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Source of Finance, Growth and Firm Size – Evidence from China

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Abstract

Using a comprehensive firm-level dataset spanning the period 1998-2005, this paper provides a thorough investigation of the relationship between firm size, total factor productivity growth and financial structure in China, controlling for the endogeneity of the latter. Generally, it finds financing source matters for firms of different size, and the extent to which financing source matters for firm growth is greater for small firms than big firms. Self-raised finance appears to be most effective in promoting small firms to grow, and bank loan seems to be more supportive to big firms. The relationship between size, finance and growth also depends on ownership. In addition, there exist strong complementarities between formal and informal finance, as well as between indigenous and foreign finance.

Keywords: China, finance, firm size, growth

JEL classification: O5, G2, L11, L25, O1

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Tables and figure are at the end of the paper.

1 Introduction

The recent finance and growth literature has concluded financial development is a robust determinant of economic growth (Levine 2005). However, the case of China has reignited the debate on the role of informal financial arrangements in a country's economic growth (Stiglitz 1990; Arnott and Stiglitz 1990). Allen, Qian and Qian (2005, hereafter referred to as 'AQQ') argue that the key driver of the country's growth has been the private sector and this sector tends to rely on informal finance and governance mechanisms rather than formal financing channels. Others argue that the role of informal financing and governance mechanisms in supporting the growth of private sector is likely to be limited. The evidence suggests that the private enterprises performance is associated with access to formal finance (bank loans), and more so, firms using formal financing sources grow faster than those financed by alternative channels (Cull and Xu 2005; Maksimovic et al. 2008). Using large firm level data, Du and Girma (2007b) show that it is inappropriate to draw a general conclusion such as formal (or informal) financial system is more important for firm growth in China, as the relationship between financing sources and growth depends on firm ownership and growth channel.

This paper extends our previous analyses by linking directly the relationship between finance and growth with firm size. There are two reasons why firm size is a crucial consideration in this context. First, one of the ongoing research questions in the finance and growth literature is to identify the distributional effects of financial development: will financial development exert a favourably positive impact on small firms as some theories predict (Beck et al. 2005, 2007), or will it disproportionately assist bigger firms as others argue (e.g. Greenwood and Jovanovic 1990)? There is some empirical work in this area based on firm level data from US (Cetorelli and Strahan 2006) and Europe (for example, Italy in Guiso et al. 2004); and other countries (as in Kumar et al. 2001). The results generally suggest that small firms benefit disproportionally more from well-developed financial system. This bears important implication for the political economy of financial system development agenda. It is perhaps more so for the developing world like China where smaller firms are likely to be more financially constrained (Claessens 2006) and financial sector reforms are still underway.

The second reason has to do with the state of small and medium-sized enterprises (SMEs) in China. Two facts are in stark contrast to each other. On one hand, the contribution of SMEs in China's fast-growing economy is substantial. According to the definition of the national statistics,[1] at least 85.8 per cent of the manufacturing firms are small firms in 1998, and this number increases to 98 per cent in 2005. By 2005, small firms account for 40 per cent of the total industrial outputs, 35.9 per cent of the total industrial value-added, 38.6 per cent of the total assets, and nearly 29.7 per cent of the total profit. On the other hand, anecdotal evidence and some survey studies suggest that SMEs are the most financially constrained. For example, according to the World Bank Investment Climate Survey for China conducted for the period 2001 and 2002, SMEs in

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[1] According to the China Statistical Yearbook (1999, 2006), firm size is defined by the National Statistical Bureau according to firm's total employment, total sales and total assets. For manufacturing industrial firms, small firms are below 300 employees, 3,000,000 yuan total sales, and 4,000,000 yuan total assets; big firms are above 2,000 employees, 30,000,000 yuan total sales, and 40,000,000 yuan total assets; medium firms are between the two sets of figures.

China face much more serious credit constraints and limited access to private finance than large firms even compared to other Asian countries (Dollar et al. 2003). Another survey conducted in 2002 on start-up firms suggests self-raised funding was the major financing source (Garcia-Fontes 2005) of SMEs. It is therefore interesting and important to investigate how this part of the economy that had not been supported by the formal financial system managed to survive and thrive.

In this paper, we attempt to provide a systematic analysis of the relationship between firm total factor productivity (TFP) growth and financing pattern for firms of different sizes in China, using the most comprehensive and up to date firm-level dataset available. In addition to domestic bank loans and self-raised finance, this dataset allows us to consider other sources of finance, namely state budget and foreign finance, that existing studies did not manage to analyse. We seek to answer the following three questions: (i) What is the financing pattern of firms of different size? (ii) Does firm size affect how financing sources determine firm TFP growth? (iii) Does the relationship between firm size, financing sources and productivity depend on ownership structure? These are important questions, not only because their answers have implications for China on how to reform its weak financial system to maximize the country's growth potential, but also offer useful lessons to other developing and transition economies in which the principal financial institutions are state-owned and the private sector starts to dominate the economic landscape. To preview our results, controlling for the potential endogeneity of finance variables, we find that the extent to which financing sources matter for growth vary according to firm size and firm ownership.

2 The literature

2.1 Source of finance and firm growth

The relationship between financial development and economic growth is well established in the literature (see Levine 2005 for a general review). Several channels through which a well-developed financial system can encourage economic growth are identified in the theoretical literature and supported by empirical evidence. For example, financial system conveys information *ex ante* regarding the value of potential investment projects to individual savers; it monitors and motivates firm's managers and ensures that effective corporate governance mechanism to be in place; its risk-pooling nature allows individual agents to undertake risky projects with high return; and it lowers transaction cost through specialization, technological innovation and growth. However, the mainstream theories and evidence are developed with default focus on formal financial system. While they are perhaps pertinent in the economies where the formal financial system dominates, they are incapable of characterizing the functions of different financial sectors when there is a coexistence of formal financial sectors and informal financial sectors, commonly known as financial dualism (see a review by the OECD by Germidis et al. 1991).

The existing theories on informal financial system and their role on the economy are limited to those of Stiglitz (1990) and Arnott and Stiglitz (1990). Set in the context of credit and insurance markets, they have built models to evaluate the effects of peer monitoring systems of informal (or 'non-market' as used by the authors) lenders and insurers. The authors demonstrate that, given the right incentives, informal lenders and insurers may stand in a superior position than their formal counterparts to address the

insufficient informational problems and to generate improved welfare for the borrowers and the insured.

Counter arguments contend that informal financial arrangements play only a complementary role to formal financial systems by serving the low end of the market but can never be a substitute for the formal system because of their inadequate monitoring capability and enforcement mechanisms (Maksimovic et al. 2008). Unfortunately, the relative advantages of informal financial system in low-income economies have not been empirically tested and investigations are still being conducted on a case-by-case basis.

2.2 China's finance-growth puzzle

While the finance and growth literature has consistently upheld the belief that a healthy financial system is necessary for a country to maintain economic growth (see Levine 2005), China, has been considered a counter example. Regarding the role of formal and informal financial system in supporting the Chinese economy, there seems to be a controversy. The research findings by AQQ (2005) contend that the key driver of the country's growth has been the private sector, which tends to rely on informal finance and governance mechanisms rather than formal financing channels. There is also evidence to show that non-state financing sources are generally more efficient in promoting output growth at provincial level between 1985 and 1998 (Liu and Li 2001).

By contrast, using the recent Investment Climate Survey (ICS) conducted by the World Bank, Cull and Xu (2005) find that the performance of Chinese private enterprises is actually associated with access to bank loans, along with enterprise managers' risk perception about property rights and local legal conditions. Maksimovic et al. (2008), using the same data, find that firms which use formal financing sources grow faster than those which use alternative channels. They argue that the role of informal financing[2] and governance mechanisms in supporting the growth of private sector firms is likely to be limited. Similarly, Cheng and Degryse (2007) provide evidence to show that, at provincial level, banks contribute more significantly to local economic growth than non-bank financial institutions, especially in regions with foreign entry. Hence, they attribute the improved efficiency of the banking industry to the ongoing financial reform, and particularly to the commercialization of state-owned commercial banks, deregulations of foreign entry and liberalization of interest rates.

As more and more data become available, empirical studies based on large-scale firm level data started emerging recently. Among others, Cull et al. (2007) examine the role of trade credit in China as an informal financing channel, and conclude that it does not play an economically significant role; instead, the significance may even decline as the formal financing allocation becomes more efficient. Du and Girma (2007b) analyse the controversy regarding the role of formal and informal financing channels in China's economic growth, and argue that this is due to the difference in the datasets and

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2   As defined by Maksimovic et al. (2008), informal financial institutions include non-market institutions such as credit co-operatives, moneylenders, informal credit and insurance, rotating savings and credit associations, which do not rely on formal contractual obligations enforced through a codified legal system.

methodologies used in the above empirical results. The authors find it inappropriate to draw a general conclusion of the relative importance of formal and informal financial sectors, which appear to complement each other in supporting different types of firms' growth.

2.3 Firm size and financial system development

Firm size has long been recognized to be of critical importance in the distribution of financial system development. Two contrasting theories are most representative. Some suggest that because small firms tend to hurt the most as a result of not being able to access finance due to underlying weaknesses of institutional environment, they hence benefit disproportionately from financial system's development, which relaxes their financing constraints. Large firms tend to internalize many of the capital allocation functions carried out by financial markets and financial intermediaries, thus they tend to benefit less from the development of financial markets and institutions compared to their smaller counterparts (Beck et al. 2005, 2007). Among empirical work on finance and firm size, some authors also find favourable effects of financial development on small firms. Guiso et al. (2004) find that effects of financial development on enhancing successful entry, increasing competition, and promoting growth are larger for small firms than large firms in Italy. Cetorelli and Strahan (2006) find that uncompetitive local banking markets in the US represents a barrier to the entry of new firms because the new firms have difficulty accessing credit.

In contrast, Greenwood and Jovanovic (1990) find small firms cannot afford financial service and financial development simply boosts aggregate growth by helping big firms. Some other research reaching similar results argues that bigger firms, compared to smaller firms, are more likely to depend on long-term financing and larger loans for their development. Although quite a number of empirical studies have provided cross-countries and industries evidences, the role of firm size in the finance-growth linkage appears an ultimate empirical issue which has to be determined on a case-by-case basis (Beck et al. 2005).

3 Financial sectors in China and firms' financing pattern[3]

As in many other developing countries, formal financial sectors and informal financial sectors comprise China's financial system. The formal finance sector covers a wide variety of institutions while the mechanisms and agents of the informal sector are equally diverse. These can be represented on three levels – the Ministry of Finance, Banks and other financial intermediaries, and capital markets (see Appendix 1 Table 1). The Ministry of Finance takes a predominant role in the economy by administering macroeconomic policies and the national annual budget, and by handling the fiscal policy and government expenditure. At firm level, state budget appropriations are the direct investment from the state budget by central and local governments.

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[3] This part draws upon Du and Girma (2007b). Appendix A, Table 1 provides the schematized structure of China's financial sectors, which was first presented in Du and Girma (2007b).

The second level is composed of various banks and non-bank financial institutions, regulated by the People's Bank of China. They are the major players in the formal sector, which is in fact dominated by four large state-owned commercial banks claiming around 70 per cent market share in terms of both national savings and loans. These banks used to carry some policy-related functions in the past and this partially explains the soft-budget constraint phenomenon (Lin et al. 1998), the large amount of non-performing loans (e.g. Ma and Gung 2002) and their lack of operational efficiency (Berger et al. 2008). Furthermore, it has been argued that the Chinese banking sector is regionally segmented; financial resources are not mobile and they are allocated inefficiently (Cull and Xu 2003; Boyreau-Debray and Wei 2005).

The third level lies China's emerging capital market. Compared to most countries in the world, even developing economies, the Chinese capital market is much smaller in terms of the size of stock market.[4] The two Chinese stock exchange markets were established in the early 1990s, and by 2004 only 1,337 companies were listed in the market, which represent only about 1 per cent of the manufacturing industry in terms of industrial value added. The stock market is thus by no means an important financing channel for the majority of domestic firms. Apart from being small, China's capital markets lack efficiency, which may be due to being policy-driven (Heilmann 2002) or ineffective regulations (AQQ 2005).

Informal financial sectors are comprised of savers, lenders and borrowers that can be individuals, firms or associations that act as financial intermediaries but not regulated by authorities. Three types of informal financial operators are classified: individual moneylenders, associations and partnership firms. As has been previously documented in other developing countries, one of the striking characteristics of the informal financial sector is the importance of personal relationship (Germidis et al. 1991). The importance of reputation and relationships in China's private sector alternative financing and governance mechanism is also discussed in depth by AQQ (2005).

From the demand side, the majority of Chinese firms are typically financed from a mixture of debt and equity. Bank loans constitute firm's debt, and almost exclusively from domestic banks and non-bank financial intermediaries. Equity, on the other hand, can be distinguished by financing source: from state budget appropriations, self-raised sources and foreign investment. Equity finance from state budget appropriations refer to the appropriations in the budget of the central and local governments earmarked for capital investment. Self-raised finance, often the most important source of finance for many firms, includes firms' finance from capital markets, bonds issued by individual enterprises, individual borrowing and funds channelled through local governments, or other bodies. This is similar to what is referred to as informal finance in Maksimovic et al. (2008). In a firm's capital, self-raised finance is reflected as three broad types of paid-in-capital: individual capital, collective capital and corporate (or legal person) capital. Finally, many domestic firms also finance their activities with funds from foreign investors or other foreign funding sources.

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4 See the comparison AQQ (2005) make with the widely referred sample in La Porta et al. (1998). For example, China's total value traded over GDP is only 0.11 while the LLSV-sample average is 0.27; its market capitalization over GDP is 0.32 while the sample average is 0.47.

The role of the four financing resources in China has changed substantially during 1980s and 1990s due to the economic reforms and financial liberation (Liu and Li 2001). State budgetary allocation, the dominant source of funding in the pre-reformed era, has been substituted by domestic bank loans and self-raised funds. The progression has been particularly facilitated by the SOE reforms, which are characterized by privatization and marketization, continuous financial system reform and regional decentralization. China's open-door policy allowed a considerable level of foreign investment in the capital market, the role of which is increasingly visible in firms' financing mix.

4   Methodology

To assess the impact of financing sources on firm growth performance, the following reduced form equation is specified:

$$Growth_{it} = \alpha + \beta' FIN_{k,i,t-1} + \gamma' X_{i,t-1} + \delta' OWN_{it} + \phi' D_{it} + \varepsilon_{it} \qquad (1)$$

Where firm performance is measured by firm TFP *Growth* using Levinsohn and Petrin (2003) approach for firm i at time t; FIN *is* a vector of financing source variables: state finance, domestic banks loan, self-raised finance and foreign investments, defined by the share of each source in a firm's total finance.[5] The vector X, a set of control variables that are found to determine firm growth in the literature, includes firm age and size (measured by the number of total employees) and their quadratic terms (e.g. Evans 1987; Geroski 1995; Caves 1998 and Cabral and Mata 2003), initial TFP level to control for firm's technological endowment, export to capture the expected performance-enhancing effects of export activities that have been widely documented across a number of countries, including China (see Kraay 1999). Similarly, innovation, measured by the percentage of new product sales in total sales, is also included to test the presence of innovation-driving growth (Jovanovic 1982). D is the full set of firm's ownership, industrial, time and regional dummies and ε is a random error term.

Among the econometric issues that may bias OLS estimator, heterogeneity, selectivity and endogeneity are more common for firm-level analyses than others. In our case, first of all, although firm ownership, location and industrial sector variations are controlled through dummy variables, firm heterogeneity may still be prevalent within a narrowly defined sector. Second, as growth is observed only among firms that have survived, it is necessary to assess potential selection bias.[6] Third, endogeneity issue can arise when firm capital structure is correlated with some unobserved factors that also impact on firm growth, even though the financial structure variables are lagged by one period.[7]

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5   Since the four shares add up to one, the state finance is set as the base group whenever all four financing sources are present, and thus the coefficients *βs* of finance source variables are interpreted as the marginal effect relative to the base group.

6   Due to the construction of the dataset, for non-SOEs, the survived firms are those included in the NBS' census, i.e. the firms that maintain an annual turnover of more than 5 million yuan.

7   For example, the unobservable managers' ability that affect firm performance, as well as affect the chances of getting finance (maybe one from some sources).

With this in view, the authors assess the above-mentioned issues by exploring several estimators, starting with OLS estimator with robust standard errors allowing for heteroskedasticity and within-firm serial correlation, outlier robust regression (Rousseeuw and Leroy 1987) to address firm heterogeneity, which offer estimates that are not sensitive to the presence of extreme values and effectively control for outliers. To assess selectivity, instead of using the popular Heckman approach (1976), which is not appropriate for panel data models with unobserved heterogeneity, this paper adopts its extension to linear unobserved heterogeneity panel data models by Wooldridge (1995) can identify the extent of selectivity bias in the model. The procedure is a two-stage estimator: in the first stage, non-selection hazard variables are estimated by a sample selection model of firm survival on a yearly basis, which are included in the original model to correct for the selectivity bias at the second stage. The variables included in the selection equations are quadratic terms of firm's size and age, TFP level, firm's export and innovation activity and industry exit rate. These are variables that are typically used in the firm survival literature (e.g. Dunne et al. 1989 and Mata et al. 1995).

In a case such as ours, when the endogeneity problem induced by multiple endogenous variables with discreteness (finance source variables are truncated), Wooldridge (2002, 2005) shows that the usual IV or control function estimators, such as Smith and Blundell (1986) and Rivers and Vuong (1988), fail to deliver consistent estimates. To the authors' best knowledge, the only available econometric technique for tackling such a problem is the correction function approach of Wooldridge (2005), which is an extension of the standard IV estimator. The study has shown that augmenting the baseline model, such as Equation (1) with appropriately defined *correction functions,* will deliver consistent estimates of the parameters of interest.

Assume FIN_j (j = 1, 2, 3), the truncated finance structure variables,[8] take standard Tobit reduced forms:

$$FIN_{ij} = \max\left[0, \vartheta_0' + \vartheta_1' X_i + \vartheta_2' Z_i + \xi_i\right] \tag{2}$$

where $[\xi \mid X, Z] \sim$ iid $N(0, \sigma^2)$, and X is the vector of covariates described in equation (1). Z is the vector of the available instrumental variables for which $E(Z'X) = 0$, or in other words, they are assumed to be exogenous and redundant in determining firm growth in the structural conditional expectation. Wooldridge (2005) shows that ignoring individual firm indicator notation, the correction function for models with truncated endogenous variables can be generated as follows:

$$h_j(X, Z, \vartheta) = \sigma^2 \cdot \Phi(r\vartheta / \sigma), \; r_i \equiv (1, x_i, z_i) \text{ and } \vartheta \equiv (\vartheta_o, \vartheta_1, \vartheta_2) \tag{3}$$

where $\Phi(.)$ is the cumulative normal density. Then equation (1) can be modified by adding the correction function and the interaction terms of the endogenous variables *FIN* with the mean variance of each element of the vector *X,* for the omitted variable bias that plagues the usual IV estimators:

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8 In the case of four financing source variables included, the share of state budget is the omitted group in the estimation.

$$Growth_{it} = \alpha + \sum_j \beta_j^{'} FIN_{ijt} + \chi' X_{it} + \sum_j \delta_j^{'} FIN_{ijt}(X_{it} - \bar{X}_t) + \sum_j \rho_{ijt} h_{ijt} + \varphi' OWN_{it} + \phi' D_i + \varepsilon_{it} \quad (4)$$

Equation (4) is then estimated by OLS with corrected standard errors by bootstrapping to account for the fact that correction functions are the generated regressors. A test of joint significance of the correction functions and the interaction terms provides a test of exogeneity of the finance variables.

To estimate correct functions, valid instrumental variables that are relevant and exogenous to firm growth must be provided. To this end, the authors employed firms' political affiliation indicators, regional level or industrial level indicators of market condition, financial development and legal environment. *Political affiliations* are a set of dummy variables that indicate the administrative level at which firms are being 'supervised'. More than half of Chinese firms (including private firms) are affiliated to the government at a certain level, and the affiliation may help the firm's finance structure. For example, association with government agencies can help obtain credit guarantees or collateral assets that banks demand (see Huang 2003). Importantly, political affiliations are normally assigned to established firms from the very beginning of the registration with the government agency, and therefore they can be considered exogenous to the error term of the current growth process.

At 3-digit SIC level, the instrumental variables *SOEs share* and *Private share* are defined as SOEs' and private firms' market share within the corresponding 3-digit SIC industry and province in terms of industrial sales. These instrumental variables are designed to capture the market and political environments, which may influence firms' access to financing sources. For example, in the presence of soft-budget constraint (Lin et al. 2000), non-SOE firms in a region and industry with high concentration of SOEs would find it more difficult to obtain funds from state budgets and bank loans.

By the same token, it is reasonable to assume that firms in industries or provinces that are more open to non-state sector investment are more likely to access foreign finance. Included at the regional level are NERI indices of regional financial development (Fan et al. 2005), financial market competitiveness, asset allocation marketization, difficulty in attracting FDI, and legal environment (measured by the number of lawyers over population). In the macro econometric literature, some of these variables are shown to be good instruments for accessing finance variables (e.g. Levine 2005).

It is worth noting that these variables are, by nature, exogenous to firm-level growth performance owing to the manner in which they are constructed. To test the relevance of the instruments, the authors conducted the Kleibergen-Paap (2006) rank test (rk test in the table) for the rank condition $rank(Z'X) \geq k$, which is a generalization of the Anderson Canonical correlation rank test (Anderson 1984), closely related to the minimum-eigenvalue test statistics proposed by Cragg and Donald (1993) (also see Hall et al. 1996).[9]

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[9] The Kleibergen-Paap (2006) rk LM test is adopted here because of multiple nonlinear endogenous regressors, which rule out the application of commonly used tests proposed by Bound et al. (1995) for single linear endogenous regressor, Shea (1997) and generalized Anderson's likelihood ratio for multiple linear endogenous regressors, as well as Cragg and Donald test for similar reasons that has been used widely.

5 Data and summary statistics

Our dataset draws on the Annual Reports of Industrial Enterprise Statistics compiled by the National Bureau of Statistics (NBS) of China, covering the population of Chinese state-owned manufacturing enterprises and non-state-owned enterprises with annual turnover more than 5 million yuan (about US$620,000) over the period of 1998-2005. The sample accounts for nearly 90 per cent of total industrial output. The data exhibit a good balance across the manufacturing industries and provinces in China, as shown in the Appendix Table 1.

Firm ownership is classified based on the share of equity capital contributed by different sources, such as the state, collective investors, domestic private and foreign investors. This differs from the traditional way of classification using firm's registration information that has been questioned recently (e.g. Dollar and Shang-Jin Wei 2007), and more appropriately in the cases when registration record cannot signal real firm's ownership structure. Specifically, the ownership is classified as:

(1) State-owned enterprises (SOE): if state capital is the major source of capital, meaning if the share of state capital in total equity finance is equal or more than 50 per cent;

(2) Collective enterprises (COE): if the share of collective capital in total equity finance is equal or more than 50 per cent;

(3) Foreign invested enterprises (FOR): if foreign capital (incl. capital from Hong Kong, Macau, and Taiwan and foreign countries) is the major source of capital, which means if the share of foreign capital is equal or more than 50 per cent;

(4) Domestic private enterprises (Private): all domestic firms that are not classified as SOEs or FORs. This group can further be classified into three: (4a) Private with state capital (Private_state): if state capital is less than 50 per cent in total equity finance; (4b) Private with foreign capital (Private_for): if foreign capital is less than 50 per cent in equity finance and there is no state capital; (4c) Pure private (PPrivate), private firms without any state or foreign finance.

As summarized in Table 1. The majority (56.3 per cent) of the firms in the sample are private firms, among which 48.7 per cent of these are pure private firms. There are relatively few private firms with state capital (2.2 per cent) and private firms with foreign capital (5.4 per cent). The average percentage of SOEs in the sample over 1998-2005 is 16.9 per cent, but the figure has dropped from 34 per cent in 1998 to 5 per cent in 2005 (not presented in the Table), mainly because of SOEs' privatization and a large-scale entry of non-state firms. Also 13.5 per cent of the firms are COEs and 13.2 per cent are FORs, 60 per cent of which are mainly financed by investors from Hong Kong, Macau and Taiwan.

Firm size is measured in the traditional way by firm's employment. Although the NBS has certain criteria for non-state firms to enter the census, there is still a large number of small firms in the data, which ensures a broad coverage in term of firm size. To observe the firm size profile in better detail, five size groups of firm are defined, instead of conventionally three (small, medium and large, as in for example, Beck et al. 2005, 2007). As reported in Table 2, they are (1) Size group 1, including firms with under 50

employees, amounts to nearly 20 per cent of the total observations. Conventionally, they are considered small firms in the empirical literature; (2) Size group 2, including firms with between 51 and 100 employees, amounts to nearly 23 per cent of the total observations; (3) Size group 3, including firms with between 101 and 200 employees, amounts to nearly 24 per cent of the total observations. Groups 2 and 3 are commonly considered as medium sized firms in the empirical literature; (4) Size group 4, including firms with between 201 and 500 employees, amounts to nearly 21 per cent of the total observations; (5) Size group 5, including firms with above 500 employees, amounts to 12 per cent of the total observations. The last groups are usually regarded as large firms.

Our previous research suggests that firm ownership structure plays an important role in firm financing pattern and performance (see Du and Girma 2007b). We hence take a step forward to build a firm size profile by firm ownership. Table 2 also reports the sample construction of firms in different size by ownership. One striking feature from the distribution is that firm size seems to relate to firm ownership. For example, there are more SOEs in the smallest and the largest size groups than other groups, while there are more pure private firms (PPrivate) in smaller size groups. PPrivates represent the largest ratios in the sample, but relatively their ratio is the lowest in large firms (size group 5). The trend appears to be the opposite for private firms with state funds (Private_state), private firms with foreign finance (Private_for) and foreign firms (FOR), as their ratios tend to be higher in larger size groups. It is interesting to note that about 20 per cent of the largest firms are foreign firms.

Financing pattern of Chinese firms during 1998-2005 is described by the statistics of breakdown by size group. Finance from state budgets, domestic bank loans, self-raised finance and foreign investments account for 12 per cent, 14 per cent, 60 per cent, and 14 per cent of firms' total finance respectively (Figure 1). Self-raised finance has throughout the largest share, particularly for small firms. The smallest firms (size group 1, employees ≤50) have on average 60.5 per cent of total finance coming from self-raised finance, almost four-fold of their second major financing source (state finance). It drops from 66 per cent for small around 40 per cent for largest firms (firms with >500 employees). The bank loans constitute in total finance seems to steadily increase with firm size. On average the share bank loan is around 13.6 per cent for size groups 1 and 2 (firms with ≤100 employees), and goes beyond 20 per cent for the largest firms. Foreign finance seems to favour big firms, although the differences among different size groups are not dramatic. It is interesting to notice that on average foreign investment represents 20 per cent of total finance for bigger firms, nearly at the same level with domestic bank loans.

As known from the previous exercise (Du and Girma 2007b), ownership structure plays an important role in firms' financing mix. This is demonstrated graphically in Figure 1 in this paper. Using the definition of ownership adopted, only firms with state ownership (SOEs and Private_state) employ all four financing sources, firms with foreign ownership use three sources except state finance, and firms with state ownership enjoy greatest access to bank loans. Self-raised finance supplies the vast majority of finance to COEs and pure private firms. It is also interesting to notice that foreign investment does not only finance foreign firms, but also domestic private firms and even SOEs.

Also in Figure 1, the financing patterns can be further observed across firm size groups within each ownership category. State budget and bank loans are the main financing

sources for SOEs, with state budget supplying more than 81 per cent and bank loans above 16 per cent. The shares from self-raised finance and foreign investment are negligible (about 2 per cent). COEs are financed by self-raised finance and bank loan only, and the share of bank loans seems increasing with size. Private_state firms finance from all four sources. The average shares of self-raised finance, state budget and foreign finance are seen decreasing over the size bands, and bank loan has the opposite trend. PPrivate firms, like COEs, only finance from self-raised finance and bank loans. It is noticeable that on average the smallest firms have a very small share of bank loans (8 per cent), the lowest among all indigenous firms, suggesting that small pure private firms are probably the most financially constrained among all as far as financing source is concerned. Private_for firms finance from three sources apart from state budget, and bigger firms seem to have more bank loans than smaller ones. Foreign firms (FOR) naturally finance mainly from foreign investment, and the rest quite evenly from self-raised budget and bank loans.

Control variables

Table 3 provides the summary statistics of the variables used in this paper. At firm level as in reported in Table 3.1, TFP measure is estimated following the methodology of Levinsohn and Petrin (2003). This approach has been widely applied in recent productivity literature for its advantage of being able to control for the simultaneity between firm's choice of input levels and unobserved productivity shocks.[10] Average TFP growth reaches 8.3 per cent over the sample period, with a high standard deviation indicating substantial heterogeneity among firms.

The average firm age is approximately 14 years, and the average firm size in the sample is 127 employees.[11] Generally older firms tend to be larger according to the mean, albeit the large standard errors of both age and firm. The initial TFP level is 1.549 for the whole sample, and it seems to relate to firm size, as the average level of TFP is the higher for larger firms. The new product sale over total sales is around 3.2 per cent for overall sample, ranging from 2 per cent among smallest firms to 7 per cent among biggest firms. There are 34 per cent of the firms that are exporters and the average export intensity is 17 per cent. Both means of export dummy and export intensity are higher among bigger firms than smaller ones. Overall, 43.9 per cent of the firms in our sample have governmental affiliations[12] at different level. Around 6.2 per cent of the firms are affiliated with either central government or provincial governments, and 8.2 per cent with regional government, and the rest 44 per cent with lower level (i.e. prefecture, county) governments. On average the market share of state sector at 3-digit SIC classified industrial level is 13 per cent, and private sector is 57.3 per cent. Table 3.2 also reports the summary statistics of the variables included in the analysis that are at regional and/or 3-digit SIC coded industrial level.

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[10] See Appendix 1 for the detail of TFP estimation.

[11] Both firm age and size take logarithm forms in the model.

[12] Du and Girma (2007a) investigate firms' affiliations to governments as political connections, and find that the connections affect the survival chance of start-up firms.

6 Empirical findings

6.1 Firm size, financing source and growth

Table 4 reports the endogeneity-corrected econometric estimates from the TFP growth model, based on the overall sample and by firm size. In all cases, the null hypothesis of exogeneity of finance is emphatically rejected, vindicating the application of correction function approach. The Kleibergen-Paap heteroskedastic robust rank condition test suggests the strong relevance of the additional instrumental variables employed. Controlling for the endogeneity of finance variables, estimates of the correction function tell the same story with the selectivity correction estimates about the relative importance of the four financing sources (estimation results are reported in Appendix Table 3). Although it is unfortunate that there is no known method that can combine the selectivity and endogeneity corrections of this case with multiple truncated endogenous variables, both estimators that deal with the separate econometric issues deliver qualitatively the same message. Focusing on finance variables, it is observed that financing sources clearly matter for firm growth, controlling for initial TFP level, firm age, size, export, innovation, ownership, industrial, time and regional characteristics. As found elsewhere (Du and Girma 2007b), overall sample estimation result (Table 4, Column 1) suggests that controlling for the endogeneity of finance variables, there is a pecking order of the contribution of financing sources to firm growth: relative to state finance, foreign finance leads to highest growth rates, followed by self-raised finance, bank loans and state budget.[13]

As expected, the results vary among different size groups (Table 4, Columns 2-6). For smallest firms in size group 1 (employees <50), the estimates of the coefficients of financing source variables are statistically significant and quantitatively different. The results generally reflect the above-mentioned pecking order. Overall, the finance variable present higher relative marginal effects on firm TFP growth than bigger firms. Put differently, the difference of relative importance of financing sources tends to be less substantial over increasing size. For example, relative to state finance, foreign finance boosts firm growth by around 14.8 per cent higher for size group 1 relative to state budget, and only 5.37 per cent for largest firms in size group 5. Self-raised finance boost firm growth by 9.52 per cent for size group 1, but only 3.96 per cent for size group 5. In sum, financing sources matter much more for smaller firms than bigger ones. In particular, self-raised finance and foreign finance are relatively more important for small firms than large ones, while bank loan is relative more important than state finance, irrespective of firm size.

Across all estimations, the authors find that initial TFP level enters with a negative and significant coefficient, suggesting productivity convergence is taking place. The expected inverted-U shaped relationships between firm age and TFP growth, and between firm size and growth are observed in small size groups (group 1-3), suggesting that on average firms tend to grow faster as they become bigger and older until a turning point. The performance-enhancing effect of being an exporter is confirmed by the estimates for overall sample estimate and in each size group. An exporter on average grows 6.7 per cent faster than a non-exporter, all else being equal. Export intensity has

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13 The marginal effects of financing source variables are tested and rejected against statistical equality in a pair wise fashion.

the opposite effects, in that given being an exporter, higher export intensive firms seem to grow less. Innovation variable is found to have a significant positive effect on firm TFP growth, which suggests the percentage of new product in total sales relates positively to firm productivity growth. The marginal effects of innovation are the largest for firms in groups 1 and 5, indicating the positive impact of innovation is most pronounced among the smallest as well as the largest firms.[14]

There are strong ownership effects. The overall sample estimates suggest that all non-state firms grow faster than SOEs, which is the base group. All else being equal, non-SOE firms and foreign firms' TFP growth is around 7~15 per cent higher than SOEs. Interestingly, there seems to be a slight shift of ownership advantage along the size distribution. Indigenous ownership advantage of non-SOEs over SOEs in helping firms to grow seems to decline as size gets bigger, while the advantage of foreign ownership seems to be bigger as size grows bigger. More specifically, the TFP growth of collective firms (COEs) of less than 50 employees is 12 per cent higher than the SOEs in the same size, while this marginal effect drops to only 4 per cent for size group 4 (that is much lower than other ownerships), and finally for firms with more than 500 employees the figure drops to 1.9 per cent and insignificant. Similarly, pure private firms' (PPrivate) ownership advantage relative to other firms is more marked for smaller firms than bigger ones. In contrast, firms with foreign ownership (both Private_for and FOR) seem to enjoy larger advantages among bigger firms than small ones, although the difference is not substantial. In addition, very big private firms with state capital possess the most advantages among all firms.

6.2 Financing source, growth and ownership by size group

Further splitting the sample into firms under different ownership, it is interesting to investigate how ownership affects the relationship between financing source and TFP growth across different size group. Table 5 reports the estimation results.

SOE   According to the whole sample estimates, self-raised finance and foreign finance has significant and positive effects on firm TFP growth relative to state budget and domestic bank loans. The positive impact is mostly concentrated among firms in size group 3 (firms with 101-200 employees). Bank loan has a small positive and insignificant coefficient for the whole sample and most of the size groups, and it even turns to negative for size group 3, which suggests for these firms bank loan has little statistical difference from state budget. Quite distinctively bank loans is found to be the most effective financing sources for very large firms with more than 500 employees, and more specifically 10 per cent of bank loans in total finance will lead to about 6.45 per cent increase in TFP growth. Also, it is notable that self-raised finance is evidently more important than all the other finance for small firms (with less than 100 employees), for which 10 per cent self-raised finance brings up more than 11 per cent TFP growth. But the impact of self-raised finance diminishes as size gets larger.

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[14] The productivity-enhancing effect of export activity is well documented in the literature, which is also the case with less extent for innovativeness. However, we assume that the lagged export (dummy and propensity) and lagged innovation variables to have negligible endogenous effect in our model. As robustness test, the model specified without these variables does not change the relative importance of the financing variable from that of the adopted model.

COE   Relative to bank loan, self-raised finance registers positive coefficients but not statistically significant for size group 1-3 (<200 employees). For large firms (>200 employees), bank loan seems to be more supportive, although the effects are not statistically significant either.

Private_state   For private firms with state ownership, not much evidence suggests that domestic financing sources help firms grow more than state finance. The exception is in size group 5, as again very large firms seem to benefit the most from financing more from bank loans.

PPrivate   For pure private firms, self-raised finance is found to significantly boost TFP growth with the marginal effects on average 3.9 per cent, relative to bank loan. This suggests that self-raised finance plays a more important role than bank loans for most pure private firms. Interestingly, again the authors find that very large firms are exceptional, in that there is no statistically significant difference between bank loans and self-raised finance for them.

Private_for   For private firms with foreign finance (foreign stake is less than 50 per cent), domestic financing channels start playing an additional effective part for large firms (>201 employees). Relative to foreign finance, 10 per cent self-raised finance promotes firm TFP growth by 7.4 per cent for firms in size group 4 (201-500 employees). For the largest firms in size group 5, 10 per cent bank loans (self-raised finance) in total finance drive firm growth by about 8.5 per cent (8.3 per cent).

FOR   The whole sample estimates suggest that for foreign invested firms (foreign investment was more than 50 per cent), bank loans appear to be more effective than foreign finance, and foreign finance is more effective than self-raised finance. The results are quite mixed among different size groups. While the only statistically significant marginal effect of bank loan is for firms in size group 3 (firms with 101-200), it does seem to have a positive impact on foreign firms' TFP growth relative to foreign finance. The negative signs (albeit statistically insignificant) of the self-raised finance suggest that it is still not as important for foreign firms as it is for other types of firms.

6.3 Summary of the results and discussions

In summary, firm size matters for the way in which financing source affects firm TFP growth. Finance source affects the growth of small firms more than large firms. If we assume firms would choose the most efficient (in boosting growth) financing source in an efficient financial market with no lending bias, then our results demonstrate what might be the case from the demand side of firm financing – small firms are more financially constrained than bigger ones, despite our modelling approach and data used tell the story of firm financing from the supply side. Apart from deliberate lending bias induced by formal financial system, this may be at odds with the argument that small firms cannot afford financial services, especially in poor countries (Greenwood and Jovanovic 1990), so that the difficulty in accessing to bank loans has harmed small firm's growth potential.

It is striking to find that bank loan has only discernible contribution to biggest firms' TFP growth, almost irrespective of ownership. After all, the formal financial sector in

China is dominated state-owned commercial banks which pool and direct more than 70 per cent of the total savings in the economy. If bank loan can be a good proxy of formal finance, it may be fair to say that small firms in China suffer from the lack of formal financial system support. This is in fact consistent with the notion 'Grasp the big and let go the small' which has been the national economic policy for years. If financial system reform is set out to make access to formal finance easier, then it would be reasonable to expect small firms to benefit from the reform.[15] Moreover, there is a noticeable positive effect of bank loans on foreign invested firms, which may indicate the Chinese formal financial institutions have actively participated in foreign invested operations in China.

The supportive role of finance among small firms growth seems to be undertaken by self-raised finance, not only for private firms, but also for COEs and SOEs. It is rather clear that it has been an alternative and very important financing channel for the part of the economy composed of the SMEs. This complements AQQ's (2005) finding in that informal finance has not only been vital to support private sector growth, but also more broadly to support private and small firms growth. It is evident that complementary roles of financing sources are undertaken in supporting firms at different stages in their life cycle. More specifically informal finance, such as self-raised finance, is more important for smaller firms, while formal finance is more important for bigger firms.

As an ignored financing channel in the literature, foreign investment has played a positive role as a financing source in firm growth not only among foreign invested enterprises but also domestic firms. There is no clear evidence to suggest that foreign investment favours specific size group. The finding also suggests that access to local finance may be beneficial for foreign-invested firms, especially for bigger firms, which demonstrates the complementarities between indigenous and foreign finance.

This result offers further evidence on the China's finance-growth puzzle (see Du and Girma 2007b). China's financial system is an unconventional mix of various formal financial sectors and informal financial sectors, which play different roles for different types of firms. China should not be considered as a counter-example to the financial and growth theory, even though the current theories cannot explain the China puzzle.

7   Conclusion

Using a comprehensive firm-level dataset of 1.46 millions observations spanning the period of 1998-2005, this study investigates the relationship between firm size, financing source and firm TFP growth of Chinese firms. A complete financing profile of firms in different size and ownership is developed. Controlling for the endogeneity of financing source in the growth equation, firm size is found to play an important role in the relationship between financing source and firm TFP growth, despite the differences in the financing sources' contribution of driving TFP growth declines as firm size grows bigger. There is evidence to suggest that complementarities of formal finance and informal finance, foreign finance and local finance exist for firms at different stage. For example, domestic bank loans are generally favourable to big firms, while self-raised finance has been found to be more supportive to smaller firms' growth. Foreign-invested firms, especially big ones, may benefit from the access to indigenous finance.

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[15] Although it is not possible to predict in the current paper whether smaller or bigger firms would benefit more from the reform.

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Appendix 1: TFP estimation method

The total factor productivity (TFP) measure is estimated following the methodology of Levinsohn and Petrin (2003). The advantage of this method lies in controlling for the simultaneity between firm's choice of input levels and unobserved productivity shocks by using firm's intermediate inputs (such as raw materials or electricity) as proxies.

Assuming a Cobb-Douglas production function for firm i at time t is:

$$y_{it} = \beta_0 + \beta_l l_{it} + \beta_k k_{it} + \omega_{it} + \varepsilon_{it}$$
$$\equiv \beta_l l_{it} + \phi_t(k_{it}, m_{it}) + \varepsilon_{it}$$

where y is log of value added, which is sales net intermediate inputs (m), l is labour input and k is capital input, and $\phi_t \equiv \phi_t(k_{it}, \omega_{it}) = \beta_0 + \beta_k k_{it} + \omega_{it}(k_{it}, m_{it})$ is an unknown function of capital and intermediate inputs. ϕ_t is strictly increasing in the productivity shock ω_{it}, so that it can be inverted and one can write $\omega_{it} = \omega_t(m_{it}, k_{it})$ for some function ω_t. Levinsohn and Petrin (2003) approximate $\phi_t(k_{it}, m_{it})$ by a third order polynomial in k and m, $\sum_{j=0}^{3} \sum_{s}^{3} \delta_{js} k_{it}^j m_{it}^s$ and obtain and estimate of β_l and ϕ_t (up to the intercept) via OLS. This constitutes the first stage of the estimation procedure. At the second stage, the elasticity of capital β_k is defined as the solution to $\min_{\beta_k^*} \sum_i \sum_t \left(y_{it} - \hat{\beta}_l l_{it} - \beta_k^* k_{it} - \varpi_{it} \right)^2$, where ϖ_{it} is a nonparametric approximation $E[\omega_{it} | \omega_{it-1}]$. Since the estimators involve two stages, the calculations of the covariance matrix of the parameters must allow for the variation due to all of the estimators in the two stages. Levinsohn and Petrin (2003) note that the derivation of the analytical covariance matrix is quite involved, and suggest the bootstrapping procedure to estimate standard errors. In this study 200 bootstrap replications are performed. Once consistent estimates of the input elasticities are derived, the log of productivity can be obtained as $\hat{\omega}_{it} = y_{it} - \hat{\beta}_l l_{it} - \hat{\beta}_k k_{it}$.

The data of industrial value-added and intermediate input are deflated by ex-factory price indices published in the Chinese Statistical Yearbook (1999-2006). The fixed assets data are deflated by fixed asset price indices published in the China Fixed Asset Statistical Yearbook and Chinese Statistical Yearbook (1999-2006). The estimation has been conducted by 2-digit SIC industry categories.

Table 1: Firm ownership defined by capital structure (1998-2005)

Ownership	Definition	Freq.	Per cent
State-owned enterprises (SOE)	If state capital is the major source of capital, which means if State capital is equal or more than 50 per cent in equity finance	243,445	16.9
Collective enterprises (COE)	If collective capital is equal or more than 50 per cent in equity finance	194,354	13.5
Private enterprises: among which:	All domestic firms which are not classified as SOEs or FORs	809,264	56.3
- Private with state capital (Private_state)	If state capital is less than 50 per cent in equity finance	32,251	2.2
- Pure private enterprises (PPrivate)	Private firms without any state or foreign finance	699,192	48.7
- Private with foreign capital (Private_for)	If foreign capital is less than 50 per cent in equity finance and there is no state capital	77,821	5.4
Foreign invested enterprises (FOR)	If foreign capital (incl. capital from Hong Kong, Macau, and Taiwan and foreign countries) is the major source of capital, which means if foreign capital is equal or more than 50 per cent in equity finance	189,952	13.2
Total		1,437,015	100.0

Note: The statistics are calculated using the dataset used in this paper based on existing observations.

Source: This table shows the classification of firm ownership and according to which the ownership structure of the data. The definitions of firm ownership in the table and a detailed description are also given in the main text Section 5 Data and Summary Statistics.

Table 2: Size profile of Chinese manufacturing enterprises (1998–2005)

Size group	Freq.	Per cent	By ownership					
			SOE	COE	PPrivate_STATE	PPrivate	Private_for	FOR
1 (<=50)	287,241	19.99	21.77	13.07	1.15	52.40	3.27	8.34
2 (51–100)	329,868	22.96	11.79	13.87	1.50	57.37	4.61	10.86
3 (101–200)	345,251	24.03	12.47	14.93	1.97	51.63	5.76	13.25
4 (201–500)	299,823	20.86	16.26	14.25	2.78	43.00	6.96	16.75
5 (>500)	174,832	12.17	28.73	9.61	5.08	29.91	7.13	19.55
Total	1,437,015	100.00	16.90	13.50	2.20	48.70	5.40	13.20

Note: Size groups are defined according to the total number of employees, for example, size group 1 includes firms with no more than 50 employees; size group 2 includes firms with employees between 51 and 100. This table gives information on the sample composition of our dataset. According to Column 3, there are 19.99 per cent observations in the sample are the smallest firms with no more than 50 employees. The size composition by firm ownership is also reported in Columns 4-9, where the figures are the percentage of firms of one type of ownership in total number of firms in each size group. For example, 21.77 per cent of Size group 1 are state-owned enterprises (SOE, Column 4), and another 52.4 per cent in this group are pure private enterprises (PPrivate).

Source: The statistics are calculated using the dataset used in this paper based on existing observations.

Table 3: Summary statistics

Table 3.1: Variables at firm level

Size group	Total	1 (<50)	3 (51—100)	4 (101—200)	5 (201—500)	6 (>500)
Performance indicators						
TFP growth	0.083	0.0566	0.0922	0.0935	0.0904	0.0801
	(0.643)	(0.6062)	(0.5560)	(0.5424)	(0.5394)	(0.5183)
Financing source						
Share of state budget	0.1187	0.1543	0.0853	0.0893	0.1132	0.1925
	(0.2945)	(0.3420)	(0.2586)	(0.2606)	(0.2834)	(0.3360)
Share of bank loans	0.137	0.0974	0.1092	0.1322	0.1619	0.2119
	(0.252)	(0.2241)	(0.2301)	(0.2499)	(0.2683)	(0.2824)
Share of self-raised finance	0.602	0.6567	0.6893	0.6372	0.5485	0.3925
	(0.428)	(0.4316)	(0.4033)	(0.4144)	(0.4245)	(0.4084)
Share of foreign investment	0.141	0.0916	0.1163	0.1412	0.1763	0.2030
	(0.315)	(0.2623)	(0.2889)	(0.3137)	(0.3438)	(0.3649)
Firm characteristics						
Firm age	13.664	10.9833	10.9257	12.9184	15.7725	21.0884
	(13.323)	(11.0040)	(10.5348)	(12.1958)	(14.3410)	(17.7280)
Firm size (log of employees)	4.8408	3.2353	4.2604	4.9297	5.6944	6.9346
	(1.2048)	(0.6520)	(0.2003)	(0.1987)	(0.2606)	(0.6655)
Initial TFP level	1.549	1.389	1.462	1.520	1.675	1.709
	(2.209)	(1.996)	(1.698)	(1.977)	(2.071)	(2.304)
Innovation (new product in total sales)	0.032	0.0200	0.0242	0.0260	0.0348	0.0700
	(0.254)	(0.2798)	(0.3213)	(0.2467)	(0.1732)	(0.1993)
Export, dummy	0.341	0.1101	0.1809	0.2510	0.3359	0.4777
	(0.474)	(0.3130)	(0.3850)	(0.4336)	(0.4723)	(0.4995)
Export intensity	0.170	0.0804	0.1252	0.1768	0.2330	0.2691
	(0.341)	(0.2489)	(0.3011)	(0.3472)	(0.3826)	(0.3887)
Affiliation to:						
Central government (%)	1.4	0.8	0.9	1.5	5.3	1.7
Provincial government (%)	4.7	3.3	3.7	5.0	9.4	4.8
Regional government (%)	8.2	7.0	8.4	12.5	21.0	10.5
Governments at other levels (%)	43.9	48.7	45.1	40.6	32.6	43.2
Weight in the whole sample (%)	**100**	**19.99**	**22.96**	**24.03**	**20.86**	**12.17**

Table 3.2: Variables at regional/industrial level

Regional/Industrial level indicator		
Industrial concentration (Herfindal index)	0.091	(0.1316)
Market share (in sales) of the state sector by 3-digit SIC industry/region/year	0.13	(0.189)
Market share (in sales) of the private sector by 3-digit SIC industry/region/year	0.573	(0.248)
Financial development (bank loans to private sector over regional GDP)	0.008	(0.006)
Financial market competitiveness	6.268	(1.349)
Asset allocation marketization	5.677	(2.89)
Difficulty in attracting FDI	3.731	(2.487)
Law (total number of lawyers over total population in a province)	5.233	(5.111)
Intellectual property right protection	5.526	(4.964)

Data source: The statistics are calculated using the dataset used in this paper based on existing observations. Note: Standard errors are in the parentheses.

Table 4: Firm size, financing sources and firm TFP growth

Size group	Overall	1 (<50)	2 (51—100)	3 (101—200)	4 (201—500)	5 (>500)
Finance						
Bank loan	0.0494***§	0.0671**§	0.0685***§	0.0135	0.0328**§	0.0577***§
	(0.0073)	(0.027)	(0.021)	(0.016)	(0.017)	(0.011)
Self-raised finance	0.0729***§	0.0952***§	0.0782***§	0.0404***§	0.0503***§	0.0396***§
	(0.0060)	(0.025)	(0.020)	(0.015)	(0.016)	(0.010)
Foreign finance	0.0979***§	0.148***§	0.145***§	0.0689***§	0.0551**§	0.0537***§
	(0.0089)	(0.042)	(0.029)	(0.018)	(0.021)	(0.016)
Reference group	State budget	State budget	State budget	State budget	State budget	State budget
Firm characteristics						
TFP level	-0.218***	-0.238***	-0.228***	-0.224***	-0.247***	-0.220***
	(0.0022)	(0.017)	(0.0063)	(0.0053)	(0.0043)	(0.0041)
Age	-0.0128	0.0813*	0.0705**	0.0617**	0.0285	-0.0118
	(0.0090)	(0.051)	(0.029)	(0.024)	(0.020)	(0.027)
Age-squared	-0.509***	-2.512***	-2.447***	-2.073***	-0.987**	0.162
	(0.19)	(0.97)	(0.62)	(0.50)	(0.44)	(0.52)
Size	-0.0107*	0.218**	0.285***	0.132**	-0.227***	-0.0225
	(0.005)	(0.032)	(0.055)	(0.055)	(0.047)	(0.040)
Size-squared	1.964***	-2.245***	-1.923***	0.349	4.062***	2.124***
	(0.076)	(0.77)	(0.63)	(0.55)	(0.42)	(0.28)
Exporter	0.0674***	0.0493***	0.0585***	0.0615***	0.0722***	0.0353***
	(0.0033)	(0.018)	(0.011)	(0.0077)	(0.0062)	(0.0063)
Export intensity	-0.167***	-0.116***	-0.141***	-0.150***	-0.174***	-0.155***
	(0.0058)	(0.034)	(0.017)	(0.011)	(0.0097)	(0.010)
Innovation	0.0379*	0.0916***	0.0370**	0.0120	0.0857***	0.106***
	(0.021)	(0.042)	(0.017)	(0.023)	(0.011)	(0.016)
Ownership						
COE	0.0709***	0.119***	0.0947***	0.0720***	0.0406***	0.0193
	(0.0061)	(0.023)	(0.018)	(0.013)	(0.013)	(0.013)
PPrivate_STATE	0.130***	0.134***	0.114***	0.122***	0.104***	0.113***
	(0.0063)	(0.029)	(0.028)	(0.016)	(0.015)	(0.012)
PPrivate	0.138***	0.164***	0.144***	0.140***	0.115***	0.107***
	(0.0055)	(0.023)	(0.019)	(0.013)	(0.012)	(0.012)
Private_for	0.139***	0.103***	0.115***	0.131***	0.115***	0.143***
	(0.0063)	(0.029)	(0.020)	(0.014)	(0.013)	(0.013)
FOR	0.145***	0.128***	0.121***	0.135***	0.134***	0.117***
	(0.0084)	(0.031)	(0.026)	(0.013)	(0.015)	(0.014)
Constant	1.385***	0.545***	0.815***	1.038***	2.119***	1.402***
	(0.035)	(0.12)	(0.14)	(0.14)	(0.13)	(0.16)
Observations	444966	53556	89262	112637	112591	76920
R-squared	0.18	0.22	0.20	0.19	0.15	0.20
Exogeneity test for correction function	Chi^2 (18) = 9552.05; p = .0000	Chi^2 (28) = 427.21; p = .0000	Chi^2 (28) = 2127.30; p = .0000	Chi^2 (28) = 1005.07; p = .0000	Chi^2 (28) = 3010.24; p = .0000	Chi^2 (28) = 2923.70; p = .0000
Kleibergen-Paap rk Heteroskedastic robust Rank condition test	Chi^2 (26) = 27125.14; p = .0000	Chi^2 (26) = 27125.14; p = .0000	Chi^2 (26) = 27125.14; p = .0000	Chi^2 (26) = 27125.14; p = .0000	Chi^2 (26) = 27125.14; p = .0000	Chi^2 (26) = 27125.14; p = .0000

Note 1: The dependent variable is firm's TFP growth, estimated by Levinsohn and Petrin (2003) method (see Appendix 1 for details). Note 2: The estimator is the correction function approach by Wooldridge (2005), applied to correct for endogeneity bias. The reported joint significance of correction function and the interaction terms indicate the existence of endogeneity. The Kleibergen-Paap rk LM test statistics provide the over-identification tests for the included instrumental variables. Note 3: All estimations include the full sets of industry (2-digit SIC level), regional dummies (province level) and year dummies, each set being jointly significant in all specifications. Note 4: § indicates that the coefficients of pair-wise financing source variables are tested using F-test, and there are statistically significant differences at 1 per cent significance level between the estimates of the coefficients of bank loans and self-raised finance, between those of bank loans and foreign finance, and between self-raised finance and foreign finance. Note 5: Bootstrapped standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Firm size, financing sources and firm TFP growth: the role of ownership structure

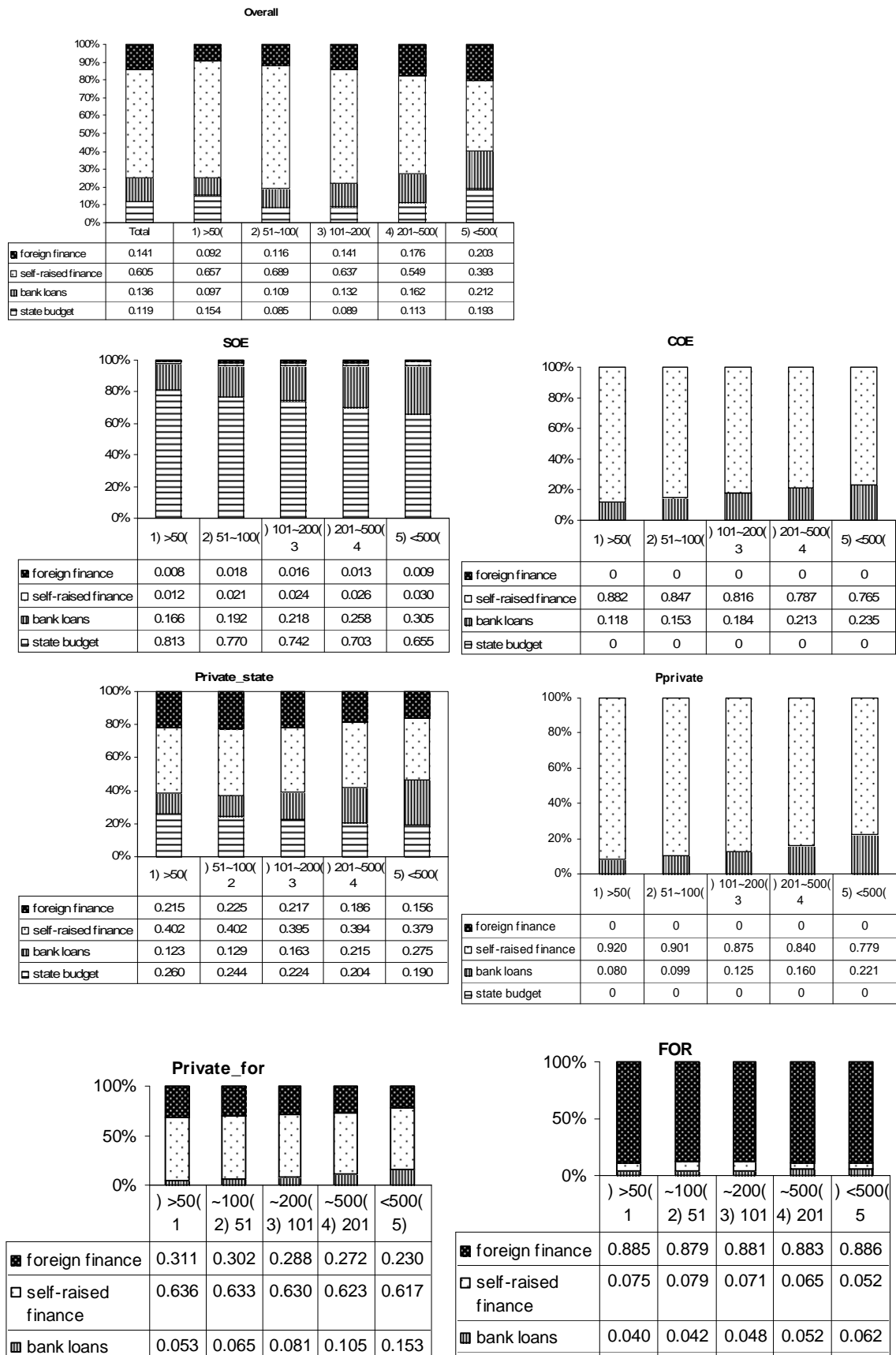| Size group	Overall	1 (<50)	2 (51−100)	3 (101−200)	4 (201−500)	5 (>500)
			Panel I: SOE			
Bank loan	0.0164	0.0686	0.0232	-0.0639*	-0.00479	0.0645***
	(0.012)	(0.043)	(0.039)	(0.038)	(0.029)	(0.020)
Self-raised finance	0.0725***§	0.117***	0.114***	0.0621**	0.0340	-0.0135
	(0.015)	(0.043)	(0.038)	(0.028)	(0.028)	(0.023)
Foreign finance	0.229***§	-0.341	0.0382	0.365***	-0.0308	-0.144
	(0.056)	(0.23)	(0.18)	(0.14)	(0.11)	(0.097)
Reference group: state budget						
			Panel II: COE			
Self-raised finance	0.0155	0.0276	0.0275	0.0176	-0.00811	-0.0139
	(0.0098)	(0.035)	(0.020)	(0.018)	(0.018)	(0.021)
Reference group: bank loans						
			Panel III: Private_state			
Bank loan	-0.0494	0.172	-0.132	-0.214***	-0.0591	0.0765**
	(0.031)	(0.18)	(0.11)	(0.068)	(0.061)	(0.038)
Self-raised finance	-0.0224	-0.00436	-0.0598	-0.128**	-0.0578	0.0312
	(0.024)	(0.15)	(0.086)	(0.062)	(0.052)	(0.038)
Foreign finance	0.162***	0.190	0.248*	0.0437	0.0807	0.0767
	(0.028)	(0.26)	(0.13)	(0.085)	(0.070)	(0.063)
Reference group: state budget						
			Panel IV: PPrivate			
Self-raised finance	0.0392***	0.0413**	0.0211*	0.0361***	0.0431***	0.0176
	(0.0044)	(0.017)	(0.011)	(0.0072)	(0.0094)	(0.011)
Reference group: bank loans						
			Panel V: Private_for			
Bank loan	0.0328	0.155	0.0415	-0.0569	0.0513	0.0849**
	(0.020)	(0.20)	(0.072)	(0.057)	(0.047)	(0.043)
Self-raised finance	0.0288	0.0242	-0.0605	-0.0105	0.0742*	0.0829**
	(0.019)	(0.081)	(0.039)	(0.025)	(0.039)	(0.036)
Reference group: foreign finance						
			Panel VI: FOR			
Bank loan	0.0681***	-0.0458	0.0845	0.132***	0.0473	0.0500
	(0.022)	(0.088)	(0.054)	(0.047)	(0.032)	(0.041)
Self-raised finance	-0.0298***	0.00465	-0.0742***	-0.00980	-0.0219	-0.0292
	(0.011)	(0.040)	(0.028)	(0.023)	(0.019)	(0.029)
Reference group: foreign finance						

Note 1: The dependent variable is firm's TFP growth, estimated by Levinsohn and Petrin (2003) method (see Appendix 1 for details). Note 2: The estimator is the correction function approach by Wooldridge (2005), applied to correct for endogeneity bias. The reported joint significance of correction function and the interaction terms indicate the existence of endogeneity. The Kleibergen-Paap rk LM test statistics provide the over-identification tests for the included instrumental variables. Note 3: All estimations include the full sets of industry (2-digit SIC level), regional dummies (province level) and year dummies, each set being jointly significant in all specifications. Note 4: § indicates that the coefficients of pair-wise financing source variables are tested using F-test, and there are statistically significant differences at 1 per cent significance level between the estimates of the coefficients of bank loans and self-raised finance, between those of bank loans and foreign finance, and between self-raised finance and foreign finance. Note 5: Bootstrapped standard errors in parentheses, *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Figure 1: Financing pattern of Chinese enterprises by firm size (1998~2005)

Overall

	Total	1) >50(	2) 51~100(	3) 101~200(	4) 201~500(	5) <500(
foreign finance	0.141	0.092	0.116	0.141	0.176	0.203
self-raised finance	0.605	0.657	0.689	0.637	0.549	0.393
bank loans	0.136	0.097	0.109	0.132	0.162	0.212
state budget	0.119	0.154	0.085	0.089	0.113	0.193

SOE

	1) >50(	2) 51~100(	) 101~200(3	) 201~500(4	5) <500(
foreign finance	0.008	0.018	0.016	0.013	0.009
self-raised finance	0.012	0.021	0.024	0.026	0.030
bank loans	0.166	0.192	0.218	0.258	0.305
state budget	0.813	0.770	0.742	0.703	0.655

COE

	1) >50(	2) 51~100(	) 101~200(3	) 201~500(4	5) <500(
foreign finance	0	0	0	0	0
self-raised finance	0.882	0.847	0.816	0.787	0.765
bank loans	0.118	0.153	0.184	0.213	0.235
state budget	0	0	0	0	0

Private_state

	1) >50(	) 51~100(2	) 101~200(3	) 201~500(4	5) <500(
foreign finance	0.215	0.225	0.217	0.186	0.156
self-raised finance	0.402	0.402	0.395	0.394	0.379
bank loans	0.123	0.129	0.163	0.215	0.275
state budget	0.260	0.244	0.224	0.204	0.190

Pprivate

	1) >50(	2) 51~100(	) 101~200(3	) 201~500(4	5) <500(
foreign finance	0	0	0	0	0
self-raised finance	0.920	0.901	0.875	0.840	0.779
bank loans	0.080	0.099	0.125	0.160	0.221
state budget	0	0	0	0	0

Private_for

	) >50(1	~100(2) 51	~200(3) 101	~500(4) 201	<500(5)
foreign finance	0.311	0.302	0.288	0.272	0.230
self-raised finance	0.636	0.633	0.630	0.623	0.617
bank loans	0.053	0.065	0.081	0.105	0.153

FOR

	) >50(1	~100(2) 51	~200(3) 101	~500(4) 201	<500(5
foreign finance	0.885	0.879	0.881	0.883	0.886
self-raised finance	0.075	0.079	0.071	0.065	0.052
bank loans	0.040	0.042	0.048	0.052	0.062

Note 1: This set of figures depicts the financing mix of Chinese enterprises by firm size and ownership structure during 1998–2005. The statistics reported in the graphs are calculated using the dataset used in this paper. See details of the data and summary statistics in Section 5.

Note 2: The reported means of financing sources by ownership in the table are tested for statistical difference by pair wise ownership groups, and the results suggest the access to each financing source variable is statistically different among firms under different ownership at 1 per cent significant level.

Note 3: See the definitions of ownership in Section 5 and the statistics in Table 1.

Appendix

Appendix Table 1: Financial sectors in China

	Financial sectors	Firm's financing channel
	Ministry of Finance, through central government and local government departments.	State budget appropriations through budget allocation via central and local governments; investments in a firm as equity capital from the state.
(I) Formal or regulated sectors	Central Bank (the People's Bank of China) → Banks and other financial intermediaries → Commercial banks → Domestic banks → State-owned commercial banks / Shareholding commercial banks; Foreign banks and agencies. Policy/development banks. Other domestic banks and deposit-taking financial institutions → Housing/building society; Rural credit cooperatives; Urban credit cooperatives (city commercial banks). Social security institutions and pension funds. Insurance companies → Domestic insurance companies / Foreign insurance companies. Capital markets → Stock market; Bond market; Money market; Foreign exchange market.	Bank loans from banks other than non-bank financial intermediaries.

Finance from capital market, mainly from listed firms in stock markets. This would be reflected as firms' equity capital, although it role is limited, as there are only 1337 listed companies in the two stock markets in China by the end of 2004, which represent only 1% of the total national industrial value-added, this financing channel. |

(II) Informal Savings and Credit Arrangements				Self-raised finance, as a major source of equity capital, broadly includes finance from individual capital, collective capital, and corporate or legal person's capital. There can be an array of channels and mechanisms that operate self-raised finance as indicated in the column on the left.
	Individual moneylending	Non-commercial arrangements ⟶	Friends Neighbours Households	
		Commercial credit arrangements	Money-based ⟶ Professional moneylenders; Mobile bankers; Private individuals from upper-income groups	
			Land-based ⟶ Landlord	
			Commodity based ⟶ Trade-moneylenders; Equipment suppliers; Produce traders; Store owners	
	Associations	Savings arrangements ⟶	Fixed-fund associations; Mutual aid associations Savings club	
		Combined savings and credit arrangements ⟶	Informal credit unions Informal savings and loan co-operatives	
	Partnership firms ⟶	Financial intermediation ⟶	Indigenous banker pawnbrokers; Finance companies; Investment companies; Leasing companies; Hire-purchase companies	

Note 1: This table shows the structure of domestic financial sectors in China. Panel I and Panel II schematize the formal or regulated financial sectors, and informal financial arrangements and agents. The right-hand column lists corresponding financial channels available at firm level from each sector, which are also considered in empirical analysis.

Note 2: The financial channel that is not included in this table but used by many Chinese firms is foreign investments. For further details, see discussion in Sections 3.2 and 5.

Note 3: This table is taken from Du and Girma (2007b).

Appendix Table 2: Dataset structure

Appendix Table 1.1 By year

Year	Freq.	Per cent
1998	146,553	10.2
1999	137,059	9.54
2000	143,158	9.96
2001	154,757	10.77
2002	165,154	11.49
2003	180,118	12.53
2004	258,879	18.02
2005	251,337	17.49
Total	1,437,015	100

Appendix Table 2.2 By 2-digit SIC industrial classification

sic2	Freq.	Per cent
13-Food processing	93,526	6.51
14-Food production	38,749	2.7
15-Beverage industry	26,778	1.86
16-Tabacco industry	2,250	0.16
17-Textile industry	120,698	8.4
18-Garments and other fibre products	69,052	4.81
19-Leather, furs, down and related products	33,838	2.35
20-Timber processing	27,508	1.91
21-Furniture manufacturing	15,758	1.1
22-Papermaking and paper products	44,172	3.07
23-Printing and record medium reproduction	32,781	2.28
24-Cultural, educational and sports goods	18,209	1.27
25-Petroleum refining and coking	10,547	0.73
26-Raw chemical materials and chemical products	106,664	7.42
27-Medical products	30,982	2.16
28-Chemical fibre	7,409	0.52
29-Rubber products	17,007	1.18
30-Plastic products	64,740	4.51
31-Nonmetal mineral products	127,340	8.86
32-Smelting and pressing of ferrous metals	34,326	2.39
33-Smelting and pressing of nonferrous metals	26,410	1.84
34-Metal products	76,678	5.34
35-Ordinary machinery	102,273	7.12
36-Special purposes equipment	60,200	4.19
37-Transport equipment	66,760	4.65
39-Other electronic equipment	75,724	5.27
40-Electrical equipment and machinery	49,561	3.45
41-Electronic and communication appliances	22,444	1.56
42-Meters and office appliances	30,298	2.11
43-Other manufacturing	4,333	0.3
Total	1,437,015	100

Appendix Table 3: Firm size, financing sources and firm TFP growth: OLS, Outline robust regression and Selection model estimation

Appendix Table 3.1: OLS estimation results

Size group	1 (<50)	2 (51–100)	3 (101–200)	4 (201–500)	5 (>500)
Finance					
Bank loan	0.120***§	0.0685***§	0.0263*§	0.0215	0.0169
	(0.0225)	(0.0180)	(0.0149)	(0.0132)	(0.0119)
Self-raised finance	0.127***§	0.0654***§	0.0332**§	0.0194	0.00119
	(0.0212)	(0.0169)	(0.0142)	(0.0129)	(0.0119)
Foreign finance	0.214***§	0.132***§	0.0499**§	0.00175	-0.0134
	(0.0342)	(0.0237)	(0.0197)	(0.0172)	(0.0167)
Firm characteristics					
TFP level	-0.191***	-0.194***	-0.187***	-0.184***	-0.140***
	(0.00509)	(0.00392)	(0.00325)	(0.00350)	(0.00364)
Age	-0.999*	-0.867**	-1.274***	-1.713***	-0.964***
	(0.513)	(0.340)	(0.272)	(0.250)	(0.279)
Age-squared	0.197***	-0.0405	0.0400*	0.0321	-0.205***
	(0.0326)	(0.0255)	(0.0243)	(0.0211)	(0.0163)
Size	-2.837***	-0.176	-0.983***	-0.631***	1.971***
	(0.431)	(0.299)	(0.259)	(0.202)	(0.123)
Size-squared	-0.00321	-0.00260	0.0219*	0.0424***	0.0151
	(0.0234)	(0.0159)	(0.0132)	(0.0126)	(0.0148)
Exporter	0.0316*	0.0506***	0.0640***	0.0778***	0.0514***
	(0.0167)	(0.00903)	(0.00663)	(0.00585)	(0.00575)
Export intensity	-0.0789***	-0.106***	-0.139***	-0.168***	-0.121***
	(0.0223)	(0.0123)	(0.00878)	(0.00794)	(0.00832)
Innovation	0.0961***	0.0426**	0.0142*	0.0908***	0.0866***
	(0.0313)	(0.0169)	(0.00830)	(0.0115)	(0.0110)
Ownership					
COE	0.202***	0.134***	0.0918***	0.0525***	0.0179*
	(0.0200)	(0.0147)	(0.0119)	(0.0105)	(0.0105)
PPrivate_STATE	0.165***	0.126***	0.120***	0.0966***	0.0868***
	(0.0299)	(0.0210)	(0.0151)	(0.0125)	(0.00937)
PPrivate	0.182***	0.132***	0.117***	0.0895***	0.0812***
	(0.0189)	(0.0140)	(0.0114)	(0.00975)	(0.00840)
Private_for	0.148***	0.127***	0.128***	0.110***	0.124***
	(0.0246)	(0.0167)	(0.0135)	(0.0114)	(0.0106)
FOR	0.176***	0.124***	0.126***	0.119***	0.109***
	(0.0297)	(0.0199)	(0.0165)	(0.0138)	(0.0134)
Constant	1.136***	1.483***	1.670***	1.616***	1.850***
	(0.252)	(0.0650)	(0.0801)	(0.0685)	(0.0714)
Observations	53840	89563	112966	112908	77161
R-squared	0.081	0.103	0.125	0.150	0.154

Note 1: The dependent variable is firm's TFP growth, estimated by Levinsohn and Petrin (2003) method (see Appendix 1 for details). Note 2: The estimator in A.Table 3.1 is OLS with the clustered robust standard errors. The Estimator in Appendix Table 3.2 is Outlier robust regression, to deal with firm heterogeneity (Rousseeuw and Leroy 1987). The estimator in Appendix Table 3.3 is the selection model by Wooldridge (1995), as an extension to the standard Heckman selection method. The reported joint significance of yearly non-selection hazard variables at the bottom of the table validates the method. Note 3: All estimations include the full sets of industry (2-digit SIC level), regional dummies (province level) and year dummies, each set being jointly significant in all specifications. Note 4: § indicates that the coefficients of pair-wise financing source variables are tested using F-test, and there are statistically significant differences at 1 per cent significance level between the estimates of the coefficients of bank loans and self-raised finance, between those of bank loans and foreign finance, and between self-raised finance and foreign finance. Note 5: Whites' robust standard errors in parentheses in Appendix Table 3.1; standard error in parentheses in Appendix Table 3.2; bootstrapped standard errors in parentheses in Appendix Table 3.3, *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Appendix Table 3.2: Outline robustness regression results

Size group	1 (<50)	2 (51–100)	3 (101–200)	4 (201–500)	5 (>500)
Finance					
Bank loan	0.105***[§]	0.0568***[§]	0.0288***[§]	0.0164*	0.0125
	(0.0147)	(0.0121)	(0.0100)	(0.00883)	(0.00848)
Self-raised finance	0.0868***[§]	0.0461***[§]	0.0307***[§]	0.00864	-0.000290
	(0.0137)	(0.0113)	(0.00958)	(0.00861)	(0.00853)
Foreign finance	0.108***[§]	0.0931***[§]	0.0459***[§]	-0.00299	-0.00971
	(0.0242)	(0.0166)	(0.0136)	(0.0120)	(0.0122)
Firm characteristics					
TFP level	-0.112***	-0.120***	-0.119***	-0.119***	-0.084***
	(0.00259)	(0.00197)	(0.00166)	(0.00153)	(0.00160)
Age	-0.634*	-0.539**	-0.838***	-1.266***	-0.935***
	(0.379)	(0.262)	(0.211)	(0.195)	(0.205)
Age-squared	0.0961***	-0.058***	0.0232	0.0241*	-0.130***
	(0.0193)	(0.0169)	(0.0142)	(0.0137)	(0.00949)
Size	-1.451***	0.124	-0.691***	-0.504***	1.247***
	(0.247)	(0.193)	(0.150)	(0.131)	(0.0729)
Size-squared	-0.00413	-0.00471	0.0118	0.0313***	0.0296***
	(0.0179)	(0.0125)	(0.0103)	(0.00986)	(0.0109)
Exporter	0.0247*	0.0379***	0.0418***	0.0535***	0.0284***
	(0.0139)	(0.00750)	(0.00562)	(0.00478)	(0.00442)
Export intensity	-0.0583***	-0.0829***	-0.0917***	-0.114***	-0.0733***
	(0.0183)	(0.0100)	(0.00738)	(0.00628)	(0.00630)
Innovation	0.0383*	0.0297**	0.0569***	0.0736***	0.0564***
	(0.0231)	(0.0127)	(0.0100)	(0.00881)	(0.00826)
Ownership					
COE	0.126***	0.0735***	0.0543***	0.0330***	0.0107
	(0.0132)	(0.00996)	(0.00817)	(0.00720)	(0.00760)
PPrivate_STATE	0.0925***	0.0701***	0.0604***	0.0579***	0.0435***
	(0.0221)	(0.0142)	(0.0110)	(0.00885)	(0.00722)
PPrivate	0.111***	0.0751***	0.0694***	0.0585***	0.0442***
	(0.0122)	(0.00939)	(0.00768)	(0.00659)	(0.00614)
Private_for	0.111***	0.0641***	0.0746***	0.0723***	0.0706***
	(0.0176)	(0.0119)	(0.00953)	(0.00825)	(0.00808)
FOR	0.134***	0.0707***	0.0734***	0.0705***	0.0642***
	(0.0214)	(0.0140)	(0.0113)	(0.00977)	(0.00985)
Constant	0.447***	0.973***	0.963***	1.086***	1.108***
	(0.129)	(0.0427)	(0.0389)	(0.0415)	(0.0385)
Observations	53840	89563	112965	112908	77161
R-squared	0.062	0.095	0.126	0.167	0.188

Note: as in Appendix Table 3.1.

Appendix Table 3.3: Selection model estimation results

Size group	1 (<50)	2 (51–100)	3 (101–200)	4 (201–500)	5 (>500)
Finance					
Bank loan	0.0571***§	0.0230***§	0.0392**§	0.0244**	0.0337***§
	(0.0178)	(0.0048)	(0.0123)	(0.0110)	(0.0106)
Self-raised finance	0.0581***§	0.00411***§	0.0359**§	0.0240**	0.00884
	(0.0166)	(0.0038)	(0.0117)	(0.0108)	(0.0106)
Foreign finance	0.140***§	0.0982***§	0.0606***§	0.0363**§	0.0268*§
	(0.0281)	(0.0196)	(0.0163)	(0.0144)	(0.0148)
Firm characteristics					
TFP level	-0.428***	-0.407***	-0.394***	-0.396***	-0.341***
	(0.00521)	(0.00402)	(0.00343)	(0.00379)	(0.00422)
Age	0.0643	-0.681**	-0.917***	-1.537***	-1.068***
	(0.434)	(0.294)	(0.233)	(0.218)	(0.245)
Age-squared	-0.259***	-0.351***	-0.266***	-0.273***	-0.425***
	(0.0259)	(0.0222)	(0.0212)	(0.0182)	(0.0136)
Size	2.026***	3.089***	2.257***	2.618***	4.306***
	(0.337)	(0.257)	(0.227)	(0.175)	(0.106)
Size-squared	-0.112***	-0.066***	-0.044***	-0.0193*	-0.035***
	(0.0200)	(0.0138)	(0.0113)	(0.0110)	(0.0131)
Exporter	-0.0613***	-0.0225***	-0.00707	0.0168***	0.00829
	(0.0149)	(0.00787)	(0.00591)	(0.00506)	(0.00506)
Export intensity	-0.0519***	-0.0805***	-0.116***	-0.166***	-0.138***
	(0.0196)	(0.0106)	(0.00776)	(0.00677)	(0.00728)
Innovation	0.00113	-0.0226	0.00191	0.0452***	0.0385***
	(0.0242)	(0.0140)	(0.00247)	(0.00996)	(0.00955)
Ownership					
COE	0.460***	0.395***	0.350***	0.329***	0.279***
	(0.0163)	(0.0123)	(0.0101)	(0.00918)	(0.00970)
PPrivate_STATE	0.0377	0.0251	0.0184	0.0128	0.0494***
	(0.0247)	(0.0168)	(0.0129)	(0.0102)	(0.00801)
PPrivate	0.137***	0.114***	0.105***	0.0895***	0.0925***
	(0.0149)	(0.0113)	(0.00933)	(0.00801)	(0.00738)
Private_for	-0.0192	-0.0152	-0.00895	-0.0106	0.0220**
	(0.0200)	(0.0137)	(0.0111)	(0.00942)	(0.00923)
FOR	-0.511***	-0.451***	-0.397***	-0.376***	-0.313***
	(0.0253)	(0.0171)	(0.0140)	(0.0123)	(0.0124)
Constant	-1.180	1.417***	0.0861	0.209	0.300***
	(0.916)	(0.0615)	(0.247)	(0.140)	(0.0716)
Observations	53840	89563	112966	112908	77161
R-squared	0.352	0.347	0.356	0.374	0.352
Specification test for selection model	$Chi^2 (28) =$ 331.84; Prob>Chi^2 = 0.0000	$Chi^2 (28) =$ 2127.30; Prob>Chi^2 = 0.0000	$Chi^2 (28) =$ 1005.07; Prob>Chi^2 = 0.0000	$Chi^2 (28) =$ 3010.24; Prob>Chi^2 = 0.0000	$Chi^2 (28) =$ 2923.70; Prob>Chi^2 = 0.0000

Note: as in Appendix Table 3.1.