Inefficiency in the Chinese banking sector

Preferential treatment of state-owned enterprises

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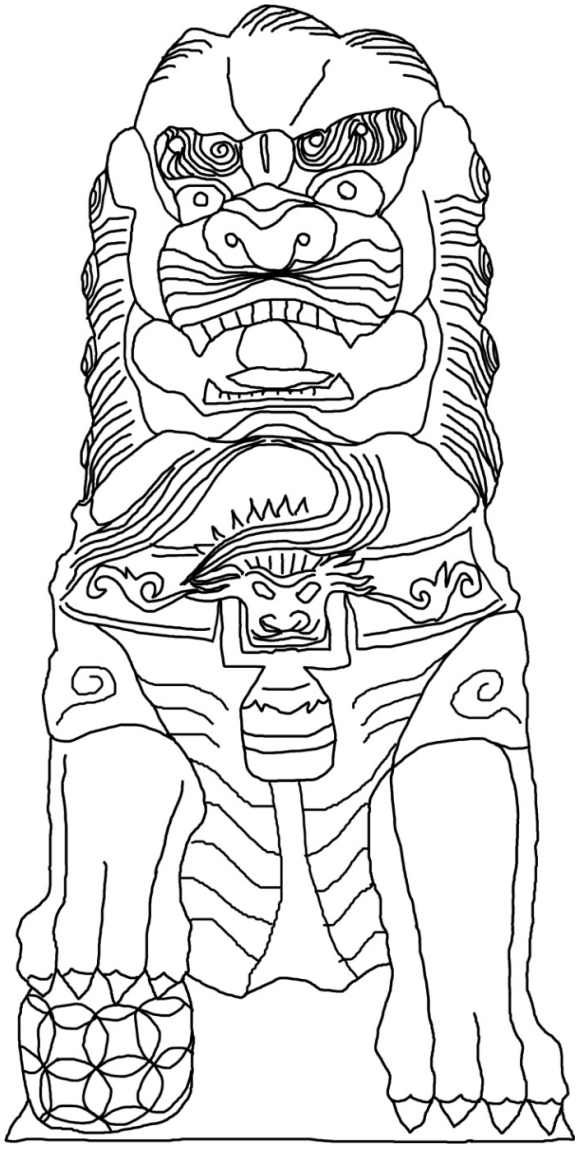

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IV

Abstract

The Chinese banking sector, which is characterized by large government ownership, has played a special role in allocating credit towards inefficient state-owned enterprises (SOEs), while it has been difficult for faster growing private enterprises to obtain bank loans. In this thesis I explore how such a misallocation of resources affects the Chinese economy, from a theoretical point of view. I have looked at the recent history of the Chinese economy, and its ongoing transition from a planned economy towards a market economy, as well as the development of the banking sector.

Despite China's impressive rate of economic growth during the past 36 years, its financial system, which is dominated by the banking sector, has not played an important role in allocating resources towards its best use. Several studies have shown that most private Chinese enterprises rely on informal financial markets, or their own savings, in order to finance investment projects (see, e.g., Ayyagari et al. (2010) and Allen et al. (2005)). I present some key theories of the roles banks play in an economy, such as creating liquidity for its depositors, monitoring borrowers and reducing the depositors' risk by diversification, roles which informal markets may not be as efficient in providing. I also explore a model of soft budget constraints, where the government affects the state-owned banks' lending in order to achieve welfare maximizing goals, rather than profit maximizing goals. Providing bank credit to unprofitable SOEs may crowd out more profitable private projects which will not be able to obtain financing.

I also discuss some rational reasons of the banks' preferential treatment of SOEs. I consider how the role of collateral affects the banks' willingness to give loans. If SOEs are more capable than the private enterprises in offering collateral, the banks may prefer to lend to the SOEs because their loans will be safer. I present a model that aims to explain how a bank's collateral requirements and preferential interest rates to SOEs will affect the speed of economic transition in China, from an economy dominated by SOEs towards an economy dominated by more efficient private firms.

Preface

First of all, I would like to thank my supervisor, Diderik Lund, professor at the Department of Economics at the University of Oslo, for his time, and his helpful comments.

The decision of writing my master's thesis on the subject of inefficiency in the Chinese banking sector is a result of spending the fall semester of 2013 as an exchange student at Fudan University in Shanghai, China.

I truly appreciate the experience of studying at one of China's best universities, and would like to thank the Department of Economics at the University of Oslo, and the School of Economics at Fudan University, for making my stay possible.

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1 Introduction

The Chinese financial system has been described as underdeveloped and dominated by the banking sector, with state-owned banks controlling the largest share of this market (e.g., Firth et al. (2009), Naughton (2007, p. 451ff) and Allen et al. (2012)). The Chinese banking system has been giving a disproportionately large share of credit to state-owned enterprises (SOEs), while firms in the private sector have had difficulty in, or been excluded from, obtaining bank credit (Ayyagari et al. (2010) and Berger et al. (2007)).

The Chinese private sector has been growing faster than the SOE sector in recent years, and private enterprises have been more efficient, meaning that they have been able to produce more output using less input, than the SOEs on average. Channeling most of the credit in the banking system towards the least efficient group of enterprises is not an optimal allocation of resources, and deserves some attention.

In this thesis I will show why such an allocation is not optimal, as well as investigate some of the economic theories of banking, to see if they can help explain the phenomenon, and why the problem may sustain. Key topics include moral hazard, cost of screening and monitoring, soft budget constraints and collateral.

The Chinese economy has been in the process of transition from a command economy towards a market economy, with a correspondingly high economic growth rate for more than three decades. The fact that the country is the world's second biggest economy and the most populous one makes it particularly interesting.

Even though China gradually started moving from a command economy towards a market economy as early as in 1978, the economy is still not as developed, and not as open as most other market economies. China still controls the capital account of the economy and the Chinese currency, the yuan, cannot be freely traded yet. In the banking sector there is a ceiling on deposit interest rates that is quite low, giving depositors a low return on their money. However because of limited investment possibilities due to capital controls, and a very high savings rate, the banking sector attracts a lot of deposits.

In chapter 2, I will present some theory of efficient resource allocation, focusing on how the economy is affected by the banks' allocation of their credit. In chapter 3 I will give a brief

review of China's economic history, and highlight some of the economic challenges China faces today. In chapter 4 I will give a short introduction to the recent history of the Chinese banking sector. In chapter 5 I will review some of the relevant literature. In chapter 6 I will focus on the role banks play in an economy, and some of the economic theory that is particular to banking. In chapter 7 I will discuss the soft budget constraint problem. In chapter 8 I will show how a lack of collateral can explain the private firms' limited access to banking credit. In chapter 9 I will show in a model with two sectors, labor intensive and capital intensive, how the banks' lending policy affects the speed of transition towards a more efficient economy, as well as the structural composition of the economy. In chapter 10 there are some concluding remarks.

2 Resource allocation

How does the credit allocation of the banks affect the output of the economy?

One of the most important roles of financial markets is to allocate resources from those with surplus savings towards those with a demand for credit. Since banks are dominant in the Chinese financial system, I will focus on the banks' influence on resource allocation. How efficiently the banking capital is allocated will affect the growth of the economy. Limited credit access to private firms will reduce the number of profitable projects in the economy, and thus reduce overall growth. Those firms that do not get access to loans from the banking sector have to either save up enough to finance their own projects using retained earnings, or borrow from some informal lending institution, often at a much higher interest rate. Alternatively firms may issue bonds, or get listed on a stock exchange in order to raise money, but these two alternatives are usually only available for very large firms, and not a viable option for most private enterprises in China.

According to a report by the World Bank and the Development Research Center of the State Council, P.R. China (2013, p. 144), the corporate bonds outstanding in China were only equal to 8.6% of GDP in 2010, while the total assets of banking institutions and total stock market capitalization were 241.6% and 66.7% of GDP respectively.

Allen et al. (2005) finds that the private sector dominates the state and listed sector in terms of growth, size and output over the years 1996 – 2002. While the private sector's industrial output grew at an annual rate of 14.3 %, the state and listed sectors grew at only 5.4 % in the same period.

The reasons why the banking sector prefers to give loans mostly to SOEs can be many. Political or ideological goals instead of profit maximizing goals, easier access to credit information on SOEs or lower credit risk because the government may bail out defaulting SOEs are some of the explanations pointed out by Brandt and Li (2003). In chapter 7 I will discuss how the SOEs obtain more bank finance due to political goals, where the state-owned banks not only maximize profits but also care about employment in SOEs. In chapter 8 I will consider how a difference in collateral may be responsible for the banks' preference towards SOEs. Regardless of the banks' reasoning, I will in this chapter present a short model that

intuitively shows how restricting credit to one group of the economy will reduce overall economic growth, and that it is an inefficient allocation.

2.1 Model of efficiency loss due to credit discrimination

2.1.1 Resource allocation with separate interest rates

Using a simple model, I will show how a preferential interest rate to SOEs compared to that of private firms leads to an efficiency loss to the economy.

Consider an economy with full competition and two profit-maximizing firms. The two firms differ only in ownership, privately owned and state-owned, in order to match the Chinese story. They both have an investment project they want to get financed, but because the project is costly, and they have no money, they need to obtain a bank loan in order to finance their project.

They produce consumption goods, using capital and labor, $X_i = F_i(K_i, L_i)$

$$\Pi_{SOE} = g(K_s, L_s)p_s - wL_s - r_sK_s \quad (1)$$

Equation (1) describes the SOE profit, which is the production function $g(K, L)$, multiplied with the price, w is the wage rate, L is the amount of labor hours, and r_s is the interest rate paid to a bank on the firms fixed capital investments.

$$\Pi_P = f(K_p, L_p)p - wL_p - rK_p \quad (2)$$

Equation (2) shows the corresponding equation for the private firm, where $r = r_s(1 + b)$, where $b > 0$, and reflects that there is an interest rate differential between the private firm and the SOE. The private firm has to pay a premium on the interest rate, so they pay a relatively higher price on capital.

The capital and labor stock in the economy are exogenously given.

Both firms maximize their profits, and the first order conditions yield:

$$g'_L(K_s, L_s)p_s - w = 0 \quad (3)$$
$$g'_K(K_s, L_s)p_s - r_s = 0 \quad (4)$$

$$f_L'(K_p, L_p)p - w = 0 \quad (5)$$
$$f_K'(K_p, L_P)p - r = 0 \quad (6)$$

By inserting for, $r = r_s(1 + b)$, into equation (6), we get,

$$f_K'(K_p, L_p)p - r_s(1 + b) = 0 \quad (6')$$

One implication of the first order conditions is that,

$$(1 + b)\frac{f_L'(K_p, L_p)}{f_K'(K_p, L_p)} = \frac{g_L'(K_S, L_s)}{g_K'(K_s, L_s)} \quad (7)$$

We see that the marginal technical rate of substitution is smaller in the private firm than in the SOE, because it follows from (7) that,

$$\frac{f_L'(K_p, L_p)}{f_K'(K_p, L_p)} < \frac{g_L'(K_s, L_s)}{g_K'(K_s, L_s)} \quad (8)$$

The result from (7) and (8) implies that there is an efficiency loss, b, resulting from the interest rate difference, and the efficiency in the economy would be improved if capital was reallocated from the SOE towards the private firm.

2.1.2 Only bank lending

Consider an economy with two firms that differ only in ownership, privately owned and state-owned. Each firm has an investment project it wants to get financed. Assuming that the firms have no initial wealth they need to obtain a bank loan in order to finance the project. They are both qualitatively equal, meaning that both firms' projects have the same positive expected mean return with equal variance.

A project costs $I = 1$ to finance, and gives a return Q to the firm, which has to pay $R = 1 + i$, to the bank, where i is the interest rate. Thus the return to a firm is,

$$\pi_F = Q - R > 0 \quad (9)$$

And the return to the bank is,

$$\pi_B = R - I > 0 \quad (10)$$

It is assumed that the bank's opportunity cost of lending is zero.

The social surplus of extending a loan is $\pi_F + \pi_B = Q - I > 0$.
The social surplus of extending two loans is, $2Q - 2I > Q - I$. If the bank for whatever reason will only give a loan to one project, the result is an efficiency loss of size, $Q - I$.

In this simple scenario, it is obvious that restricting access to bank lending for one group of firms will reduce the overall social surplus, and reduce the output of the economy. The above model may be very unrealistic, in that no private firms obtain any bank loans. The model could be altered to allow some private firms to get finance, but as long as a slightly less productive SOE is preferred to a slightly more productive private firm, there is room for improvement of the resource allocation.

2.1.3 Introducing informal lending sector

The size of the loss of output in the economy, due to the banks' no-lending policy to private firms, depends on the private firms' ability to obtain credit somewhere else. We can now assume that the firm that is denied credit from the banking sector can alternatively get a loan from an informal lending sector, which requires a higher interest rate[1].

The informal lender requires an interest rate $\hat{R} = 1 + \hat{\imath}$, where $\hat{\imath} > i \Rightarrow \hat{R} > R$.

Now as long as $Q > \hat{R}$, the total surplus seems to be the same. The return from the project to the SOE, which has access to bank funding is the same as before,

$$\pi_{SOE} = Q - R > 0 \tag{11}$$

While the return to the private firm's project is,

$$\pi_{PF} = Q - \hat{R} > 0 \tag{12}$$

The return to the bank is,

$$\pi_B = R - I > 0 \tag{13}$$

[1] Informal lenders that charge high interest rates are common in China. If a firm cannot get credit from a bank, or borrow from family or friends, the firm may borrow from private money houses, or underground lending organizations that charge high interest rates (Ayyagari et al., 2010).

And the informal lenders return is,

$$\pi_{IL} = \hat{R} - I \tag{14}$$

The social surplus is thus unchanged,

$$\pi_{SOE} + \pi_{PF} + \pi_B + \pi_{IL} = Q - R + Q - \hat{R} + R - I + \hat{R} - I = 2Q - 2I \tag{15}$$

The total social surplus is not affected even though the private firm has to borrow at a higher interest rate from an informal lender. The reduction in profits to the private firm relative to the profits it would obtain with access to bank finance is a pure transfer to the informal lender, and does not affect the total output in the economy.

The unchanged result rests on the assumption that $Q > \hat{R}$. It is however easy to see that if $Q < \hat{R}$, then there will be a output loss. In a richer model with many private firms, we could also think that there are many firms with different payoffs. All the private firms with $Q \in (R, \hat{R})$ will be forced to abandon projects that would have been profitable if they could get access to bank credit, but will not be undertaken due to the high interest rates in the informal lending market.

The point of the above model was to show that there is an output loss related to the restriction of bank credit to private firms. It is clear that the interest rate differential between the informal market and the bank sector will affect how large the output loss is.

Stiglitz and Weiss (1981) show that a higher interest rate may lead to higher riskiness of the projects, by an adverse selection effect and an incentive effect, where borrowers gets incentives to increase the risk, leading to an overall reduction in expected value. Borrowers' behavior might change towards higher risk taking when the interest rate increases; because a higher interest rate will, ceteris paribus, reduce the borrowers expected return on a project. They show that credit rationing may be an optimal choice for a bank rather than increasing the interest rate to clear the market.

In order to understand why the Chinese banking system has allocated its resources mainly towards less efficient SOEs, rather than more efficient private enterprises, a review of the

history of the Chinese economy and banking system will be presented in the following chapters.

3 A brief review of China's economic history

According to Maddison (2007), China had been the world's biggest economy for nearly two thousand years, but in the 1890s the United States took over this position. China's share of world GDP was about one third in 1820, even though GDP per capita was a bit below the world average. China's economy deteriorated relative to the rest of the world and in 1952 China's share of world GDP was only 5.2%, despite having about 22% of the world's total population. Between 1820 and 1952 China's GDP actually declined at about 0.10% annually, while Europe and the United States had annual growth at 1.71% and 3.76% respectively during the same period. China was lagging behind, and China's share of world GDP dropped to 4.9% in 1978.

The following section is to a large degree taken from Brandt and Rawski (2008, p. 4ff). The People's Republic of China was established in 1949 under the leadership of Mao Zedong. The Chinese economy was shaped after the Soviet model, and the major characteristics of the economic system was that it was dominated by state-owned enterprises, prices had little practical importance[2], and goods were produced and distributed according to the government's plan. During Mao's period[3] the economy's growth was not reaching its potential due to several inefficiencies. Limited competition between enterprises, and collective farming, did not give much incentive to innovate or increase efficiency in production, and the country had very limited trade with other nations. Misallocation of resources was bound to be widespread. There was no price mechanism, supply and demand for goods were determined by government planners, and there was scarcity of essential consumer goods due to a focus on investment goods.

In 1953 China started to focus on heavy industries, known as a Big Push strategy. The social planners channeled investments into capital intensive industries, rapidly increasing industrial output (Naughton, 2007, p. 56 and Lin, 2012, p. 85). Lin (2012, p. 97) calls this a

[2] With government planners deciding what and how much to be produced of most goods, prices did not play an important role in allocating resources. Prices were under government control, and set in accordance to their strategies. While prices typically affect supply and demand in a market economy (or vice versa), in the command economy of China, however, prices were mostly used as a way to keep account of production and investment (Naughton, 2007, p. 59f and Brandt and Rawski, 2008, p. 4). According to Naughton (2007, p.380f), prices in the world markets did not affect domestic prices either, since imports were re-priced in order to protect domestic industry.

[3] By Mao's period, I refer to the period from 1949 until Mao's death in 1976.

"comparative advantage defying" strategy which reduced output and productivity. However he claims that the biggest source of loss to the economy in this period did not come from the strategy of prioritizing heavy industries, but that the workers had few incentives and low enthusiasm.
One of the worst examples of misallocation of resources under Mao's leadership was a disastrous economic experiment known as the Great Leap Forward, between 1958 and 1960. In an attempt to grow the industrial production in China, many farmers where moved from food production in the agricultural sector, to work at rural factories and particularly in steel production. The reduction in food production, as well as bad weather in 1960, resulted in a famine that caused about 25-30 million deaths (Naughton, 2007, p. 69ff).

According to Naughton (2007, p. 379), China's trade with the outside world was very limited, and in 1970-1971, the total imports and exports combined, were together only 5% of GDP. This stands in stark contrast with the size and importance global trade has in China's economy today. According to statistics from The World Bank[4], China's total foreign trade was as high as 70% of GDP in 2006, and has since declined relative to GDP to about 52% in 2012.

In 1978, two years after Mao's death, the Communist party, under the leadership of Deng Xiaoping, initiated the first reforms of the economic system. 1978 thus marks the starting point of China's gradual and ongoing economic transition from a planned economy to a market economy. I refer to the Chinese economic transition as a process that is still ongoing in 2014, 36 years after reforms started. The reason is that there are still some areas of the economy that are being reformed in the direction of letting the markets play a larger role, with less government interventions. Some of the anticipated reforms include opening up the capital account, liberalizing the currency and reforming the financial system.

3.1 China's transition from planned economy to market economy

According to Naughton (2007, p. 88f), experimental reforms of the planned economy system were launched in several parts of the economy by the end of 1978. One of the initial successes

[4] The World Bank: World Development Indicators dataset, April 2014 version. http://databank.worldbank.org/data/download/archive/WDI_excel_2014_04.zip

of reform started in the agricultural sector that year. In the years prior to reform the agricultural sector was collectivized, and communities shared the land and what they could grow from it. Prices had been kept at low levels, and farmers had little incentives to increase their investments in agriculture. The degree of collectivization was then reduced when farmer households were given the opportunity to sign contracts with the collectives giving them control over individual pieces of land, as well as increased autonomy regarding what crops to grow. In the same period the government decided to increase the prices on agricultural goods, in order to improve conditions for the farmers. The contracting of land to farmer households, together with an increase in the prices of agricultural goods, helped give farmers incentives to increase their efforts and, as a result production of grain increased by more than one third between 1978 and 1984 (Naughton, 2007, p. 89).

One of the key initial reform strategies was the *Dual Track System*, which allowed a gradual change from planned to market economy, by allowing the two market forms to coexist. Under the planned economy, economic agents produced their output according to the plan. Under the Dual Track System the economic agents still had to fulfill their pre-determined quotas at set prices, while any production above the plan was allowed to be sold at market determined prices, which were typically higher than the price they received on the planned quota (Qian, 2002). In 1984 the government fixed the planned quotas, and since the economy was growing, this allowed the economic agents to grow out of the plan, with more and more of their production being allocated at market determined prices (Naughton, 2007, p. 92).

The Chinese economy was pretty autarkic during the planned economy years, and one of the major changes in China has been the opening up of the economy to the outside world, particularly with respect to trade in goods. As previously mentioned the reform of China's economic system has been gradual, and in the years after 1978 there were still strict quotas and limits on all foreign trade. According to Branstetter and Lardy (2008, p. 634f), tariffs on imports actually increased in the early years of the reform period in the 1980s, and stood at an average rate of 56% in 1982, before they were gradually reduced in the 1990s, and further lowered to an average rate of 15% at the time of China's accession to the World Trade Organization (WTO) in 2001. China focused on attracting foreign direct investments (FDI), by lowering barriers, and removed tariffs on processing trade, i.e., imports of goods that are processed or assembled in China, and then exported again. One of the measures to attract FDI was the establishment of four *special economic zones*, where foreign firms could get

preferential taxes and administrative treatment. These zones proved successful and later more areas where given similar status, in order to attract more FDI (Branstetter and Lardy, 2008, p. 640).

By the mid 1990s, China had successfully adopted a functioning market economy, even though the process of market transition is not complete (Naughton, 2007, p. 85). By 2003 China's GDP as share of world GDP had risen to 15.1%, from a low of 4.9% in 1978 (Maddison, 2007). Table 1 shows a comparison of China and some other major regions, and how the sizes of their economies have developed over the years, from 1700 to 2003.

Shares of World GDP, 1700-2003

(per cent)

	1700	1820	1952	1978	2003
China	22.3	32.9	5.2	4.9	15.1
India	24.4	16.0	4.0	3.3	5.5
Japan	4.1	3.0	3.4	7.6	6.6
Europe	24.9	26.6	29.3	27.8	21.1
United States	0.1	1.8	27.5	21.6	20.6
USSR	4.4	5.4	9.2	9.0	3.8

Source: Maddison (2007, Table 2.2a)

Table 1: Shares of World GDP, 1700-2003

3.2 Facts about China today

China is the world's most populous nation with 1354 million inhabitants. As late as in 1980, 80.61% of the population was living in rural areas. Since 1980 there has been a rapid rate of urbanization, and today China has an urban population of 52.57% and only 47.43% are living in rural areas, according to official figures[5]. Urbanization is a vital part of China's development process, as many people move from agriculture to working in industrial and service sectors (Naughton, 2007, p. 126). According to China Statistical Yearbook 2013[6], the

[5] China Statistical Yearbook 2013, 3-1 Population and its Composition, National Bureau of Statistics of China
[6] China Statistical Yearbook 2013, 11-2 Per Capita Annual Income and Engel's Coefficient of Urban and Rural Households

per capita annual disposable income of urban households in 2012 was 24565[7] yuan, while the rural households' disposable income was only 7917 yuan, only about one third that of the urban households. With such huge differences in average income between rural and urban areas, it is no surprise that China is experiencing rapid urbanization. The Chinese citizens have, however, not been able to move freely from rural to urban areas in the past, and there are still some restrictions. Naughton (2007, p. 124) explains how only those with urban residence permits, called *hukou*, have the right to permanently live in cities. The citizens inherit their parents' status of registration, which specifies their location and status, either *rural* or *urban*. This system has not stopped urbanization, but without a permanent urban residence permit rural migrants that move to cities are not entitled to the same social rights as inhabitants with urban hukou.

China has experienced amazing economic growth since economic reforms started in 1978, with an annual growth rate of about 10%[8] between 1978 and 2012. As a result 500 million Chinese have been brought out of poverty (World Bank and the Development Research Center of the State Council, P.R. China, 2013, p. 4).

On the other hand some imbalances have risen during this period, posing challenges for China in the years to come. There are several papers published regarding the imbalances in the Chinese economy (e.g., Deer and Song (2012), Blanchard and Giavazzi (2006) and Fukumoto and Muto (2012)). The savings rate in China is very high, and the growth in the economy has been driven by high investments, while the level of private consumption is very low. Private consumption as a share of nominal GDP was only 33.8 %[9] in 2010 according to Fukumoto and Muto (2012). Savings have been running ahead of investments, and exports running ahead of imports. China has a widening trade surplus that, Blanchard and Giavazzi (2006) describe as an imbalance when it was growing at a rate of US$30 billion in 2004. Since then the trade surplus has only increased, and by the end of 2013 the foreign exchange reserves stood at US$3.82 trillion, up from US$3.31 trillion at the end of 2012, according to the People's Bank of China[10].

[7] 100 CNY was 92.25 NOK on average during 2012, according to Norges Bank. 24565 CNY = 22661 NOK.
[8] 9.92% annual growth on average from 1978 to 2012, according to World Development Indicators 2013 from the World Bank. http://data.worldbank.org/data-catalog/world-development-indicators
[9] Fukumoto and Muto (2012) compare China with the following countries: Japan (58.6 %), USA (70.6 %), Korea (52.5 %), Thailand (53.7 %), Indonesia (56.7 %) and India (61.9 %). The number in parenthesis is private consumption as a share of GDP in 2010 in the respective countries.
[10] See People's Bank of China (2013) and People's Bank of China (2014).

Safety nets have weakened, especially hurting rural households, which are already the poorest. Fukumoto and Muto (2012) show that China's investment driven growth path has not provided as much benefit to the households as the increased GDP numbers might indicate, because the consumption to GDP ratio is the lowest among major emerging economies. They suggest increased development of the service sector as a necessary means to increase consumption. A shift towards a larger service industry and more consumption relative to investments, could also contribute to solve the challenges that China face with pollution.

Deer and Song (2012) propose reform of China's financial system as one measure to rebalance China's economy. They claim that the state-owned commercial banking sector gives preferential interest rates on loans to SOEs, which reinforces the investment and expenditure imbalances. It also forces private enterprises to rely on the informal credit system.

4 Recent history of China's banking sector

The following section is largely derived from Mishkin (2013, p. 374). Before economic reform in China started in 1978, the Chinese banking system consisted of only one bank, the People's Bank of China (PBC), which was established in December 1948. During the planned economy period, there was no room for any more banks and private banks were prohibited. PBC acted as the only bank, undertaking both commercial banking and central banking roles. Reform of the banking system started in 1980, and the commercial banking activities of PBC were divided into four state-owned banks, while PBC later continued only as the central bank. The four state-owned banks, the Bank of China (BOC), the China Construction Bank (CCB), the Agricultural Bank of China (ABC), and the Industrial and Commercial Bank of China (ICBC) were established. According to Berger et al. (2007), the four banks were initially restricted to serve their own designated sectors of the economy, as their names indicate. However in 1985 they were allowed to compete in all sectors, but because they mainly served as policy-lending banks for the government, and had lacking incentives to compete, competition was initially very limited.

These above mentioned banks are known as the "Big Four", and are important and large banks today, even though their share of total bank lending has decreased, as more banks have later been allowed to enter the banking sector. According to Naughton (2007, p. 456), the Big Four accounted for 53% of the total market share in Chinese banking industry in 2005.

In 1990 two stock exchanges were established in China, the Shanghai Stock Exchange, and the Shenzhen Stock Exchange. They have experienced rapid growth since the start, however, the stock exchanges have not been a very successful arena for private enterprises to attract funding. According to Naughton (2007 p. 469f), the listed companies are mostly former SOEs, and the government has remained the majority owner in many of these companies by keeping a certain share of the stocks as non-tradable. He points out that in the first decade after 1990, as much as 90% of the listings were SOEs. Hence the stock markets have been similar to the state-owned banking sector in that they mostly fund enterprises controlled by the government.

At the end of the 1990s and in the beginning of the 2000s the Big Four had serious problems with a huge amount of non-performing loans. According to Naughton (2007, p. 460), the banking system provided loans to loss-making firms, due to government control over the lending decisions. According to Dobson and Kashyap (2006), the government wanted to shift the allocation of credit away from direct government transfers and to go via the banking system, which is one of the reasons for the buildup of non-performing loans in the banking sector. Unproductive firms relied on bank loans to keep afloat, and their debt levels steadily increased. The result was that by 2002, the percentage of loans that were nonperforming for state-owned banks reached 26.2%, and consisted mainly of loans to SOEs (Naughton, 2007, p. 462).

Nonperforming loans in China's banking system

	State-owned banks	
Year	Percent of loans	Billion yuan
2002	26.2	2088
2003	20.4	1917
2004	15.6	1575
2005	10.5	1072

Source: Naughton (2007, p. 462)

Table 2: Nonperforming loans in China's banking system

Table 2 shows that the amount of nonperforming loans has been gradually declining, from 2002, when more than one quarter of all loans was nonperforming.

To reduce the problems of the large amount of non-performing loans the Big Four banks were saved by the government's establishment of four asset-management corporations, one for each of the "Big Four", which took over their bad loans. In addition the government injected funds to recapitalize the banks. The banks were essentially bailed out by the government (see, e.g., Naughton, 2007, p. 462f).

As a measure to improve the efficiency of the banking sector, China's central government started reforming the ownership structure of the Big Four state-owned commercial banks by listing them on the stock exchange. The Big Four banks have all been listed on the Shanghai Stock Exchange during the 2000s. They are still however controlled by the state which is the

majority owner.[11]

To get a grasp of the size of the Big Four, they are all among the top 9 of the world's largest publicly traded corporations[12], claiming the top three places, according to Forbes Global 2000 (2014), with ICBC ranked as the largest corporation in the world, CCB is the second largest, and ABC and BOC as 3rd and 9th respectively.

Both BOC and ICBC are considered as *global systemically important banks* (G-SIBs) as of November 2013, according to the Financial Stability Board (2013). A total of 29 global banks are considered G-SIBs, and they are required to hold additional common equity loss absorbency[13], as a percentage of risk-weighted assets. This is one of the measures that the Basel Committee on Banking Supervision has introduced in order to improve the resilience of banks and banking systems, and to reduce the probability of failure of global systemically important banks (Bank for International Settlements, 2013).

One of the reasons why the "Big Four" have been making large profits in recent years, despite of their inefficiencies, is that the banks in China benefit from restrictions on the interest rates on deposits. There are ceilings on the deposit rates, which reduce the competition between banks, since they cannot offer higher interest on deposits in order to attract more deposits (Song et al., 2013). There is a quite high interest rate differential between the deposit rates and the loan rates, which generates large profits for the banks. If the ceiling on deposits will be removed, one may expect that the increased competition for deposits will push the interest rates on deposits up, and reduce the interest rate differential between deposits and loan rates, such that these high profits will be reduced. This will benefit those who save as they get a higher return on their money, and increased competition should also increase the efficiency of

[11] According to the shareholder information on the banks' respective websites, Central Huijin Investment Ltd. (CHIL), a state-owned investment company, control 67.77% of total shares in Bank of China, as of 30 September 2013. CHIL holds 47.2%, and the Ministry of Finance (MOF) holds 46.9% of A-shares in ICBC, as of 30 June 2013 (A-shares account for 75.2% of total shares). According to ABCs annual report for 2012, 82.7% of the shares in the bank are state-owned shares, owned either by CHIL or MOF as of 31 December 2012. CHIL is also the controlling shareholder of CCB, with 57.21% of the shares, as of 31 December 2012, according to their 2012 annual report.

[12] The ranking in Forbes Global 2000 list is based on an equal weighting of four metrics; sales, profits, assets and market value. For further information about the ranking system, see http://www.forbes.com/sites/andreamurphy/2014/05/07/global-2000-how-we-crunch-the-numbers/

[13] The higher loss absorbency requirements will be implemented on 1 Jan 2016 (Bank for International Settlements, 2013)

the banking sector in China.

The restriction on deposit rates has also led people to seek alternative investments where they can get a higher return on their money. According to the article "China's big banks: Giant reality-check" in The Economist (2013), savers have sought riskier alternatives, like real estate and shadow banking instruments known as "wealth-management" products. Also, Alibaba and Tencent, two Chinese internet giants, offer their customers the opportunity to divert their cash into high-interest funds.

According to Naughton (2007, p. 456ff), in addition to the "Big Four", the banking system in China consists of 11[14] *joint-stock commercial banks*, established between 1986 and 2001, which are not owned by the national government, but typically have mixed ownership consisting of local governments, government agencies, SOEs, and non-state enterprises. There are about 100 *city banks*, which are mostly owned by local governments and operate locally, and at a smaller scale than the joint-stock commercial banks. There are also three *policy banks*, which were set up by the government in order to free the "Big Four" from policy lending, when they were commercialized. There are also some other categories of banks, such as rural banks, rural credit cooperatives, and some foreign banks, representing a smaller portion of the banking sector (China Banking Regulatory Commission, 2012, p. 119).

4.1 Informal financial system

Many privately owned firms in China have difficulty obtaining bank loans, and some rely on other credit markets outside the banking sector in what might be called the *informal financial system*. Ayyagari et al. (2010) describe the informal financial system as consisting of informal banks that operate illegally, pawnbrokers, moneylenders and private money houses.

The informal financial system alleviates some of the private firms' credit constraints, by providing credit trough alternative sources. However the interest rates can be much higher than what is normally charged by banks (Ayyagari et al., 2010).

[14] There are now 12 joint-stock commercial banks according to China Banking Regulatory Commission 2011 Annual Report (China Banking Regulatory Commission, 2012, p. 129).

Allen et al. (2005) finds that the banking system mostly channels funds to the state and listed sector, and out of total bank credit to GDP ratio of 1.11, the ratio of credit going to the private sector is only 0.24. In a more recent paper by some of the same authors, Allen et al. (2012) study the performance of the "*Hybrid Sector"*. They define the Hybrid Sector as all non-state, non-listed firms, including private or individually owned firms and firms that are partially owned by local governments, such as Township Village Enterprises (TVEs). They find that the Hybrid Sector is more productive than the state and listed sectors, and also dominant in size with a total output in 2009 of almost $5.7 trillion for the Hybrid Sector, compared to $2.5 trillion in the state and listed sector. The most common source of funds to the Hybrid Sector is their own retained earnings; however for newly started businesses informal credit channels such as borrowing from family, friends or unofficial lenders are also important.

The informal financial system can be considered a part of what is known as the shadow banking system. The Financial Stability Board (2011) broadly defines shadow banking as, "credit intermediation involving entities and activities outside the regular banking system".

5 Literature review

5.1 Defying China's comparative advantage

The central role of the financial systems is to perform the function of reallocating the resources of economic units with surplus funds (savers) to economic units with funding needs (borrowers) (Allen and Santomero, 1999). In order to achieve an optimal result, such a reallocation must go to those who can put those resources to best use. Lin (2012, p. 211) attributes efficient capital allocation to be the most fundamental function of the financial system.

"An efficient financial system must be able to allocate limited financial resources to the most dynamic industrial sectors in the economy and to the most capable entrepreneurs in those sectors" (Lin, 2012, p. 212).

Naughton (2007, p. 449 ff) explains how China's financial system has remained dominated by banks, and especially state-owned banks. He claims that the banking sector has been one of the most protected and overregulated industries in China, protected from international competition.

Lin (2012, p. 208f) says that as much as 80% of bank loans have gone to SOEs, making it difficult for private enterprises to get loans from the banks. He explains that the industrial strategy during the planned economy years, of prioritizing capital intensive heavy industry, created a huge demand for capital for investments in the SOEs, however, it did not create enough jobs. The government thus decided to employ more labor than actually needed in these SOEs in order to avoid unemployment (Lin, 2012, p. 199). During the planned economy period employing too many people was not a problem for the SOEs, as it was paid for by government transfers. After the reform of the economic system started, however, the SOEs faced what Lin (2012, p. 199) describes as two types of burdens. The "strategic burden" of being mainly involved in capital-intensive industries, which is not favorable, due to China being very rich on labor, and very poor in capital, thus defying China's natural comparative advantage. The second burden, he calls the "social burden", which is the SOEs' responsibility for pensions and redundant employees. Lin (2012, p. 199) claims that these burdens would have resulted in losses for the SOEs in competitive markets. Thus the government gave the

SOEs favorable treatment in the banking market, in order to alleviate the burdens laid on them by the government. How big a disadvantage these burdens lay on the SOEs is difficult for the government to figure out exactly, and this creates an opportunity for the SOEs to blame any losses on the extra burden. Lin (2012, p. 199) points out that this creates the potential of a soft budget constraint for the SOEs, meaning that loss making enterprises do not go bankrupt, but may be bailed out, or given additional bank loans, due to the governments' influence in the banking sector. I will return to the issue of soft budget constraints in chapter 7.

5.2 The effects of government intervention on bank lending

There are several empirical and theoretical studies of how financial development affects economic growth. Wurgler (2000) shows that the efficiency of allocation tends to be positively correlated with the financial development in a country, and that capital allocation improves as state ownership is reduced. Using data from 47 countries from 1976 through 1993, Levine and Zervos (1998) find that *banking development,* which they define as the ratio of bank loans to private firms relative to GDP, is significantly correlated with economic growth.

Allen et al. (2005) claims that: "*China is an important counterexample to the findings in the law, institutions, finance and growth literature: Neither its legal nor financial system is well developed, yet it has one of the fastest growing economies*". They show that growth in the private sector has exceeded that of the state and listed sectors, despite that the private sector relies on relatively poor financial and legal institutions. They explain that the role of reputation and relationships is important, and that borrowing from friends and family has been efficient particularly for start-up firms. In a survey they find that bank finance is also an important source of credit, but that most of those who could get bank finance from state-owned banks, already had established relationships with the banks. The most important source of funding for the private sector is what they call self-fundraising. Self-fundraising includes capital raised from local governments, communities, other investors and retained earnings. Zhou (2009), however, suggests that the private firms' primary reliance on internal funds may just be an indication of them being wealth constrained. Zhou (2009) also shows that having political connections help private entrepreneurs obtain bank loans.

The private sector in China has limited access to bank finance, however, it has been growing faster than the SOEs despite this handicap, and Allen et al. (2005) argue that alternative financing channels may help explain how China has been able to grow at such high rates, where the private firms have contributed to the largest share of growth.

Using data from a survey conducted in 2003 by the World Bank, Ayyagari et al. (2010) find that the relatively small portion of private firms that have access to bank loans, grow faster and with higher reinvestment rates, than firms that do not have such access. They do not find evidence that firms borrowing from alternative financing channels obtain faster growth.

Ayyagari et al. (2010) control their findings for reversed causality, i.e., the possibility that banks provide credit to the best performing firms, rather than bank credit leading to improved performance. In order to measure the effect of bank credit on firms' performance, they try to investigate whether firms which have obtained their finance from banks perform[15] better than firms which have not. Since the firms that obtain bank credit are not randomly determined, any direct estimation of the effect of bank credit on firm performance would be biased. Seeking to avoid any selection bias, they use collateral requirements[16] as an instrumental variable for bank finance, which they claim is correlated with bank financing, yet not correlated with the growth opportunities of the firms. They also check whether the Chinese government affects the banks' lending by directing the banks to lend to certain firms with good credit ratings. They find that firms with bank financing on average grow 10% faster than firms without bank finance, while the share of firms that report having received government help in obtaining bank finance grow on average 7.5% faster, thus providing evidence that the association between bank finance and growth is not driven by the governments' selection of fast growing firms. They also make the point that the relation between the fastest growing firms, regardless of causation, and bank credit, by revealed preferences shows that these firms prefer bank credit to informal sources of finance.

Ayyagari et al. (2010) define informal financing as one that is not associated with a delegated monitor, while formal financing is. Further, informal financing use self-enforcing contracts, where the borrower's ability to obtain a loan depends on trust and reputation. The degree of legality in the informal financial sector varies, from legal sources such as interpersonal

[15] Ayyagari et al. (2005) measure the performance of firms using sales growth, supplemented by labor productivity growth and reinvestment rate.
[16] Ayyagari et al. (2005) find that the most important reason why banks reject loan applications is due to lack of collateral. In the informal financial system, on the other hand, collateral is much less important.

lending and pawn shops, to illegal institutions such as money houses and underground lending organizations that are not sanctioned by the government. In some cases the lender uses unconventional methods such as coercion and violence to make sure they are repaid. The main findings of Ayyegari et al. (2010) is not that the Chinese growth experience has been driven by credit from the banks, since only a small share of private firms actually have access to the formal financial system, but that those who do obtain formal financing through banks are associated with higher growth compared with those who only get financing from informal channels. The findings from Allen et al. (2005) and Ayyagari et al. (2010) suggests that a firm will prefer to obtain financing from banks, but that the informal markets provide a second best alternative for those who cannot access bank finance.

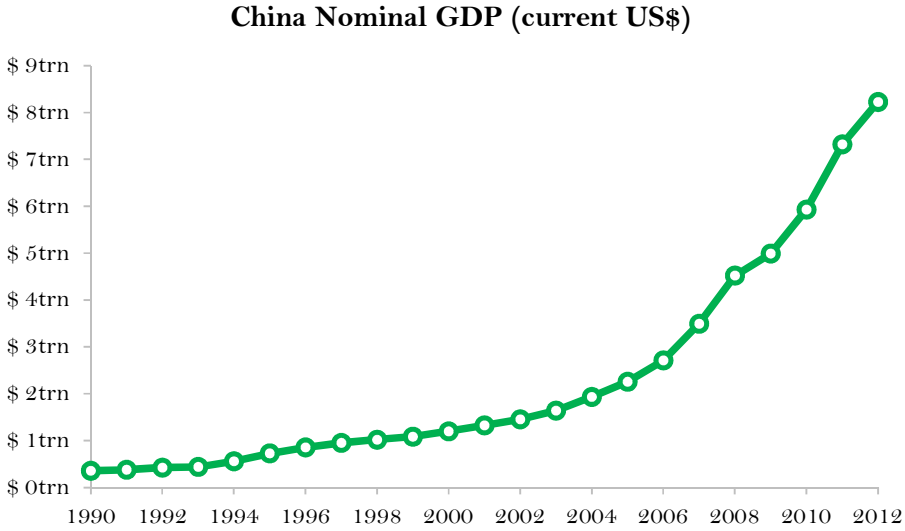
Boyreau-Debray and Wei (2005) find that the state-dominated financial system tends to allocate capital systematically away from more productive regions towards less productive ones. They claim that this allocation practice is mainly to favor inefficient SOEs. They provide the hypothesis that the state has objectives other than maximizing economic efficiency. They suggest three other potential objectives. First, the government may want to channel funds towards poor regions as a measure to reduce poverty. Second, the SOEs could obtain preferential treatment due to their important political status, even if they are not effective. The SOEs are less productive on average and would have trouble competing for funds in a well-functioning capital market, however, the government may channel capital systematically to SOEs out of other concerns than profit maximization, such as avoiding the negative effects on employment. Third, the government could direct capital flows in favor of a particular industrial structure. Boyreau-Debray and Wei (2005) casts doubt on the view that Chinese financial systems functions effectively, and conclude that an investment allocation rule by the government that favors SOEs would systematically allocate capital away from more productive regions towards less productive ones. In that sense a smaller role of government in the allocation of capital might increase the efficiency and growth rate of the economy.

Dobson and Kashyap (2006) assess the developments of the reform of the Chinese banking system in two ways. The first is optimistic, and argue that the Chinese authorities can afford to reform the state-owned banks gradually because of the economy's growth momentum, the small public sector debt-to-GDP ratio, the size of China's foreign exchange reserves, and the

large volume of domestic savings. Figure 1 shows China's annual GDP growth from 1978 until 2012. Figure 2 shows the nominal increase in GDP since 1990, and until 2012.

Source: The World Bank, World Development Indicators

Figure 1: China's economic growth



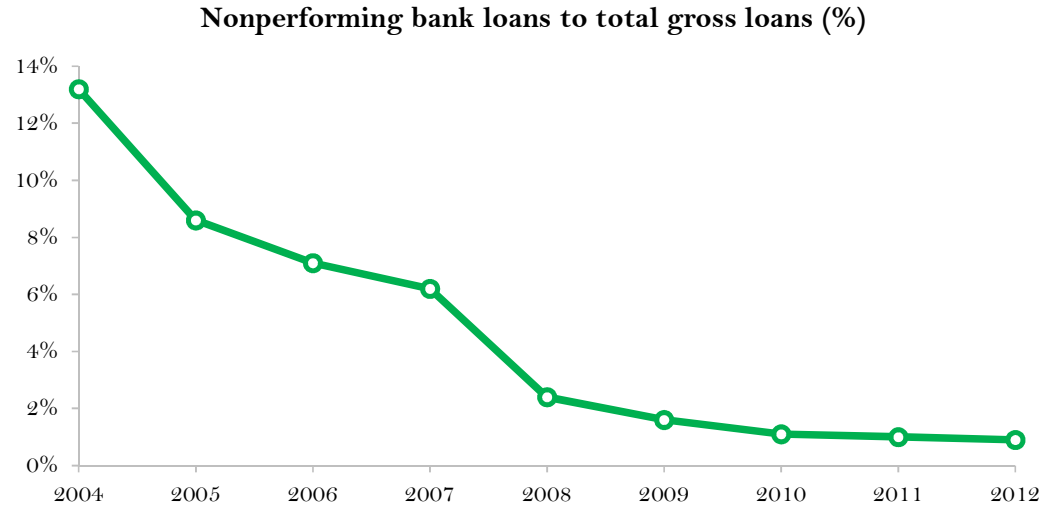
Source: The World Bank, World Development Indicators

Figure 2: China's nominal GDP

The second assessment is less optimistic, and is concerned with the depth of reforms and bank restructuring that remain. An efficient banking system is essential to the efficient allocation of capital and the transmission of monetary policy. Dobson and Kashyap (2006) are skeptical

about the gradual banking reform in China. They show that the dependence of China's SOEs on the state-owned banks for their working capital means that the banks are forced to satisfy contradictory objectives: financing employment and social stability while transforming themselves into commercially viable corporate entities.

Allen et al. (2005) and Dobson & Kashyap (2006) mention nonperforming loans (NPLs) within the Big Four state-owned banks as one of the biggest problems in the Chinese banking sector. Loans to SOEs that did not make profits, due to either political or other noneconomic reasons, made the value of NPLs reach 19 % of GDP in 2002[17], according to Naughton (2007, p. 462). The amount of NPLs has been falling drastically since then, and according to figures from the World Bank,[18] the amount of nonperforming loans to total gross loans was as low as 0.9% as of 2012.



Nonperforming bank loans to total gross loans (%)

2004	2005	2006	2007	2008	2009	2010	2011	2012
13.2	8.6	7.1	6.2	2.4	1.6	1.1	1.0	0.9

Source: The World Bank, World Development Indicators

Figure 3: Nonperforming bank loans to total gross loans (%) in China

There are however some new concerns about the quality of bank loans in China, and according to an article in The Wall Street Journal[19] (2013), some investors and analysts point

[17] 2.3 trillion CNY (Naughton, 2007, p. 462).
[18] http://data.worldbank.org/indicator/FB.AST.NPER.ZS/countries/1W?display=default
[19] Koons, C. for The Wall Street Journal Online (Dec. 3, 2013): Skepticism on China's Nonperforming loans, http://online.wsj.com/news/articles/SB10001424052702304355104579235084041750444

out that debt is being rolled over, and this could be a problem if banks suddenly decide to put a halt to such lending, which could potentially lead to an increase in nonperforming loans again.

Reinhart and Rogoff (2009) describe China as financially repressed, since most citizens are very limited as to the range of financial assets they can invest in, with low-interest bank deposits and cash essentially the only choices. Under financial repression the government can obtain large amounts of resources by exploiting their monopoly over savings vehicles. The interest rates on bank deposits remain tightly regulated. However, according to a speech by the governor of the PBC, the tightly controlled interest rate ceiling on deposits may be removed within a few years (Bloomberg, March 11th 2014).

An efficient allocation would allow the agent with the highest marginal willingness to pay to obtain the good. Stiglitz and Weiss (1981) showed, however, that when it comes to the allocation of bank loans, increasing the price, i.e., the interest rate of a loan, in order to get demand to equal supply, does not necessarily imply an efficient allocation. A profit maximizing bank, might increase profits by lowering the interest rate on loans, because at higher interest rates only more risky borrowers want to borrow, thus lowering the interest rate, and rationing out credit can be the bank's preferable option.

5.3 Misallocation and total factor productivity

There has been published several papers in recent years, discussing the impact of misallocation of resources in China. I will present some of them in order to show how large the effects have been estimated to be. Dollar and Wei (2007) find, using a survey of accounting information from 2002 to 2004 covering 12400 firms in 120 Chinese cities, that by obtaining a more efficient allocation of capital, where capital is transferred from SOEs to private firms, the growth rate of GDP could be raised by 5 percentage points. Due to China's relatively high growth rate of GDP they question the desirability of increasing the GDP growth rate further, but show that alternatively the capital stock could be reduced by 8% without reducing economic growth, which would free more resources to, e.g., raise consumption.

Hsieh and Klenow (2009) measure the impact of resource misallocation in China (and India) on total factor productivity (TFP). Using plant-level data from the Chinese Industrial Survey

(1998-2005) and U.S. Census of manufacturing (1977, 1987 and 1997), they find that if capital and labor had been reallocated to equalize marginal products across production plants to the extent observed in the U.S., TFP could be increased by 30-45% in China. They mention preferential credit markets towards SOEs as one possible explanation of the misallocation. They also find evidence that China may have increased TFP by 1.4% per year in manufacturing between 1998 and 2005 through improved resource allocation, indicating that things have been moving in a desirable direction.

TFP is not directly measurable, but in a neoclassical production function it is the residual part of output growth, the part that cannot be explained by increased factor inputs.

$$Y_t = A_t F(K_t, L_t)$$

This implies that if two countries with equal amounts of factor inputs, e.g., capital, K and labor, L, have different output, Y, the difference in output is due to a difference in TFP, A. Restuccia and Rogerson (2013) show that TFP differences between countries can be explained by either (1) differences in the speed of adopting new technology, (2) differences in the efficiency of operating the technology, or (3) due to inefficient allocation of resources within the country. According to the third explanation, aggregate TFP in a country can be increased if the input factors are allocated towards the firms that can use them most efficiently.

Dollar and Wei (2007) and Hsieh and Klenow (2009) show that distortions in capital allocation in China result in reduced investment efficiency. Dollar and Wei (2007) suggest improving resource allocation either by privatizing SOEs, reallocating capital from the state to the private sector, remove distortions faced by private firms or change the incentives faced by managers of SOEs.

Song et al. (2011) provides a model that helps explain the *"puzzle"* of a growing foreign surplus in China. It is a puzzle because China's growing foreign surplus goes against both the predictions of an open economy model, which predicts that money would flow into China, due to the high return on capital, and the predictions of a closed economy model, which predicts that a high investment rate would lead to a fall in the return to capital, neither of which is observed in China (Song et al., 2011). Their paper also argue that resource misallocation leads to low aggregate TFP, and that a country starting out with severe

inefficiencies can potentially grow fast over a long period of time by shifting factors of production from less productive towards more productive firms. The focal point of their paper is the reallocation of capital and labor within the manufacturing sector, where they propose that domestic private enterprises grow faster than SOEs, but have less access to external finance. They show that the SOEs have three times as large share of their investments financed through bank loans, as do the private firms. In 2006 the capital to output ratio was 1.75 for SOEs and 0.67 for private firms, and the capital per worker was about 5 times larger in SOEs than the private firms. The large discrepancy can, however, not only be explained by the restricted access of bank loans to private firms, but also partly by the relatively large share of private firms in the labor intensive sector, and the relatively large share of SOEs in the capital intensive sector (Song et al., 2011).

Looking to explain some of the imbalances of the Chinese economy, Brandt and Zhu (2010) analyze the resource misallocation between SOEs and private firms. They find that the most important reason for the high growth in China the past three decades is attributed to the high TFP growth in the non-agricultural private sector, as well as a large shift of labor from the agricultural sector as well as from the state sector to this part of the private sector. They find that the TFP growth in the non-agricultural *state* sector grew at an annual rate of 1.52 %, between 1978 and 2007, and that the non-agricultural *private* sector's TFP growth rate was 4.56 % over the same period. The great misallocation of resources towards the state sector has resulted in a much lower capital-labor ratio in the private sector, than the state sector. In 2007, the state's share of non-agricultural fixed investment was 53 % of total investment, even though their employment share was only 13 %. They suggest that reallocation of resources towards the private sector could result in significant gains.

Brandt et al. (2013) measure the distortions in the allocation of capital and labor across sectors and provinces in China between 1985 and 2007. They find that allocation distortions reduced aggregate TFP by 30% on average in this time period. This is however not only due to capital misallocation, but part of it is due to labor allocation distortions. Remember that there have been restrictions in the movement of labor within China, due to the hukou system as was shortly described in chapter 3.2.
Brandt et al. (2013) distinguish distortions as "between province" and "within province inter sectoral" distortions, where the sectors are either state or non-state. They find that the "between province" distortions are mostly due to labor market distortions, while "within

province inter sectoral" distortions are mostly due to the misallocation of capital between the state and non-state sector.

6 The role of banks

Since the banks are a major part of the Chinese financial system, it is interesting to consider some of the special roles banks play in the economy. If a firm wants to borrow money to finance a project, they may obtain that finance directly from savers by selling them bonds, or indirectly by borrow through a bank. If a saver invests directly in a project, the financial return should be higher than the return the saver can alternatively obtain from placing her money in bank deposits, because the bank will take some share of the revenue. So why do many savers prefer to lend their money through a bank, rather than investing directly in a business? Rødseth (2013) provides four important reasons: (1) Liquidity, (2) diversification, (3) screening and (4) monitoring.

In order to understand the meaning of these key words, consider the following short example. A saver wants to obtain a positive return on her savings. She can invest directly in a project, or deposit her savings in a bank. Let's assume that she decides to invest directly in a new restaurant. By investing her savings into the restaurant she encounters uncertainty as to when she can withdraw her money from the project. It may take a while before the restaurant starts making money, if it is ever so fortunate. If she wants to get out of the project quickly, it may be hard to sell her share of the restaurant unless the price is low, i.e., the investment is not very *liquid*. By investing all her savings into the restaurant project, all her savings may be lost if the restaurant goes bankrupt, so she has not *diversified* her portfolio. In order to choose a good investment project it may be necessary to *screen* different projects in order to find the one that seems most profitable, this can be time consuming and might require special skills, which makes it costly. She may also have to *monitor* the restaurant's finances in order to make sure that those who run the restaurant will not deliberately report losses in order to reduce the payments to the investor.

Alternatively she can deposit her savings in a bank, and in this way delegate the tasks of screening, monitoring and diversification of the portfolio to the bank, which specializes in performing these activities. The bank can also provide liquid deposits, despite investing in long term illiquid projects.

In section 6.1 I will give an explanation as to how the banks can create liquidity, and in section 6.2 I will show how banks reduce risks by diversification, and lower the total costs of monitoring.

According to Diamond (2007), two important functions of banks are (1), creating liquid deposits and (2), monitoring borrowers and enforcing loan covenants.

6.1 Creating liquidity

An investment project may take a long time before it starts paying off, and can be very illiquid. One of the important roles of banks is to create liquidity. A saver with a demand for liquidity may prefer to invest via a bank, rather than directly investing on her own (Diamond, 2007).

"An illiquid asset is one in which the proceeds from physical liquidation or a sale on some date are less than the present value of its payoff on some future date" (Diamond, 2007).

The following example is taken from Diamond (2007).

Consider the following asset at three dates, $T = 0$, $T = 1$, and $T = 2$. If one invests one unit at date 0, it will be worth r_2 at date 2, but only $r_1 < r_2$ at date 1. The investors save for future consumption, however, as of date 0, they do not know at what date they will want to consume. In period 1 the investors realize whether they need to liquidate their investment in order to consume early, or if they can keep their investment for one more period and consume in period 2. An investor who would like to liquidate at $T = 1$ is an investor of "type 1", and an investor who can wait until $T = 2$ is "type 2".

As of date 0, investors do not know what type they are, but each one has a probability t of being type 1, and probability $1 - t$ of being type 2. So a fraction t will be early consumers, and a fraction $1 - t$ will be late consumers.

Assume there are 100 investors, and $t = \frac{1}{4}$, so 25 investors are of type 1, and 75 are of type 2.

A type 1 investor with utility function $U(c)$ who consumes c_1 at $T = 1$ has utility $U(c_1)$, and a type 2 investor who consumes c_2 at $T = 2$ has utility $U(c_2)$. An investor who holds the asset (r_1, r_2), which gives a choice of r_1 at $T = 1$ or $r_2 > r_1$ at $T = 2$, consumes $c_1 = r_1$ if of type 1 (with probability t) or $c_2 = r_2$ if of type 2 (with probability $1 - t$). The investor's expected utility is given by

$$tU(r_1) + (1 - t)U(r_2) \tag{16}$$

The investors are assumed to have the risk-averse utility function $U(c) = 1 - (\frac{1}{c})$.

6.1.1 Comparing the liquidity of assets

There are two assets in this economy, one is illiquid and yields $(r_1 = 1, r_2 = R)$, and a more liquid asset which yields $(r_1 > 1, r_2 < R)$. Observe that the illiquid asset gives a lower payoff than the liquid asset, if it is realized in period 1, but a higher payoff if it is realized in period 2. Investors *only* have access to the illiquid asset.

Following Diamond (2007) I will illustrate how increased liquidity increases the utility of the investors, by using a numerical example, where $t = \frac{1}{4}$ and the illiquid asset has $(r_1 = 1, r_2 = R = 2)$. A hypothetically more liquid asset has $(r_1 = 1.28, r_2 = 1.813)$. The expected utility from holding the illiquid asset is,

$$\frac{1}{4}U(1) + \frac{3}{4}U(2) = 0.375 \tag{17}$$

The expected utility from holding the more liquid asset is,

$$\frac{1}{4}U(1.28) + \frac{3}{4}U(1.813) = 0.391 > 0.375 \tag{18}$$

Each investor prefers the more liquid asset, with a higher expected utility. The liquid asset provides a smoother return, with smaller differences in return between the two dates. The preference for the liquid asset comes from the risk-averse utility function.

6.1.2 Liquidity transformation

The hypothetically more liquid asset can be provided by the bank by offering demand deposits, even though the bank invests only in the illiquid asset with $(r_1 = 1, r_2 = 2)$. If investors[20] deposit 1 unit each at $T = 0$, the bank will offer $r_1 = 1.28$ to those who withdraw at $T = 1$ and $r_2 = 1.813$ to those who withdraw at $T = 2$.

[20] The term "investor" should be interpreted quite broadly in this context, i.e., all savers seeking a return on their savings are referred to as investors, including those who "invest" their savings in bank deposits.

With 100 investors depositing 1 unit each, the bank's entire portfolio is worth 100 units at $T = 1$. If 25 depositors withdraw 1.28 each at $T = 1$, then $25(1.28) = 32$ assets must be liquidated, i.e., 32 percent of the portfolio must be liquidated. That implies 68 assets remain until $T = 2$, when they will be worth $R = 2$ each. 75 depositors remain at $T = 2$, and they will each receive

$$\frac{[100 - 32]2}{75} = \frac{[68]2}{75} = 1.813 \tag{19}$$

The bank can provide a liquid deposit which yields a positive return even when liquidated early. Investors holding the illiquid asset directly will, on the other hand, not get a positive return if they liquidate the investment early. This liquidity transformation service is one of the most important functions of banks. The bank can invest in illiquid assets, and by knowing only the fraction of early consumers, it can create liquidity by offering liquid deposits. Investors who do not know if they will be early or late consumers will prefer the possibility the bank provides of withdrawing in period 1 if necessary, to the alternative of direct investment, where the same investor would be forced to liquidate a long term project in period 1, resulting in a lower return in period 1. In this respect, the bank provides insurance to the investors who deposit their money at the bank.

There is a particular challenge related to investing in long term projects by using deposits that can be withdrawn at any time. If a depositor of type 2, who would normally wait until period 2 to withdraw her deposits, suddenly decides to withdraw at period 1, due to, e.g., a belief that many other late withdrawers are withdrawing early, the bank may experience a bank run, and all depositors will withdraw early. In this case the bank will not be able to pay its obligations. To resolve the problem of bank runs, the bank can either suspend the convertibility of deposits to cash, such that only a fraction t of depositors are allowed to withdraw early, or have an insurance that guarantees the deposits by a third party in the event of a bank run (Diamond, 2007). When the bank has deposit insurance, or suspension of convertibility is an option, there is no reason for those who prefer to withdraw late to withdraw early, because they do not risk losing their deposits.

In China very few banks have been allowed to fail, and even though there is no deposit insurance system in China as of now,[21] deposits have been safe in the banks due to government intervention, bailing out financial institutions rather than allowing them to go bankrupt (World Bank and the Development Research Center of the State Council, P.R. China, 2013, p. 122).

If a private Chinese entrepreneur in need of finance cannot obtain a bank loan, she can potentially try to borrow from some investors directly. Many private firms in China do rely on the informal financial system or on borrowing from friends and family (Allen et al., 2005). However, these alternative sources of finance are not perfect substitutes to using a bank as an intermediary, because the entrepreneur may not provide the same liquidity as the bank can. Friends, family or other direct lenders may be reluctant to bind their savings in long term illiquid projects, and would require getting paid a sufficient compensation for the low liquidity. A single entrepreneur in need of finance for a project cannot replicate the banks' way of creating liquid deposits because it is necessary to hold a diversified portfolio of investments. A bank with only one loan and no diversification will not be very successful, since the bank will default whenever the project it invests in defaults (Diamond, 1996).

Banks' ability to create liquid deposits makes them attractive to savers who are not certain as to when they need to convert their savings into cash for consumption. A risk-averse consumer can increase her utility by smoothing consumption, which is made possible by the liquid deposits. This implies that in general many savers may prefer to place their money in banks, rather than investing directly in entrepreneurial projects. In China, however, many of the private firms rely on credit from the informal financial system, and direct borrowing from family or friends (Ayyagari et al. (2010) and Allen et al. (2005)). The interest rates on bank deposits in China are regulated by an interest rate ceiling, which is kept at a rather low level. The informal financial system has been able to offer higher interest rates than bank deposits, making it an attractive alternative for some savers. The interest rate ceiling on bank deposits, however, is expected to be removed in 2015 or 2016, according to a speech by the governor of the Chinese central bank in March 2014 (Bloomberg, March 11th 2014). If the liberalization of interest rates on deposits leads to increasing interest rates, this would, ceteris paribus, lead to a shift of savings from the informal financial system to bank deposits. It is then important that the banking sector at the same time is ready to increase the share of credit going to

[21] There is no deposit insurance system in China as of April 2014, though there are indications that a deposit insurance system will be introduced shortly (see, e.g., Bloomberg, March 6th 2014)

private firms in China. If the banks still give most loans to SOEs after the interest rate has been liberalized, this could reduce the growth potential of China's private sector, which has been the fastest growing sector in recent years.

According to Diamond (1996), the bank's use of diversification and monitoring can explain why it is beneficial to use a bank as an intermediary between investors and entrepreneurs, as will be shown in section 6.2.

6.2 Monitoring and diversification

Allen et al. (2005) show that most Chinese private firms rely on self-fundraising or borrowing from, e.g., friends, family or other informal lenders. Such borrowing and lending may be possible for smaller projects, and for those who are lucky enough to know such lenders. There are, however, some problems related to such lending in addition to the liquidity issue mentioned above. If the lenders are small, they might have to invest all their savings into one project, because diversification would be too costly. If the size of the project is large, and the entrepreneur has to borrow relatively small amounts from many individuals, then it may be beneficial to raise the funds through a bank, due to monitoring costs (Diamond, 1996). Diamond (1996) shows that the costs of monitoring the borrower may be very expensive on aggregate, if many small borrowers have to monitor the borrower individually.

According to Diamond (1996), monitoring may help solve a problem of asymmetric information between a lender and borrower. Without monitoring there would be a need for more costly contracts. Monitoring is however also costly, and especially if several lenders monitor the same loan. Thus it could reduce overall costs if, e.g., a bank acts as a delegated monitor, on behalf of many investors, who deposit their money at the bank.

6.2.1 Without monitoring

Consider a borrower who needs to finance a project, and establishes a profit sharing agreement with a lender. There is an information asymmetry problem between them, where the borrower has information about the profitability of the project, which the lender does not have. Without being monitored the borrower will always have incentives to pay the lender the smallest possible amount, and would thus report no profits.

In order to give the borrower an incentive to pay back the loan, the lender has to liquidate the borrower's project, whenever the borrower does not pay back the loan with an agreed upon interest. This is assumed to be very costly, and liquidation yields no return to either the borrower or lender. A contract between the borrower and lender would have to state a promised payment value. Any lower payment will result in liquidation, and the borrower will never pay any higher amount than the promised payment value.

6.2.2 With monitoring

If the borrower is being monitored, the monitor can observe the return from the project. Hence the project does not have to be liquidated whenever the return is less than the promised payment value. When the lender monitors, he can accept to receive a lower return and avoid the costly liquidation. With all bargaining power with the lender, whenever the borrower cannot return the promised amount, any returns will go to the lender. Because the projects that cannot pay back the promised payment value do not have to be liquidated, which is assumed to give zero return to both borrower and lender, the monitoring will lead to cost savings in the event of financial distress.

6.2.3 Delegating monitoring to a bank

Diamond (1996) shows that having a financial intermediary, like a bank, acting as a delegated monitor on behalf of investors (depositors), will reduce the monitoring costs. Delegating the monitoring gives rise to a new information problem, however, because the investors do not know if the monitor is doing any monitoring. If no one monitors the monitor, then how can depositors know that the bank is doing its job? Diamond (1996) explains that by issuing unmonitored debt contracts (deposits) to the investors, that states what interest rate the depositors will receive, and with a possibility of liquidating the bank if depositors do not receive that interest rate, the bank will have incentives to pay the sufficient amount, because liquidation would be more costly. So with a threat of liquidation of the bank if the depositors do not receive their money, the bank faces the same incentives as the borrower, and will always prefer to pay the sufficient amount needed to avoid liquidation.

If many small investors gave loans directly to a borrower, they would all have to monitor the borrower in order to get any return. The cost of monitoring could be too high. By delegating the monitoring role to a bank, the monitoring costs will be reduced. In addition, Diamond

(1996) shows that the bank can reduce the risk the small investors face, by diversifying its portfolio, and lending to many projects, instead of just one. Under the assumption of independently distributed loans, the risk of default on deposits is reduced towards zero as the bank diversifies its portfolio. The bank can transform monitored debt from those who borrow from the bank, into unmonitored debt to the depositors. The bank will minimize the monitoring costs, as well as costs in the event of the borrower not being able to pay the promised amount.

6.2.4 How is this relevant for what is observed in China?

Many of the private firms in China have difficulties obtaining bank loans. The high growth rate of private firms implies that there is no shortage of good investment projects. Some of these projects may not be realized if the borrowers cannot get access to bank loans, and have to rely on informal credit channels in order to fund their projects. There might be prohibitively high monitoring costs if projects are to be financed by several small investors, as well as higher costs of diversification. This may lead to profitable projects not being realized, which represents a resource allocation loss to the economy.

Diamond (1996) shows how diversification by the bank leads to both safer bank, as well as lower interest rates for the borrowers. If the Chinese banks who predominantly lend to SOEs will increase the share of loans going to private firms, they can become more diversified, and thus reduce costs, by lowering the probability of bank failure.

7 Soft budget constraint

The allocation of resources through the state-owned commercial banking system in China has given a disproportionate large share of loans to SOEs. This can be associated with what is known as a "soft budget constraint", a term introduced by Janos Kornai (Naughton, 2007 p. 309).

"A soft budget constraint is said to exist whenever a loss-making company continues to receive financing. A perfectly hard budget constraint exists when a company has to cover all of its expenditures in a given period from its own income" (Naughton, 2007, p. 309).

As the Chinese economy transitioned into a more market based economy, the competition between firms increased. Several of the SOEs were weak, and perhaps because of their history with little or no competition, many did not perform very well in a market economy and lost money. In a market economy the most efficient and productive firms should force out the weaker firms. However, the state-dominated banking system would not let the weak SOEs fail, but instead provided loans at low interest rates to keep the SOEs afloat. With preferential covenants and interest rates, the SOEs got a soft budget constraint, and the allocation of capital via the banking system to SOEs crowded out more profitable investments that, e.g., the private sector could have financed, and thus resulting in a reduction in overall growth in the economy (Brandt et al., 2008, p. 707).

According to Naughton (2007, p. 103f), the state-owned commercial banks themselves have had soft budget constraints, but faced increasingly harder budget constraints during a period around 1998 with economic austerity, when the access to funds from the government decreased. At this point the state-owned banks had big trouble with nonperforming loans, and in 1999 four asset management corporations, one for each of the big four state-owned banks, were established. Some of the bad loans were transferred to these four asset management corporations in order for them to liquidate the loans for as high value as possible.

Even though the budget constraints hardened for both the state-owned commercial banks, and thus also for the SOEs receiving loans, the banking system still gave a disproportionately large share of loans to SOEs. Allen et al. (2005) finds that the private sector dominates the state and listed sector in growth, size and output over the years 1996 – 2002. While the

private sector grew at an annual rate of 14.3 %, the state and listed sectors grew at 5.4 % in the same period.

Large banks with soft budget constraints are not unique to China. Because of the consequences of allowing large banks to fail, and the adverse impacts this will have on the stability of the economy, large banks are often considered "Too-big-to-fail"[22]. The costs of allowing a bank to fail may be larger to a society than the costs of bailing it out. On the other hand, if the government always bails out bad banks at the tax payers' expense, this gives rise to moral hazard problems, because banks may want to increase the riskiness of their lending, since the gain in case of success goes to the bank's management and owners, while a loss is paid by the tax payers.

The failure of an individual bank may also have negative externality effects on other banks, because a troubled bank may have to sell its assets fast in a "fire sale" which will cause a fall in the value of the those assets (Mishkin, 2013, p. 230). This could also reduce the value of similar assets held by other banks, putting them in danger of not meeting their obligations, potentially leading to more bank failures. This negative externality effect may not be taken into account when a "bad" bank decides its level of risk. In order to reduce moral hazard banks are regulated, but the extent of regulation reveals a potential dilemma for bank regulators. The regulators want to ensure financial stability, but without sacrificing too much of the efficiency in the economy. In the act of balancing between financial stability and efficiency, one of regulators' tools is the requirement of capital adequacy ratios. Because a bank has to hold a certain ratio of own equity against its liabilities, the owners of the bank will want to reduce the risk of default, since they will lose their equity in case of default (Allen and Gale, 2007 p. 192). Higher capital requirements, however, lead to lower returns to the equity holders (Mishkin, 2013, p. 279).

7.1 A model of soft budget constraints

Dewatripont and Maskin (1995) developed a model that shows how unprofitable projects may be financed, due to adverse selection. The main idea is that a bank cannot distinguish between a good (quick) project and a poor (slow) project before providing funds to the project. If a

[22] According to Mishkin (2013, p. 297f), the term "Too-big-to-fail" was first used by Congressman Stewart McKinney in 1984, during a Congressional hearing regarding the insolvency of Continental Illinois, which at the time was one of the ten largest banks in the U.S.

project turns out to be poor, the bank has to decide whether to refinance the project so it can be completed later, or terminate the project before it is completed.

The model shows how a centralized banking system with only one bank will have a "soft budget constraint" problem, which arises because initial investments in poor projects are considered sunk costs, which makes it more profitable to refinance poor projects, rather than terminating them.

China is no longer a centrally planned economy, however, the banking system is dominated by a few inefficient state-owned banks (e.g., Berger et al., 2007, Lin, 2012, p. 208 and Ayyagari et al. (2010)), making it reasonable to use Dewatripont and Maskin's (1995) model of a centralized economy, in order to understand the reason behind the inefficiency of the banking sector.

7.1.1 The Dewatripont and Maskin model

There are two types of economic agents, banks and entrepreneurs. Assume initially that this is a centralized economy, where there is only one bank. The entrepreneur has no funds of her own and has to borrow from the bank in order to finance a project. There are three periods, where in period 0, contracts between the bank and entrepreneur are written, and in period 1 and period 2, the projects are carried out. The project of an entrepreneur can either be good, and will be finished in period 1, or it can be poor, and will require refinancing in period 1 for it to be completed in period 2. If the poor project is not refinanced, it will be terminated in period 1, without being completed. The bank cannot initially distinguish between good and poor entrepreneurs, which are the entrepreneurs' private information. The probability of a project being good is α. All agents are risk neutral, and are maximizing expected profits.

The entrepreneur will receive some private benefit depending on the outcome of the project. This could be considered what the entrepreneur can pocket for herself, or how her reputation will be affected by the outcome of the project.

If the project is good, and thus completed in period 1, the private benefit to the entrepreneur is E_g. If the project is poor and is not refinanced in period 1, but is terminated, the benefit to the entrepreneur is E_t. If the poor project is refinanced in period 1, and completed in period 2, the benefit is E_p, where $E_p \geq E_t$.

In period 0, the entrepreneur applies for a loan, of size 1, from the bank, which is endowed with 2 units of capital. The bank offers a contract where the entrepreneur has to pay $R_g > 1$ to the bank, which is the entire observable profit from a good project. If the project is poor the bank receives nothing in period 1, but has the possibility of refinancing the loan by lending one more unit of capital. If the poor project is refinanced it will give a return $\tilde{R}_p$, which is a random variable that is either 0 or $\bar{R}_p > 0$.

The bank also acts as monitor of the poor project, and at a costly effort the monitoring will affect the outcome of $\tilde{R}_p$. The bank will receive information about the type of the entrepreneur in period 1, and if the entrepreneur is poor, the bank can exert effort $a \in [0, 1]$, to raise the expected outcome of $\tilde{R}_p$ where a is the probability of $\bar{R}_p$. As the bank increases its monitoring efforts, the probability, a, is also increased. The cost of monitoring is denoted $\psi(a)$, with $\psi' > 0$, $\psi'' > 0$, $\psi(0) = \psi'(0) = 0$, and $\psi'(1) = \infty$. These assumptions ensure that the optimal level of monitoring, $a^* \in (0, 1)$, such that $\bar{R}_p = \psi'(a^*)$, and an expected return for the bank (gross of its capital investment) of $\Pi_p^* \equiv a^* \bar{R}_p - \psi(a^*)$.

The payoffs to the entrepreneur and the bank, under centralization are summarized in Table 3.

Table 3: Payoffs under centralization

	Good project (assuming $E_g > 0$)	Poor project without refinancing	Poor project with refinancing
Entrepreneur	E_g	E_t	E_p
Bank	$R_g - 1$	-1	$\Pi_p^* - 2$

Source: Dewatripont and Maskin (1995)

In order to consider the simplest case of decentralization, assume that there are now two banks, $B_1$and B_2, each with only one unit of capital. If the project is good, the result is the same as in the above example with one centralized bank, and the same result also holds for a poor project that is not refinanced. For a project to be refinanced however, the entrepreneur has to turn to the other bank than the one that initially gave the loan, since this first bank has no more capital. If the entrepreneur got the initial loan from B_1in period 0, and the project is poor, she now has to get the loan refinanced from B_2. It is assumed that any monitoring done

by B_1in period 1 is B_1's private information, and not observable by B_2. It will be B_1's job to convince B_2 of lending a second unit of capital to the entrepreneur with the promise of a share of $\tilde{R}_p$. The higher B_2's expectation of B_1's monitoring effort in period 1, the smaller this share can be. Dewatripont and Maskin (1995) show that the equilibrium monitoring effort is less than a^* (the effort level under centralization), even though $B_1$is given all bargaining power, which maximizes his incentives to monitor. If $\hat{a}$ is B_2's expectation of B_1's level of monitoring, then to convince B_2 to refinance the loan, the repayment to B_2 has to be $1/\hat{a}$ if $\tilde{R}_p = \bar{R}_p$. This means that B_1 chooses a to maximize,

$$a\left(\bar{R}_p - \frac{1}{\hat{a}}\right) - \psi(a), \tag{20}$$

Differentiating this with respect to a, gives $\left(\bar{R}_p - \frac{1}{\hat{a}}\right) - \psi'(a)$. In equilibrium, $\hat{a}$ must be correct, so that if a^{**} is the equilibrium level, it has to satisfy $\bar{R}_p = \psi'(a^{**}) + 1/a^{**}$. We have $a^{**} < a^*$, since B_1hides part of the marginal return from monitoring to B_2. Thus $\Pi_p^{**} \equiv a^{**}\bar{R}_p - \psi(a^{**})$ is less than $\Pi_p^* \equiv a^*\bar{R}_p - \psi(a^*)$.

The equilibrium payoffs under decentralization are shown in Table 4.

Table 4: Payoffs under decentralization

	Good project (assuming $E_g > 0$)	Poor project without refinancing	Poor project with refinancing
Entrepreneur	E_g	E_t	E_p
B_1	$R_g - 1$	-1	$\Pi_p^{**} - 2$
B_2	0	0	0

Source: Dewatripont and Maskin (1995)

To compare the outcomes of the centralized and decentralized economy, some assumptions are necessary. It is assumed that the total payoff from a poor project in the centralized economy that is being refinanced, generates a negative "social surplus" ($\Pi_p^* + E_p < 2$), that good projects have a positive social surplus ($R_g + E_g > 1$), and the poor entrepreneurs have a

negative private benefit from having their project terminated at period 1, and a positive benefit if the poor project is refinanced and completed in period 2 ($E_t < 0 < E_p$).

Given that $E_t < 0 < E_p$, a sufficient condition for the selection of projects to differ between the equilibrium in the centralized and decentralized economy is $\Pi_p^* > 1 > \Pi_p^{**}$. If this condition holds, both the good projects and the poor ones are financed in the centralized economy, and the poor projects will be refinanced, hence they have a soft budget constraint. Only the good projects are financed in the decentralized economy, which is the socially efficient outcome.

In the decentralized economy only good projects would be financed, since entrepreneurs know that any poor projects would be terminated, because the benefit to the bank is larger from terminating rather than refinancing poor projects, $-1 > \Pi_p^{**} - 2$, when $1 > \Pi_p^{**}$. When assuming that E_t is negative, the entrepreneurs with poor projects have no incentive to apply for loans.

Dewatripont and Maskin's model shows that the budget constraint becomes harder with two banks rather than only one bank. The result implies that having more small banks could help reduce the soft budget constraint problem. Even though there are some smaller banks in China, the banking system is still dominated by the "Big Four" banks, which enables the soft budget constraint problem to exist. This could lead to a new situation of rising amounts of nonperforming loans among the state-owned banks, if the borrowers rely on easy access to bank credit and increase investments in risky projects, rather than face hard budget constraints.

7.1.2 Extending the model

I will now extend the model of Dewatripont and Maskin (1995) to be consistent with some empirical facts about China. In the previous model by Dewatripont and Maskin (1995) there was only one type of borrower, an entrepreneur, but I will extend the model to include two types of borrowers.

The two types of borrowers in the economy are SOEs and entrepreneurs, where entrepreneurs are starting private enterprises without any government ownership. For simplicity there is only one bank, and it is assumed to be state-owned. The bank is profit maximizing in regard

to its lending to the entrepreneur, but due to its government ownership, the bank suffers a non-monetary loss when state-owned projects are terminated, and thus behaves as welfare maximizing in regard to its lending to the SOE.

Assume that both SOEs and entrepreneurs have projects that are either good with probability α or poor with probability $1-\alpha$. A good project yields a monetary return, R_g, to the bank, and it yields a private benefit, E_g, to the borrower. As a simplification compared to the Dewatripont and Maskin model, I will assume that poor projects that are being refinanced will return R_p to the bank in the second period with certainty.

Table 5: Payoffs with a state owned bank concerned about unemployment from terminating SOE projects

	Good project (assuming $E_g > 0$)	Poor project without refinancing	Poor project with refinancing
Entrepreneur	E_g	E_t	E_p
SOE	E_g	E_t	E_p
Bank (w/loan to E.)	$R_g - 1$	R_t	R_p
Bank (w/loan to SOE)	$R_g - 1$	$R_t - B(N_s)$	R_p

Table 5 shows the payoffs to the different agents. Notice that there is no difference in the payoffs to the entrepreneur and the SOE, the only difference is in the bank's payoff when lending to a poor project, depending on whether the borrower is an entrepreneur or a SOE.

It is assumed that the bank, which is owned by the government, care not only about profit maximizing, but also care about the employment level in SOEs. If a SOE project is terminated the payoff to the bank is the liquidation value of the project, R_t, minus the government's valuation of the employment loss, $B(N_s)$, that is assumed to occur when a project is terminated. Where $B(N_s)$ is a function where N_s corresponds to the number of people being laid off when a SOE's project is terminated. The idea of using the term $B(N_s)$ is borrowed from Kornai et al. (2003), who use a somewhat similar term that includes *"such things as the political benefit of keeping project workers employed" (Kornai et al., 2003)*.

According to Naughton (2007, p. 185), China has always been worried about dealing with underemployment. As their population grew at the rapid rate of 2.5% per year through the 1980s, millions of new jobs had to be created each year. In order to avoid unemployment the government provided make-work jobs, similar to that of a social welfare system, where the recipients have to work for their benefits, but often at jobs that provide less financial benefit to society than they cost. Later in the 1990s as a measure to reform the labor market, a lot of employees in state-owned enterprises that were considered "surplus workers" got laid off. Naughton (2007, p. 186) claims that between 1993 and 2003, at least 28.18 million employees from state-owned enterprises were laid off. The laid-off workers were connected with Reemployment Centers, established to help them find a new job, and substantial efforts were made to buffer laid off SOE workers from their new situation as unemployed. The laid-off workers retained some income, and often housing and insurance provided by the SOE they had worked for (Naughton, 2007 p. 188).

The Chinese government has shown in the past that they are able to lay off excess workers in SOEs, but such action is typically associated with costs, since the government may have an obligation to help find other work, or provide other benefits to the unemployed. Thus it seems consistent with the empirical situation that the banks in the above model experience extra disutility if SOEs' projects fail and employees in SOEs are fired. The term $B(N_s)$ can hence be thought of as containing other costs to the government from terminating a state-owned project, which a private entrepreneur's project are excluded from, such as social security costs, or special housing and insurance costs (as mentioned by Naughton (2007, p. 188), potential protests, as well as the loss of pride from a failed state-owned project. The term can also reflect what Lin (2012, p. 199) calls the "strategic" and "social" burden of SOEs, as I mentioned in the beginning of Chapter 5.1.

Consider a loan given to an entrepreneur, and the project turns out to be a poor project. If the payoff to the bank is such that, $R_p - 1 > R_t$, the bank will want to refinance the project. It follows that a poor project started by an SOE will also be subject to a soft budget constraint in this situation, since $R_t > R_t - B(N_s)$.

Depending on the government's valuation of employment in the SOEs, $B(N_S)$, it is possible to get an outcome where the poor projects of SOEs are being refinanced, while entrepreneurs' poor projects are terminated.

Consider the following situation,

$$R_t > R_p - 1 > R_t - B(N_s) \tag{21}$$

The liquidation value of the entrepreneur's project is larger than the value obtained from refinancing the project for completion one period later. The SOE's project, on the other hand, will be refinanced because the bank would incur a lower payoff from terminating the project.

The bank has several alternative uses of one unit of capital. Assume that there are several projects that all require bank credit in order to get started. The bank cannot distinguish which projects are good and which are poor, but knows that a portion α of the loans will be good (fast), and a portion $1 - \alpha$ will be poor (slow). The probability of a random project being good is thus α, and with probability $1 - \alpha$, the project is poor. If the bank commits ex ante to terminating any loans to entrepreneurs that turn out to be poor, its expected value from lending one unit of capital to an entrepreneur's new project is,

$$\alpha(R_g) + (1 - \alpha)(R_t) \tag{22}$$

And the expected social surplus would be,

$$\alpha(R_g + E_g) + (1 - \alpha)(R_t + E_t) \tag{23}$$

The social surplus is the sum of the bank's return and the private benefit to the entrepreneur. If the bank would rather spend one unit of capital on refinancing an entrepreneur's project that is in its period 1, and that the bank has discovered is poor, the expected gross return from lending one unit of capital to refinance this project is, R_p.

Equation (22) shows the expected payoff to the bank from lending to an entrepreneur, given that the bank commits ex ante to terminate the project if it turns out to be a poor project.

If, however, the bank commit to this same strategy with an SOE's project, the expected payoff to the bank will be,

$$\alpha(R_g) + (1 - \alpha)(R_t - B(N_s)) \tag{24}$$

Equation (24) is smaller than (22), given that $\alpha \neq 1$ and $B(Ns) > 0$. The bank will thus

strictly prefer to lend to an entrepreneur, when it has committed to terminating any projects that are poor projects.

But such a commitment to terminate an SOE's project, given that it turns out to be poor, is not credible if we are in a situation like the one shown in inequality (21), where the refinancing of an SOE's poor project yields a higher payoff to the bank than the payoff from terminating the project.

$$R_g + E_g > R_t + E_t > R_p + E_p - 1 > R_t - B(N_s) + E_t \tag{25}$$

The above inequality (25) shows the social surplus of different outcomes.

Assume that the bank has committed to terminate an SOE project ex ante if it turns out to be poor. This could be signaled to SOEs in order to prevent poor projects from applying for loans, given that SOEs themselves know if a project is poor or good ex ante. As in Dewatripont and Maskin (1995), assume that the entrepreneur and SOE have private information about their project's type, but that the bank cannot observe until period 1 whether the projects are good or poor. Since the private benefit to both an SOE or entrepreneur is negative if the project is poor and terminated in period 1 ($E_t < 0$), no one will want to borrow to finance a poor project if the bank has committed to terminating any projects that turn out to be poor. Such a strong commitment would imply a hard budget constraint for the borrowers, and should deter any agents with poor projects from applying for loans.

Given that inequality (25) holds, this commitment is only credible for entrepreneurs, but not for SOEs. If an SOE with a poor project gets a loan, they will want to refinance the loan in period 1, for one additional unit of capital. The bank would face the choice of either liquidating the project or refinancing, with the respective payoffs,

$$R_t - B(N_s) \text{ versus } R_p - 1 \tag{26}$$

Consider the three possible scenarios,

$$R_t - B(N_s) > R_p - 1 \tag{27}$$

(1) The value of termination is larger than the value of refinancing and completing the project one period later. In this case the budget constraint is hard even for the SOE, and the project is terminated.

$$R_t - B(N_s) < R_p - 1 \quad (28)$$

(2) The value of termination is lower than that of refinancing and completing the project one period later. The SOEs budget constraint is soft.

$$R_t - B(N_s^*) = R_p - 1 \quad (29)$$

(3) Imagine that there is some threshold value of N_s for which the bank is indifferent between terminating the project and refinancing it. Assuming that different SOEs projects have different size in terms of the number of employees, we find that projects of size above N_S^* will be "too-big-to-fail".

In the above model it is the government's valuation, $B(N_S)$, that determines whether SOEs will be refinanced or not. If the market was allowed to determine where resources should be allocated, and the government had no influence over the banks' lending, $B(N)$ would be zero, and the SOEs and private firms would have equally hard budget constraints. This objective valuation could obviously vary over time, and in relation to the Chinese economy, we can imagine that $B(N_S)$ might slowly move towards zero as the economy gradually transitions, and market forces play an increasingly important role in the allocation of resources. However it will be up to the Chinese government to decide at what pace the valuation of $B(N_s)$ will be reduced. A reduction will however increase overall economic efficiency, because the poor SOEs that are refinanced are assumed to be ex ante inefficient, i.e., $2 > R_p > 1$. And if SOEs know that they no longer face soft budget constraints, this should affect their decision making, and reduce inefficiency.

7.1.3 Financially constrained entrepreneurs

If inequality (25) holds, we have a situation where only the good entrepreneurs will obtain bank finance, while SOEs will get both their good projects financed, as well as their poor projects refinanced. As shown in inequality (30), the liquidation value of a private entrepreneur's project, $R_t + E_t$, is higher than the value of refinancing it, $R_p + E_p - 1$, while the liquidation value of an SOEs project, $R_t - B(N_s) + E_t$, is lower than the value of refinancing it.

$$R_t + E_t > R_p + E_p - 1 > R_t - B(N_s) + E_t \quad (30)$$

I have showed how poor and inefficient SOEs get preferential treatment in the market for bank credit. I have not yet showed that this may lead to a situation where entrepreneurs with good projects are not getting sufficient access to bank credit, which is the main problem with the Chinese banking system's lending policies. I will, however, address this in chapter 7.2, where I show how refinancing poor SOEs crowds out lending to more profitable private enterprises.

Allen et al. (2005) show that the growth of the private sector is higher than the state and listed sector, despite having worse access to standard financing channels. Guariglia et al. (2011) find that private firms in contrast to SOEs are financially constrained, and are being discriminated against by the banking sector, using survey data of 79 841 Chinese firms between 2000 and 2007. They also suggest that,

"*SOEs are not subject to financing constraints, probably because of the important role they play in absorbing surplus labor and helping to maintain social stability, which guarantees them unlimited loans from the state banks" (Guariglia et al., 2011)*.

Their findings are consistent with the soft budget constraint SOEs face in my extension of the Dewatripont and Maskin model. Why are the private firms being discriminated against if they are more efficient and have higher growth rates?

I will show two explanations as to why the private entrepreneurs have trouble getting bank loans. In section 7.2 the private entrepreneurs are crowded out by loans going to poor performing SOEs, and in section 7.3 I will consider how collateral can affect the allocation of bank loans.

7.2 Crowding out profitable investment

Berglöf and Roland (1997) show how a soft budget constraint can crowd out profitable new investments, in a model similar to that of Dewatripont and Maskin (1995). In Berglöf and Roland's model, investment projects require one unit of capital, and there are two types of projects, where a projects are good, and are finished in period 1, while $(1-a)$ are poor. The bank gets the entire monetary return R_i from the projects, while the firm gets a private non-monetary benefit E_i. If a project is good, the payoffs are (R_g, E_g). If a project is poor, the firm

can either exert high or low effort, which will affect the payoffs from the project. If the firm exerts high effort, e_h, the return will be equal to a good project, with payoff (R_g, E_g), where the benefit to the firm is net of any effort. If the project is poor and low effort, e_l, is exerted, the project may be terminated, yielding the payoff $(L, 0)$. L is then the liquidation value of the project going to the bank. Assume that L is 0 for now, so neither the bank nor the firm gets any payoff whenever a poor project is liquidated. The bank can refinance the poor project where the low effort has been exerted. By investing an additional unit of capital the poor project will be completed one period later, yielding the payoff (R_p, E_p).
The bank cannot distinguish between good and poor projects before credit is given, however, by the end of period 1, the quality of projects is observed and becomes common knowledge. The firms know whether their projects are good or poor before requesting a loan, but this is their private information.

It is assumed that the private benefits from getting a project refinanced is larger than the benefits from two good projects, $E_p > 2E_g$. The private benefit from a good project is also positive, $E_g > 0$, so the firm prefers to exert high effort and get the poor project finished in period 1, if the alternative is certain liquidation, which yields zero private benefit. See the below table for an overview of the different payoffs.

Table 6: Payoffs

	Good project $E_g > 0$	Poor project with high effort	Poor project with low effort, no refinance	Poor project, low effort, with refinance
Firm	E_g	E_g	0	E_p
Bank	$R_g - 1$	$R_g - 1$	L	$R_p - 2$

There is no monitoring of the borrowers by the bank, but if the bank can credibly commit to not refinance any poor projects, this would deter poor projects from seeking credit.

Consider a sequential game with four periods. At period 0 the government transfers capital, C_0, to an independent bank. The funds will finance C_o projects. Poor entrepreneurs decide on

their effort, given their expectations about being bailed out or not. In period 1 the returns to the bank from lending in period 0 is realized, and the bank decides whether to finance new projects, or to refinance poor projects. The bank is profit maximizing, but does not monitor or screen any firms, it is assumed to not have the technology or capabilities of doing so. Any new projects financed in period 1, that are poor, will have to decide their effort level in period 1. In period 2 no new projects are generated. If poor projects with low effort are refinanced in period 2, they are completed in period 3, and the game ends.

Table 7. Timing table

Period 0	Period 1	Period 2	Period 3
t = 0 The government transfers C_0 to the bank. The bank finances projects. Firms decide effort.	t = 1 Banks reallocate revenues from period 0 between new projects or refinancing of poor projects. Firms decide effort.	t = 2 Banks decide if they will refinance poor projects. Revenues from investments at t=1 are generated.	t = 3 Revenues from refinancing at t=2 is generated.

Source: Berglöf and Roland (1997)

The assumption that no new projects are generated in period 2 might seem unrealistic, but Berglöf and Roland (1997) explain how this does not affect the results.

The return from refinancing poor projects is assumed to be ex ante unprofitable, but will be ex post profitable when the initial capital unit invested is sunk, $2 > R_p > 1$. In other words, one must in total invest two units of capital in poor projects for them to be completed, which gives a total return less than two. But since the bank does not know what projects are poor before extending the first unit of credit, this unit will be considered a sunk cost when poor firms require refinancing. This gives the foundation for the firms' soft budget constraint provided by the bank. Because the firms with poor projects know that the bank will consider the initial unit of credit as sunk cost, they have an incentive to exert low effort, and get their projects refinanced. The bank's expected net return to a new project financed in period 1, given the soft budget constraint is,

$$a(R_g - 1) + (1 - a)(R_p - 2). \tag{31}$$

One central difference from the model of Dewatripont and Maskin (1995) is that the opportunity cost of investment is not zero. In the Dewatripont and Maskin (1995) model, the

bank would refinance poor projects as long as it gave a positive return, because the alternative was an investment with interest rate set to zero. In this Berglöf and Roland (1997) model, however, the bank has a limited amount of resources, C, and it will not spend one unit of capital refinancing a poor project, if the expected payoff from investing that unit of capital in a new project is higher. The bank will consider the opportunity cost of its actions, and choose the allocation that maximizes its payoff, and depending on some conditions explored later, the firms will face either a hard or soft budget constraint.

If the bank prefers to place all revenue from period 0 into new projects, the budget constraint will be hard, and poor firms will be better off by exerting high effort in period 0. If the bank prefers to give first priority to refinance the poor projects, before financing new projects, then the poor firms will choose low effort.

The expected net return from lending to a new project is, $a(R_g - 1) + (1 - a)(R_p - 2)$, while the net expected return from refinancing a poor project is $R_p - 1$.

Given that $2 > R_p > 1$ and an exogenous a, we can find out how a, R_g and R_p affects the softness of the firms' budget constraints.

$$a(R_g - 1) + (1 - a)(R_p - 2) = R_p - 1 \tag{32}$$

The above equation shows the level where the bank is indifferent between refinancing a poor project, and financing a new project. The left hand side of the equality shows the expected value of lending a unit of credit to a new project, given that it will be refinanced if it turns out to be poor. The right hand side is the value of refinancing a poor project.

Proposition 1: It follows that the firms will face a hard budget constraint in period 1 if,

$$(R_g - R_p) > \frac{1 - a}{a} \tag{33}$$

And a soft budget constraint if,

$$(R_g - R_p) < \frac{1 - a}{a} \tag{34}$$

The budget constraint will be more likely to be hard if the ratio of good to poor projects is

high, i.e., if a is high, and if the difference in payoff to the bank from good projects and poor projects is high, that is for increasing positive values of $(R_g - R_p)$.

If there is a low ratio of good projects in the economy, and only a small difference in return between good and poor projects, then the bank will prefer to give firms a soft budget constraint. This result could be helpful in understanding the problem China's banking sector faced in the late 1990s and early 2000s with large numbers of non-performing loans. If the average quality of projects was low, the firms with poor projects knew that they would probably face soft budget constraints and would therefore apply for bank financing, causing an exacerbation of the situation.

The result in proposition 1 was based on equation (32), where all poor projects were assumed to be refinanced. If not all poor projects are being refinanced, but some of them are completed in period one due to high effort or if some are being terminated, then this would shift the point where banks are indifferent between refinancing poor projects and investing in new projects in the direction of harder budget constraints.

I will show that the number of new projects financed is lower when firms have soft budget constraints. Soft budget constraints lead to crowding out of new investment.

Under hard budget constraints, total net returns to the banks are,
$\Big(aR_g + (1-a)R_p - (1-a)\Big)\, C_{1H} - C_o$, where the number of new projects financed at $t = 1$ is given by $C_{1H} = R_g C_0$.

When calculating C_{1H}, remember that under hard budget constraints, all good projects yield R_g and all poor projects also yield R_g, because all the poor firms will use high effort, giving $C_{1H} = C_0\big[aR_g + (1-a)R_g\big] = R_g C_0$

In this setting all budget constraints will be soft at $t = 2$, since it is assumed that no new projects are generated at $t = 2$. Only at $t = 1$ does the bank have to decide whether to refinance old, or invest in new projects. Projects refinanced in period 1, generate revenue in period 2. All new projects that were financed in period 1 and turn out to be poor will then be refinanced in period 2 and generate revenue in period 3 (See Table 7 for the timing of actions).

Under soft budget constraints, total net returns to banks are, $\left(aR_g + (1-a)R_p - (1-a)\right)C_{1S} + (1-a)R_pC_0 - C_0$, where the number of new projects financed at $t = 1$, is given by $C_{1S} = \left(aR_g - (1-a)\right)C_0$.

When calculating C_{1S}, remember that the share of poor projects, $(1-a)$, that obtain credit in period 0 will be refinanced in period 1. Thus $C_{1S} = C_0(aR_g) - (1-a)C_0 = \left(aR_g - (1-a)\right)C_0$

The bank gets C_0 from the government, which is lent to different projects. Under hard budget constraints all borrowers will be either good, or exert high effort, so the return on all projects will be R_g. The bank thus gets R_gC_0 in $t = 1$, which can be used to finance new projects. The new projects yield $(aR_g + (1-a)(R_p - 1))$ which is the same as $(aR_g + (1-a)R_p - (1-a))$.

Under a hard budget constraint regime there will be no refinancing of poor projects in period 1, and all revenues from the initial projects go to new projects. In the soft budget constraint regime, poor projects will be refinanced in period 1, and if there are any remaining revenues this will be invested in new projects. In period 2, however, there will be no difference in the hardness of budget constraints between the hard budget constraint regime and the soft budget constraint regime. All the new projects that are financed using revenue attained in period 1 and turn out to be poor will be refinanced in period 2, because of the assumption that no more new projects are generated in period 2. Because there are no new projects in period 2, the best option for the bank, even in the hard budget constraint regime is to refinance the poor firms in period 2, since the bank invests only one additional unit of capital, but get a return $1 < R_p < 2$ in the third period. No poor firms in period 2 will exert high effort either, since they will receive a higher payoff by being refinanced, because of the assumption, $E_p > 2E_g$.

C_{1S} denotes the number of new projects financed at $t = 1$ when there is a soft budget constraint. This corresponds to the amount that is *not* spent on refinancing poor projects. If $(1-a)$ poor projects were financed in period 0, then only what is made on the good projects, i.e., aR_gC_0, minus what has to be refinanced on bad projects, $(1-a)C_0$, can be spent on new projects, thus $C_{1S} = C_0(aR_g - (1-a))$.

$$C_{1S} = C_0(aR_g - (1-a)) < C_{1H} = C_0(aR_g) \quad (35)$$

Since, $C_{1S} < C_{1H}$, the amount of new projects being financed is larger under a hard budget constraint regime than under a soft budget one. This implies that it is more difficult for new projects to get financed under soft budget conditions.

This result is interesting when considering the situation in China, where SOEs have had soft budget constraints and easy access to bank credit. Such soft lending may have crowded out more profitable investments, both from more efficient private firms and more efficient SOEs that alternatively could have invested in profitable projects had they obtained bank loans instead. Giving some enterprises easy access to bank credit, which enables them to roll over debt, and invest in projects that are ex ante not profitable because it gives the managers some private benefit, is not an optimal situation. Such misallocation of resources will negatively affect the aggregate TFP in the economy (as previously mentioned in chapter 5.3), and a reallocation of funds towards more efficient enterprises will improve the economic output, or alternatively, a better allocation can achieve a given level of output, but use less resources on investment, thus leaving more resources for consumption (Dollar and Wei, 2007).

In the model the liquidation value of a poor project, L, was assumed to be zero. Berglöf and Roland (1997) mention the effect a higher value of L will have, and that if, $L \geq R_p - 1$, then the hard budget constraint will apply. An underdeveloped financial market may not be able to obtain a high liquidation value, due to informational asymmetries.

Berglöf and Roland (1997) claim that any liquidation that does not satisfy $L \geq R_p - 1$ will lead to a soft budget constraint, and refinancing of the poor project. I will show one scenario where this is not the case. Assume that a poor project can be liquidated at the end of period 0, and that L can be reinvested in a new project in period 1. The bank will then choose to liquidate whenever $L\big(a(R_g - 1\big) + (1-a)\big(R_p - 2\big)) > R_p - 1$. It follows that a high liquidation value will harden the budget constraint, even if say $L = 1$, which is less than $R_p - 1 > 1$. Because $L = 1$ yields the same results as previously shown, where the budget constraint will be hard when $(R_g - R_p) > \frac{1-a}{a}$. There can be situations where a firms' project does not achieve success after one period, which would have yielded R_g, but the liquidation value may still be relatively high, if, e.g., parts of the failed project can be sold.

Soft budget constraint problems are normally associated with transition economies (Berglöf and Rolan, 1997 and Kornai et al., 2003) and because the agents in a transition economy are by definition new to a market economy, a common characteristics is that the economy is financially narrow, in the sense that capital markets are not as varied as in more developed economies (Naughton, 2007 p. 450).

China has a relatively short history as a market economy and the legal system, institutions, property rights and bankruptcy procedures are weak (Allen et al., 2005). The government can invest in institutional infrastructure, and thus by improving these institutions, a result may be a lowering of the banks' costs of screening and monitoring, due to increased transparency. As the markets are improved, the ability to value collateral and get a higher market value for liquidated assets may increase L, and thus make the threat of liquidation stronger. This will harden the budget constraints of poor firms, and make them exert high effort.

According to Mishkin (2013, p. 223), the Chinese government is in the process of developing a new bankruptcy law, which will improve the lenders ability to take over the assets of defaulting firms. This may increase the value of liquidating some projects, thus making it relatively more profitable for the banks to liquidate, rather than refinance poor projects.

8 The importance of collateral

There is informational asymmetry between borrowers and lenders, and any lender is concerned that a borrower will gamble with the borrowed funds, and take on too much risk. It is known as a moral hazard problem when firms with borrowed funds, which are protected by limited liability, want to increase the risk of their investments, because they do not lose more than their equity in the event of failure, however, in the case of success, they stand to reap the increased gains. One way to alleviate such a moral hazard problem is for the lender to demand collateral from the borrower. With collateral the lender incurs a smaller loss if the project fails, and at the same time the borrower has more incentives to perform better, because they risk losing the collateral.

The following model is from Ghosh et al. (2000), and explains the effects collateral can have on entrepreneurs' efforts.

An entrepreneur has an idea for a new project and requires an amount, L, in order to invest in the project. Because of the risk involved, the project will either succeed with probability p, giving a gross return of Q, or it will fail, with probability $(1-p)$, and return nothing. The entrepreneur can affect the probability of success by exerting effort, so that $p(e)$ is the conditional probability of success. Assume that the probability of success is increasing with effort, and that the there is diminishing marginal returns to effort, $p'(e) > 0$ and $p''(e) < 0$.

If the entrepreneur uses his own savings to invest in the project, his effort level will be chosen so as to,

$$\max_{e} = p(e)Q - e - L \tag{36}$$

The optimum level of effort, e^*, is given by the first order condition,

$$p'(e^*) = \frac{1}{Q} \tag{37}$$

Now consider that the entrepreneur does not have any savings, but has to borrow from a bank. The entrepreneur borrows L and has to pay interest, i, so the total debt repayment is $R = (1+i)L$. The entrepreneur is protected by limited liability, and the effort level is not directly visible to the bank, and thus not contractible, which is the basis of a moral hazard problem.

Now assume that the entrepreneur has some savings, or other wealth, w[23], that will be posted as collateral in order to obtain a loan.

In this situation the entrepreneur will chose his effort level, so as to,

$$\max_{e} = p(e)(Q - R) - (1 - p(e))w - e \tag{38}$$

The optimal level of effort now, $\hat{e}$, is given by the first order condition,

$$p'(e)(Q - R) + p'(e)w - 1 = 0 \tag{39}$$
$$p'(e)(Q + w - R) = 1 \tag{40}$$

$$p'(\hat{e}) = \frac{1}{Q + w - R} \tag{41}$$

The effort level $\hat{e}(w, R)$ is increasing in w and decreasing in R. Because of limited liability an increase in total debt will hurt the expected payoff in the case of success, but not in the case of failure, and the effort chosen will therefore be diminishing as R is increased. Because the collateral is lost in the case of failure, a higher level of collateral gives the entrepreneur incentives to exert more effort.

Assume that the bank's expected profit from a loan is given as, $\pi \geq 0$, and that the profit will be kept constant for any type of borrower. The bank can choose if it wants to lend, so the lending will be restricted to positive profit levels, $\pi \geq 0$. The interest rate on the loan will depend on the amount of collateral in order to obtain a fixed level of π.

$$\pi = p(e)R + \big(1 - p(e)\big)w - L \tag{42}$$

.

Given that, $L > w$, it follows that, $R > w$. From equation (37) and (41) we can see that $p'(e^*) < p'(\hat{e})$, which tells us that the effort level is higher without borrowing, $e^* > \hat{e}$, given the concavity of the $p(e)$ function.

As long as the collateral is not enough to cover the entire value of the loan, the amount of effort exerted is less than optimal.

[23] The wealth may be assets such as real estate, land, cars, or other assets acceptable as collateral by the lender.

This creates a moral hazard problem, in which the entrepreneur will be less willing to work hard when his project is partially financed with borrowed money, compared with complete self-financing.

The effort level of the borrower is increasing with respect to the amount of collateral, which is intuitive since the borrower has more incentives to reduce the risk of failure, and will thus work harder. However, this implies that for a constant profit level to the bank, higher levels of collateral will reduce the interest rate charged on the loan, which is paid when the project is successful. This will increase the payoff to the borrower, and hence increase the total surplus.

This helps explain why banks can offer lower interest rates to those with collateral. It could explain why small and medium sized Chinese private firms have difficulties obtaining financing from the banking sector. As shown, the level of collateral a firm can post could reduce the riskiness of a project, since wealthy borrowers provide better guarantees to the bank in case of default, as well as lower default risk due to increased incentives (Ghosh et al., 2000).

According to Ayyagari et al. (2010), Chinese firms typically have to post collateral in order to get bank financing. It is natural to assume that larger firms, such as large established private enterprises and most SOEs have more collateral than smaller private firms and entrepreneurs, and in this sense it requires no political influence or any other anomalies to achieve an outcome where SOEs obtain bank loans easier, and at lower interest rates than small privately owned enterprises would potentially be charged. Lin (2012, p. 214) also consider the small and medium sized enterprises' (SMEs) lower amount of fixed assets to put up as collateral relative to SOEs, as one explanation why the Big Four banks still prefer to lend to SOEs.

Stiglitz and Weiss (1981) show, on the other hand, that requiring collateral does not necessarily reduce the riskiness of borrowers, and the adverse selection problem. They show that if borrowers are risk averse, with utility function, $U(W)$, where $U'(W) > 0$ and $U''(W) < 0$, then more wealthy borrowers may, due to decreasing absolute risk aversion, undertake riskier projects.

Firth et al. (2009) claims that the problem of asymmetric information between banks and borrowers is particularly severe in China due to the short credit history of the banks. Because private firms are the newest type of customer to the banks, the information problem affects

them the most. Longer relationships can positively affect borrowers' ability to get credit, as well as reduce interest rates and collateral requirements (Boot, 2000).

According to Lin (2012, p. 214), it is the SMEs that are most adversely affected by the discriminating lending policy of the banking system. Because financial markets in China are underdeveloped, the market for certain assets is relatively illiquid, such as different types of assets that could be used as collateral. According to Ayyagari et al. (2010), collateral mostly consist of land or buildings, and movable assets are rarely accepted as collateral by the banks. If the institutional infrastructure is improved, by improving the legal system and increasing financial transparency, this could help the SMEs obtain bank loans more easily.

In China's informal lending market, the creditors are much more willing to accept movable assets, and there has been increased activity in pawn shops in recent years, which specialize on exactly lending, secured by collateral, and often at high interest rates (see, e.g., Financial Times, 27th April 2012). However, because the informal financial markets usually charge much higher interest rates than banks, it would be better if the banking system could increase its share of lending to private firms and entrepreneurs. If the banks adopt good methods of screening and monitoring the borrowers, this could reduce the reliance on collateral. This could help the banks choose viable projects, without charging so high interest rates that low risk profitable investments have to be abandoned.

8.1 Effect on the economy

The soft budget constraints of the SOEs became a big problem due to the mounting levels of nonperforming loans it facilitated in the 1990s and early 2000s (see Figure 3 in chapter 5.2). Naughton (2007, p. 306f) explains how Chinese SOEs went from having very low levels of debt before economic reforms began in 1978, at an average debt to equity ratio of only 12 % in 1978, and to a peak in 1994, with a debt to equity ratio of 211 %. The SOEs became heavily indebted in a matter of few years, and they eventually got difficulties repaying their loans. The Big Four state-owned banks had to be bailed out, by a transfer of bad loans to asset management companies established especially for the purpose of taking over the bad debt. The government bailed out the banks by an amount equal to 30 % of GDP in order to recapitalize the banks and write off bad loans (Naughton, 2007, p. 308).

The problem of nonperforming loans has gradually diminished, and according to figures from The World Bank (see Figure 3), only 0.9 % of bank loans are considered nonperforming loans by 2012, compared to 13.2 % in 2004 and 6.2 % in 2007. Nonperforming loans have declined, indicating that the borrowers have become more profitable.

The reduction in nonperforming loans may be explained by the transfer of bad debt from the Big Four to the asset management companies, and debt write-offs to SOEs, which reduced their interest rate burden (Naughton, 2007, p. 308). In addition the most unprofitable SOEs were either shut down or sold, which led to the number of industrial SOEs declining from 120 000 in the mid 1990s to 31 750 in 2004 (Naughton 2007, p. 313). Reforms in the late 1990s increasingly exposed the SOEs to competition especially in the labor intensive sector. Restructuring of SOEs as well as massive layoffs were implemented, in order to improve the efficiency of the economy (World Bank and the Development Research Center of the State Council, 2013, p. 26 and Naughton, 2007, p. 186). According to Song et al. (2011), the capital intensive SOEs in *strategic sectors* were, on the other hand, protected from competition by entry restrictions and this has resulted in them being in a highly profitable monopoly-like situation. There are seven sectors where the state keeps complete control and that are essentially state controlled monopoly sectors. These are defense, electricity generation and distribution, petroleum and petrochemicals, telecommunications, coal, civil aviation and waterway transport (World Bank and the Development Research Center of the State Council, 2013, p. 26).

In a situation where the state-owned commercial banks have become profit maximizing, how can they still prefer to give loans to SOEs, if the fastest growing and most profitable of the Chinese firms are private firms? As reported by Ayyagari et al. (2010) state-owned banks' lending makes up by far the largest share of formal lending. Even despite the inefficiency of these banks, largely due to the large share of lending going to SOEs, the authors find that those private sector firms that have been able to get bank funding has performed better than those who have had to rely on other informal lending channels.

It is a restriction to the overall growth of the economy when the on average most profitable firms have trouble getting their projects financed.

China has had great success with attracting foreign direct investment, as well as establishing jointly owned enterprises between Chinese firms and foreign firms. Through jointly owned

enterprises, foreign firms have got access to the low cost labor, and large domestic market in China, as well as China has got access to foreign technology and corporate governance strategies. Berger et al. (2009) suggest that such mutually beneficial relationships with foreign investors could hopefully also help reduce the inefficiencies and high costs in the state-owned banks. They find that the banks in China with foreign minority ownership are relatively more efficient than others, and suggest that the Big Four state-owned banks could possibly also increase their efficiency by allowing foreign investors a stake in the company. Such foreign ownership has been allowed when all the Big Four have gone public, but only a limited part of the shares are traded, and the state remains as majority owner.

9 Structural effects on the economy of giving preferential loans to SOEs

I will now establish a simple model that shows how the banks' lending policies can affect the structure and transition of the Chinese economy, where the criteria for obtaining bank finance is determined by the amount of assets (collateral) the firm has. The model is quite similar to one found in the paper "Growing Like China"[24] by Song et al. (2011) but has some simplifications, and alterations. In their model, credit market distortions lead private firms to rely on retained earnings, since they are assumed to have no access to any external credit. In my model the firms' access to external credit depends on their collateral. I will show how the combination of banks' collateral requirements and the preferential lending policies towards SOEs may slow down the rate of transition, from an economy dominated by SOEs, to an economy which has an increasingly larger proportion of more efficient private enterprises.

9.1 Model: Two types of firms and two industries

There are two types of industries, capital intensive, and labor intensive. There are also two types of firms, private firms and SOEs. The SOEs are considered large enterprises with enough assets in collateral to obtain access to bank funding. The SOEs are incumbents in both the labor- and capital intensive industries, while the private firms are challengers.

The economy consists of many different private firms and many different SOEs, but will be simplified to consist of one representative private firm, and one representative SOE. They can be considered as being averages of many different private firms and SOEs respectively.

The private firms have initial assets $A_{0p} < A^*$, where A^* denotes the level of assets (collateral) needed to obtain loans from the bank sector. To give a motivation for the collateral requirement, one can think that the bank does not wish to lend to a new borrower due to moral hazard risk, and also that it will be costly for the bank to determine that the borrower will behave diligently before the loan is given, so they demand collateral to ensure that the borrower also has some "skin in the game". Due to fixed costs, the banking sector is only interested in extending loans above a certain loan size, so A^* can also be considered as the

[24] See their Two-Sector Model in section IV, at page 233 in Song et al. (2011).

necessary level of collateral needed in order to obtain a bank loan of the smallest size that the bank finds it profitable to lend.

The SOEs have initial assets $A_{0s} > A^*$, implying that it can post enough collateral so as to obtain bank loans.

Assume that both SOEs and private firms have access to the same two technologies, but the private firms are better at adopting them. Also, because of a harder budget constraint, the private firms have stronger incentives to increase their efficiency, so they have a higher growth rate than SOEs in both the labor and capital intensive sector.

The growth rate of the private firms' assets is given by,

$$A_{1p} = A_{op}(1 + \rho_h), \tag{43}$$

where A_{1p} denotes the value of the private firms' assets after doing business for 1 year, and ρ_h denotes the annual growth rate of the private firms' assets, where the subscript h symbolizes a high growth rate.

The equivalent equation for the SOEs is,

$$A_{1s} = A_{os}(1 + \rho_l). \tag{44}$$

Assume that the growth rate of the private firms is faster than the growth rate of the SOEs, $\rho_h > \rho_l$.

Initial start up cost of entering the capital intensive industry is S_K, and the cost of entering the labor intensive industry is S_L, where $S_K > S_L$, and $A^* + D \geq S_K > A^* > A_{0p} \geq S_L$. D denotes the debt that is necessary to borrow from the banks in order to have enough funds to enter the capital intensive industry.

The private firms' initial assets, A_{0p}, are thus too low for them to enter the capital intensive industry immediately, and their only option is to enter the labor intensive industry.

Because of the assumption that private firms grow faster than SOEs, the private firms' share of total output in the labor intensive sector will gradually increase relative to the SOEs' share. The SOEs are assumed to be growing, but at a slower rate than the private firms, so their market share will gradually get smaller in the labor intensive sector.

The private firms cannot enter the capital intensive industry before they have grown their assets such that $A_p \geq A^*$, which enables them to get access to bank funding. Bank funding is necessary for the private firms to cover the high start up costs of entering the capital intensive industry.

Because of the banks' policy of requiring collateral, the SOEs are initially the only type of firm that is able to obtain bank loans. The entrance of private firms into the capital intensive sector will only happen after the private enterprises have gained enough revenue from the labor intensive industry. Thus there is a gradual transition, in which the less efficient SOEs can keep their high market share in the capital intensive industry, as the private firms accumulate the assets needed.

This is consistent with the Chinese story, where the SOEs have gradually had a declining share of total output in the labor intensive industries in the recent decades. "*Since 1997, under the slogan "Zhuada Fangxio" ("grab the big ones and release the small ones"), the ninth Five-Year Plan exposed SOEs to competition in labor intensive industries, while promoting the merger and restructuring of SOEs in strategic capital intensive industries…" (Song et al. (2011), p. 235)*

The ratio ρ_h/ρ_l will determine the speed of the transition from a SOE-dominated labor intensive sector, to one dominated by private firms.

As private firms that initially entered the labor intensive industries grow, so does their collateral. When they have accumulated enough assets, such that $A_p \geq A^*$, they can enter the capital intensive industries. $A^* = A_{0p}(1+\rho_h)^t$, where t denotes the number of years it will take for the firm to accumulate enough assets to get access to the bank borrowing.

$$A^* = A_{0p}(1+\rho_h)^t \tag{45}$$

$$ln(A^*) = ln[A_{0p}(1+\ \rho_h)^t] \tag{46}$$

$$\frac{\ln\,(A^* - A_{0p})}{\ln\,(1+\rho_h)} = t \tag{47}$$

The above equation (47) shows that the amount of time it will take before the private firms will accumulate enough collateral to get access to the banking market depends on how much collateral is needed, the level of initial assets, and the growth rate of the private firms.

I assume that the there are diminishing returns to capital. The labor intensive firms will initially have a low capital to labor ratio. As they grow they can increase their capital to labor ratio, which will help them increase output. Because of limited access to the banking market, they have to gradually increase their capital using retained earnings. Because private firms grow faster than SOEs there will be a transition towards an economy dominated by private firms in the labor intensive sector. The transition would, however, have been faster if the private firms could get bank loans earlier, posting less collateral than A^*.

When the private firms have grown their assets large enough to be able to enter into the capital intensive industry, there might be obstacles to their competitiveness that they did not face in the labor intensive industry. I have assumed that the private firms were competitive in the labor intensive industry even without any borrowing from the banks. However, to enter the capital intensive industry it is assumed that they must borrow from the banks in order to cover the initial start up costs. These costs may be thought of as large initial investment in factories, machinery and other equipment.

The private firms' ability to take market shares in the capital intensive sector from the SOEs will depend on the interest rates they are charged on their loans, relative to the interest rates the SOEs have to pay.
If we assume that the SOEs obtain preferential, low, interest rates on their loans relative to the private enterprises, they may be able to compete with the private firms, even though they are less efficient.

The SOEs can increase their capital to labor ratio at a lower price than private firms, but because of diminishing returns to capital this may only act as a way of slowing down the transition towards gradually increasing private firms' market shares in the capital intensive market. Thus the preferential interest rates that benefit the SOEs will reduce overall economic growth, since the more efficient private firms will not be able to crowd out the less efficient SOEs as fast as they would with no interest rate differential.

The private firms' annual growth rate of assets in the capital intensive industry will be the following:

$$g_p = \frac{A_{tp}\,(1+\rho_h) - D_t \cdot r_p}{A_{tp}} - 1 \tag{48}$$

A_{tp} is now the private firms' initial assets as they have entered the capital intensive industry, and $D_t \cdot r_p$ is the interest they have to pay on their outstanding debt each year.

To provide a simple comparison between SOEs and private firms I assume that SOEs and private firms have the same amount of initial assets and the same amount of initial debt.

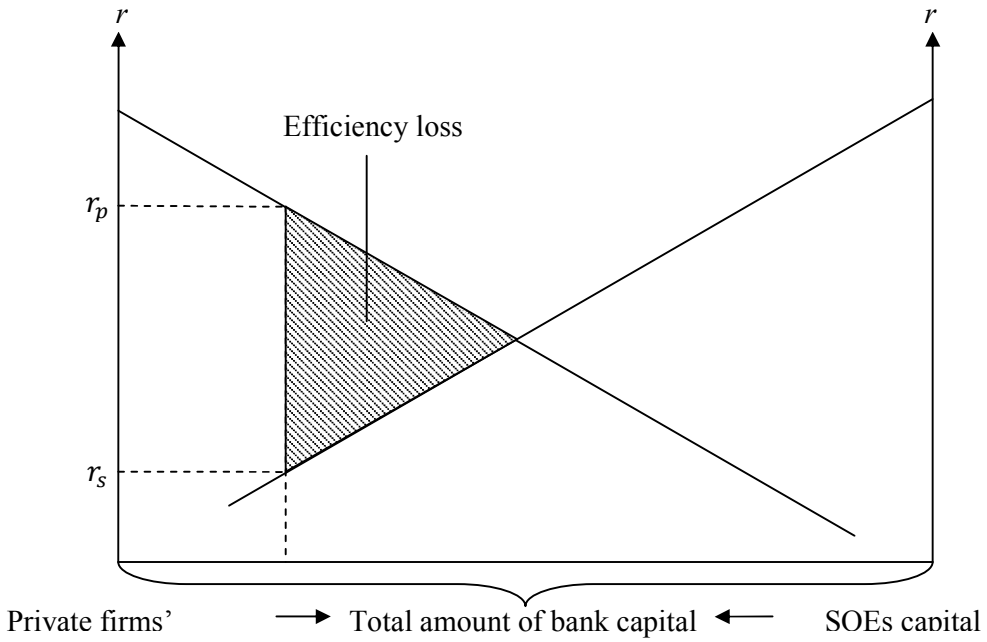
SOEs annual growth rate of assets in the capital intensive industry will be:

$$g_s = \frac{A_{ts}\,(1+\rho_l) - D_t \cdot r_s}{A_{ts}} - 1 \tag{49}$$

Assume that the SOEs get preferential interest rates on their bank loans, $r_s < r_p$

The effects of a preferential borrowing rate for the SOEs can be analyzed in a "bathtub" diagram.

Figure 4: Efficiency loss from preferential interest rate to SOEs



The efficiency loss is the shaded area, and shows that the low interest rates on borrowing for SOEs has a cost, because it leads to crowding out of access to capital for the private firms. Because of diminishing returns to capital, it would be more efficient for the economy to redistribute more of the capital to the private firms. This could be accomplished by giving loans on equal terms for private firms and SOEs, i.e., not giving SOEs preferential interest

rates on borrowing, but competitive interest rates for both types of firms.

The firms would like to increase their level of capital until their marginal productivity of capital is equal to the interest rates. Since the SOEs can borrow at a lower interest rate than the private firms, they will have a higher level of capital. $MPC_S = r_s$, and, $MPC_p = r_p$.

Figure 5: Marginal productivity of capital and investment levels

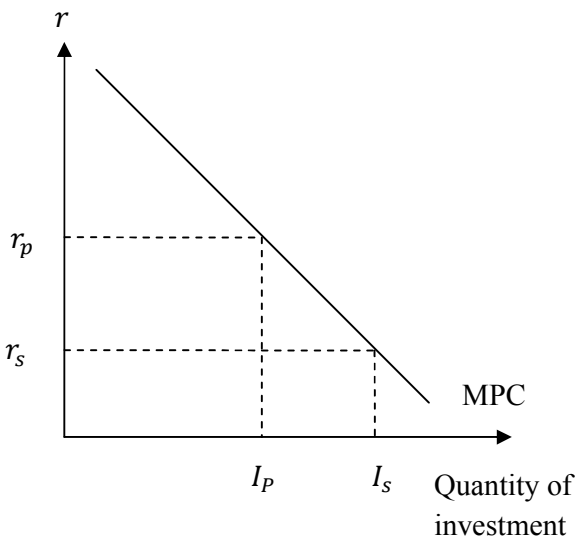


Figure 5 shows that the interest rate differential leads to different levels of investment for private firms and SOEs. The SOEs can get a higher level of investments since they can borrow at a lower interest rate. This implies that more of the investments made with borrowed funds from banks go to the SOEs, even though they have a lower efficiency than the private firms. This inefficient allocation of capital will restrict the overall growth rate of the Chinese economy. As long as the preferential interest rates to SOEs persist, the SOEs may not be completely competed away in the long run, despite being less efficient than the private firms.

9.1.1 Discussion

Brandt et al. (2008, p. 698) write the following: "*In a frictionless world, resources flow to their highest valued uses, and returns are equalized on the margins*." In the model we see that the frictions in the banking market will stop resources from flowing to their highest valued uses. The model provides a rational explanation as to why the "Big Four" state-owned banks

may restrict lending to private firms, i.e., due to limited collateral. The assumption of a lower interest rate to SOEs is not explained by the model however, but it may be considered to be a distortion afflicted by government intervention due to the government's valuation of SOEs projects, as I proposed in chapter 7.1.2. The rationality of such preferential interest rates is questionable, and can be a result of "crony capitalism", rather than profit maximizing motives. In order to sustain a high level of economic growth in China, and thereby increasing the welfare of the Chinese citizens, it should be in the economy's best interest to allow the less efficient firms to exit the market, if competition from more efficient firms would have forced them to exit in a market economy with no preferential interest rates. The preferential interest rates to SOEs act as a subsidy to the less efficient firms.

From the above model it would seem that all SOEs are less efficient than all private firms, which is obviously not true, but when the model is thought of as considering the average of all private firms and the average of all SOEs, the assumption is justified. Allen et al. (2005) have shown that on average the efficiency of private firms are higher than SOEs. As more efficient private firms enter industries where the SOEs have been dominant, this should in reality provide incentives for the SOEs to also increase their efficiency. Increased competition, however, does not have to imply that all SOEs are competed away, as long as the SOEs can to improve their efficiency, without receiving special treatment, it would be an improvement of the overall efficiency in the economy.

According to Allen et al. (2005), China is an important counterexample to the existing literature on law, institutions, finance and growth. The economy of China has been growing at very high rates, despite its poor legal and financial system. This does not, however, imply that China will not benefit from changing to a more efficient financial system, even though they have been able to grow without an efficient one in the past. There might have been substantial catch-up effects, by changing the market structure, labor market movements from rural to urban areas and using more modern technology, which has helped China develop the economy so fast in the past 35 years. And since GDP per capita in China is still quite low, it should be possible to keep a high growth rate also in the years to come. As the economy develops it will be increasingly hard to find ways of keeping the growth rate high. Increasing the efficiency of the financial system may, however, be an important step for the Chinese economy to continue developing at reasonably high levels of growth in the coming years.

9.1.2 Policy suggestions

The Chinese economy is still in the process of reform, as it has been for the past 35 years. The financial markets have not yet become as free as they are in other market economies, but there has been gradual improvement for several years. The ceiling on deposit rates is one key factor that acts as an impediment to competition between the banks. Removing the ceiling on deposit rates would lead to increased competition for deposits. The increased competition between banks should also lead them to increase their efficiency in monitoring, risk management and try to lend to the most productive firms to reduce risk of defaults. Since a removal of the ceiling on deposit rates will most likely lead to a decreased interest rate spread between deposits and lending rates, the huge profits the banks could previously reap from this differential will diminish, which should act as an incentive to improve their efficiency.

There should be increased equality in the state-owned banks' lending policies towards private firms and SOEs to increase fairness in competition. If SOEs and private firms compete on the same terms the most efficient firms will succeed, while the least efficient will be forced to exit the market.

9.1.3 Conclusions

The Chinese economy has been, and is still developing in the direction of a more market driven economy. Previous studies show that less efficient state-owned enterprises (SOEs) play a major role in the economy, partly because they have been able to obtain easy access to the credit markets, through the big state-owned banks. In this chapter I have constructed a model that shows how credit constrained private firms will slowly take over markets where they are more efficient. After the private firms have acquired enough assets to post collateral, they can also access the banking market, and obtain bank loans. But the SOEs get bank loans with preferential (lower) interest rates, than private firms, and this will make the SOEs able to compete with more efficient private firms, or at least it will slow the transition towards a more efficient market outcome, where there will be a larger proportion of private firms relative to SOEs.

10 Concluding remarks

In this thesis I have discussed some of the effects of Chinese banks' allocation of a disproportionately large share of their credit towards less efficient SOEs, rather than to more efficient private firms. I have also discussed some of the reasons for this practice.

It may seem puzzling that China has been able to achieve such an impressive rate of growth while its banking sector has been misallocating capital towards inefficient enterprises. However, informal financial systems may have helped alleviate some of the capital constraints that private firms have faced (Allen et al., 2005). Dollar and Wei (2007) and Hsieh and Klenow (2009) argue that a more efficient allocation of resources could have greatly improved the TFP of the economy. Dollar and Wei (2007) also point out that with a more efficient allocation, the same high growth could have been possible using less resources for investments, thus leaving more resources for consumption.

Based on economic theory, I have tried to explain why Chinese banks have been misallocating credit, examining the problem from a theoretical point of view. I describe some of the fundamental roles that banks play in an economy, which make it desirable for individuals to place their savings in a bank to earn interest, while maintaining high liquidity (Diamond, 2007). Banks can reduce the costs of monitoring investment projects by acting as a delegated monitor (Diamond, 1996). Many private firms in China have been excluded from obtaining bank loans for their investments, and have had to rely on retained earnings, borrowings from friends and family, or an informal financial system (see, e.g., Ayyagari et al. (2010) and Allen et al. (2005)). Since the banks play a substantial role in the Chinese financial system, due to their dominant size, reducing the rate of loans to inefficient SOEs, and reallocating a larger share of loans towards the more efficient private sector, might have a positive effect on the economy.

I have explored some reasons that may explain the large share of banks' lending to SOEs. I have presented an extension of a model by Dewatripont and Maskin (1995), which shows how poorly performing SOEs have soft budget constraints, because it is optimal for the bank to refinance projects that are performing poorly. I have shown how the state-owned banks may have other objectives than profit maximization, which make them willing to extend credit even to poorly performing enterprises. Another explanation of their practice is that the

SOEs may have better access to collateral than private firms, making it safer for the banks to lend to them.

I show how access to collateral affects the ratio of private enterprises versus SOEs in labor intensive and capital intensive industries, and argue that providing equal lending terms to private firms and SOEs may affect the speed of the transition process towards a more efficient market economy.

China used to be a planned economy and has moved a long way in some areas, but is still in an ongoing process towards a market economy. The banking sector is still affected by the past, with large state ownership in many banks. However, reform of the financial system is in progress. Privatization of many former SOEs, as well as reducing government ownership in the Big Four banks, by listing them on the stock exchange, show that the Chinese government has taken important steps towards improving the efficiency of the economy.

Increased efficiency in the banking sector, by improving lending policies so that private firms and SOEs get bank loans on more equal terms, may stimulate the future growth of the Chinese economy. A more efficient banking sector should also lead to more efficient firms, making it possible for them to compete with fewer frictions.

One way to increase the banks' efficiency may be to remove the interest rate ceiling on deposits. According to a speech by the PBC governor in March 2014, this is expected to happen in 2015 or 2016 (Bloomberg, March 11th 2014). Following this anticipated reform, the banks will have to increasingly compete to attract deposits. Increased competition should result in a lower interest rate differential between deposits and lending. This may require increased efficiency for the banks to stay profitable, incentivizing banks to improve monitoring, reduce lending to inefficient firms, and provide more funding to profitable projects. How the interest rate liberalization will affect the financial stability in China is a topic to be discussed in the coming years.

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