Economic Systems 33 (2009) 1–21

Contents lists available at ScienceDirect

Economic Systems

journal homepage: www.elsevier.com/locate/ecosys

FDI and credit constraints: Firm-level evidence from China

Jérôme Héricourt [a], Sandra Poncet [b,*]

[a] EQUIPPE-Universités de Lille, Université Lille 1, Faculté des Sciences Économiques et Sociales, USTL - Cité Scientifique - Bât SH2, 59655 Villeneuve d'Ascq Cedex, France
[b] Centre d'Économie Sorbonne and Paris School of Economics, Université Paris 1, CNRS and CEPII, Maison des Sciences Economiques, Bureau 405, 106 bld de l'Hôpital, 75013 Paris, France

ARTICLE INFO

Article history:
Received 10 October 2007
Received in revised form 20 March 2008
Accepted 2 July 2008

JEL classification:
E22
E44
G31
O16

Keywords:
Financial constraint
Corporate finance
Foreign Direct Investment
China

ABSTRACT

In this paper, we assess the success of the ongoing financial system reforms in China by investigating the extent to which firms are financially constrained. We focus on the role played by Foreign Direct Investment (FDI) in funding the Chinese corporate sector, and analyze whether incoming foreign investment in China plays an important role in alleviating domestic firms' credit constraints. Using firm-level data on 1300 domestic companies over the period 2000–2002, we confirm that the development of cross-border relationships with foreign firms helps private domestic firms to bypass both the financial and legal obstacles that they face at home.

1. Introduction

The Chinese banking sector has traditionally been considered by the authorities as a substitute for state financing in order to ensure continued funding to preserve jobs in its many inefficient but massive state-owned enterprises (SOEs). This structure, inherited from the socialist planned economy, has deprived emerging private enterprises from access to external funding. During the mid-1990s, Chinese authorities took the step of reforming the financial system through recapitalization and the transfer of non-performing loans (NPL) to asset management companies. These reforms were made

* Corresponding author. Tel.: +33 1 44 07 82 44; fax: +33 1 44 07 82 47.
E-mail address: sandra.poncet@univ-paris1.fr (S. Poncet).

0939-3625/$ – see front matter © 2008 Elsevier B.V. All rights reserved.
doi:10.1016/j.ecosys.2008.07.001

necessary by China's WTO commitments to ending restrictions in the banking sector. The ability of the Chinese financial system to allocate capital more efficiently and to guarantee non-distortionary financial access to all companies, including private firms, is therefore a key indicator of the success of the ongoing reforms.

This issue is especially important as access to external finance is a crucial determinant of business expansion.[1] Businesses will invest in projects where the expected benefits exceed the costs. Efficient investment, however, only results when businesses do not face credit constraints which are unrelated to their own performance. Indeed, a great deal of research has underlined the importance of well-developed financial markets for economic growth.[2]

Relatively few firms have access to formal finance in China (Hallward-Driemeier et al., 2003), despite the country having a very large and deep pool of financial capital—an estimated US$4.5 trillion of assets. Based on the World Business Environment Survey (WBES) of the investment climate, conducted in 80 countries over 1999–2000, 80% of private firms in China cite financing constraints as a major obstacle.[3] This figure, which is twice the median figure over the whole sample (38.5%), ranks China as the most financially constrained country in the sample, beating Haiti (74.4%) and the Kyrgyz Republic (66.7%).

Approximately one-quarter of the 2400 firms interviewed in the World Bank investment climate survey (2003)[4] reply "No" to the question "Do you have a loan from a bank or financial institution?", and on average only about 25% of firms' working capital comes from bank loans. Boyreau-Debray and Wei (2005) analyze the main pitfalls of the Chinese state-dominated financial system, and find low capital mobility within China due to local government interference and the mis-allocation of capital.

Such distortions may force private Chinese firms to look for foreign investors (Huang, 2003). By establishing cross-border relationships with foreign firms, private domestic firms can bypass both the financial and legal obstacles that they face at home. Foreign Direct Investment (FDI) can in fact be seen as a form of equity financing (Harrison et al., 2004). Moreover, from the very beginning of the economic reforms in China, foreign-financed firms were granted legal status superior to that of other private firms. It is therefore possible that, in the Chinese case, FDI provides capital to firms which would otherwise be constrained in their growth by their inability to obtain funds, due to distortions in the banking sector.

In this paper, we estimate a structural model based on the Euler equation for investment to investigate the extent to which firms are financially constrained and whether incoming foreign investment in China alleviates these constraints. We rely on firm-level data on Chinese companies provided by the Enterprise Analysis unit of the World Bank (World Bank, 2003)[5] over the period 1999–2002. We test the following hypotheses: (1) domestic firms face different credit constraints depending on their size and private or state-owned status; and (2) direct foreign investment affects the credit constraints faced by domestic firms. Following Harrison and McMillan (2003), we modify the standard Euler investment model by introducing a borrowing constraint, and then use two measures of financial distress, the debt-to-asset and interest coverage ratios, as proxies for the shadow value of the constraint. In the absence of constraints, these financial variables should play no role in determining future investment.

The results suggest that only domestic private firms face credit constraints in China. When we split domestic firms into public (state-owned) and private firms, we find that public firms' investment decisions are insensitive to debt ratios and the cost of debt. Nor is there any evidence that public firms are affected by the presence of foreign firms. We interpret this as evidence consistent with the notion of a soft budget constraint for public firms (Qian and Roland, 1998). In contrast, private domestic firms seem more credit constrained than state-owned or foreign firms but their financing constraints soften in a context of abundant foreign investment.

[1] Surveys suggest that financial constraints are a far greater deterrent to investment in developing countries than in developed countries. Developing-country firms often cite financing constraints as one of their primary obstacles to investment and business expansion (Harvard Institute for International Development and World Economic Forum, 1998).

[2] See Caprio and Honohan (2001) for an extensive summary.

[3] The figure computed by Claessens and Tzioumis (2006) excludes firms with state or foreign ownership since they probably enjoy preferential access to finance.

[4] Enterprise surveys data can be accessed at http://www.enterprisesurveys.org/.

[5] The Enterprise Analysis unit provides Enterprise survey data on the investment climate in 94 countries, based on surveys of over 60 000 firms.

Our contribution is twofold. First, we shed light on the impact of the ongoing reforms of the financial sector by using a structural model to assess the importance of credit constraints in China. In doing so, we provide an additional test of the approach used by Fazzari et al. (1988) to identify credit constraints. Second, we focus on the part played by FDI in funding the Chinese corporate sector. More precisely, we ask whether FDI eases or exacerbates domestic firms' credit constraints, and, more crucially, which types of firms benefit more from capital inflows.

The paper is organized as follows. Section 2 presents the specific context of China's financial and corporate sector and reviews the literature on financing constraints. Section 3 presents the structural model of firm investment used to estimate the impact of direct foreign investment on firms' financing constraints, and Section 4 presents the firm-level data used in our empirical work. Section 5 discusses the empirical results and undertakes several robustness checks. Section 6 concludes.

2. Literature review on financial constraints

This paper builds on two existing lines of research: (1) the analysis of firm financing constraints and their determinants; and (2) work on distortions in China's financial system.

We build on a number of recent studies that have similarly considered the impact of Foreign Direct Investment on credit constraints. Our paper is closely related to work by Harrison and McMillan (2003)[6] and Harrison et al. (2004),[7] who analyze the relationship between financial development and financing constraints by estimating Euler equations using micro-data.

This paper also provides an additional test of the approach used in the body of literature pioneered by Fazzari et al. (1988) to identify credit constraints based on their impact on investment behavior.

2.1. Financing constraints in China

One of the striking features of the Chinese financial system is the poor allocation of capital, partly due to government distortion of the financial system to achieve social ends, specifically to ensure a continued flow of funding to its many inefficient but massive state-owned enterprises in order to preserve jobs. This policy has unfortunate consequences: wasteful investments yielding negligible returns, restrictive funding for the private companies that drive growth, pervasive state ownership of financial institutions which stifles competition and lowers efficiency, a feeble array of financial products for consumers, and, as already noted, minimal growth in corporate bond markets.

Despite the very large and deep pool of financial capital, the majority of lending goes to less efficient state-owned enterprises, leaving healthy private enterprises without access to external funding. As shown by Dollar and Wei (2007), this also leads to systematic dispersion in the returns to capital across locations and sectors.[8]

Up until 1998, the four state-owned commercial banks (SOCBs, i.e., the Bank of China, China Construction Bank, the Industrial and Commercial Bank of China, and the Agricultural Bank of China) were instructed to lend to state-owned enterprises. The Chinese state enterprises submitted investment plans and funding requests that had to be approved at the provincial and central authority level. Based on this, lending quotas were issued to enterprises. Since private enterprises were excluded from submitting investment plans, they were, naturally, also excluded from lending quotas. In addition, there was a legal bias against private domestic firms, which made it harder for them to collateralize their assets in order to obtain loans, and made it riskier for banks to lend them money (Huang, 2003). While China's private companies now produce more than half of its GDP, they only receive 27% of loans and are excluded from the country's nascent equity and corporate bond markets (Farrell and Lund, 2006).

[6] The authors combine a cross-country firm-level panel for 38 countries with time-series data on restrictions on international transactions and capital flows, and find that different measures of global flows are associated with a reduction in firm-level financing constraints.

[7] Using firm-level data from the Ivory Coast over the period 1974–1987, the paper finds that domestic firms are significantly more credit-constrained than foreign firms, and that borrowing by foreign firms aggravates domestic firms' credit constraints.

[8] Bai et al. (2006) somewhat moderate this conclusion. They also find evidence of dispersion in the rate of return to capital, but their calculations suggest that this has fallen since the end of the 1970s.

The system was liberalized at the end of the 1990s, when the Chinese constitution acknowledged the private sector to be an integral part of the economy. Theoretically, lending quotas no longer exist. However, in practice, banks still consider private enterprises to be riskier than their public peers, either due to their short credit history or smaller chance of being bailed out by the government. Moreover, as discussed in Park and Sehrt (2001), lending by state banks is still determined by policy prerogatives rather than commercial motives.

In summary, a major problem in China's corporate sector is a political pecking order of firms which leads to the allocation of China's financial resources to the least efficient firms (state-owned enterprises), while denying the same resources to China's most efficient firms (private enterprises). Even though they are the engine of growth in the Chinese economy,[9] private firms are discriminated against in terms of access to external funding, protection of property rights, taxation, and market opportunities. Such distortions may force private Chinese firms to look for foreign investors (Huang, 2003). By establishing cross-border relationships with foreign firms, private domestic firms can bypass both the financial and legal obstacles that they face at home. FDI can in fact be seen as a form of equity financing (Harrison et al., 2004). Moreover, from the very beginning of the economic reforms in China, foreign-financed firms were accorded a superior legal status to other private firms. China is now among the top FDI recipients in the world (Prasad and Wei, 2005).

Guariglia and Poncet (2008) provide primary empirical confirmation that FDI is used to alleviate the costs associated with the inefficient banking sector. They study the relationship between finance and economic growth using data for 30 Chinese provinces and a wide range of financial indicators over the period 1989–2003. They find that the negative impact of financial distortions on economic growth is weaker for high FDI recipients. These results indicate that, in the Chinese case, FDI provides capital to firms which would otherwise be constrained in their growth by their inability to obtain funds, due to distortions in the banking sector.

The objective of this paper is to rely on firm-level data to understand how exactly fast-growing private Chinese firms finance themselves and to check whether private firms, which are generally discriminated against by the local financial system, have been able to use foreign joint-ventures as a way of acquiring the capital necessary for investment.

2.2. Testing for financing constraints: the literature

The central idea of the literature on financing constraints is that investment should not be determined by a firm's net worth or internal funds but only by the firm's expected future profitability. The seminal work of Modigliani and Miller (1958) indeed suggests that in perfect capital and credit markets the investment behavior of a firm is irrelevant for its financing decisions and vice-versa. However, in the presence of market imperfections, financing constraints will be reflected in firms' investment decisions. Empirically, financing constraints could be identified via the sensitivity of investment to internal funds.[10] Work here typically computes the correlation between investment and measures of internal (cash flow) or external (debt) funds, after controlling for other factors, to identify credit constraints. Significant correlations are usually attributed to capital market imperfections and therefore suggest the presence of financing constraints.[11]

Following Fazzari et al. (1988), it is typically assumed that there are cross-sectional differences in the effect of internal funds on firms' investment, so that the investment equation should hold across adjacent periods for *a priori* unconstrained firms but not for constrained firms. This has led to different *a priori* classifications of firms which attempt to distinguish financially constrained from

[9] Allen et al. (2005) show that the private sector in China dominates the state and listed sectors, both in terms of output size and growth trend. Specifically, they show that between 1996 and 2002, the private sector grew at an annual rate of 14.3%, while the combined state and listed sector only grew at 5.4%. Using firm-level data over the 2002–2004 period, Dollar and Wei (2007) report that domestic private firms have higher (marginal and average) returns to capital than state-owned firms, with figures of 151 and 99%, respectively.

[10] This literature relies on the assumption that external finance is more costly than internal finance due to asymmetric information and agency problems, and that the "premium" on external finance is an inverse function of the borrower's net worth.

[11] See the surveys by Schiantarelli (1995), Blundell et al. (1996), Hubbard (1998) and Claessens and Tzioumis (2006).

unconstrained firms. Previous research has typically focused on firm characteristics that are associated with information costs as a proxy for credit constraints. Financially constrained firms are often thought to be younger, smaller, more indebted and to not pay dividends.[12]

Empirical tests are then used to determine whether these firms exhibit stronger correlations between either investment and cash flow (Fazzari et al., 1988), or investment and debt-to-asset ratios and interest coverage (Whited, 1992). The intuition is that a stronger investment-cash flow or investment-debt relationship reflects more prevalent financing constraints. Most work on financing constraints following on from Fazzari et al. (1988) has used the Q-theory of investment suggested by Tobin (1969) and Euler equations to study financing constraints. Both the Q-theory and Euler models of investment result from the same optimization problem.[13]

A number of recent papers have called into question the validity of using investment-cash flow correlations as proxies for financing constraints. Based on statements contained in annual reports, Kaplan and Zingales (1997) argue that firms identified in Fazzari et al. (1988) as financially constrained are in fact not constrained.[14] However, many authors still support the use of investment-cash flow sensitivity as an indicator of credit constraints (Fazzari et al., 2000; Allayannis and Muzomdar, 2004; Chirinko and von Kalckreuth, 2003) while others are more doubtful (Gomes, 2001; Moyen, 2002; Alti, 2003).[15] As explained by Harrison et al. (2004), most papers which question this methodology relate more directly to the *Q*-model of investment[16] rather than the Euler equation model[17] (although some of the criticisms apply to both models). In addition, none of the recent theoretical models questioning this methodology were derived in a dynamic multi-period setting with investment adjustment costs (see Bond et al., 2003). While it is true that no theoretical consensus has been reached and that the relationship between investment and cash flow sensitivities continues to be an important empirical question, numerous recent results and survey evidence support the intuition that investment-cash flow sensitivities are indeed a reflection of the extent of financing constraints (Love, 2003; Beck et al., 2005).[18]

3. Theoretical framework

The dynamic model of firm-value optimization we rely on is similar to those used in the work previously mentioned in Section 2, and closely follows the specification in Harrison and McMillan (2003), which has the advantage of explicitly including credit constraints.[19]

[12] Several *a priori* criteria have been used: dividend policy (Fazzari et al., 1988), bond rating (Whited, 1992), age (Devereux and Schiantarelli, 1990) and firm size (Audretsch and Elston, 2002). However, the empirical application of one single criterion for classifying firms can be overly simplistic since financing constraints depend on many firm characteristics such as size, age, legal form and indebtness (Petersen and Rajan, 1994).

[13] Euler equations for investment have been estimated by numerous authors, with most work concentrating on US firms. See Whited (1992), Hubbard and Kashyap (1992), Hubbard et al. (1995), and Calomiris and Hubbard (1995), among others. The scarcer work using international data includes Bond and Meghir (1994) for the UK, Jaramillo et al. (1996) for Ecuador, Harris et al. (1994) for Indonesia, Gelos and Werner (1999) for Mexico, Bigsten et al. (2000) for African countries, Patillo (2000) for Ghana, and Harrison and McMillan (2003) for the Ivory Coast.

[14] Kaplan and Zingales' (1997) results have themselves in turn been criticized (Fazzari et al., 2000).

[15] Alti (2003) and Gomes (2001) find that investment-cash flow sensitivities can be positive even in the absence of financial frictions.

[16] Hayashi (1982) argues that average *Q* may be an imprecise proxy for the unobservable marginal *Q*. In this case, internal funds could be a proxy for the profitability of investment and the positive relationship cannot solely be interpreted as capital and credit market imperfections but rather as firms with better liquidity also attaining superior investment possibilities (Hoshi et al., 1991; Schiantarelli, 1996).

[17] The Euler equation uses a structural model to capture the influence of current expectations of future profitability on current investment decisions. Unlike the *Q*-model, the Euler-equation approach measures how internal funds indirectly affect investment via a Lagrange multiplier and does not use the market value of *Q*. The advantage of this approach is that future profitability, i.e., marginal *Q*, does not need to be specified or observed.

[18] Love (2003) finds that firms in less financially developed countries have higher investment-cash flow elasticities, especially small firms. Survey evidence (see for example, Beck et al., 2000) confirms that firms in countries with lower levels of financial development are more financially constrained, especially small firms.

[19] The primary advantage of explicitly introducing a borrowing constraint in the framework is that it is no longer necessary to reject the model in order to find evidence of credit constraints, nor is it necessary to assume that rejection of the model implies the presence of credit constraints. The other advantage is that since the coefficient on cash flow is no longer the critical variable of interest for identifying credit constraints, the possibility that cash flow proxies for unobserved profit opportunities no longer poses a critical estimation problem (Harrison and McMillan, 2003).

We adopt the Euler equation methodology used in recent contributions to the financing constraints literature (see footnote 11), which relies on less restrictive assumptions than Tobin's *Q*.[20]

Using this framework, we focus on two basic questions: (1) are firms in China credit constrained? And (2), how does Foreign Direct Investment affect the credit constraints of domestic firms? As in Harrison and McMillan (2003), both hypotheses can be nested in the same general specification. To test for the presence of credit constraints, we proxy for the shadow value of the borrowing constraint using two firm-level measures of financial distress, the debt-to-assets ratio (*DAR*) and the interest coverage ratio (*COV*). The basic idea is that, in the context of the Euler equation, these indicators of financial distress should have no impact on future investment in a world of perfect information. If, however, there are information asymmetries which restrict borrowing, then firms that are financially distressed today will be forced to substitute investment tomorrow for investment today. Hence, the model predicts a positive relationship between the shadow value of the constraint and future investment. To test for a differential impact of ownership, we estimate the model separately for private and for state-owned firms. Finally, to test for the possibility of crowding out by FDI, we include a variable that measures the overall level of foreign borrowing by city and industry, and another that measures the overall level of foreign sales by city and industry. Both measures are interacted with our proxies for borrowing constraints.

3.1. The model

We estimate a version of the Euler equation, combining insights from Whited (1992), Bond and Meghir (1994), Gilchrist and Himmelberg (1998), Love (2000) and Harrison and McMillan (2003). The model exploits the relationship between investments in successive time periods, derived from dynamic optimization in the presence of symmetric, quadratic costs of adjustment. In this model, a firm is assumed to maximize the present discounted value of current and future net cash flows. Firm i borrows an amount B_{it} at time t. Credit constraints are modeled as either a non-negative dividend constraint or a ceiling on borrowing.

The Euler equation characterizing the optimal investment path relates the marginal adjustment costs in adjacent periods. The constrained firm behaves as if it had a higher discount rate for a given level of today's adjustment costs. Ceteris paribus, constrained firms will then substitute investment tomorrow for investment today.

As shown by Harrison and McMillan (2003), the present value of the marginal adjustment cost of investing tomorrow is given by

$$(1-\delta)\beta_{t+1}^{t}E\left[(1-\Omega_{i,t})\left(\frac{\partial R}{\partial I}\right)_{i,t+1}\right]=\left(\frac{\partial R}{\partial I}\right)_{i,t}+\left(\frac{\partial R}{\partial K}\right)_{i,t} \tag{1}$$

where β_{t+1}^{t} is the nominal discount factor between periods t and $t+1$, δ denotes the depreciation rate and $E_t(.)$ is the expectations operator conditional on information available in period t. The major challenge is to find empirical proxies for the derivatives of net revenue R with respect to investment I and capital K, as well as for $\Omega_{i,t}$, the shadow value of the financial constraint. We follow Bond and Meghir (1994), who show that the derivatives of net revenue with respect to I and K can be written as

$$\left(\frac{\partial R}{\partial I}\right)_{t}=-\alpha_1 p_t\left(\frac{I}{K}\right)_{t}+\alpha_2 p_t-p_t^{I} \tag{2}$$

$$\left(\frac{\partial R}{\partial K}\right)_{t}=\alpha_3 p_t\left(\frac{Y}{K}\right)_{t}-\alpha_3 p_t\left(\frac{\partial F}{\partial L}\frac{L}{K}\right)_{t}+\alpha_1 p_t\left(\frac{I}{K}\right)_{t}^{2}-\alpha_2 p_t\left(\frac{I}{K}\right)_{t} \tag{3}$$

where net output Y is assumed to be linearly homogeneous in capital K and labor L, $p_{i,t}^{I}$ is the price of the investment good, and $p_{i,t}$ is the price of output.

[20] As explained in the previous section, numerous recent papers have highlighted other problems with the *Q*-methodology, such as severe measurement error and identification issues (see Kaplan and Zingales, 1997; Erikson and Whited, 2000; Bond and Cummins, 2001).

If we assume that there are no credit constraints ($\Omega_{i,t} = 0$), then combining (2) and (3) above, and adding the subscripts c and k to denote city and industry, yields the following estimating equation:

$$\left(\frac{I}{K}\right)_{i,ck,t+1} = \beta_1\left(\frac{I}{K}\right)_{i,ck,t} - \beta_2\left(\frac{I^2}{K}\right)_{i,ck,t} + \beta_3\left(\frac{Y}{K}\right)_{i,ck,t} - \beta_4\left(\frac{CF}{K}\right)_{i,ck,t} + \beta_5 U_{i,ck,t} + \eta_{ck} + \lambda_t + \varepsilon_{i,ck,t+1} \quad (4)$$

where $CF_{i,ck,t} = p_{i,ck,t}F(K_{i,ck,t}, L_{i,ck,t}) - p_{i,ck,t}G(I_{i,ck,t}, K_{i,ck,t}) - w_{i,ck,t}L_{i,ck,t}$, with $F(K,L)$ being the production function gross of adjustment costs and $G(I,K)$ the adjustment cost function.

In the above equation, I denotes gross investment in fixed assets, K denotes the capital stock at the beginning of the period, CF stands for cash flow, $Y = F - G$ is net output, and $U_{i,ck,t}$ is the real user cost of capital. The subscripts i, c, k and t denote the firm, city, industry and time period, respectively; η_{ck} and λ_t, respectively, capture the city–industry and time-specific effects, and $\varepsilon_{i,ck,t}$ is the error term.

Eq. (4) underscores that expected future investment (proxied by actual future investment) is positively related to current investment and negatively related to the square of current investment. Future investment is negatively related to current cash flow[21] and positively related to the user cost of capital $U_{i,ck,t}$, which is a function of the interest rate and the firm-specific depreciation rate, and to current Y/K.

3.2. Testing for credit constraints using the Euler specification

We follow Harrison and McMillan (2003) and modify Eq. (4) to test for credit constraints. We put $\Omega_{i,t}$ on the right-hand side of Eq. (4) by linearizing (using a Taylor expansion) the product of $(1 - \Omega_{i,t})$ and the following period's derivative of net revenue with respect to investment.[22]

We proxy empirically for $\Omega_{i,t}$, the shadow value of the financial constraint, via a firm-level measure of financial distress. We rely on two such indicators: the ratio of total debt-to-assets (DAR) and a measure of interest coverage (COV), defined as interest payments divided by debt.[23] In the absence of credit constraints, these measures should have no impact on investment which will only depend on the associated expected future profitability. If, however, there are information asymmetries which restrict borrowing, then firms that are financially distressed today will be forced to substitute investment tomorrow for investment today. Hence, these two measures will be positively correlated with future investment. Firms that are financially distressed are more likely to be up against their borrowing constraints and are hence more likely to postpone investment.

To test for different ownership effects, we split our sample between private and state-owned companies. Finally, to see whether FDI alleviates financial constraints, we include a variable measuring the importance of foreign investment by city and industry, both as a main effect and interacted with our proxies for credit constraints:

$$\left(\frac{I}{K}\right)_{i,ck,t+1} = \beta_1\left(\frac{I}{K}\right)_{i,ck,t} - \beta_2\left(\frac{I^2}{K}\right)_{i,ck,t} + \beta_3\left(\frac{Y}{K}\right)_{i,ck,t} - \beta_4\left(\frac{CF}{K}\right)_{i,ck,t} + \beta_5 U_{i,ck,t} + \beta_6\Omega_{i,ck,t} + \beta_7 FDI_{ck,t} + \beta_8\Omega_{i,ck,t} \times FDI_{ck,t} + \eta_{ck} + \lambda_t + \varepsilon_{i,ck,t+1} \quad (5)$$

[21] Harrison and McMillan (2003) explain the negative relationship between current cash flow and future investment as follows. A high level of current cash flow implies lower net marginal adjustment costs today. Because, in equilibrium, expected marginal adjustment costs are equated across periods, this implies lower expected marginal adjustment costs and hence lower expected investment tomorrow.

[22] See Harrison and McMillan (2003) for details.

[23] Our empirical estimation also includes a proxy for the real user cost of capital (see *infra*) which gives another indication of the degree of financial distress faced by the firm. Most of our results support a positive and significant impact of capital cost on future investment, consistently with our expectations.

Therefore, Eq. (5) is estimated separately for private[24] and for state-owned[25] firms. Firms with average private ownership greater than 49% over the sample period are considered as private, otherwise they are state-owned. A dummy variable η_{ck} is also included to control for unobservable fixed characteristics by city (c) and industry (k). Last, we also control for year specific dummies (λ_t).

4. Data and indicators

We use firm-level data from the World Bank's 2003 Investment Climate Survey.[26] This survey was run in collaboration with the Chinese National Bureau of Statistics and is part of a larger World Bank project studying the business environment at the firm level in Africa, Latin America, and South and East Asia in 2003. A total of 2400 firms were interviewed in 18 Chinese cities in 15 provinces: Dalian, Benxi (Liaoning), Changchun (Jilin), Haerbin (Heilongjiang), Hangzhou, Wenzhou (Fujian), Nanchang (Jiangxi), Zhengzhou (Henan), Wuhan (Hubei), Changsha (Hunan), Shenzhen, Jiangmen (Guangdong), Nanning (Guangxi), Chongqing (Chongqing), Guiyang (Guizhou), Kunming (Yunnan), Xian (Shaanxi), and Lanzhou (Gansu). The interviews were carried out by members of the Enterprise Survey Organization of the Chinese National Bureau of Statistics. The survey unit is the main production facility of the firm. The data include accounting information on sales, inputs, labor, capital stock, investment and several other expenditures; broader information is also included, such as ownership structure, labor force characteristics, relations with competitors, clients and suppliers, innovation, and market environment and investment climate.

Around 1800 of these firms correspond to 14 different 3- and 4-digit level industries in the manufacturing sector,[27] while the other 600 are in services.[28] The 14 industries were selected non-randomly in order to focus on the main sectors in China, and on those sectors with high growth and innovation rates. Within these groups, firms were chosen randomly and are therefore representative of the population.

Firms were interviewed only once in 2003 but were asked to provide information for each year between 1999 and 2002. As a result some indicators (such as sales, profits and investment) are available annually, while others (such as the ownership structure) are measured only once over the whole 3-year period. We focus on the section "Questions for the Firm's Accountant and/or Personnel Manager". These latter include all the information related to ownership, finances and accounting. The accounting information on sales and input use is annual. Here the data has the structure of a 3-year panel with no firm entry or exit. The questions regarding finance and accounting (investment, cash flows, liabilities) are answered annually.

We therefore have a maximum of 9600 observations (2400 per year). From the 2400 firms, we restrict our attention to the 2198 that are considered to be domestic.[29] We further eliminate firms that are undergoing restructuring and/or bankruptcy by including firms with positive values of total sales and total assets (Cleary, 1999). For consistency, we also decided to restrict our sample to firms reporting positive debt, interest payments and investment. This leaves us with 5684 usable observations (around 1300 firms over 3 years), of which 75% come from private firms.

Eq. (5) is estimated over the 2000–2002 period (missing values for a number of key variables prevent us from using information from 1999). The main firm-level variables are investment, sales, profits, interest payments, borrowing, ownership shares and cash flows, all scaled by beginning-of-period

[24] As measured in the World Bank survey. Private owners include domestic top managers or family, other domestic individuals, domestic institutional investors, domestic firms, and domestic banks.

[25] As measured in the World Bank survey. Public owners include the national government, state/provincial governments, local/municipal governments, and other governments, including co-operatives and collective enterprises.

[26] Enterprise survey data can be accessed at http://www.enterprisesurveys.org/.

[27] These include garment and leather products, electronic equipment, electronic part-making, household electronics, auto and auto-parts, information technology, food processing, chemical products and medicine, biotech products and Chinese medicine, metallurgical products (manufacturing and tools), and transportation equipment (incl. telecommunications and ship-building).

[28] Services include accounting and non-banking financial services, advertising and marketing, and business services.

[29] We define a firm as foreign when foreign participation in its capital is at least 49%; it is otherwise defined as domestic.

capital for consistency. We complement the firm-level data with city- and industry-level data on foreign-firm presence computed as the aggregate of firm-level information.[30]

Following Whited (1992) and Harrison and McMillan (2003), *DAR* is computed as the ratio of the market value of the firm's debt to the value of the firm's fixed assets. It can therefore be interpreted as both a measure of the firm's lack of collateral and a measure of the firm's current demand for borrowing relative to its capacity to borrow. The other indicator of firm-level financial distress used to proxy for the shadow value of the constraint is the interest coverage ratio, *COV*, defined as the ratio of the firm's interest payments to the sum of the firm's interest payments plus cash flow. A higher value of *COV* means that the firm expends a larger part of its resources on debt service, and is thus likely to be closer to its debt capacity.

The real user cost of capital, *U*, is typically unobservable. The survey does, however, report the approximate annual rate of interest for the firm's most recent loan or overdraft.[31] This approach thus provides us with a fourth indicator (in addition to *COV*, *DAR* and *CF*/*K*) to assess firms' credit constraints.

The lack of this kind of data is certainly a limitation in the related work of Bond and Meghir (1994) and Harrison and McMillan (2003), who use firm dummies to proxy for the user cost of capital. The introduction of firm fixed effects[32] would arguably help to capture unobserved firm factors. It would also control for the possibility of a correlation between a time-invariant component of the error and the regressors which would make the pooled OLS estimation inconsistent.

However, in our case, data limitations (data is reported for only 3 years) prevent us from controlling for firm fixed effects. Since our model includes the lagged dependent variable, our estimations are only run for 2 years (2001 and 2002) of our explained variable. While theoretically only 2 years of data is needed to use fixed effects, we want to emphasize that our dataset is lacking a crucial feature, that is, time heterogeneity. The 2 years we have are consecutive and most of our variables do not vary a lot over time. First differencing could have been an option, had we had 2 years of observations several years apart. However, that is not without problems either, as it may exacerbate potential problems with noise or measurement errors in the data (Griliches and Hausman, 1986). Again, in our case, the lack of time-variance precludes us from adopting this approach. There is not much heterogeneity left in our data.[33]

Moreover, even if firm dummies were introduced, we would be confronted with the classical issue of correlation of lagged dependent variable with firm fixed effects and our limited time coverage would not allow us to use the usually warranted Arellano-Bond estimations. Our estimations nevertheless include dummies to account for city–industry time-invariant specificities.

Our main foreign investment variable is the importance of foreign capital, which we scale by sales (*SALES*) or alternatively by debt (*DEBT*). We therefore measure the importance of foreign investment at the city and industry level as

$$FDI_{ck,t} = \frac{\Sigma_i SALES_{i,ck,t} \times FDI\_Firm_{i,ck,t}}{\Sigma_i SALES_{i,ck,t}} \tag{6}$$

$$FDI_{ck,t} = \frac{\Sigma_i DEBT_{i,ck,t} \times FDI\_Firm_{i,ck,t}}{\Sigma_i DEBT_{i,ck,t}} \tag{7}$$

with $FDI\_Firm_{i,ck,t}$ being the share of foreign-equity participation at the plant level, which varies between 0 and 100%. In a regression with city–industry dummies, the impact of foreign investor presence will be identified through its time dimension.

[30] Indicators of foreign presence at the city and industry level are calculated so as to include all the firms in the same city and industry. We checked that the results regarding financing constraints of firm *i* remain unchanged when foreign presence is calculated excluding the foreign presence in firm *i* itself.

[31] When the information for a specific firm is missing, we use the average value computed for responding firms in the same city and industry instead.

[32] The fixed effects estimator is often preferred in the literature to the random effects estimator. Indeed the extra orthogonality condition used in the random effects estimator – namely, the assumption that the firm-specific intercept is exogenous – is considered dubious.

[33] We did perform estimates relying on first differencing; as expected, the significance of most coefficients disappeared, measurement error being the likely culprit.

Table A1 in the Appendix provides descriptive statistics. Since we want to compare the financial constraints of private and public firms, we divide the full sample according to ownership. The 49% cut-off used to differentiate between public and private firms, as well as to define domestic firms, appears to be appropriate since in our data only a small proportion of firms have in fact a mixed ownership structure. The majority of firms report being almost fully state-owned or fully privately owned. In fact, 88% of firms defined as domestic state-owned in our sample have 100% state ownership. The average public share for those firms is 96.7% while the average foreign share is below 1%. The situation is very similar for the sub-sample of firms defined as private: 96% of the firms defined as domestic private in our sample have 100% private ownership. The average private share for those firms is 98.8%, with an average foreign share of around 2%. In our empirical analysis, we checked that our results did not depend on the ownership cut-off level.

Table A1 in the Appendix also presents the mean, standard deviation, and minimum and maximum values for each variable within both categories of firms. Apparently, our dataset covers a wide range of firms, primarily SMEs. Indeed, median employment for the entire sample is 144 and 106 for the subset of private firms. Comparison with the cutoff for an SME using the EU definition (250 employees) and the US definition (500 employees) clearly points out that our sample is dominated by SMEs. Private firms are significantly smaller, as proxied by total fixed assets and number of employees. However, they also turn out to be significantly more profitable, as measured by the ratio of total profits to total fixed assets (profits). As a consequence, our empirical analysis will control for size.

5. Empirical results

5.1. Investment equation estimates

The model includes dummies by city and industry in order to account for unobservable characteristics at the city and industry level. We also allow for year specific intercepts. We expect that most elements of financial development and institutional reforms will be captured by these dummies. The structure of our data, however, confronts us with the problem of error clustering. The observable and unobservable characteristics of the firms within the same city and industry are expected to be correlated (see Moulton, 1986, 1990). In this paper we correct for clustering via the Froot (1989) correction. We therefore correct for the correlation of errors between firms within a specific city and industry.

Our estimation approach of the impact of the city–industry level FDI on firm-level investment should alleviate the potential problem of FDI endogeneity, since it is unlikely that a firm shock translates into a change in city–industry level FDI.[34] However, since we want to ensure that our results are free from any estimation bias, we also use instrumental variables estimation.[35] Due to missing data, second lags are not available for all right-hand side variables. Besides, those available were often subject to the weak instrument phenomenon. We decided to use as instruments first lags of regressors[36] as well as the square of these first lags. Besides, our indicator for interest coverage (*COV*) raised specific problems in terms of instrumentation (cf. *infra*). Therefore, full specification including *COV* also relies on two additional instruments, namely interest rate payments and the interaction of *COV* with a profitability indicator (the ratio of total profits over sales).

Table 1 reports the results from estimating Eq. (4).[37] We distinguish between domestic private firms and public firms. As noted above, a private firm is defined as one for which more than 49% of the equity is owned by private investors.

[34] When the dependent variable is at the finest level possible, shocks in the error term will be less likely to affect the right-hand side variables. Moreover, if the explanatory variables are more aggregated, endogeneity is again less likely since shocks to individual variables affect regional variables only slightly.

[35] The 2SLS estimator is a special case of the Generalized Method of Moments (GMM) approach (Verbeek, 2004). Contrary to work taking firm-level specific effects into account, our estimations do not suffer from systematic bias in the lagged dependent variable, which is traditionally solved by taking a within transformation, and then applying instrumental variables (IV) estimation or Generalized Method of Moments estimation (Harrison and McMillan, 2003).

[36] Note that the "User cost of Capital" does not appear among the tested right-hand side variables. It was systematically dropped by the IV regressions due to collinearity problems, possibly coming from insufficient variability.

[37] Following a referee's advice, we judge the significance at the 1 or 5% level but we leave the 10% threshold in the tables for information purposes.

Table 1
Baseline specification.

Explained variable	Investment over capital (IoverK) $t+1$					
	1 private	2 state-owned	3 private	4 state-owned	5 private	6 state-owned
IoverK	0.34***	0.42***	0.32***	0.42***	0.29***	0.397***
	(0.05)	(0.13)	(0.04)	(0.13)	(0.05)	(0.137)
IoverK^2	−0.03***	−0.09***	−0.03***	−0.09***	−0.029**	−0.088***
	(0.01)	(0.03)	(0.01)	(0.03)	(0.012)	(0.031)
YoverK	0.001***	0.01***	0.001***	0.01***	0.0001	0.01***
	(0.0001)	(0.002)	(0.0001)	(0.002)	(0.0001)	(0.002)
User cost of capital	0.005	0.001	0.008	0.001	0.016**	0.001
	(0.007)	(0.006)	(0.007)	(0.006)	(0.007)	(0.006)
Cash flow	−0.001***	0.03	−0.001***	0.03	0.002	0.03
	(0.0001)	(0.03)	(0.0001)	(0.03)	(0.004)	(0.03)
DAR total debt to asset			0.002***	−0.001	0.0018***	0.001
			(0.0006)	(0.005)	(0.0006)	(0.005)
COV interest coverage					0.0018*	−0.001
					(0.0009)	(0.0001)
No. of observations	1865	640	1853	635	1732	605
No. of cities and sectors	148	99	148	99	144	95
No. of firms	1048	353	1042	351	972	337
Dummies			Year			
Dummies			City and sector			
R^2	0.21	0.39	0.22	0.39	0.11	0.38
Hansen *J*-stat	3.59	2.49	3.40	3.42	7.37	6.85
p-Value	0.17	0.65	0.18	0.64	0.19	0.23
χ^2 degrees of freedom	2	4	2	5	5	5
Durbin-Wu–Hausman stat	0.49	1.10	0.58	2.37	3.21	1.16
p-Value	0.78	0.58	0.90	0.50	0.52	0.88
χ^2 degrees of freedom	2	2	3	3	4	4
Tests for weak identification						
Cragg-Donald *F*-stat	14.65	16.66	13.93	12.55	19.06	1.98
Critical value (10%)	8.78	9.48	7.77	9.01	9.37	9.37
Critical value (5%)	13.97	15.72	12.20	15.18	16.10	16.10
F-Stat for weak instruments						
YoverK	24.36	92.79	12.11	289.48	259.39	46.19
Prob > *F*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
F-stat degrees of freedom	3	6	4	8	9	9
Cash flow	5.54	10.00	10.98	9.20	2192.77	10.83
Prob > *F*	0.0013	0.0000	0.0000	0.0000	0.0000	0.0000
F-Stat degrees of freedom	3	6	4	8	9	9
DAR			2.77	12.65	13695.49	30.41
Prob > *F*			0.0300	0.0000	0.0000	0.0000
F-Stat degrees of freedom			4	8	9	9
COV					2.96	2.16
Prob > *F*					0.004	0.044
F-Stat degrees of freedom					9	9

Froot's (1989) correction for city–sector cluster correlations. Critical values for the Cragg–Donald test are, respectively, based on a 10% and 5% 2SLS bias at the 5% significance level (see Stock and Yogo (2002)).

* Heteroskedastic-consistent standard errors in parentheses, with significance at the 10% levels.

** Heteroskedastic-consistent standard errors in parentheses, with significance at the 5% levels.

*** Heteroskedastic-consistent standard errors in parentheses, with significance at the 1% levels.

We systematically check the validity of our instruments with heteroskedastic and clustering robust Hansen's *J*-test of overidentifying restrictions. Insignificant test statistics indicate that the orthogonality of the instruments and the error terms cannot be rejected, and thus that our choice of instruments is appropriate.[38] In all cases, the overidentifying restrictions are accepted.

Table 1 also provides the first-stage cluster-robust *F*-test (with degrees of freedom corresponding to the number of regressors in the first-stage regression) and the associated *p*-values of the excluded instruments for each regressor. We also report the cluster-robust *F*-stat form of the Cragg–Donald statistic; this statistic has been suggested by Stock and Yogo (2002) as a global test for the presence of weak instruments (i.e., it tests the null hypothesis that a given group of instruments is weak against the alternative that it is strong). This statistic is also reported together with the critical values based on a 5 and 10% maximum bias of the IV estimator relative to the OLS at the 5% confidence level tabulated by Stock and Yogo (2002). The test rejects if the computed statistic exceeds the critical value. Results of weak identification tests are overall quite satisfactory. Our instruments pass the Cragg–Donald test comfortably in all cases but column (6), when the full basic specification is tested on state-owned companies. Regarding column (6), the limited number of observations and the difficulties for instrumenting *COV* seem to be mainly responsible for this situation.[39] Overall, most of our first-stage *F*-statistics are consistently above 10, verifying the Staiger and Stock (1997) "rule of thumb".

The next step is to perform the Durbin-Wu–Hausman test, which tests for the endogeneity of the market access indicator in a regression estimated with IV.[40] Since the heteroskedastic and clustering robust Durbin-Wu–Hausman test statistic does not reject the null hypothesis of exogeneity of market access (at the 10% confidence level), we report OLS estimates since they are more efficient than IV estimates (Pagan, 1984).

We also want to ensure that our results are not biased due to there being only few firms in some of the city–industry clusters. The average number of firms by cluster is 60; we obtain almost identical qualitative and quantitative results if we re-run our estimations excluding clusters with fewer than 30 firms.

The basic specification, reported in columns (1) and (2), does not include debt or interest coverage. As in Harrison and McMillan (2003), the restrictions imposed by the model are mainly accepted: the coefficient on lagged investment is positive, the coefficient on squared (lagged) investment is negative and the coefficient on Y/K is positive. However, the coefficient on cash flow is negative (and highly significant) only for private companies, meaning that higher cash flow today incites companies to substitute investment tomorrow for investment today. Conversely, public companies' investment is not affected by the level of cash flow. This is a first hint that private and public companies do not take their investment decisions the same way. Columns (3) through (6) of Table 1 add successively our two proxies for credit constraints, the total debt-to-assets ratio (*DAR*) and interest coverage (*COV*). The coefficient on *DAR* is significant and positive for private companies, as is our proxy for the user cost of capital, *U*. The coefficient on *COV* is also positive but not significant at the 5% level. However, all of these coefficients are close to zero and insignificant for public companies. Private companies are therefore credit constrained and care about the cost of funds, while public companies are not affected by any of these problems. It is useful to interpret the size of the estimated coefficients. Holding other factors constant, a one standard deviation increase in *DAR* raises the future investment rate by about 4 percentage points on average. In addition, a one standard deviation increase in *COV* raises the future investment rate by 1 percentage point. Since the average investment rate over our sample is 20%, these impacts are not economically insignificant.

In a second step, we want to check if our results on credit constraints are related to firm characteristics. We start by controlling for the size of the firm in Table 2, using the value of total fixed

[38] Under the joint null hypothesis that instruments are valid instruments and that the excluded instruments are correctly excluded from the estimated equation, the test statistic is distributed as χ^2 in the number of other identifying restrictions. Significance is judged at the 10% level.

[39] We believe this problem is quite secondary, since one does not see why this specific estimation based on state-owned companies subsample should be more concerned by endogeneity problems than the others.

[40] The rejection of the null hypothesis (at the 10% confidence level) that the OLS estimator of the same equation yields consistent estimates means that endogenous regressors have a statistically relevant effect on coefficients, so that we should rely on the IV estimates. Under the null hypothesis, the test statistic is distributed as χ^2 with degrees of freedom equal to the number of regressors tested.

Table 2
Investigation of size dependency.

Explained variable	Investment over capital (IoverK) $t+1$					
	1 private	2 state-owned	3 private	4 state-owned	5 private	6 state-owned
IoverK	0.28*** (0.04)	0.39*** (0.13)	0.31*** (0.04)	0.42*** (0.12)	0.28*** (0.04)	0.39*** (0.13)
IoverK^2	−0.03** (0.01)	−0.09*** (0.03)	−0.03*** (0.01)	−0.10*** (0.03)	−0.03** (0.01)	−0.09*** (0.03)
YoverK	0.0015 (0.0014)	0.010*** (0.002)	0.001*** (0.0001)	0.01*** (0.002)	0.001 (0.001)	0.010*** (0.002)
User cost of capital	0.02** (0.007)	0.001 (0.006)	0.008 (0.007)	0.001 (0.006)	0.02** (0.007)	0.001 (0.006)
Cash flow	0.002 (0.004)	0.029 (0.028)	−0.001*** (0.0001)	0.028 (0.026)	0.001 (0.004)	0.029 (0.027)
DAR total debt to asset	0.0017*** (0.0006)	0.001 (0.004)	0.002*** (0.0001)	0.001 (0.004)	0.002*** (0.0001)	0.001 (0.004)
DAR interacted with fixed assets[a]			−0.356** (0.174)	−0.145** (0.067)	−0.281* (0.152)	−0.156 (0.096)
COV interest coverage	0.0018** (0.0009)	−0.001 (0.001)			0.002** (0.001)	−0.001 (0.001)
COV interacted with fixed assets[a]					−0.094 (0.074)	0.006 (0.048)
Fixed assets[a]	−0.084 (0.062)	−0.001 (0.004)	−0.001 (0.056)	0.022* (0.012)	−0.032 (0.051)	0.022 (0.012)
No. of observations	1732	605	1853	635	1732	605
Dummies			Year			
Dummies			City and sector			
No. of city and sectors	144	95	148	99	144	95
No. of firms	972	337	1042	351	972	337
R^2	0.11	0.39	0.22	0.39	0.10	0.38

Froot's (1989) correction for city–sector cluster correlations.
[a] Indicates that coefficients and standard errors are multiplied by 10^7.
* Heteroskedastic-consistent standard errors in parentheses, with significance at the 10% levels.
** Heteroskedastic-consistent standard errors in parentheses, with significance at the 5% levels.
*** Heteroskedastic-consistent standard errors in parentheses, with significance at the 1% levels.

assets as a proxy measure. Our prior is that credit constraints decrease with the value of fixed assets (firm size). In a world of imperfect financial markets with information asymmetries, a larger firm will have easier access to credit since it has more collateral. Columns (1) and (2) of Table 2 simply add the value of total fixed assets to the model with *DAR* and *COV*. The coefficient on total fixed assets has the expected negative sign (i.e., greater fixed assets increase investment today and consequently decrease investment tomorrow), but it is not significant. The coefficients on the other variables are almost identical to those presented in Table 1. We subsequently check for a direct impact of size on credit constraints by adding two interactions: *DAR* and *COV* interacted with total fixed assets. The results are presented in columns (3) through (6) of Table 2. For private companies, while the coefficients on *U*, *DAR* and *COV* remain positive and significant, the coefficients on the two interactions are both negative, so that larger firms are less affected by credit constraints. More importantly, even though private firms with more fixed assets are less credit constrained, the two firm-level financial distress indicators remain positive and significant.

Conversely, there is no impact of size or credit constraints for public companies, except for a counter-intuitive positive – but not significant at the 5% level – coefficient on total fixed assets (column (4)). Overall, the evidence of a size effect is not overwhelming. As a robustness check, we rely on the number of employees as an alternative proxy for size.[41] Results (available upon request) are virtually unchanged.

Last, we also test for possible reputation effects by introducing the age of firms in a similar way, first adding age alone, and then including interactions.[42] Our intuition is that younger firms may be more credit constrained, since they must prove their viability by obtaining and keeping market share, and generally have a greater probability of bankruptcy. However, we did not find any evidence of such effects either for private or public companies.

5.2. Testing for the impact of FDI

One of the key questions addressed in this paper is whether FDI eases or exacerbates domestic firms' credit constraints. We test for a differential impact of ownership in Table 3. These show equations which include two additional interaction terms, *COV* times FDI and *DAR* times FDI, with FDI being scaled by sales (Eq. (6)) in columns (3) and (4) or by debt in columns (5) and (6).

Both specifications suggest that FDI eases Chinese private firms' credit constraints, as compared to estimates from the specification including only *COV* and *DAR*, reproduced in columns (1) and (2). The coefficient on *DAR* is slightly smaller in magnitude and less significant than that on *COV*. More ambiguous evidence is obtained for the user cost of capital *U*, which is close to zero and insignificant for the specification using the share of foreign sales but remains positive and significant for that including the share of foreign debt. The coefficients on *COV* × Share Foreign Sales and *COV* × Share Foreign Debt, which are negative and significant at the 1 and 5% level, respectively, for private firms, suggest that the presence of foreign firms reduces credit constraints. However, no convincing evidence of crowding-out is found. The coefficients on the share of foreign debt and the share of foreign sales are positive but insignificant at the 5% level. These findings are in line with those of Harrison et al. (2004) from a cross-country firm-level panel which showed that global flows are associated with a reduction in firm-level financing constraints. However, they contrast with the results in Harrison and McMillan (2003) on Ivory Coast data, where the presence of foreign firms crowds local firms out of domestic capital markets. These diverging results highlight differences in financial sector organization and practice: the scope of crowding out is much more limited in China because of the lack of incentives of most banks to lend to non-state-owned companies. Our results regarding private firms contrast strongly with those on public firms. We again find that public firms' investment decisions are not affected by debt ratios or the cost of debt. Nor is there any evidence that public firms are affected by the presence of foreign firms. We interpret this as evidence in support of the notion of a soft budget constraint for public firms (Qian and Roland, 1998).

[41] The use of total fixed assets as a proxy for size runs the risk of conflating size effects with collateralizability (or similar) effects. Results using log(employment) show that this is actually not the case.

[42] The results are not reported here in order to save space, but are available on request from the authors.

Table 3
Investigation of FDI impact (scaled by sales (columns (3) and (4)) or debt (columns (5) and (6))).

Explained variable	Investment over capital (IoverK) $t+1$					
	1 private	2 state-owned	3 private	4 state-owned	5 private	6 state-owned
IoverK	0.28*** (0.04)	0.39*** (0.13)	0.28*** (0.05)	0.39***(0.14)	0.28*** (0.04)	0.39*** (0.14)
IoverK^2	−0.03** (0.01)	−0.09*** (0.03)	−0.03** (0.01)	−0.09*** (0.03)	−0.03** (0.01)	−0.09*** (0.03)
YoverK	0.001 (0.001)	0.01*** (0.002)	0.02** (0.007)	0.010*** (0.002)	0.001 (0.001)	0.01*** (0.002)
User cost of capital	0.016** (0.007)	0.001 (0.006)	0.001 (0.001)	0.001 (0.006)	0.02** (0.007)	0.001 (0.006)
Cash flow	0.002 (0.004)	0.03 (0.03)	0.002 (0.004)	0.03 (0.03)	0.002 (0.004)	0.03 (0.03)
COV interest coverage	0.0018* (0.0009)	−0.001 (0.001)	0.0025* (0.0013)	0.001 (0.002)	0.0023** (0.0011)	0.01 (0.01)
COV interacted with share of foreign sales			−0.034*** (0.012)	−0.001 (0.003)		
COV interacted with share of foreign debt					−0.033** (0.015)	−0.01 (0.01)
DAR total debt to asset	0.0018*** (0.00056)	0.001 (0.005)	0.0016* (0.0008)	0.002 (0.006)	0.0017* (0.0009)	0.01 (0.01)
DAR interacted with share of foreign sales			0.002 (0.004)	−0.005 (0.02)		
DAR interacted with share of foreign debt					0.001(0.002)	0.01 (0.03)
Share of foreign sales over total sales			0.19* (0.10)	0.12 (0.27)		
Share of foreign debt over total debt					0.20(0.17)	0.40 (1.04)
No. of observations	1732	605	1732	605	1532	605
Dummies			Year			
Dummies			City and sector			
No. of city and sectors	144	95	144	95	144	95
No. of firms	972	337	972	337	972	337
R^2	0.11	0.39	0.10	0.37	0.11	0.37

Froot's (1989) correction for city–sector cluster correlations.
* Heteroskedastic-consistent standard errors in parentheses, with significance at the 10% levels.
** Heteroskedastic-consistent standard errors in parentheses, with significance at the 5% levels.
*** Heteroskedastic-consistent standard errors in parentheses, with significance at the 1% levels.

Table 4
Robustness checks (1) FDI scaled by sales. Private firms subsample.

Explained variable	Investment over capital (IoverK) $t+1$					
	1	2	3	4	5	6
IoverK	0.29***	0.29***	0.28***	0.28***	0.28***	0.29***
IoverK^2	−0.029**	−0.029**	−0.029**	−0.029**	−0.029**	−0.029**
YoverK	0.00014	0.00014	0.00015	0.00014	0.00013	0.00014
User cost of capital	0.016**	0.016**	0.016**	0.016**	0.017**	0.016**
Cash flow	0.002	0.002	0.003	0.005	0.001	0.001
COV interest coverage	0.0025* (0.0013)	0.0023* (0.0012)	0.0032*** (0.0012)	0.0027* (0.0016)	0.0046** (0.0023)	0.0026* (0.0013)
COV interacted with share of foreign sales	−0.034*** (0.012)	−0.036*** (0.012)	−0.035*** (0.012)	−0.033** (0.013)	−0.028** (0.013)	−0.028* (0.017)
DAR total debt to asset	0.0016* (0.0008)	0.0016* (0.0009)	0.0013* (0.0008)	0.0019* (0.0011)	0.0018* (0.0097)	0.0017* (0.0009)
DAR interacted with share of foreign sales	0.002 (0.004)	0.002 (0.005)	0.002 (0.004)	0.005 (0.004)	0.004 (0.005)	0.005 (0.006)
Share of foreign debt over total sales	0.18* (0.10)	0.18* (0.10)	0.164 (0.11)	0.194** (0.094)	0.16 (0.10)	0.17* (0.10)
COV interacted with profitability		−0.003** (0.0015)	−0.004 (0.003)			
DAR interacted with profitability		−0.01 (0.01)	0.0017 (0.0011)			
Profitability		0.01 (0.01)	−0.0045** (0.0019)			
COV interacted with labor intensity				−0.01 (0.01)		
DAR interacted with labor intensity				−0.01 (0.01)		
Labor intensity				−0.01 (0.01)		
COV interacted with innovation					−0.01 (0.01)	
DAR interacted with innovation					−0.01 (0.01)	
Innovation					−0.01 (0.01)	
COV interacted with outward orientation						−0.015 (0.021)
DAR interacted with outward orientation						−0.007 (0.009)
Outward orientation						−0.08 (0.65)
No. of observations	1732	1732	1732	1732	1667	1732
Dummies			Year			
Dummies			City and sector			
No. of city and sectors	144	144	144	135	144	144
No. of firms	972	972	972	972	945	972
R^2	0.11	0.11	0.11	0.11	0.11	0.11

Froot's (1989) correction for city–sector cluster correlations.
* Heteroskedastic-consistent standard errors in parentheses, with significance at the 10% levels.
** Heteroskedastic-consistent standard errors in parentheses, with significance at the 5% levels.
*** Heteroskedastic-consistent standard errors in parentheses, with significance at the 1% levels.

Table 5
Robustness checks (2) FDI scaled by debt. Private firms subsample.

Explained variable	Investment over capital (IoverK) $t+1$					
	1	2	3	4	5	6
IoverK	0.29***	0.29***	0.29***	0.28***	0.28***	0.29***
IoverK^2	−0.03**	−0.03**	−0.03**	−0.03**	−0.03**	−0.03**
YoverK	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
User cost of capital	0.02**	0.02**	0.02**	0.02**	0.02**	0.02**
Cash flow	0.002	0.002	0.003	0.006	0.001	0.002
COV interest coverage	0.0023** (0.0011)	0.002* (0.0010)	0.0027*** (0.0010)	0.0028* (0.0016)	0.0045* (0.0023)	0.0024** (0.0012)
COV interacted with share of foreign debt	−0.033** (0.0146)	−0.036** (0.0143)	−0.034** (0.0145)	−0.033** (0.0144)	−0.025* (0.0149)	−0.024 (0.016)
DAR total debt to asset	0.0017* (0.0009)	0.0017* (0.0009)	0.0013* (0.0008)	0.0029* (0.0011)	0.0019* (0.0009)	0.0017* (0.0009)
DAR interacted with share of foreign debt	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
Share of foreign debt over total debt	0.21 (0.17)	0.21 (0.17)	0.21 (0.17)	0.22 (0.16)	0.18 (0.17)	0.17 (0.18)
COV interacted with profitability		−0.003** (0.0013)	−0.003 (0.003)			
DAR interacted with profitability		0.001 (0.001)	0.0018* (0.0010)			
Profitability		−0.001 (0.001)	−0.00461** (0.0018)			
COV interacted with labor intensity				−0.0007 (0.0007)		
DAR interacted with labor intensity				−0.00019 (0.00013)		
Labor intensity				−0.006 (0.004)		
COV interacted with innovation					−0.0003 (0.0002)	
DAR interacted with innovation					−0.000069* (0.000035)	
Innovation					−0.0011 (0.0023)	
COV interacted with outward orientation						−0.024 (0.019)
DAR interacted with outward orientation						−0.007 (0.012)
Outward Orientation						−0.05 (0.66)
No. of observations	1732	1732	1732	1732	1667	1732
Dummies				Year		
Dummies				City and sector		
No. of city and sectors	144	144	144	144	135	144
No. of firms	972	972	972	972	945	972
R^2	0.11	0.11	0.11	0.11	0.11	0.11

Froot's (1989) correction for city–sector cluster correlations.
* Heteroskedastic-consistent standard errors in parentheses, with significance at the 10% levels.
** Heteroskedastic-consistent standard errors in parentheses, with significance at the 5% levels.
*** Heteroskedastic-consistent standard errors in parentheses, with significance at the 1% levels.

Based on results from column (5), we can compute the impact of a one standard deviation increase in foreign presence (corresponding roughly to a doubling of the share of foreign sales or debt), holding other factors constant. We find that it would have a relatively limited impact since it would reduce the future investment rate by about half a percentage point on average.

Finally, we check the robustness of our results using a dummy variable for the share of foreign sales (or the share of foreign debt) being greater than the yearly median among the different industries. The results (available upon request) are very similar in terms of magnitude and significance.

5.3. Robustness checks

One potential criticism of our approach is that the impact of FDI shown above may reflect omitted variables. Apart from capital, FDI may bring additional benefits (such as innovation and new management techniques). Moreover, FDI may flow to sectors which display certain characteristics. Typically, greater FDI is found in sectors with higher profitability, labor intensity and outward orientation. We would then want to check whether the relaxation of financial constraints actually results from one of these factors, instead of FDI. We therefore carried out additional regressions, including new variables measuring profitability, labor intensity, productive innovation and export-orientation, and their interactions with our proxies for financial constraints.

The results are shown in Tables 4 and 5. In Table 4, *FDI* is scaled by sales while in Table 5 it is scaled by debt. Columns (1) and (2) test to see whether the correlation between credit constraints and the foreign sector share for private firms comes from higher profitability. The latter is defined as the ratio of operating profits (1) or business profits (2) to sales. Column (3) addresses the same concerns, but with respect to labor intensity, defined as the number of employees over fixed investment. Column (4) introduces the interaction between credit constraints and the share of new products in exports. Last, column (5) tests for an effect via export orientation, measured as the value of exports over total sales. As for the FDI indicators, these variables are computed as averages by industry and city in order to alleviate potential endogeneity problems. Were foreign investment to be simply a proxy for these variables, the relaxing of credit constraints emphasized in the previous section should disappear. Conversely, if foreign investment really does alleviate credit constraints, the negative interactions with credit constraint proxies should remain statistically significant. The results strongly suggest that this is the case.

The introduction of interactions between credit constraints (*COV* and *DAR*) and the variables for profitability, labor intensity, share of new products in exports or outward orientation leaves the results basically unchanged. Only one interaction (*COV* interacted with profitability) is negative and significant, providing some evidence that profitable practices help to alleviate credit constraints for private firms in China. However, these additional controls do not affect the main finding of negative and significant interactions between FDI and credit constraints as proxied by *COV*.

6. Conclusion

Using firm-level panel data across Chinese cities, we estimate a dynamic investment model to study the presence of financing constraints for Chinese domestic firms. Our results shed light on the impact of ongoing financial sector reforms designed to improve the efficiency of capital allocation. They suggest a striking difference between the credit constraints faced by domestic private and state-owned firms. We find that our two firm-level measures of financial distress (debt-to-asset ratios and interest coverage) do significantly affect investment for domestic private firms, suggesting that they are credit constrained. On the other hand, investment by state-owned firms is not significantly related to these indicators. Nor is there any evidence that this latter is significantly correlated with FDI inflows.

However, the results suggest that FDI inflows are associated with a modest reduction in financing constraints for private domestic firms. FDI inflows do seem to reduce the imperfections faced by private domestic firms when dealing with financial markets. We thus find support for the general argument that the development of cross-border relationships with foreign firms helps private domestic firms to bypass both the financial and legal obstacles that they face at home (Huang, 2003).

Table A1
Summary statistics.

Variable	Mean	S.D.	Minimum	Maximum
Private firms: no. of observations = 1865				
Average foreign share	2.17	8.06	0	48
Average public share	1.21	6.63	0	48
Employees (median = 100)	425	1 385	1	28 215
Fixed assets (median = 4450)	110 044	895 139	2	37 000 000
Investment over capital	0.26	0.47	0.00	10.00
Squared investment over capital	0.29	2.97	0.00	100.00
Sales over capital	3 609	129 749	0.00	5 464 201
User cost of capital	5.39	1.58	0.08	25.50
Total profits (cash flows)	0.33	3.87	−29	137
COV int. cov./fixed assets (N = 1741)	0.09	3.02	−107	40
DAR total debt to asset	5.48	26.34	0.00	552
FDI scaled by foreign sales	0.10	0.18	0.00	0.96
FDI scaled by foreign debt	0.09	0.17	0.00	1.00
State-owned firms: no. of observations = 640				
Average foreign share	0.41	3.52	0	39
Average public share	96.65	10.55	51	100
Employees (median = 348)	1 688	6 808	1	82 927
Fixed assets (median = 31 201)	464 258	2 628 994	7	40 900 000
Investment over capital	0.14	0.26	0.00	4.01
Squared investment over capital	0.09	0.66	0.00	16
Sales over capital	1.76	4.59	0.00	82
User cost of capital	5.70	2.25	0.08	25
Total profits (cash flows)	0.03	0.33	−1.66	4.25
COV int. cov./fixed assets (N = 608)	0.32	11	−50	271
DAR total debt to asset (N = 635)	1.69	2.05	0.00	21.58
FDI scaled by foreign sales	0.07	0.13	0.00	0.95
FDI scaled by foreign debt	0.06	0.12	0.00	0.83

Our findings are moreover consistent with those in the literature that consider a role for demand in addition to the traditional supply-side perspective in explaining the massive amount of inward foreign investment in China. FDI to Chinese provinces is not only the consequence of good policies, but also results from distortions in the banking market and in state investment policies (Havrylchyk and Poncet, 2007).

Acknowledgements

We would like to thank Anne-Célia Disdier and two anonymous referees for valuable comments. We have also benefited from remarks from participants at the SIUTE Seminar of the Universities of Lille, the 24th Symposium of the GDR Monnaie Finance in Rennes, the 12th Spring Meeting of Young Economists (SMYE) in Hamburg, the third international conference of the Asia-Pacific economic association in Hong Kong, the 22nd Congress of the European Economic Association held in Budapest and the 56th annual congress of the Association Française de Sciences Economiques in Paris.

Appendix A

See Table A1.

References

Allayannis, Y., Muzomdar, A., 2004. The impact of negative cash-flows and influential observations on investment-cash flow sensitivity estimates. Journal of Banking and Finance 28, 901–930.
Allen, F., Qian, J., Qian, M., 2005. Law, finance, and economic growth in China. Journal of Financial Economics 77, 57–116.
Alti, A., 2003. How sensitive is investment to cash flow when financing is frictionless. Journal of Finance 58, 707–722.

Audretsch, D., Elston, J.A., 2002. Does firm size matter? Evidence on the impacts of liquidity constraints on firm investment sensitivity behaviour in Germany. International Journal of Industrial Organization 20, 1–17.
Bai, C.-E., Hsieh, C.-T., Quian, Y., 2006. The return to capital in China. Brookings Papers on Economic Activity 32, 61–102.
Beck, T., Levine, R., Loayza, N., 2000. Finance and the sources of growth. Journal of Financial Economics 58, 261–300.
Beck, T., Demirguc-Kunt, A., Maksimovic, V., 2005. Financial and legal constraints to firm growth: does size matter? The Journal of Finance 60, 137–177.
Bigsten, A., Collier, P., Dercon, S., Fafchamps, M., Gauthier, B., Gunning, J.W., Soderbom, M., Oduro, A., Oostendorp, R., Patillo, C., Teal, F., Zeufack, A., 2000. Credit constraints in manufacturing enterprises in Africa. Centre for the Study of African Economies Working Paper Series 134.
Blundell, R., Bond, S.R., Meghir, C., 1996. Econometric models of company investment. In: Matyas, L., Sevestre, P. (Eds.), The Econometrics of Panel Data: A Handbook of the Theory with Applications. Advanced Studies in Theoretical and Applied Econometrics, vol. 33. Kluwer Academic Publishers, Dordrecht, pp. 685–710.
Bond, S.R., Meghir, C., 1994. Dynamic investment models and the firm's financial policy. Review of Economic Studies 61, 197–222.
Bond, S., Elston, J., Mairesse, J., Mulkay, B., 2003. Financial factors and investment in Belgium, France, Germany, and the UK: a comparison using company panel data. The Review of Economics and Statistics 85, 153–165.
Bond, S.R., Cummins, J.G., 2001. Noisy share prices and the Q model of investment. The Institute for Fiscal Studies Working Paper W01/22, London.
Boyreau-Debray, G., Wei, S.-J., 2005. Pitfalls of a state-dominated financial system: the case of China. NBER Working Paper 11214, Cambridge, MA.
Calomiris, C., Hubbard, G., 1995. Internal finance and firm-level investment: evidence from the undistributed profit tax of 1936–1937. Journal of Business 68, 443–482.
Caprio, G., Honohan, P., 2001. Finance for growth: policy choices in a volatile world. In: A World Bank Policy Research Report, Oxford University Press, Oxford, and World Bank, Washington, DC.
Claessens, S., Tzioumis, K., 2006. Measuring Firms' Access to Finance. Mimeo, World Bank, Washington, DC.
Cleary, S., 1999. The relationship between firm investment and financial status. Journal of Finance 61, 197–222.
Chirinko, R., von Kalckreuth, U., 2003. Further evidence on the relationship between firm investment and financial status. Emory University Department of Economics Working paper 03-02, Atlanta, GA.
Devereux, M., Schiantarelli, F., 1990. Investment, financial factors, and cash flow: Evidence from UK panel data. In: Hubbard, R. (Ed.), Asymmetric Information, Corporate Finance, and Investment. University of Chicago Press, Chicago, pp. 279–306.
Dollar, D., Wei, S.-J., 2007. Das (wasted) kapital: firm ownership and investment efficiency in China. IMF Working Paper 07/09, Washington, DC.
Erikson, T., Whited, T., 2000. Measurement error and the relationship between investment and Q. Journal of Political Economy 108, 1027–1057.
Farrell, D., Lund, S., 2006. Putting China's capital to work. Far Eastern Economic Review 169, 5–10.
Fazzari, S., Hubbard, G., Petersen, B., 1988. Financing constraints and corporate investment. Brookings Papers on Economic Activity 1, 141–195.
Fazzari, S., Hubbard, G., Petersen, B., 2000. Investment-cash flow sensitivities are useful: a comment on Kaplan and Zingales. Quarterly Journal of Economics 115, 695–706.
Froot, K.A., 1989. Consistent covariance matrix estimation with cross-sectional dependence and heteroskedasticity in financial data. Journal of Financial and Quantitative Analysis 24, 333–355.
Gelos, G., Werner, A., 1999. Financial liberalization, credit constraints, and collateral: investment in the Mexican manufacturing sector. IMF Working Paper WP/99/25, Washington, DC.
Gilchrist, S., Himmelberg, C., 1998. Investment. In: Bernanke, B., Rotemberg, J. (Eds.), Fundamentals and Finance, NBER macro Annual. MIT Press, Cambridge, pp. 223–274.
Gomes, J.F., 2001. Financing investment. American Economic Review 91, 1263–1285.
Griliches, Z., Hausman, J., 1986. Errors in variables in panel data. Journal of Econometrics 31, 93–118.
Guariglia, A., Poncet, S., 2008. Could financial distortions be no impediment to economic growth after all? Evidence from China. Journal of Comparative Economics 36, 633–657.
Hallward-Driemeier, M., Wallsten, S., Xu, L.C., 2003. The investment climate and the firm: firm-level evidence from China. World Bank Policy Research Working Paper 3003, Washington, DC.
Harris, J.R., Schiantarelli, F., Siregar, M.G., 1994. The effect of financial liberalization on the capital structure and investment decisions of Indonesian manufacturing establishments. The World Bank Economic Review 8, 17–47.
Harrison, A., McMillan, M., Love, I., 2004. Global capital flows and financing constraints. Journal of Development Economics 75, 269–301.
Harrison, A., McMillan, M., 2003. Does direct foreign investment affect domestic firm credit constraints? Journal of International Economics 61, 73–100.
Harvard Institute for International Development and World Economic Forum, 1998. The Africa Competitiveness Report 1998. World Economic Forum, Geneva.
Havrylchyk, O., Poncet, S., 2007. Foreign Direct Investment in China: reward or remedy? The World Economy 30, 1662–1681.
Hayashi, F., 1982. Tobin's marginal q and average q: a neoclassical interpretation. Econometrica 50, 213–224.
Hoshi, T., Kashyap, A., Scharfstein, D., 1991. Corporate structure and investment: evidence from Japanese panel data. Quarterly Journal of Economics 106, 33–60.
Huang, Y., 2003. Selling China: Foreign Direct Investment During the Reform Era. Cambridge University Press, New York.
Hubbard, G., 1998. Capital market imperfections and investment. Journal of Economic Literature 36, 193–225.
Hubbard, G., Kashyap, A., 1992. Internal net worth and the investment process: an application to U.S. agriculture. Journal of Political Economy 100, 506–534.
Hubbard, G., Kashyap, A., Whited, T., 1995. Internal finance and firm investment. Journal of Money Credit and Banking 27, 683–701.
Jaramillo, F., Schianterelli, F., Weiss, A., 1996. Capital market imperfections before and after financial liberalization: an Euler equation approach to panel data for Ecuadorian firms. Journal of Development Economics 51, 367–386.

Kaplan, S., Zingales, L., 1997. Do investment-cash flow sensitivities provide useful measures of financing constraints? Quarterly Journal of Economics 112, 169–215.
Love, I., 2000. Financial Development and Financing Constraints: International Evidence from the Structural Investment Model. PhD Dissertation, Columbia Business School.
Love, I., 2003. Financial development and financing constraints: International evidence from the structural investment model. Review of Financial Studies 16, 135–161.
Modigliani, F., Miller, M.H., 1958. The cost of capital, corporation finance and the theory of investment. American Economic Review 48, 261–297.
Moulton, B., 1986. Random group effects and the precision of regression estimates. Journal of Econometrics 32, 385–397.
Moulton, B., 1990. An illustration of a pitfall in estimating the effects of aggregate variables on micro units. The Review of Economics and Statistics 72, 334–338.
Moyen, N., 2002. Investment-cash flow sensitivities: constrained vs. unconstrained firms. Working Paper, University of Colorado, Boulder, CO.
Pagan, A., 1984. Model evaluation by variable addition. In: Hendry, D.F., Wallis, K.F. (Eds.), Econometrics and Quantitative Economics. Blackwell, Oxford, pp. 103–134.
Park, A., Sehrt, K., 2001. Tests of financial intermediation and banking reforms in China. Journal of Comparative Economics 29, 608–644.
Patillo, C., 2000. Risk, financial constraints and equipment investment in Ghana: a firm-level analysis. In: Collier, P., Patillo, C. (Eds.), Investment and Risk in Africa. St. Martin's Press and MacMillan, New York, Basingstoke and London, pp. 96–119.
Petersen, M., Rajan, R., 1994. The benefits of lending relationships: Evidence from small business data. Journal of Finance 49, 3–37.
Prasad, E., Wei, S.-J., 2005. The Chinese approach to capital inflows: patterns and possible explanations. IMF Working Paper 79, Washington, DC.
Qian, Y., Roland, G., 1998. Federalism and the soft budget constraint. American Economic Review 88, 1143–1162.
Schiantarelli, F., 1996. Financial constraints and investment: methodological issues and international evidence. Oxford Review of Economic Policy 12, 70–89.
Schiantarelli, F., 1995. Financial constraints and investment: a critical review of methodological issues and international evidence. In: Peek, J., Rosengren, E. (Eds.), Is Bank Lending Important for the Transmission of Monetary Policy? Conference Series 39, Federal Reserve Bank of Boston. Boston, MA, pp. 177–214.
Staiger, D., Stock, J.H., 1997. Instrumental variables regression with weak instruments. Econometrica 65, 557–586.
Stock, J. H., Yogo, M., 2002. Testing for weak instruments in linear IV regression. NBER Technical Working Paper 284, Cambridge, MA.
Tobin, J., 1969. A general equilibrium approach to monetary theory. Journal of Money Credit and Banking 1, 15–29.
Verbeek, M., 2004. A Guide to Modern Econometrics, 2nd edition. John Wiley and Sons, London.
Whited, T., 1992. Debt, liquidity constraints, and corporate investment: evidence from panel data. Journal of Finance 47, 1425–1460.
World Bank, 2003. World Bank Investment Climate Survey, 2003. The World Bank, Washington, DC. Available at: http://www.enterprisesurveys.org/rawdata.aspx.