



## Investment and financing constraints in China: Does working capital management make a difference?

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### ABSTRACT

We use a panel of over 116,000 Chinese firms of different ownership types over the period 2000–2007 to analyze the linkages between investment in fixed and working capital and financing constraints. We find that those firms characterized by high working capital display high sensitivities of investment in working capital to cash flow (*WKS*) and low sensitivities of investment in fixed capital to cash flow (*FKS*). We then construct and analyze firm-level *FKS* and *WKS* measures and find that, despite severe external financing constraints, those firms with low *FKS* and high *WKS* exhibit the highest fixed investment rates. This suggests that an active management of working capital may help firms to alleviate the effects of financing constraints on fixed investment.

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### 1. Introduction

In the last three decades, the Chinese economy has been characterized by persistently high fixed investment rates and phenomenal growth rates (Song et al., 2011).<sup>1</sup> Yet, considering that the Chinese financial system is poorly developed, this can be seen as a puzzle (Allen et al., 2005).<sup>2</sup> Several authors have tried to find explanations for this puzzle. Among these, Ayyagari et al. (2010) focus on the role of informal finance, and conclude that it is not because of their access to informal financial sources that Chinese firms were able to grow, despite limited access to external finance. Cull et al. (2009) conclude that access to trade credit did not play a significant

role in explaining the puzzle. Guariglia et al. (2011) demonstrate that the Chinese growth miracle was driven by the highly productive private firms, which were able to accumulate very high cash flows. According to their study, it is thanks to this abundant internal finance that Chinese private firms managed to finance their high growth rates despite their limited ability to obtain external finance.

In this paper, we focus on investment in fixed capital, which is a significant determinant of growth, both generally (Bernanke and Gurdikanyan, 2001; Bond and Schiantarelli, 2010) and in China (Ding and Knight, 2009, 2011).<sup>3</sup> Specifically, we explore the role played by working capital management in explaining why Chinese firms were able to invest at very high rates despite significant financing constraints. Working capital is defined as the difference between current assets and current liabilities, and is often taken to be a measure of liquidity. We choose to focus on working capital management motivated by the observation that, over the period 2000–2007, the Chinese firms in our dataset were characterized by a very high average ratio of working capital to fixed capital (66.6%). Considering

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<sup>1</sup> According to our dataset, which is fully described in Section 3, over the more recent period covering the years 2000–2007, Chinese firms are characterized by an average total assets growth rate of 9.0%, sales growth rate of 11.6%, and fixed investment to capital ratio of 8.6%.

<sup>2</sup> A vast literature uses macro country-level data to investigate the links between broad measures of financial development and growth, and generally finds a positive relationship (see Levine, 2005, for a survey). A number of studies extend this literature making use of firm-level data for different countries (see for instance Love, 2003; Beck et al., 2005).

<sup>3</sup> The fact that there is a positive association between high fixed investment and high growth is supported by our data, according to which those firms whose fixed investment rate falls in the top quartile of the distribution of the fixed investment rates of all firms in the sample, exhibit an assets growth rate of 20.5% and a sales growth rate of 18.6%, while the corresponding figures for those firms whose fixed investment rate falls in the bottom quartile of the distribution are –2.5% and 4.6%.

that, contrary to fixed capital, working capital is highly reversible,<sup>4</sup> and that firms can easily adjust it (Fazzari and Petersen, 1993; Carpenter et al., 1994), our aim is to investigate the extent to which, in the presence of fluctuations in cash flow, Chinese firms are able to adjust their working capital instead of their fixed capital investment, therefore alleviating the effects of cash flow shocks on the latter. Our analysis is related to Fazzari and Petersen (1993) who conduct a similar investigation of US firms and find that these firms are indeed able to smooth out cash flow fluctuations with working capital.<sup>5</sup> To the best of our knowledge, no such investigation has been undertaken for a developing country. We fill this gap in the literature, focusing on the Chinese case.

Our study is based on a panel of 116,724 firms over the period 2000–2007. We initially run standard fixed investment regressions as a function of cash flow, separately for state-owned, foreign, private, and collective enterprises. We find that the former always exhibit poorly determined sensitivities of fixed investment to cash flow, suggesting that state-owned enterprises (SOEs) are not financially constrained. This can be explained by these firms' needs to fulfil political and social objectives as well as economic objectives (Bai et al., 2006) and the priority that central and local governments and the (predominant) state-owned banks accord to them. On the other hand, all other groups of firms exhibit high sensitivities of fixed investment to cash flow, which suggests that they suffer from significant liquidity constraints.<sup>6</sup> Moreover, all firms with the exception of SOEs exhibit significant sensitivities of working capital investment to cash flow. These findings indicate that, in the presence of fluctuations in cash flow, firms tend to adjust both their fixed and working capital investment. Yet, when we differentiate firms into those with a relatively high and a relatively low working capital to fixed capital ratio, we find that, in the presence of cash flow shocks, it is only those firms with a high ratio that are able to adjust their working capital investment. Furthermore, for all but foreign firms, the sensitivity of fixed capital investment to cash flow is much lower for those firms with high working capital: these may therefore use their working capital to alleviate the effects of cash flow shocks on their fixed capital investment.

To fully take into account the heterogeneity characterizing firms in our sample, we then construct firm-level sensitivities of investment in fixed and working capital to cash flow (*FKS* and *WKS* respectively) and analyze their determinants. To the best of our knowledge, no other study in the literature has analyzed the links between investment in fixed capital, working capital, and financing constraints by making use of firm-level sensitivities. This represents our second contribution. We find that in the presence of cash flow shocks, older, larger, and slow-growing firms typically adjust fixed capital investment, while smaller, younger, and fast-growing firms are able to adjust working capital instead. Furthermore, firms with low cash flow, which are likely to face significant

internal credit constraints, are particularly active in adjusting both their fixed and working capital investment, while highly leveraged firms with low collateral tend to adjust the latter more than the former.<sup>7</sup> Combining the two sensitivities, we find that, compared to the other groups, those firms with low *FKS* and high *WKS* are more externally financially constrained (being younger, smaller, more indebted, and less collateralized), have high investment opportunities (exemplified by their high sales growth rates), and high working capital. Yet, they also have the highest fixed investment to fixed capital ratios. Despite the financing constraints that they face, in the presence of adverse cash flow shocks, these firms can maintain high fixed investment levels by adjusting working capital more than fixed capital. It is therefore possible that, although they face severe financial constraints, Chinese firms are able to maintain high fixed investment and growth rates by effectively managing their working capital. In addition to the ability to accumulate high cash flows highlighted in Guariglia et al. (2011), active working capital management may contribute to the explanation of the Chinese growth puzzle.

The remainder of the paper is organized as follows. Section 2 provides some background about working capital management and its importance in the Chinese context. Section 3 describes our data and presents some descriptive statistics. Section 4 illustrates our baseline specification and estimation methodology. Section 5 presents our main empirical results, and Section 6, our analysis of firm-level sensitivities of fixed and working capital investment to cash flow. Section 7 concludes.

## 2. Working capital management and its importance in the Chinese context

Working capital is defined as the difference between firms' current assets (which include accounts receivable, inventories, and cash) and current liabilities (which include accounts payable and short term debt). It represents the source and use of short-term capital. According to Dewing (1941), it is, along with fixed capital, one of the "key elements" of the firm. Kim and Srinivasan (1988) stress the value of individual components of working capital. For instance, holding large inventory stocks enables firms to avoid interruptions in the production process and costly stock-outs.<sup>8</sup> Moreover, granting trade credit to one's clients can stimulate sales, as it enables customers to verify the quality of the product before paying for it, and as it represents an additional source of credit for them (Long et al., 1993; Petersen and Rajan, 1997).

Working capital is often used to measure a firm's liquidity. Liquidity is a precondition to ensure that firms are able to meet their short-term obligations. Insufficient liquidity can lead to bankruptcy (Dunn and Cheatham, 1993). Yet, too much liquidity can be detrimental to firms' profitability (Bhattacharya, 2001). Good management of working capital therefore requires striking a balance between liquidity and profitability in order to maximize the value of the firm. The advantages of holding inventories and extending trade credit to customers have been outlined above. Yet, the higher the inventories and trade credit, the less money is available to the firm for profitable investment. This suggests that finding the optimal level of working capital may be a difficult task for firm managers (DeLoof, 2003).

<sup>4</sup> A huge literature focuses on the effects of the irreversibility of fixed capital investment on firm behavior. Irreversibility arises when firms find it difficult or costly to reverse an investment decision because of a differential between the purchase price and resale price of capital goods, or because of fixed costs from divesting. The problem is particularly severe when capital goods are highly specialized or industry specific. See Section 2 in Chirinko and Schaller (2009) for a survey of recent studies on the effects of fixed investment irreversibility.

<sup>5</sup> Using a methodology similar to that in Fazzari and Petersen (1993), Brown and Petersen (2011) show that US firms are able to use cash reserves (which are one of the components of working capital) to smooth their highly irreversible R&D expenditures.

<sup>6</sup> It should be noted that the view that, within a *Q* model framework, a positive link between cash flow and investment can be interpreted as an indicator of financial constraints is challenged, among others, by Kaplan and Zingales (1997), Cleary (1999), Cummins et al. (2006), and Chen and Chen (2012). Authors like Whited (1992), Whited and Wu (2006), and more recently Lin et al. (2011) test for the presence of financing constraints within an Euler equation framework. See Hubbard (1998) and Bond and Van Reenen (2007) for surveys of the literature on financing constraints and firm behavior.

<sup>7</sup> As in Guariglia (2008), we define as internally financially constrained those firms whose activities are constrained by the amount of internally generated funds they have at hand. Firms may also be susceptible to the effects of information asymmetries, which translate themselves into difficulties in obtaining external funds. Along these lines, external financial constraints can be identified using criteria such as firms' size, age, leverage, collateral, dividend payout ratio, and so on.

<sup>8</sup> A stock-out is defined as a situation in which the demand for a product cannot be fulfilled from the current inventory.

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