

## **The Impact of the Liability-Asset Ratio on Profitability in China's Industrial State-owned Enterprises**

The liability-asset ratio of China's industrial state-owned enterprises (SOEs) has increased dramatically in the course of the economic reform period. Western observers point out the inherent dangers to enterprise solvency. Chinese policymakers view today's level as exceedingly detrimental to enterprise profitability and are introducing measures to reduce it. Yet the increase in the liability-asset ratio of industrial SOEs is the inevitable result of systemic changes; since the early 1990s the liability-asset ratio has stabilized. The perceived negative impact of the current level of the liability-asset ratio on enterprise profitability does not hold up in regression analysis. It is true that low-profitability SOEs tend to have a high liability-asset ratio, perhaps due to government-ordained support through bank loans. However, once the endogeneity of the liability-asset ratio is controlled for, a high liability-asset ratio tends to imply a high level of profitability. This suggests that current industrial SOE reforms in China which focus on debt alleviation are misguided.

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## 1. Introduction

China's industrial state-owned enterprises (SOEs) are commonly viewed as in urgent need of reform. One frequently cited reason for the decline in industrial SOE fortunes is the rise in their liability-asset ratio.<sup>1</sup> During the reform period, the liability-asset ratio of industrial SOEs rose from around 11% in 1978 to approximately 65% in 1997. In as many as one-fourth of industrial SOEs, liabilities have even come to exceed assets; these enterprises are de facto insolvent. The World Bank (1996, 42) suggests that debt restructuring may be necessary for the most heavily indebted enterprises.

The rising liability-asset ratio is viewed with growing concern by the Chinese leadership. The Chinese Communist Party Central Committee's decision on SOE reform (22 September 1999) lists as main problems of SOEs their poor management, over-employment, a low technological level, and a high liability-asset ratio. The high liability-asset ratio is perceived as leading to high interest costs and therefore low profitability. The deputy minister of the State Economic and Trade Commission (SETC) on the link between a high volume of liabilities and low profitability states very explicitly: "with all the interest to be paid on such a large volume of liabilities, it has already become very difficult for enterprises to still earn money" (Chen 1998, 6). Figure 1 with 1995 industrial census data across the 37 industrial sectors confirms the negative relationship between the liability-asset ratio and profitability.

*Figure 1 about here*

But neither is the liability-asset ratio in industrial SOEs increasing continuously, nor need a high liability-asset ratio lead to low profitability. The liability-asset ratio of industrial SOEs rose continuously throughout the 1980s. Yet this increase is not so much a sign of deterioration as of economic transition; it was caused by economic reforms that changed the financing mechanisms of SOEs. In the early 1990s the liability-asset ratio stabilized.

A high liability-asset ratio need not even imply low profitability.<sup>2</sup> If two firms are identical except for their liability-asset ratio, profit in the firm with the higher liability-asset ratio naturally

must be lower than in the firm with the lower liability-asset ratio. Profit is the residual of sales revenue after subtracting various costs, including interest payments on the liabilities; a high liability-asset ratio entails a large volume of interest payments and therefore a small residual profit. However, a small volume of profit per se is no reason for concern. What matters is the volume of profit *relative* to equity (profitability). If the interest rate paid on debt is the same as the rate of profitability, then the level of the liability-asset ratio has no impact on the rate of profitability.<sup>3</sup>

Furthermore, if the state-determined, nationwide fixed interest rate on bank loans is low relative to a firm's return on equity, the firm always has incentives to increase its liabilities rather than its equity. A high liability-asset ratio in this case increases the return on equity (profitability). This outcome conflicts with the view held by the Chinese Communist Party Central Committee in its 1999 SOE reform decision.

On the contrary, a high liability-asset ratio could lead to low profitability if banks prefer SOEs to have a certain volume of equity as pre-condition for extending additional loans. Banks could require equity as safety margin in case the finances of the firm deteriorate. Any potential future losses then reduce equity rather than lead to bankruptcy (which could force banks to forego full recovery of their loans). If a high liability-asset ratio deters banks from lending to a firm which at the same time faces high administrative barriers in its access to equity, and consequently cannot finance regular production, enterprise profitability may suffer. A high liability-asset ratio then implies low profitability. Overall, the effect of the liability-asset ratio on profitability is not self-evident.

Which of the causalities is correct? Does a high liability-asset ratio indeed imply low profitability and thus justify the concern of Chinese economic policy makers with the level of the liability-asset ratio in SOEs? Or is the perceived link between the liability-asset ratio and the rate of profitability spurious, or perhaps even positive?

The following section explains the data and the statistical indicators used. The third section examines the claim that the liability-asset ratio in industrial SOEs has deteriorated continuously

since the beginning of the economic reforms; in doing so it explains what has caused the rise in the liability-asset ratio that has taken place. The fourth section tests whether a high liability-asset ratio has a negative impact on profitability, as the Chinese Communist Party Central Committee believes. The fifth section concludes.

## 2. Data and Profitability Indicators

The focus in the following is on *industrial* SOEs due to data limitations in other sectors of the economy. In 1997, industrial SOEs accounted for approximately 55% of total employment in SOEs.<sup>4</sup> Detailed data are only available for industrial SOEs with *independent* accounting system, i.e., do not include the in terms of output negligible SOEs with *dependent* accounting system.<sup>5</sup> The unit of analysis is the aggregate of all SOEs within one industrial sector or sub-sector. The 1995 industrial census offers detailed data on industrial SOEs with independent accounting system in 37 (out of 40) industrial sectors, as well as on their 191 sub-sectors. Less detailed industry-specific data are available for SOEs in 39 sectors for the years 1993 through 1997, as well as for 1999. Due to a severe statistical break in 1998, the 1999 data are not included in the analysis of the impact of the liability-asset ratio on profitability.<sup>6</sup>

Profitability can be measured by a number of indicators. The first indicator is profit per equity. Profit is the residual of sales revenue once all costs, including interest payments on debt, have been deducted; it thus constitutes the return to equity holders. (“Profit” is the aggregate profit of profitable enterprises minus the losses of loss-making enterprises; similarly below.) A related second indicator is profit plus interest payments on debt (“financial charges”) relative to total assets, measuring the overall return on all sources of funds together. A third indicator is losses of loss-making enterprises relative to profit of profitable enterprises, i.e., losses per “gross profit.” A fourth indicator is profit per value-added, relating the aggregate profit of SOEs in each industrial sector to the value-added produced by SOEs in this industrial sector.

These four indicators measure profitability from three very different angles. The first and second indicator, profit per equity and profit plus financial charges per total assets, standardize a measure of financial return by the corresponding source of funds. Profit per equity is clearly the most preferred indicator of profitability, matching the common usage of the term profitability in market economies. The third indicator, losses per gross profit, splits profit into the two components losses and gross profits, and looks at their ratio. It is an extremely sensitive measure of profitability across an industrial sector; if profit of both loss-making and profitable enterprises decreases, the numerator rises and the denominator falls, yielding a sharp increase in the indicator. The fourth indicator, profit per value-added, standardizes profit by the appropriate output measure.<sup>7</sup>

The indicator usually found in the literature is profit and taxes per fixed-quota working capital (or current assets) and net fixed assets (see, for example, Naughton, 1992, Jefferson and Rawski, 1995, Fan and Woo, 1996). This indicator may have been appropriate in the pre-reform period, yet it no longer is today.<sup>8</sup> First, profit reflects the return to equity holders, *not* the return on debt (liabilities). Yet the sum of fixed-quota working capital (which together with above-quota working capital constitutes current assets) and net fixed assets is approximately equal to total assets, i.e., equity *plus* debt. If the denominator is total assets, then the numerator must be profit *plus* financial charges. Profit is the return to equity holders, financial charges are the return on debt; profit plus financial charges are the return to equity and debt holders, i.e., the return on total assets. Second, this profitability indicator is directly influenced by changes in circulation tax rates. If the government changes the rates of circulation taxes, such as the value-added tax rate, the value of the profitability measure “profit plus taxes” changes. Yet a meaningful measure of profitability should not be a function of circulation taxes. The proper numerator is profit, which by definition includes income taxes only. Thus changes in income tax rates, correctly, do not affect profit. Neither, correctly, do changes in circulation taxes. Even though profit and taxes relative to some measure of current assets plus net fixed assets is today an inappropriate measure

of profitability, this measure is still included as a fifth indicator due to its prevalence in the literature.

### **3. Misperception 1: The Liability-Asset Ratio of Industrial SOEs Has Been Deteriorating Continuously**

The liability-asset ratio of industrial SOEs has increased dramatically during the economic reform period. But this increase need not come with a negative connotation (“deterioration”). Much of the increase simply reflects systemic changes in how the economy operates, breaking free from the socialist past. Since 1994, furthermore, the liability-asset ratio has stabilized.

#### *3.1. Commonly used data tells only part of the story*

Table 1 shows the trend of the liability-asset ratio over time. For data up to 1992 the table, in the absence of official data, relies on Lardy’s (1998, 41) liability-asset ratios collected from a large number of dispersed sources.<sup>9</sup> Since 1993, the official time series on assets and liabilities published in the statistical yearbooks allow the consistent calculation of liability-asset ratios. The liability-asset ratio of industrial SOEs has increased markedly throughout the reform period from perhaps around 10% in the beginning of the reform period to 67% in 1993. Yet at least since 1994 the liability-asset ratio of both industrial SOEs as well as all industrial enterprises has stabilized.

*Table 1 about here*

A comparison between the official data for the 1990s and the earlier data points could be difficult if the earlier data points were not to include the value of land use rights, as the latter, official data do. Table 1 therefore also shows a liability-asset ratio based on liabilities per current and fixed assets. This measure ignores intangible assets, which include, among others, patents, non-patent technologies, trade marks, copyright, *land use rights*, and brand name. This incorrectly measured liability-asset ratio has also stagnated since 1994. Valuation of land use

rights or other intangible assets thus is not an issue that impacts on the conclusion that the liability-asset ratio has stabilized since 1994.<sup>10</sup>

According to Lardy (1998, 40-42), the liability-asset ratio is even higher than reported in the early data as (i) “Chinese sources that analyze enterprise assets and liabilities [...] do not take into account interenterprise debt,” (ii) “depreciation rates used by Chinese firms are too low,” and (iii) “many enterprises hold large inventories of finished goods that they value at full price when in at least some cases the goods may not be saleable.”

Yet there exists no evidence that official statistics on assets and liabilities do not include inter-enterprise debt. Inter-enterprise arrears cannot have been consolidated out. The nationwide balance sheet data—reported for all years since 1993 in the statistical yearbooks (ZGTJNJ) and used in constructing Table 1—in the year 1995 are equal to that reported in the 1995 nationwide industrial census (Industrial Census 1995). The latter source provides detailed sectoral data; sectoral liability and asset values add up to the nationwide total. If any consolidation has taken place, it must have occurred within each sector individually. But within one sector, not many inter-enterprise arrears should consolidate out. Inter-enterprise arrears can also not simply have been omitted; since accounts payable are unlikely to always equal accounts receivable, the balance sheet would no longer be balanced. The accounting regulations furthermore clearly require all accounts receivable and payable to be included (SC Law Office 1993), and the State Statistical Bureau in its instructions on compiling balance sheets allows no exceptions (SSB 1997).

Fixed assets need not be over-valued. Depreciation rates are centrally determined and often artificially low, thus leading to an upward bias in fixed asset estimates. Yet at the same time, net fixed assets are calculated by adding the price of each newly acquired fixed asset to the value of previously acquired fixed assets (valued at purchasing price net of depreciation). There is no correction for changes in the price level over time.<sup>11</sup> This leads to a downward bias in fixed asset estimates, potentially offsetting any upward bias introduced by low depreciation rates.

Current assets finally indeed include some stockpiled goods that either cannot be sold at the price at which they are accounted for in the balance sheet, or cannot be sold at all. Inventories at industrial SOEs in 1995 were valued at 14.25% of total assets. This figure is lower than the 16.76% for all industrial enterprises (including SOEs), the 21.52% for individual-owned enterprises, or the 18.39% for foreign-funded enterprises and 18.94% for Hong Kong, Macao, and Taiwanese enterprises. (Industrial Census 1995, Vol. 1, 48) For comparison, in the U.S. in 1995 inventories of non-financial corporate businesses were equal to 9.60% of total assets (Board of Governors), only about one third lower than in industrial SOEs in China. Furthermore, much of this difference could be due to larger inventories of *material inputs* in Chinese SOEs—to judge from provincial-level data, in Chinese SOEs finished products are likely to account for only one fourth to one third of inventories, with the rest consisting of material inputs.<sup>12</sup>

A final argument to the effect that the official liability-asset ratio underestimates the actual liability-asset ratio is that many of the assets of industrial SOEs are non-existent due to asset-stripping. A frequently reported figure on asset stripping for all SOEs (not only in the industrial sector) is 50b yuan per year in the early and mid-1990s (Ding 2000, or Smyth 2000). While this figure by itself may appear large, it is equivalent to only 1.05% of *industrial* SOE assets in 1995. Moreover, while asset stripping may lead to an inflation in reported assets, the inclusion of the value of patents, non-patent technologies, trade marks, copyright, land use rights and brand name rights in the reported assets of industrial SOEs is only just beginning. These intangible assets together in 1997 accounted for just 8.01% of total assets, up from 6.22% in 1995.<sup>13</sup> The value of total assets then could well be underestimated.

Two conclusions emerge. First, while the liability-asset ratio has risen rapidly in the 1980s, it has stabilized in the early 1990s. The reasons for this particular development are explored in the next section. Second, the various reasons advanced as to why the liability-asset ratio calculated based on the official liability and asset data could underestimate the true liability-asset ratio appear either without substance or of insignificant impact. Proceeding below with the 1995 as

well as the 1993 through 1997 data on liabilities and assets in analyzing the impact of the liability-asset ratio on profitability is reasonable.

### 3.2. *The rise in the liability-asset ratio during the reform period reflects the process of transition*

The increase in the liability-asset ratio throughout the 1980s primarily reflects the phasing out of certain enterprise financing mechanisms employed in the socialist economy. The concept of equity and liabilities did not exist in the pre-reform economy.<sup>14</sup> The Finance Ministry provided regular budget appropriations for both investment and ‘fixed-quota working capital’ increases. The financial system played at best a supporting role, providing above-quota working capital, with no independent lending decisions. The key turning point was the 1983/85 tax reform. Enterprises making own production and investment decisions could no longer surrender all their surplus to the finance ministry to be endowed again with new funds through budget appropriations. As enterprises switched to paying only a portion of their profit as taxes to the state (*ligaishui*), so the state withdrew from providing working capital funds as well as investment funds to enterprises, while banks gradually provided more loans.

When the economic reforms began in 1978, 62.16% of total investment in fixed assets by *all* state-owned units was financed through budgetary funds, with the rest being provided through enterprises’ own funds as well as some foreign funds; financial institutions accounted for just 1.69% of investment financing.<sup>15</sup> In addition, government working capital appropriations to *all* state-owned units in 1978 were 3.87 times higher than the increase in bank loans outstanding for industrial production.<sup>16</sup> Consequently, the volume of liabilities was close to zero. Given how the economic system functioned, there was no role for debt.

In contrast, by 1998 the government financed only 7.03% of the investment of *all* state-owned units, with banks providing 23.28% of the funds needed; in 1997, the government financed only 2.84% of investment by *industrial* state-owned units, while banks provided the funding for another 32.02%. Similarly, by 1998 *all* government working capital appropriations were equivalent to only 0.03% of the change in bank loans outstanding for industrial

production.<sup>17</sup> As the government abandoned its direct financing of industrial activity through the budget, the liability-asset ratio since 1978 could not but rise. Once this transition was virtually complete by the mid-1990s, this force for an increase in the liability-asset ratio disappeared.

A number of further factors may have contributed to the stabilization of the liability-asset ratio. A serious effort to have banks switch from state-commanded to commercial lending began in 1994/95. Bankers became reluctant to lend to the worst performing enterprises as they were now supposedly held responsible for their lending decisions. But poorly performing enterprises are those enterprises with low profitability, and therefore relatively little accumulation of profit to increase equity. If they cannot obtain new bank loans, their liability-asset ratio stagnates; if they can obtain new equity, their liability-asset ratio falls. On the other hand, enterprises that perform well can increase assets by accumulating profit and may not be interested in additional bank loans, likewise stabilizing if not lowering the liability-asset ratio.

Furthermore, the 1994 tax reform clarified the tax obligations of enterprises and largely ended the practice of handing over most post-tax profit to the superordinate department; the existence of profit then automatically implies an increase in net worth. Since the opening of the Shanghai and Shenzhen stock markets in December 1990 more than one thousand, usually large SOEs have also been able to raise new external funds in the form of equity rather than debt, with a dampening effect on the liability-asset ratio. At the same time, loss-making SOEs are being closed or sold; if the SOEs that are most likely to have a high liability-asset ratio leave the pool, this lowers the average liability-asset ratio of the remaining SOEs. The stagnating liability-asset ratio since 1994 thus is not astonishing given the end of significant government budget appropriations for enterprises and the completion of a series of market-oriented reforms.

### *3.3. The liability-asset ratio of China's industrial SOEs is not excessive in domestic and international comparison*

If Chinese policy makers are concerned about the negative impact of the currently “high” liability-asset ratio of industrial SOEs on their profitability, their concern should equally apply to

enterprises in other ownership forms. Industrial SOEs' liability-asset ratio of 65.81% in 1995, the year for which detailed data are available, is clearly below that of collective-owned enterprises (71.67%), and only half a percentage point above the nationwide average (65.31%).<sup>18</sup> (See Table 2.) The centrally owned SOEs have the lowest liability-asset ratio among all SOEs at 59.15%, close to that of the foreign-funded enterprises, which have the lowest ratio overall. Locally owned SOEs, on the other hand, have a relatively high ratio at 69.48%.

*Table 2 about here*

The liability-asset ratio of Chinese industrial SOEs is not even inherently high in international comparison. The category industry in China comprises (i) mining and quarrying, (ii) manufacturing, and (iii) production and supply of electricity, gas and water, with the first two categories accounting for 85.80% of industrial SOE value-added in 1997 (ZGTJNJ 1998, 448). In Germany, a country with as China a strong emphasis on banks rather than stock markets, the liability-asset ratio of mining and manufacturing enterprises in 1996 was 93.98% and 76.11%, respectively. If pension liabilities and other provisions are excluded from the liabilities, the ratios were 83.15% and 49.49%.<sup>19</sup> The ratio in China's industrial SOEs, presumably largely free of pension liabilities, in 1996 was 65%.

The liability-asset ratio in the U.S. non-financial corporate business sector in 1996 was 51.94%.<sup>20</sup> The ratio for all non-financial incorporated enterprises in Japan in 1996 was 53.83%; this includes private enterprises with a relative low liability-asset ratio as well as public corporations with very high liability-asset ratios.<sup>21</sup> In Korea, the liability-asset ratio across industry in 1996 was 77.0%, in mining and quarrying 77.7%, and in manufacturing 76.0%.<sup>22</sup>

In domestic as well as cross-country comparisons the liability-asset ratio of China's industrial SOEs thus does not appear excessively high. Yet the important question is whether the liability-asset ratio has a negative impact on profitability, as the Chinese leadership believes. If so, then a relatively high liability-asset ratio may well be undesirable.

#### **4. Misperception 2: A High Liability-Asset Ratio Implies Low Profitability**

Figure 1 at first sight suggests that a high liability-asset ratio implies a low rate of profitability. Similarly, loss-making industrial enterprises (across all forms of ownership) have a liability-asset ratio of 76.05%, more than 14 percentage points higher than that of profitable enterprises at 61.72%. (See Table 2.) Yet these are correlations, not causal relationships. Other factors need to be controlled for, and the direction of the causality further explored.

##### *4.1. Linking the liability-asset ratio to profitability measures*

The liability-asset ratio is related to profit through financial charges. A high liability-asset ratio implies a large volume of interest payments (financial charges). In a second step, high financial charges, subtracted from sales revenue, reduce the residual profit. (See Figure 2.) The group of loss-making enterprises with their above-average liability-asset ratio, for example, also expends a far above-average share of sales revenue on interest payments; the share is 9.02% for loss-making enterprises compared to 3.95% for profitable enterprises and a combined average of 4.78%. (See Table 2.)

*Figure 2 about here*

A high liability-asset ratio can lead to high financial charges through two channels. First, a high liability-asset ratio implies a relatively large volume of loans on which interest has to be paid.<sup>23</sup> Second, the marginal and therefore also average interest rate paid could depend positively on the liability-asset ratio. As banks become reluctant to lend to highly leveraged firms, they may demand a high marginal interest rate. However, interest rates on bank loans are centrally determined and uniform across China; they only vary according to the maturity of the loan. Banks have no decision-making authority on the interest rate.<sup>24</sup> Empirical analysis confirms that there is no correlation between the liability-asset ratio and the rate of interest paid.<sup>25</sup>

The second part of the argument, that high financial charges reduce the residual profit, is only correct if all other factors are held constant. Profit is derived from sales revenue in the profit

and loss account by subtracting various expenses, *among them* financial charges. (See Figure 2.) But between 1993 and 1997, these other expenses were not constant; the correlation between financial charges and profit was negative, but insignificant.<sup>26</sup> Enterprises whose products are in high demand could finance new investment by borrowing (an increase in the liability-asset ratio), driving up the absolute value of financial charges, but at the same time the increase in output and sales revenue could more than compensate for the extra cost and yield a larger residual profit. Even if financial charges increased relative to sales revenue, a counter-effect of, for example, efficiency-increasing investment could be that other expenses such as sales costs fall relative to sales revenue. Overall, profit and, given a constant amount of equity, profitability, need not decline.

Beyond the potential direct impact of the liability-asset ratio on financial charges and thereby profit, a high liability-asset ratio could also matter if it were to lead to quantity rationing by banks—the only dimension, along which banks have some decision-making authority. Access to new equity may have been restricted by the government, and other sources of external funds such as supplier credit exhausted. Enterprises then might have difficulty finding the funds necessary to maintain production, and would thus be driven into losses simply due to the lack of funds. In this scenario, a high liability-asset ratio is negatively correlated with profit, not due to the financing cost of debt, but due to risk considerations of the bank and perhaps systemic restrictions on raising equity.

On the other hand, well-informed bankers could actively support an enterprise with good prospects and thus drive up the liability-asset ratio. Access to new loans in itself, in an economy where access to new equity is severely restricted, could lead to a rise in profitability if profitable investment projects can be implemented and regular production maintained. An increase in the liability-asset ratio then implies higher profitability.

A high liability-asset ratio, finally, should imply a high degree of external control as creditors, concerned about the payment of interest and the repayment of the principal, have incentives to monitor the enterprise. Highly leveraged SOEs thus should be subject to better

supervision than those SOEs whose assets are primarily financed through ‘free’ state equity that comes with little monitoring. A higher degree of supervision could lead to higher profitability. Until the mid-1990s, banks carried little responsibility for their lending practices and had few incentives to monitor enterprises, but this is likely to have changed in recent years.

The impact of a high liability-asset ratio on profit thus is not clear-cut. *Ceteris paribus*, a high liability-asset ratio has a direct negative cost effect on profit, yet other financial factors are not always constant. A high liability-asset ratio could invite credit rationing with difficulties for firms to maintain production, leading to a reduction in profit. On the other hand, an increase in the liability-asset ratio could allow profitable investments to be realized and thus imply an increase in profitability. A high liability-asset ratio could also encourage better external supervision with beneficial effects on profit.

#### *4.2. Testing the link between the liability-asset ratio and profitability measures*

The bivariate relationship between the liability-asset ratio and profit per equity pictured in Figure 1 does not take into account other variables that might impact on profitability. One such variable is the degree of competition, measured as SOE value-added in a particular industrial sector divided by total value-added of all enterprises in this sector. The higher the share of SOE value-added, the more likely SOEs are to set monopolistic prices and thus to achieve higher profit. In the extreme, sectors in which SOEs enjoy a monopoly by government decree, such as in petroleum and natural gas extraction (with a SOE market share in terms of value-added of 94.63% in 1995) or tobacco processing (98.06%), prices are likely to be such that production is profitable—profit per equity in the two sectors in 1995 was well above the economy-wide average of SOEs (at 0.1135 and 0.2832, respectively, vs. the average of 0.0211).

A second factor that needs to be controlled for is market demand. The higher demand at a given price, the higher capacity utilization is likely to be and thus the higher the likelihood for SOEs to be profitable, or less loss-making. A lack of demand is proxied by the volume of inventories relative to value-added.

The regression then consists of the five indicators of profitability introduced above (profit per equity, profit and financial charges per total assets, losses per gross profit, profit per value-added, taxes and profit per current and net fixed assets), each individually regressed against the three independent variables market share, inventories per value-added, and the liability-asset ratio. The regression is run for two different sets of data.

The first dataset comprises 1995 sub-sectoral data. Instead of using the 37 industrial sectors as observations, the complete set of their 191 sub-sectors is used. (For some sub-sectors the data are incomplete and the number of observations in the regressions therefore is slightly lower). This allows using either a common intercept or sector-specific intercepts in a fixed effects model.

Second, the same regression is run using data on 39 industrial sectors for the period 1993 through 1997. Since inventory data are only available for 1995, the variable inventory per value-added is replaced by the variable current assets (working capital) per value-added. Current assets besides inventories (37.33% of current assets in 1995) comprise such items as cash and bank deposits, accounts receivable, and pre-payments made. Current assets per value-added thus are likely to be an imperfect measure of demand.<sup>27</sup> Also, data on losses and financial costs are not available (except for 1995), reducing the number of available dependent variables to three (profit per equity, profit per value-added, and taxes and profit per current and net fixed assets).<sup>28</sup> Finally, after inspection of the raw data, the 38<sup>th</sup> sector, gas production and supply, was removed in each year due to questions about the quality of its value-added data, leaving 190 observations (38 sectors times 5 years).<sup>29</sup> Regressions are again run using either a common intercept or sector-specific intercepts in a fixed effects model.

Table 3 shows the regression results. As expected, the higher the SOE share in sectoral value-added, the higher profitability, with as only exception the 1995 regression with profit per value-added as dependent variable. (All coefficient signs in the regression with losses per gross profit as dependent variable should be the reverse, as losses per gross profit is a loss rather than a profitability indicator.) Also as expected, the higher inventories relative to value-added, the

lower profitability, with as only exception the 1995 regression with losses per gross profit as dependent variable. The impact of the liability-asset ratio on profitability is mixed. In almost half of all regressions the coefficient is insignificant. In five out of six 1995 regressions in which the coefficient is significant, the sign is negative, implying that the higher the liability-asset ratio, the lower profitability. In the 1993-97 regressions the sign is once positive and once negative.

*Table 3 about here*

Overall, the coefficient of the liability-asset ratio is insignificant in half of all regressions. In the 1993-97 regressions all impact disappears once sectoral dummies are included. The 1995 regressions tend to suggest a negative impact, but this regression comprises sub-sectors of vastly different size and gives different sectors different weights as sectors differ in the number of sub-sectors. Thus seven sectors have only two sub-sectors, with a lack of data points reducing some sectors to one observation only, while other sectors have as many as nine sub-sectors. If 1995 sectoral rather than sub-sectoral data were used (37 observations), the liability-asset ratio has a positive impact on profitability in the case of two profitability measures, and no impact otherwise (not reported in the table).

#### *4.3. Resolving potential endogeneity problems*

The straightforward OLS regression of profitability on the liability-asset ratio and two control variables ignores the fact that the liability-asset ratio is an endogenous variable. The liability-asset ratio can affect profitability, as shown above, through the financial charges as well as credit rationing and monitoring effects. Yet profitability in turn may affect the liability-asset ratio. A high degree of profitability immediately implies that the relative addition to net worth through newly accumulated profit, should it not be paid out to the owners, is large; *ceteris paribus*, the liability-asset ratio decreases.

The liability-asset ratio may depend not only on profitability but also on the demand for SOEs' products. If demand at a given price level is high, inventories relative to value-added tend to be low or are being run down, reducing the need for funding (the amount of funds tied up in

these inventories). If inventories were primarily financed through bank loans, then low inventories relative to value-added imply a low liability-asset ratio. On the other hand, if banks are reluctant to finance inventory build-ups caused by a lack of demand, high inventories may have to be financed through accumulated profit and paid-in equity, implying a low liability-asset ratio.

With two equations, one determining profitability, and the other determining the liability-asset ratio, another exogenous variable is needed in the determination of the liability-asset ratio in order for the first equation to be identified. This is the share of current assets in total assets. Since additions to fixed assets are traditionally financed primarily through own sources of funds (usually around half of all investment funding), while the provision of working capital traditionally is viewed as the banks' task, a high ratio of current assets to total assets should imply a high liability-asset ratio.<sup>30</sup> (Both equations then are just identified, with each equation containing one exogenous variable not included in the other equation.)

The system of two equations to be estimated then is

$$\text{Profitability} = b_1 + b_2 * \text{SOE share in VA} + b_3 * \text{inventory} / \text{VA} + b_4 * \text{LAR}, \quad \text{and}$$

$$\text{LAR} = b_5 + b_6 * \text{profitability} + b_7 * \text{inventory} / \text{VA} + b_8 * \text{current assets} / \text{total assets},$$

where VA denotes value-added and LAR is the liability-asset ratio. Table 4 reports the three stage least squares regression results. The two datasets and profitability measures are the same as those used previously; one common intercept is used.

*Table 4 about here*

The estimated coefficients of the first equation without exception show the SOE market share to have a positive impact on profitability, while large inventories imply low profitability (both effects are as expected). The liability-asset ratio either has no impact on profitability (in three regressions), or a positive impact (in five regressions). In other words, once the endogeneity of

the liability-asset ratio is accounted for, a higher liability-asset ratio implies higher profitability, or has no impact on profitability.

In all five cases where the liability-asset ratio has a positive impact on profitability (rather than no impact), a high degree of profitability implies a low liability-asset ratio (second equation). The liability-asset ratio is also higher, the lower demand, i.e., the higher inventories per value-added in the 1995 regressions (second equation). Banks thus appear to support enterprises whose sales stagnate. On the other hand, in the 1993-97 regressions the higher current assets relative to value-added, the lower the liability-asset ratio. One interpretation could be that large cash holdings and deposits reflect a good cash flow and thus imply no need to borrow from the bank to maintain production; on the other hand, if these funds are not put to productive use, they may have a negative impact on profitability (first equation). Finally, the liability-asset ratio is higher, the larger the share of current assets in total assets, as expected.

The results are surprisingly stable across five of the eight estimations involving two different datasets. An interesting result is that the relationship between profitability and the liability-asset ratio comes with a sign which depends on the direction of causality. Thus a high liability-asset ratio implies high profitability, but high profitability implies a low liability-asset ratio in the same five regressions plus one further one (with a positive sign in only one of the eight regressions). This relationship between the liability-asset ratio and profitability carries a number of implications.

The fact that a high liability-asset ratio implies a high level of profitability suggests that contrary to market-based economic theory (the Modigliani-Miller theorem), industrial SOEs in China may indeed be able to achieve leverage effects. The positive impact could in large part be driven by artificially low government-determined interest rates on loans. Those industrial SOEs that obtain loans at interest rates below the market rate can improve their profit and thus return on equity. But government-subsidized bank lending rates simply reflect a redistribution of economic surplus from the budget through banks to SOEs, and any improvement in profitability due to a rise in the liability-asset ratio has to be measured against government subsidies through

low interest rates. (With virtually all bank lending rates determined by the government, it is impossible to ascertain the market rate that would prevail in the absence of government interference.)

An additional set of implications issues from the second equation. That low profitability causes a high liability-asset ratio is understandable if banks tend to (or are forced to) lend to these SOEs in order to keep production going. In recent years this has taken the characteristics of “closed-circuit” lending (*fengbi daikuan*), implying that bank loans are to be used for the designated purposes only, that banks exercise strict monitoring on the use of these loans, that the bank loans are being repaid as soon as the output has been sold, and that the loans are repaid preferentially in the case of firm bankruptcy. The economic and trade commission helps in identifying production processes which are potentially profitable but lack funding. Thus low-profitability enterprises end up with a higher liability-asset ratio. The first equation shows that on average this high liability-asset ratio, controlling for other factors, indeed implies improved profitability.

On the other hand, the second equation also says that high profitability leads to a low liability-asset ratio. Interviews with enterprise managers in 1997 and 1998 revealed that enterprise managers in fact often preferred not to have to deal with banks. Bank loans are frequently viewed as unreliable because they are overwhelmingly short-term and then need to be rolled over. They tend to come with strings attached, such as that part of the loan has to be kept as a deposit. Overall, dealing with bank officials appears to be an unpleasant experience, perhaps exactly because it leads to some degree of external control. Many enterprise managers thus appear happy not to incur new bank loans as long as their current profitability and liquidity levels allow them to finance ongoing production and investment.

The regressions reported in Table 4 can be run in a number of variations. In regressions based on the 37 sectors (rather than 191 sub-sectors) in 1995, the liability-asset ratio has a positive impact on four of the five profitability measures (and no impact on the fifth profitability measure). Sectoral dummies could be included in both equations of the regressions reported in

Table 4. That would render the coefficient of the liability-asset ratio for the 1995 sub-sectors positive in three cases (and negative and insignificant each in one), and insignificant in the 1993-97 regressions; sectoral dummies would be highly significant throughout. This suggests that each sector tends to follow its own patterns. Since the Chinese Communist Party Central Committee believes in the overall negative impact of the liability-asset ratio on profitability, the results in Table 4 omit sectoral dummies to derive an overall impact of the liability-asset ratio on profitability across sectors.

In the 1995 regressions inventory per value-added could be replaced by current assets per value-added in order for the two datasets to use exactly the same variables. The liability-asset ratio would then have a positive impact on four of the five profitability measures (and no impact on the fifth measure); if sectoral dummies were included, the liability-asset ratio would still have a positive impact on three out of the five profitability measures (and no impact and a negative impact each on one profitability measure).

Finally, the variable inventory per value-added (or current assets per value-added) could be removed from the second equation, as it is perhaps measuring similar effects as current assets per total assets. In the 1995 regressions this would yield a positive impact of the liability-asset ratio on two out of the five profitability measures (and no impact on the other three) or, if including sectoral dummies, a positive impact on two out of the five profitability measures, no impact on a further two profitability measures, and a negative impact on one profitability measure. In the 1993-97 regressions the impact of the liability-asset ratio on the three profitability measures is unambiguously positive, independent of whether sectoral dummies are included or not.

## **5. Conclusions**

The perception of a continuously deteriorating liability-asset ratio in industrial SOEs with as consequence ever larger losses, is wrong. The increase in the liability-asset ratio during the 1980s reflects the transition from a socialist economy to an economy partly financed through financial intermediaries; by the mid-1990s the ratio has stabilized. Furthermore, Chinese policy makers concerned about the negative impact of a high liability-asset ratio on profitability should note that once other factors are controlled for, a high liability-asset ratio tends to imply a high rate of profitability.

This suggests that current industrial SOE reforms in China that focus on debt alleviation are misguided. Resolution trust companies set up in 1999 by each of the four state commercial banks are charged with swapping the liabilities of approximately 600 large, centrally owned industrial enterprises into equity. Numerous reports on individual swaps all indicate that the liability-asset ratio consequently falls from a level in the 60% range to a level in the 30% or 40% range. By reducing financial charges, the absolute amount of profit as a residual of sales revenue after subtracting financial charges will necessarily rise. But the regression results suggest that profitability, for example profit per equity, is likely to decline.

If the government expects no return on its newly acquired equity, the debt-equity swap simply implies a transfer from the government (which has to buy the debt from the state commercial banks by issuing interest-carrying bonds) to the enterprises (which no longer have to pay as much interest due to the reduction in their debt). The same objective could have been achieved through a reduction in corporate income tax rates or outright subsidies. Economically more pressing issues such as a lack of demand for many industrial SOEs' products is not addressed by turning debt into equity.

The fact that the coefficient of the liability-asset ratio in the determination of profitability is significantly positive in three out of the eight regressions if sectoral dummies are included, and insignificant in four—compared to the five significantly positive coefficients plus three insignificant coefficients in the case of a common intercept (Table 4)—furthermore cautions against economy-wide policies. The impact of debt-equity swaps on profitability may differ

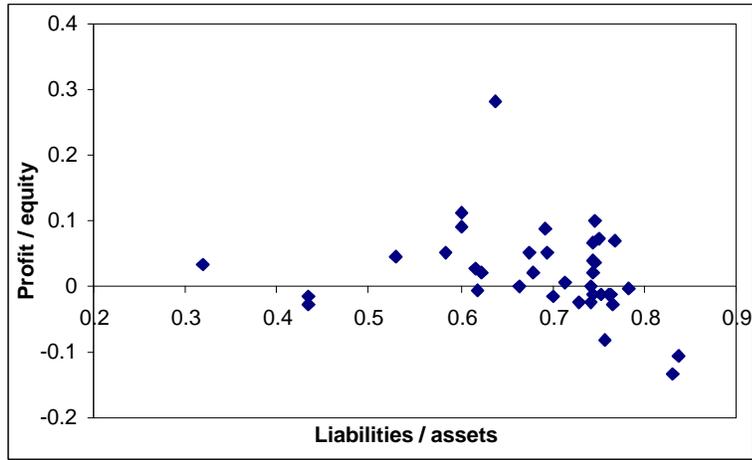
depending on the industrial sector, although the overall effect of an increase in the liability-asset ratio still tends to be a rise in profitability.

This positive impact of the liability-asset ratio on profitability raises further questions as to the mechanisms through which the causalities operate. Two specific issues are bank and enterprise behavior. What would a survey of bank managers reveal about how banks make their lending decisions? As bank managers are increasingly held responsible for their lending decisions, they will take enterprise profitability into consideration before extending loans. Does the causality from low profitability to a high liability-asset ratio then reflect conscious bank lending decisions to extend a loan despite current low profitability, or external pressure on bank managers to lend? A second issue is the question as to whether a high liability-asset ratio actually strengthens external control over SOEs and thus improves the governance structure (and thereby in the end profitability), or whether the positive impact of a high liability-asset ratio on profitability operates solely through the leverage effect (due to artificially low lending rates). Profitability finally is an accounting concept that need not reflect efficiency levels as much as economic or re-distributive policies. The impact of the liability-asset ration on enterprise efficiency would be a separate topic to explore.

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Source: Industrial Census 1995, Vol. 2.

**Figure 1. Liability-Asset Ratio and Profitability Across 37 Sectors, 1995**

**Table 1. Liability - asset ratio (in %)**

	Lardy		<i>China Statistical Yearbook (ZGTJNJ): Industrial enterprises<sup>a</sup></i>			
	All SOEs	Industrial SOEs	total assets	SOEs: liabilities <sup>b</sup> per current + fixed assets <sup>c</sup>	current + net fixed assets <sup>c</sup>	All enterprises: liabilities per total assets
1978	n.a.	11				
1980	n.a.	19				
1988	n.a.	45				
1989	55	n.a.				
1990	58	n.a.				
1991	61	n.a.				
1992	62	n.a.				
1993	72	68	67.48 <sup>d</sup>	71.77	77.80	
1994	75	79	67.84	72.95	80.10	66.66
1995	85	n.a.	65.62	69.97	76.97	64.86
1996			65.06	70.05	77.08	64.73
1997			64.82	70.47	78.45	63.94
1998 <sup>e</sup>			64.28	69.92		63.75
1999 <sup>e</sup>			61.51			61.23

a Industrial enterprises with independent accounting system on township tier and above.

b With total liability data only available for 1995, total liabilities for all years are approximated by the sum of short- and long-term liabilities, thus omitting one very minor item, deferred tax payments. Ratios with liabilities calculated as total assets minus equity, possible since 1994, are consistently slightly higher (by up to approximately half a percentage point).

c These two measures do not lead to proper liability-asset ratios but may help in linking up to the earlier data. Total assets minus current and fixed assets equals other assets. Other assets include, among others, patents, non-patent technologies, trade marks, copyright, land use rights, and brand name. Fixed assets minus net fixed assets approximately equals unfinished assets. Unfinished assets reflect the current value of realized fixed asset investment in investment projects that have not yet been completed. Once the project has been completed, the value of the investment at the time of completion enters the net fixed assets category.

d 1993 total assets, which are not available, were approximated by the sum of current and long-term liabilities plus equity. Using approximated rather than reported total assets to calculate the liability-asset ratio in 1994 yields a difference in the last (second) decimal only, and in 1995 a difference by one unit in the first decimal. The approximation in 1993 thus appears acceptable; the increase in the ratio between 1993 and 1994 is unlikely to be due to the approximation.

e 1998 and 1999 data are not fully comparable to earlier years. Industrial SOEs since 1998 comprise all SOEs independent of type of accounting system plus all state-controlled shareholding companies (rather than only SOEs with independent accounting system as in previous years). All industrial enterprises since 1998 refers to all SOEs plus all other industrial enterprises with independent accounting system and with annual sales revenue in excess of 5m yuan (rather than all industrial enterprises with independent accounting system on township tier and above as in previous years).

**Sources:**

Lardy (1998, 41).

Industrial SOEs: ZGTJNJ 1994, 389-91; ZGTJNJ 1995, 384, 393-5; ZGTJNJ 1996, 410, 419f; ZGTJNJ 1997, 429f; ZGTJNJ 1998, 449f, 461; ZGTJNJ 1999, 433f; ZGTJNJ 2000, 415f.

All industrial enterprises: ZGTJNJ 1994, 379, 381; ZGTJNJ 1995, 384-6; ZGTJNJ 1996, 410-12; ZGTJNJ 1997, 421f, 425; ZGTJNJ 1998, 441f, 445; ZGTJNJ 1999, 433f; ZGTJNJ 2000, 415f.

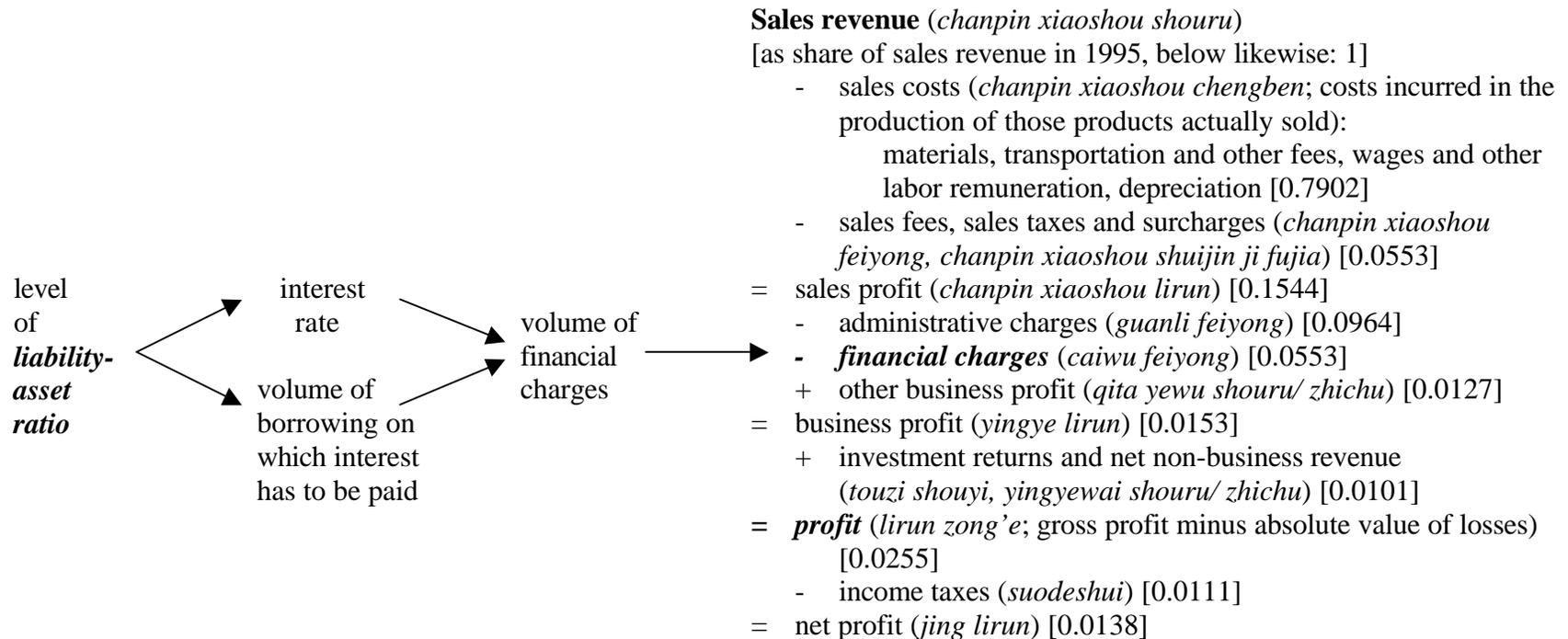
**Table 2. Liability-Asset Ratio of Industrial Enterprises with Independent Accounting System on Township Level and Above, 1995**

	Liabilities / assets (in %)	Financial charges / sales revenue (in %)
Nationwide total	65.31	4.78
State-owned enterprises	65.81	5.53
Centrally owned	59.15	4.89
Locally owned	69.48	5.89
County-level	73.16	6.81
Collectively owned enterprises	71.67	4.38
Private enterprises	58.61	2.84
Joint enterprises	64.38	3.76
Share-holding enterprises	55.07	4.08
Foreign-funded enterprises	55.72	3.11
Hong Kong, Macao and Taiwanese enterprises	63.35	3.94
Other enterprises	59.97	4.40
Profitable enterprises	61.72	3.95
Loss-making enterprises	76.05	9.02

Liabilities comprise all liabilities, i.e., short- and long-term liabilities as well as deferred tax payments.

Financial charges (*caiwu feiyong*) comprise all costs associated with bank loans and other forms of borrowing, whether they are interest rates or fees.

**Source:** Industrial Census 1995, Vol. 1, 46-53.



Source for data on share of sales revenue, industrial SOEs: Industrial Census 1995, Vol. 1.

**Figure 2. Linking the Liability-Asset Ratio to Profitability Measures**

**Table 3. Impact of the Liability-Asset Ratio on Profitability**

Dependent variable	1995: 191 sub-sectors of 37 industrial sectors					1993-1997: 38 industrial sectors		
	Profit per equity	Profit + financial charges per assets	Losses per gross profit	Profit per value-added	Tax + profit per current + net fixed assets	Profit per equity	Profit per value-added	Tax + profit per current + net fixed assets
Number of observations	186	182	179	186	186	190	190	190
R <sup>2</sup>	0.3249	0.2281	0.5845	0.7306	0.2575	0.3984	0.4871	0.3303
Intercept	***0.1909 (3.4971)	0.0088 (0.7196)	***8.3101 (4.1854)	***0.8644 (7.2377)	***0.0633 (2.3233)	*0.0883 (1.7904)	***0.2301 (3.6432)	-0.0356 (-0.5392)
SOE share in sectoral value-added	***0.1166 (5.1337)	***0.0352 (6.9702)	***-9.7911 (-12.0356)	***-0.4017 (-8.0809)	***0.0699 (6.2137)	***0.0787 (2.9466)	***0.0993 (2.9040)	***0.1545 (4.3155)
Inventory per value-added (Current assets per v.a.)	***-0.0361 (-4.4507)	***-0.0076 (-4.1904)	***-1.2118 (-4.2030)	***-0.2450 (-13.8053)	***-0.0184 (-4.5909)	***-0.0295 (-4.3890)	***-0.0387 (-4.4897)	***-0.0302 (-3.3483)
Liability-asset ratio	***-0.2757 (-3.5655)	*0.0314 (1.8009)	-1.1894 (-0.4218)	***-0.5492 (-3.2454)	-0.0333 (-0.8608)	-0.0359 (-0.6422)	***-0.2059 (-2.8800)	**0.1680 (2.2451)
<i>Fixed effects model</i> (coefficients of sectoral dummies not reported)								
Number of observations	186	182	179	186	186	190	190	190
R <sup>2</sup>	0.5615	0.5371	0.7201	0.8246	0.5466	0.8063	0.8149	0.9675
SOE share in sectoral value-added	***0.1572 (5.0117)	***0.0379 (5.6423)	***-9.4133 (-8.2503)	***-0.3736 (-5.4363)	***0.0646 (4.2523)	***0.3777 (5.0753)	***0.4748 (4.7075)	***0.1679 (4.3347)
Inventory per value-added (Current assets per v.a.)	***-0.0515 (-5.4592)	***-0.0105 (-5.1838)	***-0.8378 (-2.4367)	***-0.2625 (-12.6999)	***-0.0210 (-4.5766)	***-0.0280 (-3.6805)	***-0.0547 (-5.3056)	***-0.0142 (-3.5790)
Liability-asset ratio	***-0.4682 (-4.9788)	-0.0143 (-0.6879)	3.0499 (0.8493)	***-0.5390 (-2.6160)	***-0.1449 (-3.1488)	-0.0567 (-0.5071)	-0.0347 (-0.2287)	0.0608 (1.0448)

Values in parentheses are t-values. Significance levels: \* 10% level, \*\* 5% level, \*\*\* 1% level.

Following an F-test (or a log-likelihood test), the sectoral dummies in the fixed effects model are not redundant. (To conduct the test, each regression was run with a common intercept plus dummy variables for all sectors except the first; all sectoral dummies were then tested jointly.)

In the 1995 regressions, the second explanatory variable (not counting the intercept(s)) is inventory per value-added, in the 1993-1997 regressions current assets per value-added.

**Source:** Industrial Census 1995, Vol. 1 and 2; ZGTJNJ 1994, ZGTJNJ 1995, ZGTJNJ 1996, ZGTJNJ 1997, ZGTJNJ 1998.

**Table 4. Impact of the Liability-Asset Ratio on Profitability After Accounting for Endogeneity (3SLS Results)**

Dependent variable	1995: 191 sub-sectors of 37 industrial sectors					1993-1997: 38 industrial sectors		
	Profit per equity	Profit + financial charges per assets	Losses per gross profit	Profit per value-added	Tax + profit per current + net fixed assets	Profit per equity	Profit per value-added	Tax + profit per current + net fixed assets
Number of observations	186	182	179	186	186	190	190	190
<b>First equation</b> (Profitability = ...)								
Intercept	-2.7721 (-1.3695)	*-0.2988 (-1.8749)	*25.5534 (1.6681)	-5.1311 (-1.2469)	*-0.7418 (-1.8991)	***-0.3797 (-3.4067)	*-0.2592 (-1.9580)	***-0.6647 (-4.4450)
SOE share in sectoral value-added	*0.5604 (1.7731)	***0.0802 (3.1559)	***-12.0697 (-5.4297)	0.4964 (0.7726)	***0.1820 (3.0234)	***0.2007 (4.7757)	***0.2268 (4.5446)	***0.3184 (5.6478)
Inventory per value-added (Current assets per v.a.)	*-0.2570 (-1.6712)	** -0.0303 (-2.4730)	0.0468 (0.0149)	** -0.6920 (-2.2136)	***-0.0773 (-2.5946)	***-0.0421 (-4.6449)	***-0.0518 (-4.8129)	***-0.0470 (-3.8714)
Liability-asset ratio	4.0417 (1.3708)	**0.4802 (2.0669)	-26.3498 (-1.1796)	8.1872 (1.3659)	**1.1442 (2.0043)	***0.6094 (4.1972)	***0.4686 (2.7176)	***1.0353 (5.3148)
<b>Second equation</b> (Liability-asset ratio = ...)								
Intercept	***0.5341 (16.7579)	***0.5969 (14.8035)	***0.5421 (15.2050)	***0.6100 (12.6996)	***0.5679 (17.0878)	***0.5029 (12.9190)	***0.5622 (12.3988)	***0.4757 (13.0716)
Profitability	***-0.4999 (-4.5912)	***-2.1704 (-3.5254)	***0.0077 (3.4903)	***0.3527 (3.0639)	***-0.9070 (-3.7460)	***-1.4533 (-4.3060)	***-1.0023 (-4.6839)	***-0.9773 (-4.1361)
Inventory per value-added (Current assets per v.a.)	0.0057 (0.6506)	*0.0171 (1.9227)	***0.0474 (4.9363)	***0.1602 (3.6647)	0.0123 (1.4233)	***-0.0571 (-2.6345)	***-0.0487 (-2.6687)	***-0.0416 (-2.1797)
Current assets per total assets	***0.3623 (4.6735)	***0.3671 (4.0063)	0.2034 (2.4133)	-0.2264 (-1.2335)	***0.3577 (4.4644)	***0.8293 (7.8155)	***0.6464 (8.8478)	***0.8848 (7.3221)

Values in parentheses are t-values. Significance levels: \* 10% level, \*\* 5% level, \*\*\* 1% level.

First equation: Profitability =  $b_1 + b_2 * \text{SOE share in value-added} + b_3 * \text{inventory / value-added} + b_4 * \text{liability-asset ratio}$ .

Second equation: Liability-asset ratio =  $b_5 + b_6 * \text{profitability} + b_7 * \text{inventory / value-added} + b_8 * \text{current assets / total assets}$ .

In the 1995 regressions, the second explanatory variable (not counting the intercept(s)) is inventory per value-added, in the 1993-1997 regressions current assets per value-added.

**Source:** Industrial Census 1995, Vol. 1 and 2; ZGTJNJ 1994, ZGTJNJ 1995, ZGTJNJ 1996, ZGTJNJ 1997, ZGTJNJ 1998.

## Notes

<sup>1</sup> The liability-asset ratio is defined as liabilities divided by (total) assets. Leverage, in contrast, denotes the ratio of liabilities to equity. Since assets are equal to liabilities plus equity, any change in the liability-asset ratio implies a change in leverage with the same sign (and vice-versa). Both concepts, liability-asset ratio and leverage, are equally valid in the analysis of the impact on profitability. The Chinese practice of working with the liability-asset ratio is adopted in the following.

<sup>2</sup> Following the Modigliani-Miller theorem, the return on equity cannot be raised by increasing or decreasing the ratio of liabilities to equity (or assets). Yet the Modigliani-Miller theorem is based on a number of explicit and implicit assumptions which are virtually never met, perhaps least of all in China. The assumptions are that (i) firms can be identified by “risk class” (or that they have a zero probability of bankruptcy), (ii) individual borrowing can substitute for firm borrowing, (iii) investors have full information about the returns of the firm, and (iv) tax policy does not treat debt and equity differentially. (See, for example, Stiglitz 1988 for further elaboration on the assumptions.)

<sup>3</sup> For example, assume the residual of sales revenue after subtracting all costs except interest costs were 100 yuan. Firm 1 has debt of 800 yuan and equity of 200 yuan, Firm 2 has debt of 300 yuan and equity of 700 yuan. If the interest rate were 10%, Firm 1 pays 80 yuan interest and earns a profit of 20 yuan on its equity of 200 yuan, i.e., profit per equity equals 10%. Firm 2 pays 30 yuan interest and earns profit of 70 yuan on its equity of 700 yuan, i.e., its rate of profitability is also 10%.

<sup>4</sup> The share in 1978 was 53%. (For the data see ZGTJNJ 1998, 138f.) Industry comprises (i) mining and quarrying, (ii) manufacturing, and (iii) electricity, gas, and water production and supply. Employment in *all* state-owned *enterprises* has been calculated as total employment in all state-owned *units* minus employment in (state-owned) (i) social services, (ii) health care, sports and social welfare, (iii) education, culture and arts, radio, film and television, (iv) scientific research and technological services, (v) government agencies, Party agencies, and social organizations, and (vi) in “other” sectors. State-owned *enterprises* thus are taken to comprise all state-owned *units* in industry, agriculture, construction, geological prospecting and water conservancy, transport and communication, wholesale and retail trade plus catering, banking and insurance, and real estate trade. In 1997, employment in *industrial* state-owned enterprises (units) accounted for 37.53% of total employment in state-owned units (42.13% in 1978). A comparison based on output data is not possible.

<sup>5</sup> For comparison, in 1978 industrial SOEs with independent accounting system produced 96.44% of the Gross Output Value of all industrial state-owned units, in 1997, 95.97%; this share was constant at 96% to 97% in the two decades in between. (Calculated from GGKF, 146; ZGTJNJ 1998, 435, 454; ZGTJNJ 1997, 413.) The limitation to industrial SOEs with independent accounting system is common practice in the literature. See, for example, Lardy (1998) or Jefferson and Rawski (1994).

<sup>6</sup> The 37 industrial sectors covered in the 1995 industrial census in terms of value-added accounted for 99.26% of the nationwide SOE total. The 39 industrial sectors covered in the statistical yearbooks (ZGTJNJ) for the years since 1993, in 1995 accounted for 99.40% of total industrial SOE value-added. (The two additional industrial sectors are “other mineral mining and processing” and “other manufacturing;” the fortieth sector on which no individual data at all are available is the military industrial sector.) For 1998 no industry-specific SOE data are available, only aggregate nationwide industrial SOE data. Up to and including 1997, data on industrial SOEs with independent accounting system excluded state-controlled share-holding companies; since 1998 these are included.

<sup>7</sup> Value-added is the value that has been added in the process of production, *net* of the payments on the borrowed funds (debt), but not net of the returns to equity holders.

<sup>8</sup> The assumptions that presumably underlie this indicator are that in the socialist economy (i) all funds for investment in fixed assets and fixed-quota working capital (as part of current assets) are provided by the government, and (ii) the enterprise pays for these funds by handing over its annual surplus to the government as a combined taxes and profit transfer. Since the beginning of the reform period, both assumptions are no longer met. According to bank statistics (*China Financial Statistics (1952-1991)*), banks began to extend their first investment in fixed asset loans in 1979; at the same time, fixed-quota working capital appropriations began their steady decline to virtually zero today. The 1983-85 tax reform instituted a clear distinction between profit and taxes, with taxes being paid by enterprises independent of ownership form.

<sup>9</sup> Lardy's sources are primarily individual newspaper and journal articles. Not all sources could be located; the data are therefore taken directly from Lardy (1998, p. 41). While the general trend, as argued below, is definitely correct, individual data points appear of dubious quality. For example, the 1978 ratio for industrial SOEs is in effect the ratio of bank loans (i.e., a sub-category of liabilities) to depreciated fixed capital plus the value of all inventories (the 1995 Industrial Census shows this denominator in 1995 to be equal to 57.50% of total assets.) The 1980 and 1994 ratios for industrial SOEs are based on a sample of 20,000 SOEs (compared to 87,905 SOEs with independent accounting system in 1995); the sampling criteria are not identified in the article.

<sup>10</sup> Lardy suggests that the earlier data do not include the value of land use rights; the various sources of his data that could be located do not reveal whether land use rights are included or not. For the definition of total assets and its sub-categories see ZGTJNJ 1998, 490.

In an attempt to find a time series to link up with the dispersed earlier liability-asset ratio data, the ratio of liabilities to current and *net* fixed assets is also included in Table 1. Net fixed assets, in contrast to fixed assets, do not include the current value of investment projects that are not yet completed. This ratio has also been stable since 1994.

<sup>11</sup> Suppose a firm purchases a piece of machinery for 100 yuan. One year later the market price of exactly this type of machinery (if newly bought) is 300 yuan due to economy-wide inflation. The actual, second-hand market value of the piece of machinery bought the previous year would very likely be "(100 yuan - depreciation) \* 3." The firm accounts only consider the depreciation, not the inflationary factor of three.

<sup>12</sup> See, for example, *Beijing tongji nianjian 1996*, 175, or *Shaanxi tongji nianjian 1996*, 299. A break-down of inventories is not available in the source of the U.S. data.

<sup>13</sup> See ZGTJNJ 1998, 440 and 454; Industrial Census 1995, Vol. 1, 48f. Intangible assets, current assets plus fixed assets by definition add up to total assets. The intangible asset data reported here are calculated as total assets minus current and fixed assets since the statistics do not report intangible assets directly. Comparable aggregate values for the U.S. again are not available.

Blayney (1999) reports that in the case of 6 SOEs in Shanghai that had their assets appraised for their conversion into joint stock companies, approximately 827 million yuan in intangible assets were excluded from the final asset appraisal of 1.688 billion yuan. In this case thus intangible assets accounted for one third of total assets.

<sup>14</sup> The concept of liabilities and equity did not take hold in official statistics before the early 1990s. The first balance sheet on industrial enterprises to include the two categories was published for the year 1993 (ZGTJNJ 1994). Before, assets were viewed as balanced by state funds, bank funds, and other funds.

<sup>15</sup> See ZGGDZCTZTJNJ 1950-1995, 23. Industry-specific data are not available. (The bank statistics show loans for investment in fixed assets to begin in 1979 only; see *China Financial Statistics (1952-1991)*.)

<sup>16</sup> See *China Financial Statistics (1952-1991)*, 10, and ZGTJNJ 1997, 241.

<sup>17</sup> See ZGTJNJ 1999, 186, 269, 624; ZGGDZCTZTJNJ 1998, 54; and ZGJRNJ 1998, 508. Since 1997, working capital loans to industrial enterprises are likely to include loans to material supply and sales enterprises, and possibly also to urban collective-owned enterprises. As these items in previous years were of a size approximately equal to only one quarter of loans to industrial enterprises, the impact should be minor; furthermore, state working capital appropriations may also go to these enterprises. Working capital loan data specific to industrial SOEs with independent accounting system are not available.

<sup>18</sup> Industrial SOEs' liability-asset ratio in Table 1 and Table 2 are slightly different. With total liability data only available for 1995, total liabilities in Table 1 were calculated as the sum of short- and long-term liabilities, thus omitting deferred tax payments. Table 2 ratios are based on the actual total liability data. Also see notes to the two tables.

<sup>19</sup> The year 1996 was chosen as it is the most recent year for which data across several countries are available. In the years 1991, 1981, and 1971 (the first year, for which data are available) the ratios for mining (without pension liabilities and other provisions in parentheses) were 94.65% (83.92%), 95.15% (87.85%), and 88.94% (83.19%). For manufacturing the ratios were 77.06% (51.68%), 76.82% (58.11%), and 70.07% (58.82%). All ratios are based on those (West-German) enterprises reporting to the central bank. Mining enterprises reporting to the central bank in 1994 accounted for approximately 96.3% of the value-added taxes paid by all mining enterprises; for the manufacturing enterprises the percentage was 73.1%. Sales of the mining sector in 1994 were 45.0b DM, and of manufacturing 2158.5b DM. (Deutsche Bundesbank, 1999) No data are available on the "production and supply of electricity, gas and water" in Germany.

<sup>20</sup> The liability-asset ratio of non-farm non-financial corporations in 1994, the most recent year for which these data are available, was 52.28%, up from 49.09% in 1991 and 31.97% in 1981 (Board of Governors, Balance Sheets for the U.S. Economy 1945-94, 36f.). For *all* active corporations, the ratio in 1991, the most recent year for which

the data are available, was 72.27% (Internal Revenue Service 1994, 33). All active corporations include financial institutions; according to the first source (p. 43), private financial institutions in 1991 had a liability-asset ratio of 92.22%.

<sup>21</sup> In 1997, the ratio was 54.77%, in 1990 43.22%, and in 1985 51.34%. (Economic Planning Agency 1999, 322f)

<sup>22</sup> In 1997, the ratio for all industry was 80.9%, in mining and quarrying 89.3%, and in manufacturing 79.8%. (National Statistics Office of Korea)

<sup>23</sup> This assumes that the share of interest-free liabilities (such as salaries and taxes due but not yet paid) in total liabilities is constant; if an increase in the liability-asset ratio went hand in hand with an increase in interest-free liabilities, the increase in the liability-asset ratio may not be accompanied by higher interest payments.

<sup>24</sup> Borrowing in different sectors and regions would have to be characterized by different maturity structures to yield different average sectoral or regional interest rates. In the late 1990s, banks for some loan categories were given a small range within which they could vary the interest rate. This scope for own decisions appears negligible.

<sup>25</sup> Plotting the liability-asset ratio against the financial charges per liabilities for the 37 industrial sectors in 1995 does reveal a significant, slightly positive correlation. Once three outliers are removed, the correlation vanishes. In addition, on average liabilities equal to perhaps 25% of all assets are interest-free liabilities. (See, for example, detailed data available on township- and village-run enterprises in ZGXZQYNJ 1996, 254f.) They include such items as inter-enterprise arrears, pre-payments received, and salaries and taxes due but not yet paid. The correlation coefficient for the 37 industrial sectors in the case of SOEs turns insignificant once the estimated interest-free liabilities (equal to 25% of all assets) are removed, even if the three outliers are still included.

<sup>26</sup> The correlation coefficient between financial charges and profit for the years 1993 through 1997 is -0.7331, but this correlation coefficient is not significant (at the 10% level).

<sup>27</sup> No detailed data on the composition of industrial SOE 1995 current assets beyond the figures on inventories are available. To judge from more detailed data on township and village enterprises (in ZGXZQYNJ), cash and bank balances as well as pre-payments made should be very small, while accounts receivable could account for as much as half of current assets. The implications of demand for an enterprise's products on accounts receivable could be the same as on inventories. High demand could allow enterprises to demand immediate payment, thus reducing accounts receivable (same sign as in the case of inventories).

<sup>28</sup> In the 1993-97 dataset, no data on total liabilities and net fixed assets are available. Total liabilities are therefore calculated as total assets minus equity, and average annual net fixed assets are used instead of (year-end) net fixed assets.

<sup>29</sup> Value-added in this sector in 1994 fell to 1/4 of its 1993 value, then fell by one half again in 1995; 1996 data on value-added in this sector are not available, and the 1997 value is up again at the 1993 value.

<sup>30</sup> The third explanatory variable in the one-equation model, the SOE share in value-added (as a proxy for monopolistic pricing power), should have no direct impact on the liability-asset ratio other than through the variable profitability. Similarly, the share of current asset in total assets should not have any direct impact on profitability.