that characteristics such as irreversibility, competition, and firm size are relevant to firm investment decisions under uncertainty. Irreversibility makes it difficult or even impossible for firms to dispose of their used machinery in order to cope with a downturn of the economic environment, thereby discouraging them from investing. In contrast to irreversibility, it is likely that competition will boost investment because competition induces firms to invest so as to preempt competitors. The investment-uncertainty relationship may also be linked to firm size. However, the direction of this link is not clear. Our cross-section data set enables us to deal with these characteristics. Particularly, we focus on the links between irreversibility, competition, firm size and the investment-uncertainty relationship.

Third, since it is likely that firms take the future into account when making investment decisions, this empirical study examines the effect of *ex ante* uncertainty on firm investment. The uncertainty is measured using the expected growth rates of sales of private rice millers in the MRD.

Fourth, our empirical study uses uncertainty variables constructed based on the expectations about future sales. In order to be sure about the relevance of the uncertainty variable, we deliberately asked rice millers for their judgement of the importance of changes in sales to their investment decisions. Table 7.6 of Chapter 7 revealed that unanticipated changes in sales were among the most important factors affecting their investment decisions.

The survey that we carried out in 2000 aids in establishing a set of firm-level data over 204 private RMs, containing the following aspects:[148]

- investment projections;
- past sales and expectations about the future growth rate of sales;
- the possibility to resell used milling machinery and the resale price of used milling machinery expressed as a percentage of the purchase price. These two aspects reflect irreversibility;
- the degree of competition;
- past profitability;
- the amount of money that private RMs borrowed; and

[148] According Chapter 7, our data set includes 210 private RMs. In this chapter, we use information of only 204 RMs because of missing values.

- total fixed assets.

These variables together are sufficient in terms of helping to create variables necessary for the empirical study in this chapter.

9.3 Measuring uncertainty

In order to measure uncertainty, we have to obtain information about the expectations of private rice millers about the future growth rates of sales of their businesses. Following Guiso and Parigi (1999), Question 27 of our questionnaire asked: "*in which direction would the sales of your business change in* 2001*?*"[149] Each rice miller was requested to assign weights, which sum to 100, to a set of intervals of growth rates of sales. A summary of the information obtained using this question is given in Table 9.1. In general, this table shows that 74 per cent of the sample's population expected sales to rise and 26.0 per cent expected sales to fall. The information obtained using Question 27 enables us to create our uncertainty variables, which will be described below.

Table 9.1 Frequency distribution of the expected growth rate of sales

Interval	*Number of firms*	*Frequency*	*Interval*	*Number of firms*	*Frequency*
Negative (*per cent*)			*Positive* (*per cent*)		
More than 25	3	1.5	0–1	21	10.3
25–10	5	3.0	1–5	105	51.0
10–5	6	3.0	5–10	19	9.3
5–1	35	17.2	10–25	5	2.2
1–0	4	2.0	More than 25	1	0.5
Subtotal	53	26.0	*Subtotal*	151	74.0
			Total	204	100.0

Source: Own survey in 2000.

9.3.1 *Coefficient of variation of the expected sales* (*CEV*)

The coefficient of variation of expected sales (*CEV*) is one of the measures of uncertainty that we use in this chapter. Appendix 9.1 at the end of this chapter shows how to calculate this variable from survey data. The greater the value of *CEV*, the higher the

[149] As you can see from the questionnaire (attached at the end of this dissertation), we deliberately asked the private rice millers for this information for the year of 2003 as well. However, only few rice millers responded to this question because most of them find it very difficult to make judgments of distant future.

degree of uncertainty is.

In order to provide the reader with an overview of the degree of uncertainty facing private rice millers, we show the frequency distribution of the *CEV* in Table 9.2. This table reveals that around 90.7 per cent of the sample's population expected values of *CEV* of 10 per cent or higher (Lines 4-7); the portion of the sample corresponding to *CEV* of less than 10 per cent accounts for as only little as 9.3 per cent of the sample (Lines 1-3).

Table 9.2 Frequency distribution of the coefficient of variation of the expected sales (*CEV*)

No.	*Interval* (*per cent*) [1]	*Number of RMs* [2]	*Frequency* [3]
1	$0 \leq CEV < 1$	9	4.4
2	$1 \leq CEV < 5$	0	0
3	$5 \leq CEV < 10$	10	4.9
4	$10 \leq CEV < 15$	126	61.8
5	$15 \leq CEV < 20$	18	8.8
6	$20 \leq CEV < 25$	23	11.3
7	$25 \leq CEV$	18	8.8
	Mean (per cent):	17.3	
	Median (per cent):	14.1	
	Total	204	100

Source: Own survey in 2000.

9.3.2 *Another uncertainty variable: DEVAS*

According to our understanding, no consensus about what variable is the best measure of uncertainty has been reached. Therefore, apart from the *CEV* the empirical study in this chapter uses another uncertainty variable: *DEVAS*. This variable is defined as the ratio of the (subjective) standard deviation of the expected sales to total fixed assets in 1999. Appendix 9.1 also shows how to calculate the *DEVAS* from the subjective probability distribution. The aim of using this variable is twofold. First, this variable will be used to check the robustness of the findings based on the *CEV*. Second, it is clear from the definition that this variable helps to avoid scale effects. This may be good because although we do not know in which dimension size of a RM would influence the uncertainty facing its owner, the influence may exist (see Chapter 6).

9.4 Measuring irreversibility

As we have discussed in Chapter 6, since irreversibility cuts short the possibility for firms to dispose of used physical capital in order to cope with a downturn of the economic environment, it may lead to postponed and/or suppressed investment under uncertainty. Therefore, irreversibility is an important factor that should be taken into account when studying the investment-uncertainty relationship. This section aims to reveal the causes of irreversibility facing private rice millers and deal with the question of how to measure the irreversibility confronting private rice millers using the data that we collected.

9.4.1 *Causes of irreversibility for private rice millers in the MRD*

Like other firms, private rice millers in the MRD may be confronted with some degree of irreversibility because of impediments to reselling their used machinery. There are some factors that impede the possibility to resell the used rice-milling machinery:

- First, an important cause of irreversibility may be the co-movement with respect to sales of RMs. If the whole industry were in a downturn, no one would risk buying second-hand machinery. The co-movement of the rice-milling industry is likely to occur because the rice-milling industry as a whole is largely influenced by the volatility of the demand for and price of rice. Therefore, common shocks may be important in this industry, making (aggregate) irreversibility substantial.[150]
- Second, as for private RMs irreversibility may arise from the fact that it is difficult to use rice-milling machinery for other purposes because of its specificity. As a matter of fact, the only component that can easily be used for other purposes is the engine. Some other components can be transformed for different uses, but the transforming costs may be prohibitively high, according to our observation.
- Third, private rice millers are able to resell their machinery, but they may have to resell it in unorganised second-hand markets. Therefore, reselling used rice-milling machinery will be largely subject to the “lemons” problem as well as high transaction costs.

In sum, used rice-milling machinery may be hard to resell, meaning that irreversibility is relevant for private rice millers. This suggests that our empirical study should allow for irreversibility. We combine the methods used by Guiso and Parigi

[150] According to Guiso and Parigi (1999), there are two types of shocks: common shocks and idiosyncratic shocks. Common shocks are far more important in creating irreversibility than idiosyncratic shocks (that is specific to individual firms) because the former hit the whole industry in which individual firms operate. Ogawa and Suzuki (2001) also give similar arguments (see Chapter 6).

(1999) and Pattillo (1998) to construct a proxy for irreversibility facing private rice millers in the MRD. Guiso and Parigi use the possibility to access second-hand markets, and Pattillo employs the resale value of the capital to its real replacement value.

9.4.2 *Possibility to resell rice-milling machinery*

Our questionnaire has two questions asking for information about the irreversibility facing private rice mills. Question 28, which is based on Guiso and Parigi (1999), asked: "*if you would not want to continue your business, how easily could you resell your machinery?*" This question envisages four possibilities: (1) = nearly impossible to resell, (2) = not so easy to resell, (3) = easy to resell, and (4) = very easy to resell. The respondents were requested to mark one out of these four possibilities.

The information obtained using this question, which is provided in the upper part of Table 9.3, reveals the self-perception of how likely private rice millers are able to reverse their investment. If a rice miller releases a higher number, her/his milling

Table 9.3 Frequency distribution of the possibility to resell rice-milling machinery and the resale price

Category [1]	*Dummy variable* [2]	*Number of observations* [3]	*Frequency distribution* (*per cent*) [4]
Possibility to resell (*REV*1)			
Nearly impossible to resell	1	13	6.4
Not so easy to resell	2	177	86.8
Easy to resell	3	14	6.8
Very easy to resell	4	0	0
Total		204	100
Resale price as a percentage of purchase price (*REV*2)			
Nearly zero	1	0	0
1–50 per cent	2	102	50.0
51–75 per cent	3	91	44.6
76–100 per cent	4	11	5.4
Total		204	100

Source: Own survey in 2000.

factory, as perceived by her/himself, is of a higher degree of reversibility. Table 9.3 suggests that the second-hand market for used rice-milling machinery somehow exists in the MRD because the rice millers stated that they could resell their used machinery. Yet, the possibility to reverse investment seems to be limited. A large proportion of the

sample reported that it was not so easy to resell the used machinery. For instance, as much as 86.8 per cent of the sample reported "*not so easy to resell*" while only 6.8 per cent reported "*easy to resell*". Notably, 13 rice millers, amounting to 6.4 per cent of the sample, found it nearly impossible to resell their used machinery.

The information on the possibility to resell used rice-milling machinery is useful in helping to construct the irreversibility variable. Yet, it may not provide a complete picture about the irreversibility facing rice millers. Another aspect of irreversibility that is likely to be pertinent to investment decisions of a private rice miller concerns the perceived value of its used machinery.

9.4.3 *Resale price (as percentage of purchase price) of used rice-milling machinery*

In order to complete the information about irreversibility, Question 29 of our questionnaire, which is based on Pattillo (1998), asked: "*if you could resell your milling machinery, what would be the price as percentage of the purchase price?*" Each respondent was requested to mark one out of four scales formulated as follows: (1) = almost zero, (2) = 10-50 per cent, (3) = 51-75 per cent, and (4) = 76-100 per cent of the purchase price. The higher the ratio of resale price to purchase price, the higher the degree of reversibility (or the lower the degree of irreversibility).

The lower part of Table 9.3 shows the frequency distribution of the resale price as percentage of the purchase price. Notably, all the respondents reported that used rice-milling machinery is worth something because none of them confirmed a zero resale price. However, a large portion of the sample revealed that the resale price was not so high. Fifty per cent of the sample reported the resale price would be between 1 and 50 per cent of its purchase price; 44.6 per cent of the sample thought that their used machinery could get a price between 51 and 75 per cent of its purchase price; and only 5.4 per cent of the sample could think of a price of more than 75 per cent of its purchase price.

9.4.4 *Proxy for irreversibility of used rice-milling machinery*

As noted we asked Question 28 and Question 29 separately because combining them, like what Guiso and Parigi (1999) did, produces so many possibilities that the respondents may find it very difficult to answer.[151] However, the separation has its shortcoming. Suppose one rice miller gives "*not so easy to resell*" to Question 28 and "10-50 *per cent*" to Question 29, and another rice miller gives "*not so easy to resell*" to Ques-

[151] In this case, it is very likely that the respondent refuse to give answers.

tion 28 and "51-75 *per cent*" to Question 29. If only the answers to Question 28 are examined, both rice millers will be thought of as facing the same degree of irreversibility. This may be misleading because rice millers also consider the resale prices of their rice-milling machinery. Since the resale prices are different for these two rice millers, their machinery will not have the same degree of irreversibility. However, using only the resale price to measure irreversibility makes the degrees of irreversibility encountered by the former rice miller largely different from that encountered by the latter. This difference may not be reasonable. Therefore, an appropriate irreversibility variable should be able to encompass both above-mentioned aspects of irreversibility.

Since neither of the two variables can be the appropriate irreversibility proxy separately, we derive our proxy for irreversibility using these two variables simultaneously. A simple way of coming up with one variable that may cover both aspects of irreversibility is to take the average of the two variables. Here, we follow a bit more sophisticated approach by performing a principal components analysis of the two. The procedure that we apply to construct our proxy for irreversibility as follows:

- First, for each RM we code the possibility to resell used rice-milling machinery and the resale price (as a percentage of the purchase price) as dummy variables (see Column [2] of Table 9.3). Then, each RM has two dummy irreversibility variables, *i.e.*, *REV*1 (the possibility to resell rice-milling machinery) and *REV*2 (the resale price of rice-milling machinery).
- Second, we use the principal components technique to construct our irreversibility variable based on *REV*1 and *REV*2. We name this new irreversibility variable as *REV* and use it in the empirical study of this chapter.[152]

  In general, the principal components technique is a technique that helps to construct a variable out of correlated variables. If these variables are correlated, using all of them may be redundant. The new variable is actually a kind of a weighted average of the variables in consideration, and it can pick up most of the essence of these variables.

  *REV*1 and *REV*2 appear to be correlated with each other. The correlation coefficient between these two variables is 0.18. It is understandable that *REV*1 and *REV*2 are positively correlated because one can imagine that a used rice-milling machine that is difficult to be resold may not be resold at a high price. We think that this positive correlation coefficient is sufficient to guarantee the use the principal components technique to construct our irreversibility variable. A descriptive statistics of *REV* is given in Table 9.4.

[152] In Appendix 9.2, we replace *REV* by *REV*1 and *REV*2 in order to test if the results found using *REV* are robust.

9.5 Results and discussions

In this section, we first study the effect of uncertainty on investment for the entire sample in Subsection 9.5.1. Afterwards, we investigate the variation of the investment-uncertainty relationship with regard to the degree of uncertainty and the degree of irreversibility in Subsections 9.5.2 and 9.5.3, respectively. We will go further to examine how competition and size affect the investment-uncertainty relationship in Subsection 9.5.4 and Subsection 9.5.5, respectively. The analysis in the remainder of this chapter employs the ordinary least squares technique.

9.5.1 *Entire sample*

Model specification

In this subsection, we use the following specification:

$$I_t = \alpha_1 + \alpha_2 \cdot UNCER + \alpha_3 \cdot REV + \alpha_4 \cdot PRO_{t-1} + \alpha_5 \cdot SAL_{t-1} + \alpha_6 \cdot BOR_{t-1} \quad (9.1)$$

where:

- I_t, *i.e.*, the dependent variable, represents total planned investment (see Subsection 7.3.7 of Chapter 7) divided by total fixed assets in 1999.
- *UNCER* is the uncertainty variable, which can be either *CEV* or *DEVAS*. Based on the arguments of the real options approach to investment, we expect that α_2 is negative.
- *REV* is the (ir)reversibility variable (see Subsection 9.4.4). This variable is included based on the hypothesis that uncertainty may have a negative effect on firm investment in the presence of irreversibility. We expect α_3 to be positive.
- $PRO_{t\text{-}1}$ is the profit realised at the end of 1999 divided by total fixed assets in 1999. The inclusion of this variable is suggested by the outcome in Chapter 8 that private rice millers are financially constrained. We expect α_4 to be positive because we assume that planned investment of a rice miller is also positively sensitive to its internal funds.
- $SAL_{t\text{-}1}$ is sales in 1999 divided by total fixed assets in 1999. This variable helps to control for investment opportunities. α_5 should be positive.
- Finally, $BOR_{t\text{-}1}$ is the amount of money that the rice millers borrowed in 1999 divided by total fixed assets in 1999. α_6 is also expected to be positive because rice millers may plan their investment based on the amount of money that they borrow currently.

Results and discussions

In this subsection, we investigate the investment-uncertainty relationship for the entire sample using Specification (9.1). The technique that we use is ordinary least squares. Descriptive statistics of the variables used in this subsection are given in Table 9.4.

Table 9.4 Descriptive statistics of variables: entire sample

Variables	*Mean*	*St. dev.*	*Skewness*	*Kurtosis*	*Obs.*
I_t	0.101	0.196	4.158	28.900	204
CEV	0.173	0.138	3.476	14.420	204
DEVAS	0.171	0.160	2.531	9.609	204
*REV*1	2.029	0.383	0.297	3.878	204
*REV*2	2.529	0.556	0.403	0.888	204
REV	0.0003	0.561	0.497	0.410	204
$PRO_{t\text{-}1}$	0.143	0.129	1.508	3.818	204
$SAL_{t\text{-}1}$	1.069	0.740	0.833	0.134	204
$BOR_{t\text{-}1}$	0.110	0.213	3.820	22.270	204

Source: Own survey in 2000.

Table 9.5 shows the outcomes of the empirical investigation with the uncertainty variable being *CEV* (Column [2]) and *DEVAS* (Column [3]). We first discuss the outcome in Column [2]. This outcome shows that the uncertainty variable (*CEV*) has a significantly negative coefficient at the 5 per cent level. Column [2] also discloses a positive relationship between reversibility and investment of rice millers: the reversibility variable (*REV*) has a significantly positive coefficient at the 1 per cent level; this would mean a negative relationship between irreversibility and investment. These outcomes suggest that uncertainty reduces RMs' investment in the presence of irreversibility, as predicted by the real options approach to investment. Profit in 1999 ($PRO_{t\text{-}1}$) has a significantly positive coefficient at the 10 per cent level, implying the importance of internal funds to planned investment. Sales in 1999 ($SAL_{t\text{-}1}$) has a positive effect on investment because it has a significant coefficient at the 1 per cent level. Borrowing in 1999 ($BOR_{t\text{-}1}$) also has a positive coefficient at the 1 per cent level.

In Columns [3] of Table 9.5 we use the *DEVAS* instead of the *CEV*. The aim of this replacement is to test the robustness of the previous finding. This column shows that all the coefficients have the same signs as those in Columns [2], and they all remain significant. These results appear to support the previous finding.

Table 9.5 Uncertainty and investment of rice millers
Dependent variable: Ratio of planned investment for 2000 and 2001 to total fixed assets in 1999

[1]	*UNCER = CEV* [2]	*UNCER = DEVAS* [3]
Constant	0.0310	-0.0075
	(1.1357)	(-0.3485)
UNCER	-0.2180**	-0.3546***
	(-2.5219)	(-3.6395)
REV	0.0780***	0.0788***
	(3.7074)	(3.8072)
PRO_{t-1}	0.2122**	0.2273**
	(2.0507)	(2.2298)
SAL_{t-1}	0.0397**	0.0933***
	(2.1726)	(4.2402)
BOR_{t-1}	0.3144***	0.3316***
	(5.6351)	(6.0064)
N	204	204
R^2	0.285	0.308

Note: * significant at the 10 per cent level; ** significant at the 5 per cent level; and *** significant at the 1 per cent level. *CEV* = the coefficient of variation of the expected sales; *DEVAS* = the subjective standard deviation of the expected sales divided of total fixed assets; *REV* = the reversibility variable; PRO_{t-1} = profit in 1999; SAL_{t-1} = the sales in 1999 variable; and BOR_{t-1} = borrowing in 1999.

In sum, we find that given the presence of the irreversibility of rice-milling machinery the uncertainty with respect to future sales does have a negative effect on investment of private rice millers in the MRD. Since the uncertainty discourages investment of private rice millers, it may hold back them from expanding and adopting better rice-milling technology. Thus, apart from financial market imperfections (see Chapter 8) the uncertainty provides another explanation for the observation that in Vietnam rice milling is done by a number of small RMs using obsolete, inefficient machinery (see Chapter 1).

9.5.2 *High uncertainty versus low uncertainty*

In this subsection, we will test the hypothesis that the uncertainty only has an adverse effect on investment of private rice millers in the MRD if its magnitude reaches a certain level. There is a reason behind this hypothesis. For a given rice miller, if the uncertainty is sufficiently low, it would mean that according to him/her the probabilities

associated with the expectation that the future sales of his/her business will fall down to extreme levels is very low. One can imagine that if this is the case, the uncertainty is not likely to come into the investment decisions of the rice miller. In contrast, the rice miller definitely takes the uncertainty into account if the degree of the uncertainty is high because he/she wants to avoid making costly irreversible decisions. Then, the uncertainty may adversely affect the rice miller's investment as usually explained in the literature.[153]

In this subsection, we divide the sample according to the median of *CEV*.[154] The high-uncertainty group consists of rice millers that have a *CEV* equal or larger than the sample's median. This group (consisting of 103 rice millers) accounts for around 51 per cent of the sample's population. The low-uncertainty group (101 rice millers), including all rice millers having *CEV* smaller than the sample's median, makes up the remaining 49 per cent. Table 9.6, which gives descriptive statistics of the variables we use in this subsection, shows that the planned investment was largely different across these two groups of rice millers. The planned investment ratio (I_t) of the former group was of 0.070, and the corresponding figure for the latter group was of 0.132. The difference in these two investment rates is significant. This hints to this point that the degree of uncertainty may affect investment of rice millers.

We are to test the above-mentioned hypothesis. Table 9.7 shows the finding with the uncertainty variable being the *CEV*. Columns [2] and [3] of Table 9.7 lend support to our hypothesis on the difference of the investment-uncertainty relationship between the two groups of rice millers. The first impression is that investment of low-uncertainty rice millers is not significantly correlated with the uncertainty variable (*CEV*): the *CEV* has no significant coefficient (Column [2]). The reversibility variable (*REV*) has a significant positive coefficient at the 5 per cent level (Column [2]). Similarly, profit in 1999 ($PRO_{t\text{-}1}$) has a significant coefficient at the 5 per cent level. Sales in 1999 ($SAL_{t\text{-}1}$) does not a have significant coefficient. Borrowing in 1999 ($BOR_{t\text{-}1}$) has a significant coefficient at the 1 per cent level.

[153] Some studies on the uncertainty-investment relationship, *e.g.*, Sarkar (2000), Bo (2001), show that this relationship can be described with an inverted U-curve. An inverted U-curve relationship between uncertainty and investment means that low uncertainty has a positive effect on firm investment, and high uncertainty has a negative effect on firm investment. This may be explained if one assumes that there is a sort of risk-loving behaviour over the domain of small losses. However, in the context of private RMs on which our study focuses we do not have any reason to believe in this assumption.

[154] We divide the sample according to median since the median, but not the mean, allows for subsamples with relatively even populations. The median of the sample is 0.141.

Table 9.6. Descriptive statistics of variables: high and low uncertainty

Variables	*Mean*	*St. dev.*	*Skewness*	*Kurtosis*	*Obs.*
		High-uncertainty group			
I_t	0.070	0.136	2.554	7.392	103
CEV	0.235	0.169	2.726	7.520	103
REV	0.021	0.563	0.402	-0.445	103
PRO_{t-1}	0.150	0.126	1.488	3.144	103
SAL_{t-1}	0.993	0.715	0.875	0.250	103
BOR_{t-1}	0.120	0.194	2.282	6.354	103
		Low-uncertainty group			
I_t	0.132	0.239	3.930	23.880	101
CEV	0.110	0.037	-2.280	4.327	101
REV	-0.021	0.563	0.603	-0.304	101
PRO_{t-1}	0.136	0.133	1.564	4.675	101
SAL_{t-1}	1.146	0.761	0.791	0.056	101
BOR_{t-1}	0.100	0.231	4.872	31.00	101

Source: Own survey in 2000.

Table 9.7 Investment-uncertainty relationship and degree of uncertainty

Dependent variable: Ratio of planned investment 2000 and 2001 to total fixed assets in 1999

	Low uncertainty	*High uncertainty*
[1]	[2]	[3]
Constant	-0.0122	0.0241
	(-0.1718)	(0.8737)
CEV	0.0525	-0.1157*
	(0.0984)	(-1.6452)
REV	0.0790**	0.0665***
	(2.2141)	(3.1361)
PRO_{t-1}	0.3800**	-0.0010
	(2.3618)	(-0.0088)
SAL_{t-1}	0.0350	0.0632***
	(1.2409)	(3.0220)
BOR_{t-1}	0.4849***	0.0757
	(5.6132)	(1.2187)
N	101	103
R^2	0.362	0.275

Note: * significant at the 10 per cent level; ** significant at the 5 per cent level; and *** significant at the 1 per cent level.
CEV = the coefficient of variance of the expected sales; *REV* = the reversibility variable; PRO_{t-1} = profit in 1999; SAL_{t-1} = the sales in 1999 variable; and BOR_{t-1} = borrowing in 1999.

The story is different for the group of private rice millers that face a high degree of uncertainty. The uncertainty variable (*CEV*) has a negatively significant coefficient at the 10 per cent level (Column [3]). This means that if uncertainty is high, it will affect investment negatively. As anticipated, the reversibility variable (*REV*) has a significant positive coefficient at the 1 per cent level. Profit in 1999 ($PRO_{t\text{-}1}$) has no significant coefficients. Sales in 1999 ($SAL_{t\text{-}1}$) has a significant coefficient at the 1 per cent level. Borrowing in 1999 ($BOR_{t\text{-}1}$) has no significant coefficient.

9.5.3 *High irreversibility versus low irreversibility*

As revealed in Chapter 6, irreversibility may play an important role in generating the negative effect of uncertainty on investment. In subsection 9.5.1, we find that under the presence of irreversibility uncertainty has a negative effect on investment of rice millers. However, it has not been shown how the degree of irreversibility affects the uncertainty-investment relationship. Since higher irreversibility makes it more difficult for rice millers to get rid of their used machinery, irreversibility may exacerbate the negative relationship between uncertainty and investment. In this subsection, we investigate the connection between the degree of irreversibility and the uncertainty-investment relationship. In order to do this, we test the following specification:

$$\begin{aligned} I_t &= \alpha_1 + \alpha_2 \cdot UNCER + \alpha_3 \cdot UNCER \times REV + \\ &+ \alpha_4 \cdot PRO_{t-1} + \alpha_5 \cdot SAL_{t-1} + \alpha_6 \cdot BOR_{t-1} \end{aligned} \tag{9.3}$$

By differentiating Specification (9.3) with respect to *UNCER*, we get:

$$\frac{\partial I_t}{\partial UNCER} = \alpha_2 + \alpha_3 \cdot REV \tag{9.4}$$

Expression (9.4) divulges that the degree of irreversibility affects the sensitivity of investment to uncertainty. We expect that $\alpha_2 < 0$ and $\alpha_3 > 0$. If this is the case, as the degree of reversibility increases, investment becomes less negatively sensitive to uncertainty. Table 9.8 shows the findings with the uncertainty variable being *CEV* and *DEVAS*, respectively.

Table 9.8 shows that both uncertainty variables (*CEV* and *DEVAS*) have a significantly negative effect on investment at the 5 per cent level. As expected, the interactive term (*UNCER***REV*) has a significant, positive coefficient at the 5 per cent level in both Columns [2] and [3]. All the other variables have significant coefficients with expected signs. This finding suggests that irreversibility increases the negative

effect of uncertainty on investment.

Table 9.8 Investment-uncertainty relationship and irreversibility
Dependent variable: Ratio of planned investment 2000 and 2001 to total fixed assets 1999

	UNCER = CEV	*UNCER = DEVAS*
[1]	[2]	[3]
Constant	0.0250	-0.0127
	(0.8970)	(-0.5821)
UNCER	-0.1939**	-0.3098**
	(-2.1728)	(-3.0970)
*UNCER*REV*	0.2547**	0.2541**
	(2.4032)	(3.0491)
$PRO_{t\text{-}1}$	0.2229**	0.2119**
	(2.1147)	(2.0412)
$SAL_{t\text{-}1}$	0.0391**	0.0902***
	(2.0942)	(4.0440)
$BOR_{t\text{-}1}$	0.3295***	0.3567***
	(5.7988)	(6.3692)
N	204	204
R^2	0.257	0.291

Note: * significant at the 10 per cent level; ** significant at the 5 per cent level; and *** significant at the 1 per cent level.
CEV = the coefficient of variation of the expected sales; *DEVAS* = the subjective standard deviation of the expected sales divided by total fixed assets; *REV* = the reversibility variable; $PRO_{t\text{-}1}$ = profit in 1999; $SAL_{t\text{-}1}$ = the sales in 1999 variable; and $BOR_{t\text{-}1}$ = borrowing in 1999.

9.5.4 *Competition*

As we have discussed in Chapter 6, competition may affect the investment-uncertainty relationship. The main argument emerging from the discussion in Chapter 6 is that since competition may induce firms to invest quickly so as to preempt competitors, it contributes to reducing the adverse effect of uncertainty on firm investment.

Before testing this argument using the data set, we like to reveal that the degree of competition may vary across private rice millers. There may be some kinds of private rice millers that face less competition. One probably includes those rice millers producing rice for home consumption (of farming households); they face less competition because farming households usually choose those rice millers located nearby. Another may consist of those rice millers producing cargo rice for the traders who prefer not to change suppliers because doing so would result in high search and transportation costs for them. The last one regards those rice millers specializing in polishing

and supplying milled rice directly to rice exporters, *i.e.*, pure polishers and millers-cum-polishers; since it is often difficult for rice exporters to locate polishers capable of providing rice qualified for export and also difficult for polishers to find exporters, who are few, both of them want to maintain the relationships that have been established.[155] Other private rice millers may face higher competition because they do not have such special relationships.

Since it is not possible for us to directly identify rice millers with respect to the degree of competition, we assume that those rice millers whose sales decrease as they increases their output prices will face higher degrees of competition than those whose sales increase or remain unchanged as they increase their output prices. Our data set records information on those rice millers having decreasing sales as they raise their output price and on those rice millers having increasing or unchanged sales as they increase their output price. The former group, which we called high-competition group includes 67 rice millers, accounting for 32.8 per cent of the sample's population. The low-competition group consists of 137 rice millers and makes up 67.2 per cent. Table 9.9 gives descriptive statistics of the variables used in this subsection with regard to these two groups of rice millers.

Table 9.9 Descriptive statistics of variables: high and low competition

Variables	*Mean*	*St. dev.*	*Skewness*	*Kurtosis*	*Obs.*
		High-competition group			
I_t	0.049	0.111	3.005	10.330	67
CEV	0.185	0.158	2.351	6.278	67
REV	-0.034	0.502	-0.101	-1.840	67
PRO_{t-1}	0.125	0.129	1.517	6.158	67
SAL_{t-1}	0.830	0.662	1.317	1.413	67
BOR_{t-1}	0.109	0.212	2.678	7.748	67
		Low-competition group			
I_t	0.126	0.222	3.830	24.030	137
CEV	0.168	0.127	4.413	23.160	137
REV	0.017	0.590	0.649	-0.196	137
PRO_{t-1}	0.152	0.129	1.547	2.999	137
SAL_{t-1}	1.178	0.748	0.691	-0.020	137
BOR_{t-1}	0.111	0.214	4.375	29.510	137

Source: Own survey in 2000.

[155] Regarding other Vietnamese enterprises, McMillan and Woodruff (1999) give an identical argument: "… the product is specialized and not available in the market so both the enterprise and its customers have to depend on each other…"

Table 9.10 shows the result of the test. It reveals that for the low-competition group the uncertainty variable (*CEV*) has a significant negative coefficient at the 1 per cent level. In addition, the irreversibility variable (*REV*) has a significant positive effect at the 1 per cent level. Profit in 1999 ($PRO_{t\text{-}1}$), sales in 1999 ($SAL_{t\text{-}1}$), and borrowing in 1999 ($BOR_{t\text{-}1}$) all have significant coefficients with expected signs.

It appears that the negative effect of uncertainty on investment is absent for the high-competition group: the uncertainty variable (*CEV*) has no significant coefficient while all the other variables have insignificant coefficients.

Table 9.10 Investment-uncertainty relationship and competition

Dependent variable: Ratio of planned investment 2000 and 2001 to total fixed assets 1999 (I_t)

	Low competition	*High competition*
[1]	[2]	[3]
Constant	0.0183	0.0569**
	(0.4895)	(2.0033)
CEV	-0.3365***	-0.0709
	(-2.7772)	(-0.8073)
REV	0.0762***	0.0396
	(2.9948)	(1.3803)
$PRO_{t\text{-}1}$	0.4096***	0.0476
	(3.0878)	(0.3813)
$SAL_{t\text{-}1}$	0.0400*	-0.0041
	(1.7306)	(-0.1674)
$BOR_{t\text{-}1}$	0.4807***	0.0370
	(6.8492)	(0.5314)
N	137	67
R^2	0.416	0.052

Note: * significant at the 10 per cent level; ** significant at the 5 per cent level; and *** significant at the 1 per cent level.
CEV = the coefficient of variance of sales; *REV* = the reversibility variable; $PRO_{t\text{-}1}$ = profit in 1999; $SAL_{t\text{-}1}$ = the sales in 1999 variable; and $BOR_{t\text{-}1}$ = borrowing in 1999.

In sum, the finding in this subsection only shows that investment of the group of private rice millers who face low competition is negatively affected by uncertainty, and there is no clear conclusion for the other group. Since this finding implies that uncertainty, together with low competition, holds back pure polishers and millers-cum-polishers, who actually own and may be more able to acquire better rice-milling technology, from investing, it probably provides an explanation for the observation that better rice-milling technology has been absent in Vietnam (Chapter 1).

9.5.5 *Large RMs versus small RMs*

As discussed in Chapter 6, there are few studies that investigate the link between firm size and the investment-uncertainty relationship. These studies have come up with different findings about this link. Inspired by these studies, we devote this subsection to examining if the effect of uncertainty on investment varies with firm size in the context of private RMs in the MRD. In this subsection, we partition the sample into two groups: (i) large-RM group, which includes all RMs having total fixed assets in 1999 of VND 400 million or larger, and (2) small-RM group, which includes all the remaining RMs. Table 9.11 gives descriptive statistics of the variables used in this subsection with respect to these two groups of RMs.

Table 9.11 Descriptive statistics of variables: large and small RMs

Variables	*Mean*	*St. dev.*	*Skewness*	*Kurtosis*	*Obs.*
		Large RMs			
I_t	0.063	0.106	1.808	2.382	96
CEV	0.181	0.139	3.711	18.310	96
REV	0.007	0.535	0.363	-0.705	96
PRO_{t-1}	0.114	0.097	0.875	1.059	96
SAL_{t-1}	0.935	0.704	1.119	0.999	96
BOR_{t-1}	0.096	0.147	1.704	2.670	96
		Small RMs			
I_t	0.135	0.246	3.557	19.830	108
CEV	0.167	0.137	3.310	11.500	108
REV	-0.006	0.587	0.596	-0.223	108
PRO_{t-1}	0.169	0.148	1.393	2.881	108
SAL_{t-1}	1.187	0.754	0.634	-0.220	108
BOR_{t-1}	0.123	0.258	3.719	18.530	108

Source: Own survey in 2000.

Columns [2] and [3] of Table 9.12 report the finding on the variation in the effect of uncertainty on investment across the two size groups of RMs. As for the large-RM group, the uncertainty variable has no significant coefficient although the coefficient has the expected negative sign. The reversibility variable (*REV*) has a significant positive coefficient at the 5 per cent level. Sales in 1999 (SAL_{t-1}) also has a significant coefficient at the 1 per cent level, implying that sales as a variable controlling investment opportunities is important for large RMs' investment.

The story is remarkably different for small RMs. The uncertainty variable has (*CEV*) a significantly negative coefficient at the 10 per cent level. Similarly, the reversibility variable (*REV*) has a significant coefficient at 1 per cent level. Both profit

in 1999 (PRO_{t-1}) and sales in 1999 (SAL_{t-1}) have significantly positive coefficients at the 10 per cent level. Borrowing in 1999 (BOR_{t-1}) has a significant coefficient at the 1 per cent level.

The findings suggest that uncertainty is harmful for small RMs while it is not the case for large RMs. In Vietnam, large RMs tend to have direct connections with a wider range of clients than small RMs. Although these direct connections do not eliminate uncertainty, they enable large RMs to diversify risk and may thus reduce the adverse effect of uncertainty on their investment.

Table 9.12 Investment-uncertainty relationship and firm size
Dependent variable: Ratio of planned investment 2000 and 2001 to total fixed assets 1999

	Large RMs	*Small RMs*
[1]	[2]	[3]
Constant	0.0432*	0.0284
	(1.7335)	(0.6449)
CEV	-0.0204	-0.2686*
	(-0.2589)	(-1.9240)
REV	0.0382**	0.1114***
	(1.9401)	(3.4174)
PRO_{t-1}	-0.0739	0.2440*
	(-0.6402)	(1.6292)
SAL_{t-1}	0.0445***	0.0507*
	(2.6962)	(1.7155)
BOR_{t-1}	-0.1080	0.4101***
	(-1.4597)	(5.5405)
N	96	108
R^2	0.137	0.392

Note: * significant at the 10 per cent level; ** significant at the 5 per cent level; and *** significant at the 1 per cent level.
CEV = the coefficient of variance of sales; *REV* = the reversibility variable; PRO_{t-1} = profit in 1999; SAL_{t-1} = the sales in 1999 variable; and BOR_{t-1} = borrowing in 1999.

9.7 Conclusions

This chapter finds that the uncertainty with respect to the future sales has a negative effect on irreversible investment of private rice millers in the MRD. This finding can be explained by referring to the real options approach to investment: firms in general may delay investment to wait for more information because of irreversibility and thanks to the flexibility regarding their investment decisions; this may also be applicable to private rice millers in the MRD. In addition, the irreversibility stemming from

the co-movement of the rice milling industry, the specificity of the rice-milling machinery, and the absence of a formal market for used milling machinery may add to the negative relationship between uncertainty and investment of private rice millers. Since rice millers may view that irreversibility would be binding in the future, they plan to invest less and/or later.

This chapter also reveals that the investment-uncertainty relationship varies depending on the degree of uncertainty. We find that investment of rice millers who encounter low uncertainty does not appear to be sensitive to uncertainty, and investment of rice millers facing high uncertainty is adversely affected by uncertainty. This is because low uncertainty may not come into the investment decisions of the rice millers, but they must consider the uncertainty if it is high in order to avoid making costly irreversible investment decisions. Then, the uncertainty will have a negative effect on investment of the rice millers. We also discover that the negative effect of uncertainty on investment increases with the degree of irreversibility. This may be understandable because the higher the degree of irreversibility, the more difficult the resale of the used milling machinery and/or the lower the resale price.

As argued in the literature, competition may play a role in shaping the relationship between investment and uncertainty. We find that investment of rice millers who encounter a high degree of competition is not correlated with uncertainty while investment of the others is. Investment of rice millers who face a higher degree of competition is not affected by uncertainty because these rice millers may have to invest to preempt competitors.

Finally, this empirical study investigates the link between size of RMs and the uncertainty-investment relationship. This study finds that the uncertainty has an adverse effect on the investment of small RMs but not on that of large RMs. Our explanation is that large RMs may manage to avoid the effect of uncertainty due to their direct connections with a wider range of clients established through their business relationships. Since small RMs may not have such connections, the negative effect of uncertainty on their investment is present.

Appendix 9.1 **Calculating uncertainty variables**

This appendix provides a quick reference of how we calculate our uncertainty variables. The uncertainty variables include *CEV* and *DEVAS*. These variables are calculated from our survey data as follows:

a. *Calculating the mean and variance of the expected growth rate of sales*

The mean of the growth rate of the sales (*CM*) is given by:

$$CM = \frac{\sum_{i=1}^{n} x_i p_i}{\sum_{i=1}^{n} p_i} \tag{9.5}$$

For example, if a respondent anticipates that in 2001 sales would increase by 5 per cent (x_1) at a probability of 0.2 (p_1) and by 15 per cent (x_2) at a probability of 0.8 (p_2) as compared with sales in 1999 (SAL_{1999}), then

$$CM_{2001} = \frac{\sum_{i=1}^{n} x_i p_i}{\sum_{i=1}^{n} p_i} = \frac{5 \times 0.2 + 15 \times 0.8}{0.2 + 0.8} = 13\%.$$

The variance of the growth rate of sales (*CV*) is given by:

$$CV = \frac{\sum_{i=1}^{n} (x_i - CM)^2 \times p_i}{\sum_{i=1}^{n} p_i} \tag{9.6}$$

Using the above information, we can calculate the variance of the growth rate of sales as follows:

$$CV_{2001} = \frac{\sum_{i=1}^{n}(x_i - CM)^2 \times p_i}{\sum_{i=1}^{n} p_i} = \frac{(5-13)^2 \times 0.2 + (15-13)^2 \times 0.8}{0.2 + 0.8} = 14.4\% .$$

b. *Calculating the mean, the variance, and the standard deviation of the expected sales*

The mean of the expected sales is given by:

$$E(SAL_{2001}) = (1 + CM) \times SAL_{1999} \tag{9.7}$$

The variance of the expected sales is given by:

$$VAR(SAL_{2001}) = CV \times SAL_{1999}^2 \tag{9.8}$$

The standard deviation of the expected sales is given by:

$$DEV(SAL_{2001}) = \sqrt{VAR(SAL_{2001})} \tag{9.9}$$

Assume that SAL_{1999} = 100, then

$$E(SAL_{2001}) = (1 + 0.13) \times 100 = 113$$

$$VAR(SAL_{2001}) = 0.144 \times 100^2 = 1{,}440$$

$$DEV(SAL_{2001}) = \sqrt{VAR(SAL_{2001})} = \sqrt{1{,}440} = 38 .$$

c. *Calculating the coefficient of variation of the expected sales*

The coefficient of variation of the expected sales is given by:

$$CEV = \frac{\sqrt{VAR(SAL_{2001})}}{E(SAL_{2001})} = \frac{DEV(SAL_{2001})}{E(SAL_{2001})} \tag{9.10}$$

Based on the above information, we have:

$$CEV = \frac{\sqrt{VAR(SAL_{2001})}}{E(SAL_{2001})} = \frac{\sqrt{1{,}440}}{113} = 33.6\% .$$

d. *Calculating DEVAS*

DEVAS (in a certain year) is given by:

$$DEVAS = \frac{DEV(SAL)}{FA}$$

where: *FA* stand for total fixed assets.

The greater the value of these uncertainty variables (*i.e.*, *CEV* and *DEVAS*), the higher the degree of uncertainty is.

Appendix 9.2 **Robustness of the irreversibility proxies**

As revealed in the literature, irreversibility is one of important factors that influence the investment-uncertainty relationship. Therefore, it is essential to select proper irreversibility variable. In this chapter, we have used *REV* as the measure of irreversibility facing private rice millers in the MRD. We like to test the robustness of this measure by introducing alternative measures of irreversibility. The result of the test is shown in Table 9.13.

Table 9.13 shows that all the signs and magnitudes of the coefficients remain nearly the same when these two irreversibility variables are used. This suggests that using *REV* to study investment of private rice millers is plausible.

Table 9.13 Uncertainty and investment of rice millers

Dependent variable: Ratio of planned investment 2000 and 2001 to total fixed assets in 1999

[1]	[2]	[3]
Constant	-0.0807	-0.1616***
	(-3.6212)	(-2.6848)
CEV	-0.2258**	-0.2190**
	(-2.5458)	(-2.5286)
*REV*1	0.0549*	
	(1.7184)	
*REV*2		0.0760***
		(3.5661)
PRO_{t-1}	0.2177**	0.2179**
	(2.0431)	(2.1020)
SAL_{t-1}	0.0383**	0.0399**
	(2.0388)	(3.1752)
BOR_{t-1}	0.3367	0.3110***
	(5.8490)	(5.5529)
N	204	204
R^2	0.248	0.282

Note: * significant at the 10 per cent level; ** significant at the 5 per cent level; and *** significant at the 1 per cent level. *CEV* = the coefficient of variation of the expected sales; *REV*1 = the reversibility variable 1; *REV*2 = the reversibility variable 2 (see Section 9.4); PRO_{t-1} = profit in 1999; SAL_{t-1} = the sales in 1999 variable; and BOR_{t-1} = borrowing in 1999.

PART FOUR

Conclusions, recommendations and further research

Chapter 10

Conclusions, recommendations and further research

10.1 Introduction

This chapter serves to draw conclusions about the factors that affect investment of private rice millers in the MRD according to the findings in the previous chapters of this dissertation (Section 10.2). These conclusions will be translated into recommendations that may contribute to boosting investment of private rice millers in the MRD (Section 10.3). Finally, Section 10.4 tries to propose some suggestions for further research.

10.2 Conclusions

10.2.1 *Financial market imperfections and investment of private rice millers*

The Vietnamese government has carried out a number of reforms concerning the financial system since the onset of *doi moi*. The reforms have to some extent led to a diversification of the financial system. Nevertheless, the financial system in Vietnam remains shallow, inefficient and dominated by a few state-owned commercial banks. These banks have provided a substantial portion of their credit to SOEs according to the directives of the government. At the same time, they appear to overlook private enterprises. Foreign banks that operate in Vietnam face costly acquisition of financial information about private enterprises, which discourages them from lending to this

sort of enterprises. Domestic joint-stock commercial banks are weak and seem to be less able to serve private enterprises. Therefore, in many cases private enterprises may easily find themselves seeking credits from informal lenders. Yet, informal lenders have inadequate capacity of financing firm investment because of resource constraints. As a result, Vietnamese private enterprises have limited access to credit and thus have to rely on internal funds. This problem appears to be applicable to private RMs in the MRD as well.

The limited access to credit of private RMs is likely to be the cause of the significant sensitivity of their investment to internal funds. We find that the sensitivity of investment to internal funds varies across RMs of different sizes: investment of large private RMs is not sensitive to internal funds while investment of small private RMs exhibits a significant sensitivity to internal funds. This may be because access to credit is probably less constrained for large RMs than for small RMs since large RMs have more acceptable collateral, and the lenders face lower information and transaction costs in lending to large RMs.

According to the literature, investment of old firms may be less sensitive to internal funds than that of young firms. This is because the former are likely to have better access to credit due to longer lender-borrower relationships. We do not find evidence that would support this argument; our empirical study appears to reveal that the investment of both old and young private RMs does not exhibit any sensitivity to internal funds. The amount of money that old and young RMs borrowed and the number of contacts they have with lenders revealed by our data set seems to suggest that old RMs in the MRD do not have better access to credit than young RMs. This may help to explain why the above argument does hold for our sample.

In sum, there is empirical evidence on investment financing constraints regarding private RMs in the MRD. The evidence provides an explanation for the fact that in the MRD rice milling is done by a large number of small private RMs using backward, inefficient machinery. If private RMs continue using such rice-milling machinery, the loss rendered by the milling process will remain to be huge.

10.2.2 *Uncertainty and investment of private rice millers*

Apart from financial market imperfections, there is another factor that may affect investment of private rice millers, that is, market uncertainty. In general, private rice millers are uncertain about the development of the markets in which they sell their output. The causes of the uncertainty are the fluctuations of rice markets and the lack of information that private rice millers encounter. Given the presence of irreversibility of investment, the uncertainty appears to have an adverse effect on investment of private rice millers. This is due to the possibility that if uncertainty is present, rice millers

may wait for more information because once an investment is made, it is difficult to be reversed.

We find that the investment-uncertainty relationship varies according to the degree of uncertainty. Investment of private rice millers who encounter a low degree of uncertainty is not found to be sensitive to uncertainty. This is likely because if the degree of uncertainty is low, the uncertainty does not really bother private rice millers. However, if the degree of uncertainty is high, the rice millers will take it into account because they want to avoid making costly irreversible investment decisions. This finding means that uncertainty may not always negatively affect investment of private rice millers, but if its magnitude reaches a certain level, it may impede the investment.

As identified in the literature, irreversibility is an important factor that affects the investment-uncertainty relationship. Private rice millers in the MRD may face a high degree of irreversibility due to the specific nature of their assets, the absence of a secondary market for used rice-milling machinery, and the co-movement of their sales. Our empirical study finds that irreversibility affects the uncertainty-investment relationship: the higher the degree of irreversibility, the stronger the adverse effect of uncertainty on investment of private rice millers. If a rice miller perceives that there is only a little chance for him/her to resell his/her used machinery and/or the resale price of the machinery is too low, which means that the irreversibility facing the rice miller is of a high degree, he/she may be more inclined to postpone investment.

We also find that investment of private rice millers who encounter a high degree of competition does not appear to be correlated with the uncertainty variable while investment of those who experienced low competition does. This is because it may not be feasible for the rice millers who face a higher degree of competition to delay investments since if they do so, their competitors will take the best of the investment opportunity, leaving them with few chances of success.

Our study also analyses the relation between firm size and the uncertainty-investment relationship. We find that the uncertainty has an adverse effect on investment of small private RMs, but this is not the case for large private RMs. Large private RMs may manage to avoid such an adverse effect of the uncertainty thanks to their direct connections with a wide range of clients established through business relationships, which are likely to help them to diversify and reduce risks. Small RMs may not have such relationships.

In sum, the uncertainty with respect to future sales is found to have an adverse effect on investment of private rice millers in the MRD given the presence of irreversibility. Yet, the uncertainty has a negative effect on investment of private rice millers only if it reaches a certain degree and is ineffective if otherwise. We also find that the higher the irreversibility, the stronger the negative effect of uncertainty on investment. As expected, stronger competition appears to lessen the severity of the adverse effect of the uncertainty on investment of private rice millers. Finally, invest-

ment of small private RMs is found to be negatively affected by the uncertainty while that of large private RMs is not.

To close this section, it should be emphasized that the above-mentioned findings and conclusions are only indicative because of the weaknesses of the data set (*e.g.*, containing some estimates instead of exact figures) and the limitations of the empirical methodology that we have applied (such as exogenous splitting of the data set and the use of sales instead of the change of sales). Despite this, we were still able to provide intuitive explanations for all the findings. Therefore, we are convinced that the findings guarantee some worthwhile recommendations, as will be mentioned below.

10.3 **Recommendations**

10.3.1 *Improving access of private rice millers to credit*

As revealed, private rice millers mainly use internal funds to finance investment because their access to credit is limited. This type of investment behaviour is likely to be one of the causes of the inadequacy of investment in the rice-milling industry. Thus, one measure that can help to boost firm investment in this industry in order to get rid of the existing backward, inefficient machinery is to improve access of private rice millers to external finance, especially to bank credit. This recommendation regards three points:

- correcting the long-lasting weak incentives of the commercial banks, especially the state-owned ones, in terms of lending to private enterprises;
- improving property rights so that immovable property (such as land and buildings) can be more easily put up as collateral. In addition, since private rice millers may not own any or enough land or buildings to offer as collateral for loans, laws on movable property-based financing should be developed in order to help to get more credit available for private enterprises; and
- enhancing financial transparency from the side of private rice millers so as to alleviate the acute problem of information asymmetry between private rice millers and commercial banks. This can be done by requiring private rice millers have bookkeeping and to disclose information about their businesses.

If access to external finance is eased for private rice millers, this may contribute to increasing their investments, which may in turn lead to a growth of the rice-milling sector.

10.3.2 *Reducing uncertainty and irreversibility*

Since the uncertainty appears to have a significant adverse effect on investment of private rice millers, abating uncertainty is important for them. There may be some ways to do this, as will be suggested in the following.

One way to abate uncertainty for private rice millers is to assist them in finding partners. In this respect, a recent effort of the government in establishing the so-called "paddy and rice wholesaling marketplace" in the MRD is promising. This marketplace will first serve as a place where paddy/rice sellers and buyers can meet to trade their output. Moreover, through this marketplace information is also exchanged among sellers and buyers, which may helps them to come up with trade agreements.

One could also think about a futures market for paddy and rice, which will facilitate private rice millers and other rice-marketing agents to know better about the future demand for and price of paddy/rice. Yet, it should be borne in mind that such a futures market can only be developed when the paddy/rice market is standardised.

Finally, it would be good if the Vinafood 1 and the Vinafood 2 can act as public information agencies searching for market information and providing it to rice-marketing agents.

We also find that irreversibility is an important factor that causes the adverse effect of uncertainty on investment of private rice millers. Therefore, irreversibility should be reduced as much as possible. The "paddy and rice wholesaling marketplace" mentioned in the previous paragraph may also be a good solution to decreasing irreversibility facing private rice millers because of its ability to support the exchange of machinery-related information among private rice millers. In addition to this, a well-functioning market for used machinery may be another solution. If this market is in place, it would be easier for private rice millers to find buyers if they want to resell used machinery. The existence of this market may help to increase investment thanks to its capability of reducing irreversibility for private rice millers.

10.4 Suggestions for further research

In this dissertation, we find that both financial market imperfections and uncertainty appear to affect investment of private rice millers. The finding generates a background for explaining why in Vietnam backward, inefficient technology has been used in a number of small RMs. Apart from financial market imperfections and uncertainty, there may be other aspects, such as taxes and regulation, that can also affect investment of private rice millers. These aspects can be interesting topics for further studies on the determinants of investment of private rice millers in Vietnam. Lower tax, for instance, would contribute to triggering investment of private rice millers because

they can use the tax reduction to reinvest, other things being equal. If the regulation concerning access to real estate, land-use right, licensing, *etc*. is improved to create a better regulatory environment, it would also promote investment of private rice millers.

We believe that the findings in the empirical part of this dissertation is likely to hold for other Vietnamese private enterprises because they operate in the same economic and financial environment as the private rice millers covered in this dissertation. However, as this dissertation and also other studies have pointed out, uncertainty and financing constraints facing a certain enterprise depends on its characteristics and the market condition in which it operates. Therefore, similar studies done using information from other types of firms, *e.g.*, private textile and garment enterprises, would be useful in terms of improving the understanding of private-sector investment in Vietnam.

Finally, in this dissertation the effects of financial market imperfections and uncertainty are examined separately using information from the same set of private rice millers. Both factors exhibit significant effects on investment of private rice millers. Therefore, it can be understandable that a rice miller may at the same time encounter both financial market imperfections and uncertainty. The coexistence of financial market imperfections and uncertainty provokes some questions to be answered. Do these factors affect investment of rice millers independently or jointly? Do these factors intensify or mitigate each other's effect on investment of rice millers? Studies focussing on these issues may lead to interesting and relevant results. There are some studies that have tried to combine these issues, *e.g.*, Lensink and Sterken (2002), Bo, Lensink, and Sterken (2003).

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Questionnaire

Name of the RM: . . . . . established in: . . . . . .
Name of the interviewer: . . . . . Date: . . . . . / . . . . . / 2000.
RM's address: . . . . . Street: . . . . . Commune: . . . . . .
Village: . . . . . District/Town: . . . . . Province: . . . . . .
Phone number: . . . . . .

A. General information

1. Education level of the owner/manager: . . . . . ./12 or university [Yes / No].
2. Vocational training: *(specify number of training)* . . . . . .
3. Ownership: State-owned Private
4. Distance to nearest bank: . . . . . (in kilometer).
5. Activities

1.	Milling	*Y*	*N*	5.	Local rice trading	*Y*	*N*
2.	Polishing	*Y*	*N*	6.	Rice exporting	*Y*	*N*
3.	Paddy trading	*Y*	*N*	7.	By-product trading	*Y*	*N*
4.	Rice supplying to rice exporters	*Y*	*N*	8.	Other: *(specify)*	*Y*	*N*
***Note**: Y = Important (in terms of sales); N = Not important (in terms of sales).*							

6. Sources of funds for establishment

Sources	*Amount of money borrowed in VND*	*Interest rate* (*) (*per cent /month*)	*Duration* (*months*)	*Condition*	*Borrowing fee* (*VND* 1,000)
1. State-owned banks					
2. Non-state banks					
3. Moneylenders					
4. Friends, relatives					
5. Own capital					
6. Others:					
***Note**: * If interest rates cannot be specified, please write down the absolute amount of the interest payment.*					

7. Estimated value of fixed assets of the RM in 1998 and 1999 (VND million)

	Items	1998	1999		*Items*	1998	1999
1.	Milling machine			5.	Warehouse		
2.	Polisher			6.	Transportation means		
3.	Dryer			7.	Average inventory		
4.	Building			8.	TOTAL		

8. Sales (in VND million)

Milling		*Polishing*		*Own milled rice trade*		*Own by-product trade*		*Total*	
1998	1999	1998	1999	1998	1999	1998	1999	1998	1999

9. Investment and sources of funds for investment in 1998

No.	*Items*	*Invested amount (VND million) and sources*	*Interest rate (*) (%/month)*	*Duration (months)*	*Condition*	*Borrowing fee (VND1,000)*
1.	MILLING MACHINE	1. State-owned banks:				
		2. Non-state banks:				
		3. Moneylenders:				
		4. Friends, relatives:				
		5. Other rice millers:				
		6. Own capital:				
2.	POLISHER	1. State-owned banks:				
		2. Non-state banks:				
		3. Moneylenders:				
		4. Friends, relatives:				
		5. Other rice millers:				
		6. Own capital:				
3.	DRYER	1. State-owned banks:				
		2. Non-state banks:				
		3. Moneylenders:				
		4. Friends, relatives:				
		5. Other rice millers:				
		6. Own capital:				
4.	BUILDING	1. State-owned banks:				
		2. Non-state banks:				
		3. Moneylenders:				
		4. Friends, relatives:				
		5. Other rice millers:				
		6. Own capital:				
5.	WARE-HOUSE	1. State-owned banks:				
		2. Non-state banks:				
		3. Moneylenders:				
		4. Friends, relatives:				
		5. Other rice millers:				
		6. Own capital:				
6.	TRANS-PORTA-TION MEANS	1. State-owned banks:				
		2. Non-state banks:				
		3. Moneylenders:				
		4. Friends, relatives:				
		5. Other rice millers:				
		6. Own capital:				
7.	INVEN-TORY	1. State-owned banks:				
		2. Non-state banks:				
		3. Moneylenders:				
		4. Friends, relatives:				
		5. Other rice millers:				
		6. Own capital:				
***Note**: * If interest rates cannot be specified, please write down the absolute amount of the interest payment.*						

10. Investment and sources of funds for investment in 1999

No.	*Items*	*Invested amount* (*VND million*) *and source*	*Interest rate* (*) (*%/month*)	*Duration* (*months*)	*Condition*	*Borrowing fee* (*VND*1,000)
1.	MILLING MACHINE	1. State-owned banks:				
		2. Non-state banks:				
		3. Moneylenders:				
		4. Friends, relatives:				
		5. Other rice millers:				
		6. Own capital:				
2.	POLISHER	1. State-owned banks:				
		2. Non-state banks:				
		3. Moneylenders:				
		4. Friends, relatives:				
		5. Other rice millers:				
		6. Own capital:				
3.	DRYER	1. State-owned banks:				
		2. Non-state banks:				
		3. Moneylenders:				
		4. Friends, relatives:				
		5. Other rice millers:				
		6. Own capital:				
4.	BUILDING	1. State-owned banks:				
		2. Non-state banks:				
		3. Moneylenders:				
		4. Friends, relatives:				
		5. Other rice millers:				
		6. Own capital:				
5.	WARE-HOUSE	1. State-owned banks:				
		2. Non-state banks:				
		3. Moneylenders:				
		4. Friends, relatives:				
		5. Other rice millers:				
		6. Own capital:				
6.	TRANS-PORTA-TION MEANS	1. State-owned banks:				
		2. Non-state banks:				
		3. Moneylenders:				
		4. Friends, relatives:				
		5. Other rice millers:				
		6. Own capital:				
7.	INVEN-TORY	1. State-owned banks:				
		2. Non-state banks:				
		3. Moneylenders:				
		4. Friends, relatives:				
		5. Other rice millers:				
		6. Own capital:				
***Note**: * If interest rates cannot be specified, please write down the absolute amount of the interest payment.*						

11. How much do you plan to invest in 2000 and 2001 (in VND million) if you can borrow?

	Items	2000	2001		*Items*	2000	2001
1.	Milling machine			5.	Warehouse		
2.	Polisher			6.	Transportation means		
3.	Dryer			7.	Average inventory		
4.	Building			8.	TOTAL		

12. How much do you plan to invest in 2000 and 2001 (in VND million) if you cannot borrow?

	Items	2000	2001		*Items*	2000	2001
1.	Milling machine			5.	Warehouse		
2.	Polisher			6.	Transportation means		
3.	Dryer			7.	Average inventory		
4.	Building			8.	TOTAL		

13. How much was the profit of your business in:

1998: . . . . . VND million 1999: . . . . . VND million

14. Please specify which category was and will be profit of your rice mills as percentage of sales:

	Category	1998	1999	2000	2001		*Category*	1998	1999	2000	2001
1.	Negative					4.	6-15%				
2.	0-5%					5.	> 15%				

15. Please indicate the importance of the following factors to your investment decisions

	Items	*Importance to investment decisions*					
		Milling machine	*Polisher*	*Dryer*	*Ware-house*	*Building*	*Transpor-tation means*
1.	Access to bank loans	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹
2.	Interest rates of charged by banks	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹
3.	Collateral requested for bank loans	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹
4.	Access to loans by moneylenders	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹
5.	Interest rates charged by money-lenders	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹
6.	Unanticipated changes in output demand	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹
7.	Unanticipated changes in output price	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹
8.	Unanticipated changes in sales	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹
9.	Unanticipated changes in prices of milling and polishing	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹
10.	Unanticipated changes in input supply	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹
11.	Unanticipated in input price	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹	❶❷ ❸❹
***Note**: ❶ Unimportant; ❷ Not so important; ❸ Important; ❹ Very important.*							

B. Market conditions

16. If you raise milling or output prices, by how much would your sales change?

[ ] Increase by 0-1%	[ ] Increase by 1-5%	[ ] Increase by 5-10%	[ ] Increase by 10-25%	[ ] Increase by >25%
[ ] Decrease by 0-1%	[ ] Decrease by 1-5%	[ ] Decrease by 5-10%	[ ] Decrease by 10-25%	[ ] Decrease by >25%
[ ] Unchanged				

17. How many competitors do you have?

[ ] No	[ ] 1-5
[ ] 6-10	[ ] 11-15
[ ] 16-20	[ ] More than 20

C. Finance

18. How many times did you apply for loans in 1998 and 1999 from

	Number of times			*Number of times*			*Number of times*	
	1998	1999		1998	1999		1998	1999
1. State banks			3. Moneylenders			5. Other rice millers		
2. Non-state banks			4. Relatives, friends			6. Others: *(specify)*		

19. Please specify the reasons why you applied for loans from

No.	*Item*	*State banks*		*Non-state banks*		*Moneylenders*		*Relatives, friends*		*Other sources*	
1	Low interest rates	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*
2	Do not know any other possibility	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*
3	Do not have any other possibility	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*
4	Low borrowing fee	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*
5	No collateral requested	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*
6	Longer repayment period	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*
7	Personal relationship	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*
8	Nearby	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*
9	Other reasons: (specify)	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*
***Note**: Y = Yes; N = No*											

20. Please specify how many times your application was

Category	*State banks*	*Non-state banks*	*Moneylenders*	*Relatives and friends*	*Others*
1. totally accepted by					
2. partially accepted by					
3. totally turned down by					

21. Please specify the reasons why your application was turned down by

No	*Items*	*State banks*		*Non-state banks*		*Moneylenders*		*Relatives, friends*		*Other rice millers*	
1	Low profitability	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*
2	Unstable sales	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*
3	Unstable output price	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*
4	Lack of information	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*
5	Lack of collateral	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*
6	High risks	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*
7	Old machinery	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*
8	Poor management capability	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*
9	Lack of relationship	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*
10	Lack of management experience	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*
11	Poor past performance	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*
12	Other: *(Specify)*	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*
13	Do not know	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*
***Note**: Y = yes; N = no.*											

22. Borrowing and sources of funds in 1998

Sources	*Amount of money borrowed in VND million*	*Interest rate (*) (per cent /month)*	*Duration (months)*	*Condition*	*Borrowing fee (VND 1,000)*
1. State-owned banks					
2. Non-state banks					
3. Moneylenders					
4. Relatives, friends					
5. Other rice millers					
6. Others					
*Note: * If interest rates cannot be specified, please write down the absolute amount of the interest payment.*					

23. Borrowing and sources of funds in 1999

Sources	*Amount of money borrowed in VND million*	*Interest rate (*) (per cent/month)*	*Duration (months)*	*Condition*	*Borrowing fee (VND 1,000)*
1. State-owned banks					
2. Non-state banks					
3. Moneylenders					
4. Relatives, friends					
5. Other rice millers					
6. Others					
***Note**: * If interest rates cannot be specified, please write down the absolute amount of the interest payment.*					

24. What kind of information that you have to provide to the lenders in order to get the loans?

Items	*State banks*		*Non-state banks*		*Moneylenders*		*Relatives, friends*		*Other rice millers*	
1. Business plan	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*
2. Information about past profits	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*
3. Creditworthiness records	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*
4. Management experiences	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*
5. Others: *(specify)*	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*	*Y*	*N*
***Note**: Y = yes; N = no*										

25. Please specify how you were satisfied with the banking services and the loans contracts

Items	*Rank*	*Items*	*Rank*
General banking services		4. Speed of banking operations	❶❷❸❹
1. Arranging domestic payments	❶❷❸❹	5. Financial consulting	❶❷❸❹
2. Arranging foreign payments	❶❷❸❹	6. Access to short-term loans	❶❷❸❹
3. Arranging foreign exchanges	❶❷❸❹	7. Access to long-term loans	❶❷❸❹
The loan contracts			❶❷❸❹
1. Overall conditions of the loan	❶❷❸❹	5. Collateral requirements	❶❷❸❹
2. Value of the loan	❶❷❸❹	6. Transaction costs involved	❶❷❸❹
3. Interest rate	❶❷❸❹	7. Application procedure	❶❷❸❹
4. Repayment period	❶❷❸❹	8. Other *(specify)*	❶❷❸❹
***Note**: ❶ Bad; ❷ Not so bad; ❸ Good;* and *❹ Very good.*			

C. Uncertainty and Irreversibility

26. In 1999 how much did rice price, sales, and profit of your business change as compared to 1996 and 1998?

Intervals	*As compared to* 1996			*As compared to* 1998		
	Rice price	*Sales*	*Profit*	*Rice price*	*Sales*	*Profit*
Increase by 0-1%						
Increase by 1-5%						
Increase by 5-10%						
Increase by 10-25%						
Increase by > 25%						
Decrease by 0-1%						
Decrease by 1-5%						
Decrease by 5-10%						
Decrease by 10-25%						
Decrease by > 25%						

27. In which direction would the sales of your business change?

In one year (2001)				*In three year (2003)*			
Intervals	*Probability*			*Intervals*	*Probability*		
	Rice price	*Sales*	*Profit*		*Rice price*	*Sales*	*Profit*
Increase by 0-1%				Increase by 0-1%			
Increase by 1-5%				Increase by 1-5%			
Increase by 5-10%				Increase by 5-10%			
Increase by 10-25%				Increase by 10-25%			
Increase by >25%				Increase by >25%			
Decrease by 0-1%				Decrease by 0-1%			
Decrease by 1-5%				Decrease by 1-5%			
Decrease by 5-10%				Decrease by 5-10%			
Decrease by 10-25%				Decrease by 10-25%			
Decrease by >25%				Decrease by >25%			
TOTAL	100%	100%	100%	TOTAL	100%	100%	100%

28. If you would not want to continue your business any longer, how easily could you sell?

Items	*Rank*	*Items*	*Rank*	*Items*	*Rank*
1. Milling machine	❶❷❸❹	3. Dryer	❶❷❸❹	5. Transportation means	❶❷❸❹
2. Polisher	❶❷❸❹	4. Warehouse	❶❷❸❹	6. Others	❶❷❸❹
Note: *❶ Impossible, ❷ Not so easy, ❸ Easy, ❹ Very easy.*					

29. If you could sell your rice mill, what would be the price?

Items	*Rank*	*Items*	*Rank*	*Items*	*Rank*
Milling machine	❶❷❸❹	Dryer	❶❷❸❹	Transportation means	❶❷❸❹
Polisher	❶❷❸❹	Warehouse	❶❷❸❹	Others	❶❷❸❹
Note: ❶Very low price, ❷ Around 1-50% *of purchase price; ❸ Around* 50-75% *of purchase price; ❹ Around* 76-100% *of purchase price.*					

Samenvatting

In 1986 begon in Vietnam, met het lanceren van een programma van economische hervormingen (*doi moi*), een proces van transitie van een centraal-geleide economie naar een markteconomie. Een van de doelstellingen van dit beleidsprogramma was het bevorderen van de private sector, welke doelstelling voortvloeide uit de erkenning dat de economie gebaseerd op staats- en collectief eigendom van productiemiddelen niet functioneerde en dat de privare sector een belangrijke rol zou moeten spelen in het stimuleren van investeringen en daarmee economische groei. De werkelijkheid van het Vietnam sinds de start van het hervormingsproces laat evenewel een daling van het aandeel van de private sector in de investeringen in Vietnam zien. Voor zover deze daling het gevolg is van onvoldoende private investeringen roept ze de vraag op hoe dit tekortschieten kan worden verklaard.

Deze dissertatie probeert een bijdrage te leveren aan het beantwoorden van de zojuist geformuleerde vraag door de factoren die de investeringen van Vietnamese private bedrijven bepalen te onderzoeken. Het onderzoek concentreert zich op een specifieke bedrijfstak, te weten die van de rijstmaalderijen, welke een centrale rol speelt in de rijstsector, een zeer belangrijke sector in de Vietnamese economie. In Vietnam vindt het malen van rijst in belangrijke mate plaats in kleine private bedijven die veelal verouderde, inefficiënte machines gebruiken. De verouderde technologie in de rijstmaalderijen, die op sectorniveau de gevolgen van het tekortschieten van investeringen lijkt aan te geven, en de negative gevolgen daarvan vormen een reden temeer om het onderhavige onderzoek op deze sector toe te spitsen.

Volgens de beschikbare literatuur vormen imperfecties in financiële markten en onzekerheid belangrijke verklarende factoren van bedijfsinvesteringen. In deze dissertatie zal het vertrekpunt worden gevormd door de *hypothese dat imperfecties in financiële markten en onzekerheid een negatieve invloed hebben op de investeringen van private rijstmaalderijen in Vietnam.* In het empirische deel van het proefschrift wordt deze hypothese getoetst met gebruikmaking van gegevens op bedrijfsniveau van 210 private rijstmaalderijen in de Mekong Delta, de belangrijskte productieregio van rijst in Vietnam. De bevindingen kunnen als volgt worden samengevat.

Imperfecties in financiële markten en investeringen van private rijstmaalderijen

In Vietnam vloeien imperfecties in de financiële markten vooral voort uit de onderontwikkeldheid van het financiële stelsel. Sinds de eindjaren tachtig heeft het formele

financiële stelsel in Vietnam een aantal hervormingen doorgemaakt. Deze hebben geleid tot de aanwezigheid van verschillende typen banken, zoals buitenlandse banken en commerciële banken in de vorm van van naamloze vennootschappen, en andere financiële instellingen. Ondanks de hervormingen wordt het Vietnamese financiële stelsel nog steeds gedomineerd door enkele grote commerciële staatsbanken. Deze banken geven staatsbedrijven een voorkeursbehandeling bij het verstrekken van kredieten, zulks op basis van richtlijnen van de regering. Bovendien hanteren deze banken, als gevolg van slechte ervaringen met financiële transacties met en onvoldoende informatie over de private sector, stringente leenprocedures en vereisten aangaande onderpand, die de toegang van de private sector tot krediet van de staatsbanken verder bemoeilijken. Voor buitenlandse banken geldt dat kostbare verkrijging van informatie over private bedrijven, mede door cultuurverschillen en verschillen in regulering en toezicht, hen heeft afgeschrokken van kredietverlening aan deze bedrijven; zij hebben in plaats daarvan gekozen voor kredietverstrekking aan of via staatsbanken of aan andere staatsbedrijven. Commerciële banken in de vorm van naamloze vennootschappen zijn weinig solide; vanwege een smalle kapitaalbasis, hoge aandelen van slechte leningen in de leenportefeuilles en liquiditeitsproblemen zijn ze van weinig betekenis als vermogensverschaffers aan private bedrijven. De Vietnamese aandelenbeurs, ten slotte, is nog zeer jong en slechts van belang als vermogensbron voor grote ondernemingen.

In Vietnam bestaat, zoals in vele ontwikkelingslanden, naast de formele een informele financiële sector. De informele geldschieters, die een belangrijk deel van de informele financiële sector uitmaken, hebben vanwege beperkingen in de hen ter beschikking staande middelen een beperkte betekenis in de financiering van private bedrijfsinvesteringen. *Huis*, de Vietnamese variant van ROSCA's (*Rotating Savings and Credit Associations*), zijn in sommige gevallen belangrijk als vermogensverschaffer. Hun verhoogde faillissementsrisico maakt hen echter tot een riskante bron van vermogen.

Alles tezamen genomen leveren de formele en infomele sector in Vietnam een beperkte bijdrage aan de financiering van investeringen van private bedrijven. De uit de steekproef die ten grondslag ligt aan het empirische deel van het proefschrift voortkomende informatie bevestigt dit beeld. Van de onderzochte bedrijven deed slechts ongeveer de helft een beroep op krediet, dat in iets meer dan de helft van de gevallen werd gehonoreerd. Dit betekent dat de private rijstmaalderijen hun investeringen in overwegende mate financierden uit eigen middelen. Voor zover de beschikbaarheid van eigen middelen een beperking vormt voor het realiseren van investeringen kan dit worden gezien als een aanwijzing voor het bestaan van imperfecties in financiële markten, in het bijzonder van financieringsrestricties (*financing constraints*). Het empirische onderzoek in deze dissertatie lijkt hiervoor inderdaad aanwijzigingen te verschaffen. Een schatting van een uitgebreide investeringsvergelijking

levert als resultaat dat voor de steekproef als geheel sprake is van een positief en statistisch significant verband tussen beschikbaarheid van interne middelen en investeringen.

Behalve voor de gehele steekproef wordt het verband tussen beschikbaarheid van interne middelen en investeringen onderzocht voor ondernemingen van verschillende omvang en leeftijd. De mate waarin sprake is van financieringsrestricties blijkt significant te variëren met de omvang van bedrijven, waarbij grotere bedrijven minder beperkingen ondervinden in hun toegang tot externe financiering. Tussen de leeftijd van bedrijven en financiële restricties wordt geen significant verband gevonden.

Onzekerheid en investeringen van private rijstmaalderijen

In het algemeen vloeit de onzekerheid waarmee bedrijven hebben te maken in belangrijke mate voort uit volatiliteit van markten. In het geval van Vietnamese rijstmaalderijen wordt deze onzekerheid verergerd door een gebrek aan informatie over marktontwikkelingen. In Vietnam beperkt de gebrekkigheid van informatiekanalen de toegang van rijstmaalderijen tot informatie. Daarnaast zijn er andere belemmeringen in de toegang tot informatie, zoals taalproblemen en het probleem van hoge kosten van informatie. Voor informatie die wel beschikbaar is geldt nogal eens dat er problemen zijn in de sfeer van het absorberen en verwerken ervan, zulks als gevolg van het doorgaans lage opleidingsniveau van de eigenaars van rijstmaalderijen.

Dit proefschrift laat zien dat onzekerheid met betrekking tot de toekomstige verkopen een negatief effect heeft op de investeringen van private rijstmaalderijen in de Mekong Delta. Dit resultaat kan theoretisch worden verklaard uit de reële-optiebenadering: rijstmaalderijen kunnen gebruik maken van hun optie om te wachten en zodoende meer informatie te verkrijgen die de kans op het maken van fouten bij het nemen van onomkeerbare investeringen verkleint. Tevens wordt aangetoond dat de relatie tussen onzekerheid en investeringen verschillend is naar gelang van de mate van onzekerheid: de investeringen van rijstmaalderijen die te maken hebben met een geringe mate van onzekerheid blijken ongevoelig te zijn voor onzekerheid, terwijl de investeringen van maalderijen met hoge onzekerheid wel negatief worden beïnvloed door onzekerheid. Kennelijk is onzekerheid eerst van belang bij het nemen van investeringsbeslissingen nadat deze een bepaalde drempelwaarde heeft overschreden.

Een andere uitkomst van het empirische onderzoek in deze dissertatie betreft het verband tussen de relatie tussen investeringen en onzekerheid enerzijds en de mate van onomkeerbaarheid van investeringen anderzijds. Het verband tussen onzekerheid en investeringen blijkt sterker negatief te worden bij toename van de mate van onomkeerbaarheid. Dit kan worden verklaard uit het feit dat de hogere mate van onomkeerbaarheid, tot uitdrukking komend in het minder gemakkelijk kunnen verkopen van

gebruikte machines en/of in een lagere prijs bij verkoop, de waarde van de optie om te wachten verhoogt en daarmee het uitstellen van investeringen bevordert.

Ook wordt een relatie gevonden tussen de aanwezigheid van een verband tussen investeringen en onzekerheid en de mate van concurrentie die rijstmaalderijen ondervinden. Bij maalderijen die te maken hebben met sterke concurrentie blijkt geen sprake te zijn van een negatieve relatie tussen investeringen en onzekerheid, in tegenstelling tot maalderijen waar de concurrentie minder sterk is. De noodzaak om door middel van investeringen de concurrentie voor te blijven lijkt voor de eerstgenoemde groep maalderijen de invloed van de onzekerheid te overschaduwen.

Ten slotte dient melding te worden gemaakt van het feit dat een relatie wordt gevonden tussen het verband tussen onzekerheid en investeringen enerzijds en de omvang van de onderzochte bedrijven anderzijds. Het negatieve verband tussen onzekerheid en investeringen blijkt slechts op te gaan voor kleine bedrijven. Grotere bedrijven zijn kennelijk in staat de effecten van onzekerheid te reduceren door hun contacten met een bredere verzameling van zakelijke relaties.

Samenvattend blijken zowel marktimperfecties als onzekerheid een negatief effect te hebben op de investeringen van private rijstmaalderijen, hetgeen inhoudt dat deze factoren de maalderijen verhinderen om te expanderen en om modernere technologie toe te passen. Aldus levert het onderzoek een bijdrage aan de verklaring van het gegeven dat in Vietnam het malen van rijst overwegend plaatsvindt in kleine private maalderijen die verouderde, inefficiënte machines gebruiken.

Aanbevelingen

Zoals reeds beschreven gebruiken private rijstmaalderijen in de Mekong Delta in Vietnam voornamelijk eigen middelen ter financiering van hun investeringen omdat de toegang tot krediet aan beperkingen onderhevig is. Verbeterde toegang tot externe financiering zou het hieruit resulterende tekortschieten van de investeringen en daarmee het voortgezette gebruik van verouderde technologie kunnen redresseren. Het gaat daarbij vooral om een verbeterde toegang tot bankkrediet. Drie aanbevelingen zijn in dit verband van belang: (i) het corrigeren van van de te zwakke prikkels bij de commerciële staatsbanken om kredieten te verlenen aan private bedrijven; (ii) het verbeteren van de eigendomsrechten zodat onroerend goed gemakkelijker kan worden gebruikt als onderpand voor leningen; en (iii) het verbeteren van de financiële transparantie van de rijstmaalderijen om zodoende het probleem van asymmetrische informatie tussen de maalderijen en commerciële banken te verlichten.

Het feit dat onzekerheid een significant negatief effect blijkt te hebben op de investeringen van rijstmaalderijen roept de vraag op hoe de onzekerheid zou kunnen worden gereduceerd. Er zijn verschillende wegen die in dit verband kunnen worden

gevolgd. Een mogelijkheid is het helpen van de bedrijven bij het vinden van potentiële klanten. In dit verband is een recent initiatief van de Vietnamese regering, in de vorm van het opzetten van een groothandelsmarktplaats voor padie en rijst, waar vragers en aanbieders elkaar kunnen ontmoeten, veelbelovend. Behalve voor het aangaan van handelstransacties is zo'n ontmoetingsplaats ook van belang voor het uitwisselen van informatie. Een andere stap die van belang kan worden geacht is de totstandkoming van een termijnmarkt voor padie en rijst, die rijstmaalderijen en andere partijen in de rijstsector informatie geeft over de te verwachten toekomstige prijzen. Ten slotte zou het positief zijn als er een informatie-instantie voor de padie- en rijstmarkt zou worden opgezet, die marktinformatie verzamelt en verspreidt onder de bij de padie- en rijsthandel betrokkenen.

Omdat onomkeerbaarheid van investeringen uit het empirische deel van het proefschrift naar voren komt als een belangrijke verklarende factor voor het negatieve verband tussen onzekerheid en investeringen zou ook gezocht moeten worden naar wegen om de onomkeerbaarheid te reduceren. De hiervoor reeds genoemde groothandelsmarktplaats voor padie en rijst kan ook in dit verband een positieve rol spelen als ontmoetingsplaats waar ook vragers en aanbieders van maalderijmachines elkaar kunnen ontmoeten dan wel informatie kan worden uitgewisseld over vraag naar en aanbod van machines. Een andere manier om het probleem van de onomkeerbaarheid van investeringen te reduceren zou het opzetten van een afzonderlijke secundaire markt voor machines kunnen zijn.

Suggesties voor verder onderzoek

In deze dissertatie is gebleken dat zowel imperfecties in financiële markten als onzekerheid hun negatieve invloed doen gelden op de investeringen van private rijstmaalderijen in de Mekong Delta in Vietnam. Deze uitkomst levert een bijdrage aan het verklaren van het gegeven dat in de desbetreffende sector sprake is van verouderde, inefficiënte technologie. Naast de aangeduide factoren zijn wellicht andere factoren van invloed op het investeringsgedrag van private rijtsmaalderijen, zoals belastingen en regulering. Een nadere studie van deze factoren kan van belang worden geacht in het licht van het kunnen bevorderen van investeringen in de sector. Zo zouden lagere belastingen de beschikbaarheid van eigen middelen voor investeringen positief kunnen beïnvloeden. Veranderingen in de regulering, bij voorbeeld in de sfeer van het beter definiëren van eigendomsrechten, zouden ook, via het gemakkelijker maken van het verschaffen van onderpand aan kredietverschaffers, investeringen in de sector kunnen bevorderen.

De auteur is van mening dat de uitkomsten van het onderzoek waarschijnlijk ook van toepassing zijn op andere private bedrijven in Vietnam. Deze andere private

bedrijven opereren namelijk in dezelfde economische en financiële omgeving als de private rijstmaalderijen. Daar staat tegenover dat de invloed van financieringsresctricties en onzekerheid op investeringen, zoals wordt aangegeven in deze dissertatie, mede afhangt van de specifieke omstandigheden van bedrijven, bij voorbeeld in de sfeer van de positie op de afzetmarkt. Het zou daarom goed zijn als ook voor bedrijven uit andere sectoren, zoals de textiel- en kledingindustrie, soortgelijk onderzoek zou worden gedaan.

Ten slotte dient te worden opgemerkt dat in de onderhavige dissertatie imperfecties in financiële markten en onzekerheid afzonderlijk worden behandeld als verklarende factoren voor het investeringsgedrag van private rijstmaalderijen. Het is evenwel heel goed denkbaar dat rijstmaalderijen tegelijkertijd te maken hebben met imperfecties in financiële markten en met onzekerheid. Dit roept verschillende vragen op. Zijn er interacties tussen de beide factoren? Is de gezamenlijke invloed van de beide factoren sterker of juist minder sterk dan hun afzonderlijke invloed? Van nader onderzoek naar deze vragen mag worden verwacht dat het interessante uikomsten genereert.