Privatisation, State Ownership and Productivity:

Evidence from China

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Abstract.

This paper examines the relationship between the transfer of ownership between the public and private sectors of Chinese industry, and its impacts on performance. We link ownership changes to productivity growth, and demonstrate that privatisation contributes significantly. We offer an extension that is generally ignored in the literature, in looking at firms that are taken back into state ownership, and evaluating the productivity growth effects of this. Further, we highlight the well-understood simultaneity problems, and demonstrate the hazard of ignoring the issue by comparing various estimators, including the modified control function approach. In general, the results stress the importance of allowing for such endogeneity when evaluating the productivity effects of ownership change.

Keywords: China, Ownership change, Productivity.

JEL codes: D24 G34 L33

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1. Introduction

The purpose of this paper is to investigate the importance of ownership changes for productivity growth. This work is based on analysis of firm level census data for China, including both Chinese State-owned enterprises (SOEs) and domestic private enterprises. China is of particular interest in the context of privatisation and performance for two reasons. Firstly, while much has been written on the impressive economic growth achieved in China, very little is known about the decompositions of this within firms and across sectors, beyond more general comparisons of organisational form. Secondly, China offers a particularly rich dataset in the context of privatisation, and the transfer of SOEs to the private sector (and in some cases the reverse) as well as the much-analysed foreign owned sector (see for example, Huang, 2003). While there have been several studies of SOEs generally, see for example Dewenter and Malatesta (2001), less is known about the performance of Chinese SOEs, largely due to data constraints. Equally, an issue that (as far as we are aware) all previous work in this area has ignored, is the issue of the reverse of this process, the number of firms that are transferred to SOE status from the private sector.

We extend this literature by distinguishing between different forms of privatisation, the transfer of SOEs to private firms (private individual), PLCs (private company), cooperatives, and private firms with foreign investors. Table 1 demonstrates, perhaps surprisingly that some private firms were converted to SOEs during the period. There have been some comments recently in the popular press that the Chinese government has recognised the potential of state ownership in contributing to performance[i], though little is known about this process in China. Indeed the return of assets to state control is now so rare internationally that little

analysis is offered on this process. We therefore offer some analysis of which firms are taken into state hands, and their subsequent performance.

This paper proceeds as follows: Section 2 discusses the relationship between privatisation and performance in general, and the previous work on ownership change and productivity growth. Section 3 offers a Chinese context to this debate, while section 4 presents some key aspects of our data. Section 5 discusses the modelling and econometric considerations, while the remaining sections present the results and discuss some conclusions.

2. Privatisation and performance

Much of the work on the productivity effects of privatisation is summarised in Megginson and Netter (2001) while Kirkpatrick and Parker (2005) and Boubraki et al (2005) offer an analysis of the impacts of privatisation in developing countries. Much of the recent work in this area is based on a study on US firms by McGuckin and Nguyen (1995). This is based on ownership change in the context of acquisitions, and highlights the problems of selection bias in linking productivity growth to ownership change. Aivazain *et al.* (2005) discuss the selection problem in the context of Chinese SOEs, pointing out that in this context, the selection is performed, not by the market for corporate control, as would be the case for mergers or acquisitions in western countries, or even wholesale privatisation in eastern Europe for example, but through the government deciding which firms to privatise.

The analysis of privatisation and productivity is based on the extended literature that has developed along similar lines to that which has sought to evaluate the post merger performance of firms, see for example Lichtenberg and Siegel (1987, 1990a, 1990b), McGuckin and Nguyen (1995, 2001), and Maksimovic and Phillips (2001), and more recently Siegel *et al.* (2005).

The recent literature on productivity and ownership change is discussed in some detail by Harris *et al.* (2005) which derives Solow residual estimates of total factor productivity, and relates them to a particular form of ownership change, management buy outs. This type of work highlights two problems. Firstly, there exists a sample selection problem, in that there may be a latent relationship between the likelihood of a firm to change ownership and its potential for productivity growth. Secondly, there is an issue with how one measures total factor productivity, not only in allowing for endogeneity of inputs, but also other decisions that are taken by the firm that may impact on productivity. This will be discussed in more detail below.

Recently, Brown *et al.* (2006) provide an update and extension of Earle and Telgedy (2002), demonstrating that productivity does indeed increase post privatisation, and argue that productivity gains have been achieved quickly. This is consistent with most empirical findings in this area, which associates privatisation with productivity growth. They also however highlight the importance of endogeneity in the productivity-ownership relationship, and the importance of not simply looking at privatisation *per se*, but the form that it takes. What is perhaps surprising is that in their estimates of productivity, Brown *et al.* (2006) do not allow for the potential endogeneity of capital, which is potentially important when considering ownership change and productivity.

3. Ownership changes in China

There is a good deal of casual analysis that has highlighted the very low levels of productivity in Chinese SOEs. There are broadly two explanations offered for this. The first is based on the standard problem of low incentives within public sector organisations, while the second highlights the important role that they play in contributing to wider social welfare. As a result of this, Megginson and Netter (2001)

just five years ago placed some doubt on the ability of the Chinese government to transfer its SOEs into the private sector because of this, based on the analysis of Lin (2000), Lin *et al.* (1998) and Bai *et al.* (1997). The conversion of Chinese SOEs to private sector companies has received much attention recently, see for example Avaizan *et al.* (2005) and Gupta (2005), who have commented on the importance of "partial privatisation", that is the transfer of a non-controlling share of equity of SOEs to the private sector. Most authors suggest that this has had a significant productivity effect, see for example Wei *et al.* (2003) and Sun and Tong (2003). This is based on an earlier literature concerning the increasing use of incentives in SOEs, and their seemingly beneficial effects on productivity, see for example Shirley and Xu (1998). Much of this literature highlights the sample selection problems in identifying the specific effects of incentives, compared with wider sources of productivity growth.

A special feature of the Chinese privatization is that it has never proceeded in a complete market liberalization or democratization (Sun and Tong, 2003). Sun and Tong (2003) review the history of China's SOE reform during 1978-2000 in four stages. Using a sample of 634 listed SOEs on China's two stock exchanges upon share issuing privatization (SIP) in the period of 1994-98, they find privatized SOEs through SIP have significantly improved earning and labour productivity. After SIP, state ownership has been found to negatively affect firm performance, while single person ownership appears to have positive impacts.

Jefferson and Su (2006) also document the process of China's ownership reform in four stages, including the first stage where a large number of new entries of non-state firms during 1980s; the second stage where the reform of managerial control rights within SOEs was undertaken since mid-1980s; the third stage where there were lots of associations between formal ownership classification and ownership structure

of assets, which prepared in the fourth stage where the formal conversion of the ownership later on in mid-1990s. According to this, the ownership changes happen during 1999-2002 in our dataset are mainly through formal conversion stage.

Song and Yao (2004) use survey data for 683 firms across 11 cities over the period of 1995-2001 to study the effects of privatization on profitability unit cost and labour productivity. Given that the Chinese SOEs have reduced employment in recent years, labour productivity measures may overstate the efficiency gain associated with ownership changes. Thus, while the approach of Song and Yao (2004) offers the advantage of more information on ownership holdings, it also suffers from the normal problems with self-administered surveys, concerning sample selection problems and approximations of certain key variables.

Jefferson *et al.* (2000) demonstrate that the analysis of productivity in China is not simply a story of comparative productivity growth, privatisation, or even one of post privatisation performance. Rather, what is required is an analysis of the effects of different forms of ownership on productivity. Motohashi (2005) finds some evidence that new firms have higher productivity than older firms, but makes no comparison between forms of ownership. One weakness of previous work in this area is that it ignores the subtle distinctions in ownership and merely uses the public / private one. Rather, Chinese firms can be classified into state-owned enterprises (SOEs), collectively owned enterprises (COEs), domestic private individual enterprises (PIEs), domestic private companies (PCOMs) and foreign-invested firms (FIEs) (foreign includes Hong Kong, Macau, Taiwan, as well as other foreign counties), the importance of which is highlighted by Brown *et al.* (2006). The definitions of these distinctions are provided in Appendix 1. Secondly, the transfer from SOE to private is not a one-way process, there are many examples of private and collective firms that

have, in recent years been transferred back into public ownership, and this is seldom commented on in the literature. This is clearly an important issue if one wishes to relate ownership (change) to productivity growth.

We therefore seek to extend the literature on ownership and performance in China, by allowing for more sophisticated estimation of total factor productivity, controlling for potential endogenous ownership changes and selectivity bias, and also by a more elaborate firm ownership classification in our analysis.

4. The modelling of privatisation and performance

4.1 Predicting change of ownership

The interaction between ownership change and productivity growth is well-understood in the literature (see for example, Conyon *et al.,* 2002; Harris and Robinson, 2002; Harris *et al.* 2005). As such therefore, in order to test for the endogeneity of ownership change, we propose an intermediate step in the analysis of privatisation and performance, determining the importance of productivity in explaining the probability of ownership change. Work on predicting ownership change has developed from McGuckin and Nguyen (1995). The prediction is based on a relatively standard probit model of ownership change, and is discussed in more detail in Conyon *et al.* (2004), Harris and Robinson (2002), and more recently in Svejnar *et al.* (2005). In practice, the number of control variables that are used in these studies tends to be rather limited. In addition to firm size, various ownership and industry and regional characteristics, the variables employed in this literature tend to be confined to measures of firm performance, such as productivity[ii].

We assume a firm faces a set of mutually exclusive and exhaustive choices in changing its ownership form. Take the choices for a SOE as an example:

- remaining state owned
- changing to COE
- changing to private individually owned firm
- changing to private company
- becoming an FIE.

In order to model this multiple discrete choice situation, we adopt a multinomial logit model (MNL). The covariates that are hypothesized to affect firm's decision are firm's characteristics, relevant resources and constraints, market condition, industry and regional dummies (for details of the variables and their definitions see Table 2). The coefficients are estimated by using method of maximum likelihood. A critical property of MNL is that the odds ratios of alternatives need to be independent of the remaining probabilities. Violating the IIA assumption leads to biased estimates, and one can test this assumption by Hausman and McFadden (1984).[iii]

4.2 Impact of ownership change on productivity

This section describes the empirical approach employed to examine the impact of ownership change on firms' total factor productivity. The basis of our empirical design is modelled as:

$$TFP_i = f(X_i, OC_i), \qquad \dots (1)$$

where TFP is a measure of the TFP level or TFP growth of firm i, X is a vector of firm-specific determinants of performance, and OC captures the set of ownership changes, through a vector of dummy variables. X includes firm size, age, firms' financial constraints, exports, innovation and labour quality. This extends previous work in this area that tends to focus merely on age and size, see for example Conyon et al. (2002) and Crisicuolo and Martin (2003). We also include exporting behaviour, as exporters are generally found to have higher levels of productivity (see Wagner (2005) for a review). The performance-enhancing effects of exporting in China are

also documented (Kraay, 1999). Innovation is widely found to be a key indicator of productivity growth (Jovanovic, 1982; Pakes and Ericson, 1998; Kremp and Mairesse, 2004). Financing constraints are an important limitation on total factor productivity growth (Hansen, 1999), yet they are seldom considered in studies of productivity growth, largely one suspects due to data availability. In addition, labour quality indicator is included as a potential stimulus of productivity enhancement. Finally, we include a full set of industry and regional dummies.

Our empirical analysis adopts the following strategy. As the panel is relatively short, we employ collapsed cross-sectional regressions. The dependent variable is the average TFP (growth) over the period, and the initial values of other variables enter the regression as explanatory variables. This will sacrifice the time-variant information, but generates more reliable and robust results. In addition to the standard least square regression with robust standard errors, two alternative approaches are adopted to deal with firm heterogeneity: outlier robust regression (Rousseeuw and Leroy, 1987) and median regression (which is a special case of quantile regressions, Koenker and Bassett, 1978).

As is discussed above, a further potential problem with much of the analysis in this area is that it is beset by endogeneity, simultaneity or the reverse causality problem. Further, one cannot simply assume a competitive market for corporate control in the context of Chinese SOEs in the way that most M&A studies do. We therefore start by testing for the potential endogeneity of productivity in ownership change by predicting ownership changes as discussed in section 4.1, and then to address the problem of multiple endogenous treatment variables with discreteness by applying Wooldridge's (2005) modified control function (MCF) approach. MCF approach possesses an advantage of allowing for multiple treatments and various

distributional characteristics over the usual control function approach (Wooldridge, 2002). The expected "correction functions" (named so to distinguish from usual control function) serve the purpose of instrumental variables, which is the correction for omitted variables bias and can be obtained through a set of standard probit reduced models of each binary variable, (which in our case the binary choice variables of ownership change). In form of:

$$Owner\_change_{ij} = 1[\theta_0' + \theta_1'X_i + \theta_2'Z_i + \upsilon_i], \ \upsilon \mid X, Z \sim \text{Normal } (0,1), \qquad ....(2)$$

where X is a vector of exogenous covariates vector; Z is a vector of available instrumental variables, which are assumed to be exogenous and redundant in determining firm growth in the structural conditional expectation. To satisfy these assumptions, we construct Z using firms' political affiliation indicators and business environmental variables. A significant proportion of Chinese firms are affiliated to some level of government for so-called supervisory purposes. As such, they are likely to be influenced by their supervisory agency, particularly in the context of ownership change. Equally, the supervisory relationship is also expected to affect the ability of firms to access finance. *Political affiliation* therefore includes a set of exclusive dummy variables capturing the level at which a firm is being supervised, such as central government or local government (province, prefecture, country, town, neighbour). The influence of political affiliations on firms' behaviour is recognised in the literature, see for example Huang (2003) and Du and Girma (2007). Further, we employ *SOE share* and the *Foreign share*, which are defined as the share in terms of sales of the relevant group in each 3-digit industry and province. We also capture the "social welfare" nature of SOEs, through the *SOE Loss Ratio*, defined as the share of the loss-making SOEs in each industry and each province. The three instrumental variables that capture the market environment within a relatively homogeneous setting

which may be relevant in explaining a firm's choice of ownership transfer. All instrumental variables are taken at their initial level to avoid possible endogeneity. This approach generates consistent, asymptotically normal estimation of the average treatment effects (Wooldridge, 2005). It also gives simple and straightforward specification test for the usual instrumental variable (IV) estimator.

5.3 Total factor productivity estimation

We construct a consistent firm-level measure of TFP 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:

$$
\begin{aligned}
y_{it} &= \beta_0 + \beta_l\, l_{it} + \beta_k\, k_{it} + \omega_{it} + \varepsilon_{it} \\
&\equiv \beta_l l_{it} + \phi_t(k_{it}, m_{it}) + \varepsilon_{it}
\end{aligned}
\tag{3}
$$

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. Levinshon 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 $E\left[\omega_{it} \mid \omega_{it-1}\right]$. 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. Levinshon 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 250 bootstrap replications are performed. Once consistent estimates of the input elasticities are derived, the log of productivity can be obtained as $\hat{\omega}_{it} = y_{it} - \hat{\beta}_l l_{it} - \hat{\beta}_k k_{it}$.

This literature on the TFP measurement is discussed in detail in Harris et al (2005), Doms and Jensen (1998), and Crisicuolo and Martin (2003), and in addition to the context of privatisation, in Boubakri et al (2005) and D'Souza et al (2005).

5. Data

This paper draws on the Annual Reports of Industrial Enterprise Statistics compiled by the National Statistics Bureau (NSB) of China, which contains the population of medium and large SOEs and private enterprises with annual turnover more than 5 million RMB Yuan[iv]. This covers some 72% of the total assets and 57.6% of the national total industrial output[v]. These firms are distributed across 30 two-digit manufacturing industries and 31 provinces (which are further grouped into 6 geographical regions in the analysis).

Table 1 demonstrates that for the period 1999-2002, 10% of Chinese SOEs were through one mechanism or another transferred to either collective enterprises, or private firms, or FIEs. This represents 7% of total assets and 9% of total output within the SOE sector, and 2.47% of total output of the Chinese manufacturing industry. At the same time, 2.85% of the private firms changed their ownership, accounting for 2.2% total output and 1.7% total assets in the whole sample. Among these firms, 60% became collective firms, 1.76% became SOEs, and the rest changed from one form to another within the private ownership category.

(Table 1 here)

Table 2 provides some descriptive statistics of the relevant variables for overall

sample and by ownership. We capture firm characteristics by age, size, exporting activity and innovation activity, as well as wage rates. The average firm age is around 14 years, while SOEs are relatively older (24 years), in contrast to PIEs (7 years), and PCOMs (10 years). SOEs are also bigger firms in terms of total employment with 433 employees per firm on average, compared to 123 employees in PIEs, and 369 employees in PCOMs.

The data demonstrate significant variation in initial total factor productivity levels; this difference being particularly marked when comparing SOEs (0.09) and private firms (1.08-1.12), although a large standard deviation indicates a great heterogeneity within the each group. 15% of firms are exporters, made up of 11% of all SOEs and 18% of private firms. In terms of export intensity, private firms export between 9 and 13% of their output, while SOEs only export 5%. On average there are around 8% firms who undertake innovation activities, with the SOE group above average (10%) compared with only 3% of PIEs and 12% of PCOMs. Innovation intensity varies between 2% and 5% (defined as the new product sales over total sales). Firms' finance constraints are captured by the ratio of firms' domestic bank loans (measured by long-term liability over its total assets). Private firms are the most constrained financially.

6. Results

Table 3 presents the results of the multinomial logit estimation of the transfer of SOEs to other types of ownership. It is clear that the potential endogeneity problem does exist; in that existing TFP level is important in explaining the transfer of firms from the state to private sector. In general, it appears that it is the smaller SOEs that are privatised, with the exception being those become private firms, where the reverse is true. Younger firms also appear more likely to be privatised. These results all fit the

"stylised facts" regarding Chinese manufacturing firms that the largest SOEs tend to be the least productive ones, and potentially least attractive to private investors. The most common explanation for this is that SOEs are simply less efficient than other firms, though an alternative is that some SOEs are either in strategic industries, or have a social welfare role in generating employment in traditional sectors. The results also show some differences across the four types of privatisation. For example, financially constrained SOEs are more likely to be taken over by foreign investors; similarly, the more the foreign investment a SOE possesses, the more likely it converts to foreign ownership but the less likely it is to become a domestic private company. While ownership change does not seem to be linked with SOEs' profitability, exporters are most likely to shift to foreign ownership, and firms with high levels of labour quality are less likely to become collectives or private individual firms. The non-state share in an industry and regional unit is positively associated with the likelihood of a SOE changing to private individual firms and domestic private companies. Neither of these results is surprising in itself, and both are consistent with similar studies for both developed and developing countries (Boubraki *et al.* 2005, D'Souza *et al.*, 2005). They do however highlight the importance of distinguishing between types of private sector firm in privatisation, rather than simply treating all forms as the same.

(Table 3 here)

Table 4 presents the results of the estimation of the performance equation for the SOEs. The specification tests of MCF estimators justify the adoption of the method, which guides us to focus on the MCF results, while offering the alternatives for comparison. In general, younger firms have higher TFP, both in levels and growth, and the importance of this diminishes with age There is an interesting contrast

between the levels and growth effects in terms of firm size, with larger firms having lower levels of productivity, but also catching up [vi]. The endogeneity-corrected estimates produce different inferences for the effects of both age and size. For example, the relationship between firm size and productivity level (growth) becomes monotonically decreasing (increasing) according to MCF estimates. Thus ignoring the endogeneity may produce biased results. Firms with higher productivity levels experience slower productivity growth, while exporting and innovation are associated with higher TFP levels, but not TFP growth. Labour quality is also, not surprisingly an important determinant of both TFP level and growth. Financing constraints are found to have significant and negative effects on firm's productivity level and growth, once one allows for the endogeneity of the privatisation decision the importance of financing constraints in productivity falls considerably. Again however this is true only for productivity levels, not growth. The apparent positive relationship between foreign investment and productivity growth disappears as the endogeneity is corrected, which may also reflect the self-selection issue. This is an important result in the context of the privatisation literature discussed above, as it diminishes the expected effects from foreign investments at firm level. Similar results emerge for exporting activity, as the coefficients of exporting dummy and intensity both lose their effects after one controls for the endogeneity. The positive impact of innovation however is consistent across the different estimators, indicating the importance of innovation in productivity growth. However, in general, the difference in the size of the point estimates across different estimators is marked.

Overall changing ownership to non-state sector increases SOEs' productivity and growth. The estimated coefficients of the ownership change dummies are generally smaller for the MCF estimator than the other estimators. This suggests that

if the endogeneity is not taken into account, then the effect of ownership change will be over stated.

The results also suggest a definite "ordering" of the productivity-enhancing effects of the various forms of ownership change. Firms changing to FIEs tend to have the highest productivity level (22.5% marginal effect) and fastest growth (22.5% marginal effect), followed by firms changing to PIEs (20.7% and 19.1% marginal effect on TFP and TFP growth), and then PCOMs (17% and 17.6% marginal effect on TFP and TFP growth) and COEs (12.7% and 13.9% marginal effects on TFP and TFP growth). The results indicate that PIEs, PCOMs and FIEs are all associated with increased total factor productivity and total factor productivity growth. Perhaps a little surprisingly, so is collective ownership. These results in general are in line with the findings presented for a range of countries, particularly the importance of foreign investment. Interestingly, while ownership change associated with foreign investors displays remarkably robust productivity-enhancing effects across model specifications, increasing foreign investment share in SOE's total finance only does not have significant effects, based on to the MCF estimates. This would appear to suggest that the appropriate corporate control rather than simply cashflow rights is the key to improving productivity.

Finally a notable result here highlights the importance of access to bank loans in generating productivity growth. Those firms that can be characterised as financially constrained are associated with lower total factor productivity, and also lower total factor productivity growth.

(Table 4 here)

Turning now to the reverse case, in which firms moved from the private to the public sector. As reported in Table 5, the multinomial logit estimation that explains

the transfer of ownership to the public sector highlights some important contrast with the privatisation results. The first thing to note is that age now has the opposite effect from the privatised cases, in that older firms are more likely to be taken into public ownership. Again however there is a tendency for it to be the smaller firms that change ownership form, which is largely in line with the general M&A literature, and suggests the usual difficulties with changing ownership of very large firms. Exporting firms are less likely to move to public ownership, as are firms with existing foreign investors (though this effect is only marginally significant). The productivity effect dominates however, and is negative, suggesting that it is the less productive firms that are taken back into public ownership. It is a widely reported result that total factor productivity for publicly owned firms is below that of their private counterparts (Gonzalez-Paramo and Hernandez De Cos, 2005), and we, in line with previous work such as Jefferson *et al.* (2000), Jefferson and Su (2006) extend this argument by finding that it is the more productive firms tend to be those that are privatised. The results presented here extend this even further, and to the best of our knowledge is the first evidence that the firms move into public ownership in China are those with below average productivity. This contrasts with the recent anecdotal evidence for China discussed above. The most likely explanation of this is that such firms are taken into state ownership to protect their existence, possibly for long-term strategic reasons. The non-state share (within an industry and region) is negatively associated with the possibility of firm's changing ownership, suggesting that the firms in the industry and region where the non-state share is higher are less likely to convert to state ownership. The coefficients of the regional dummies suggest that firms converted to SOEs are most likely to be in the central area, where large SOEs are concentrated. This contrasts with those converted to COEs and FIEs, and suggests that

ownership change may serve part of the State's resource adjustment and re-allocation policies.

(Table 5 here)

Turning to the impacts of ownership change on productivity for private firms, the results across the various estimators are consistent, suggesting less importance of endogeneity of ownership change within the private sector than for SOEs. This is perhaps not surprising. The standard rationale, as discussed by Siegel *et al.* (2005) or Harris and Robinson (2002) for example, is the competitive nature of the market for corporate control. This leads to the assumption that firms with (potential of) high productivity growth are more likely the targets for takeovers than other firms. The same rationale may not apply in the reverse case however, where other considerations are more important. Focusing on the more reliable MCF estimates, they suggest that transferring to state ownership reduces a firm's TFP (by 17.3%) and productivity growth (by 14.5%). By contrast, changing ownership to other forms does not have a statistically significant impact on productivity. Foreign investment has no significant effects on productivity (both in level and growth) within private sector companies, indeed the share of equity in private firms held by inward investors seems to be negatively associated with productivity levels. Recalling the results based on the SOEs (in Table 4), this suggests that the share of foreign finance in a firm's capital structure has little discernible effect on the productivity among Chinese firms. This however should be interpreted in a wider picture where foreign investments are likely to boost firms' productivity through technology transfer and superior management ability, which would captured by the ownership change rather than the continued ownership. This ordering is consistent with the results presented in Table 6, outlining

the effects of change of ownership for privately owned firms. Finally, both labour quality and innovation are again strongly associated with firm performance.

(Table 6 here)

7. Conclusions

This paper offers several contributions to the analysis of ownership change and productivity. Firstly, it has demonstrated the importance of allowing for endogeneity of productivity in ownership change, and how certain inferences can be sensitive to the treatment of endogeneity, particularly firm size, age and productivity. Secondly, the results confirm that privatisation in China is important for generating productivity growth. Thirdly, we find a degree of cherry picking by foreign investors when acquiring a stake of SOEs, but not when investing in private firms. Interestingly, foreign investors also have the effect of generating further productivity growth among hitherto SOEs. This highlights the second contribution of this paper, which is to distinguish between different types of ownership change in a manner that has, to the best of our knowledge not been done previously for China, and seldom at all. The results indicate that the transfer of SOEs to the private sector is important for productivity growth, and there is a consistent ranking of the productivity growth effects of privatisation. Changing to foreign ownership generates the greatest productivity-enhancing effect among SOEs, followed by the transfer to private individual enterprises, then to private company, and finally to collectively owned enterprises, which is still significant. Finally, our results question the wisdom of taking firms back into public ownership, as this appears to be associated with lower productivity, both in terms of level and growth.

Notes:

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[i] *China plans to profit from Marx*, Jane MaCartney, *The Times* Jan 3, 2006, *China: Battle for Oil and Money, Kremlin Style*, Antoaneta Bezlova, *Energy Bulletin* October 2004;
http://www.energybulletin.net/2927.html.

[ii] There is an alternative strand in this literature based on Brous, and Kini, (1993) or Matsusaka (1993) that evaluate merger decisions on the basis of "external calculations such as Q ratios, though that is clearly impractical for private individual firms or SOEs.

[iii] See Greene (2005) chapter 21.

[iv] RMB is China's legal tender, and Yuan is the unit of RMB Its average exchange rate with USD is around 8.3:1 during 1999-2002.

[v] The percentages are calculated at the mean level during the period 1999-2002, based on our data and the statistics reported in Chinese Statistical Yearbook (2003).

[vi] According to the estimates in Table 5, the mean turning point of firm size is between 363-794 persons. This means there are 10-20% firms that have reached this level in our sample. However this result does not hold in MCF estimation.

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Tables

Table 1: Ownership changes during 1999-2002 (mean over the period)

To ==>	No change	Change to SOE	Change to Collectives	Change to private		Chang FIE
				To PIEs	To PCOMs	
Change from below:						
SOE	45,596	/	987	865	2889	110
Private	79,774	405	1,435	/		503
PIEs	*51,664*	*30*	*741*	*/*	*1376*	*335*
PCOMs	*24,589*	*375*	*694*	*2146*	*/*	*168*

Note: The figures are calculated based on the database used in this paper.

Table 2 Descriptive Statistics

Variables and Definitions	Overall		SOEs		PIEs		PCOMs	
	Mean	Sta.dev	Mean	Sta.dev	Mean	Sta.dev	Mean	Sta.dev
Explained variables (mean level)								
TFP growth	0.01	0.72	-0.03	0.75	0.06	0.69	0.02	0.72
TFP level	0.73	1.18	0.09	1.29	1.12	0.84	1.08	1.18
Explanatory variables (initial level)								
Age	13.42	15.39	23.57	17.51	5.69	5.98	10.07	13.71
Size (total employment)	293	1218	433	1804	123	292	369	947
Size (log of total employment)	4.50	1.60	4.51	1.98	4.27	1.13	4.91	1.55
TFP level	0.72	1.24	0.11	1.38	1.09	0.90	1.07	1.13
Normalized profit (total profit, normalized by average level by industry, province and ownership)	0.99	64.70	0.86	95.71	0.72	22.40	1.77	49.72
Export participation (export dummy)	0.15	0.36	0.11	0.31	0.18	0.38	0.18	0.39
Exporting intensity (exports/total employment)	0.09	0.47	0.05	0.51	0.13	0.34	0.09	0.60
Innovation participation (innovation dummy)	0.08	0.27	0.10	0.30	0.03	0.18	0.12	0.33
Innovation intensity (New products sales/total sales)	0.03	0.13	0.03	0.13	0.02	0.11	0.05	0.18
Labour quality (total wage and salary/total employment, normalized by average level by industry, province and ownership)	0.98	2.37	0.97	2.96	0.96	1.39	1.05	2.70
Financial constraints (Bank loans/total assets)	0.09	0.20	0.14	0.25	0.05	0.14	0.09	0.16
Foreign investment/total external finance (%)	0.65	6.49	0.27	3.38	0.89	8.23	0.83	6.66
Non-state share (share of non-SOEs within industry and region)	0.80	0.19	0.70	0.21	0.88	0.14	0.82	0.16

Note: Data are deflated using industry-specific ex-factory price indices obtained from China Statistical Yearbook (2000-2003).

Table 3: Determination of Ownership Change: **SOEs**

Explained Variable: Choice of ownership change	To COEs Coeff. (Standard. err.)	To PIEs Coeff. (Standard. err.)	To PCOMs Coeff. (Standard. err.)	TO FIEs Coeff. (Standard. err.)
Age	-0.0118***	-0.0133***	-0.0128***	-0.0445***
	(0.0035)	(0.0028)	(0.0015)	(0.0085)
Age-squared	0.0000292	0.0000501***	0.0000399***	0.000111**
	(0.000046)	(0.000019)	(0.000010)	(0.000046)
Size (log employment)	0.358***	0.272***	0.0626*	0.510**
	(0.067)	(0.071)	(0.036)	(0.23)
Size-squared	-0.0468***	-0.0334***	0.0118***	-0.0433*
	(0.0082)	(0.0086)	(0.0039)	(0.024)
TFP level	0.376***	0.255***	0.358***	0.283***
	(0.030)	(0.031)	(0.018)	(0.090)
Financial constraints	-0.133	-0.146	-0.0299	0.569**
	(0.17)	(0.17)	(0.100)	(0.24)
Foreign investments	-0.838	-0.176	-1.646**	5.445***
	(1.24)	(1.14)	(0.70)	(0.48)
Profitability	-0.0000735	-0.0000362	-0.0000701	0.000151
	(0.00028)	(0.00036)	(0.00014)	(0.0011)
Exporting participation	-0.0372	-0.0370	0.292***	1.298***
	(0.12)	(0.14)	(0.061)	(0.25)
Exporting intensity	-0.00419	-0.0264	-0.0235	0.0357
	(0.060)	(0.097)	(0.050)	(0.049)
Labour quality	-0.106***	-0.156***	0.00187	-0.0273
	(0.036)	(0.046)	(0.0054)	(0.055)
Non-state share	0.0336	0.413**	0.580***	0.701
	(0.19)	(0.20)	(0.11)	(0.64)
Central area	-0.423***	0.272***	-0.193***	-0.0665
	(0.085)	(0.084)	(0.051)	(0.25)
West area	-0.248**	-0.0567	0.242***	-0.864**
	(0.10)	(0.11)	(0.056)	(0.41)
Constant	-3.932***	-4.161***	-3.467***	-7.408***
	(0.22)	(0.24)	(0.13)	(0.80)
Observations	43232			
Hausman test of IIA: H0: Odds are independent of other alternatives				
Chi_squared (df)	-4.944 (65)	-8.950(64)	-29.094(64)	-1.118(59)

Note 1: Multinomial logit model for ownership changes (Choice set: 0: no change (base group); 2: change to COEs; 2: change to PIEs; 3: change to PCOMs; 4. change to FIEs). The reported Hausman tests for IIA validate the application of multinomial tests by confirming the independence of alternatives.
Note 2: All estimations involve industry dummy.
Note 3: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table 4: Impacts of Ownership Change on TFP (and Growth): **SOEs**

Explained variable	TFP Level				TFP Growth			
Estimation method	Robust-OLS	Outlier	Median	MCF	Robust-OLS	Outlier	Median	MCF
	Coeff.(se.)	Coeff.(se.)	Coeff.(se.)	Coeff.(se.)	Coeff. (se.)	Coeff.(se..)	Coeff.(se.)	Coeff.(se.)
Age	-0.014***	-0.019***	-0.015	0.002	-0.005***	-0.004***	-0.003***	-0.007***
	(0.001)	(0.000)	(0.000)***	(0.001)***	(0.000)	(0.000)	(0.000)	(0.001)
Age-squared	0.00008***	0.00026***	0.00014	0.00009	0.00004***	0.00003***	0.00003***	0.00013***
	(0.003)	(0.001)	(0.001)***	(0.002)***	(0.001)	(0.000)	(0.000)	(0.002)
Size (employment)	-0.394***	-0.369***	-0.342	-0.048	0.015**	0.037***	0.042***	0.012
	(0.010)	(0.009)	(0.010)***	(0.009)***	(0.007)	(0.004)	(0.004)	(0.008)
Size-squared	0.118***	0.117***	0.116	-0.045	0.011***	0.006***	0.005***	0.012***
	(0.002)	(0.002)	(0.002)***	(0.003)***	(0.002)	(0.001)	(0.001)	(0.001)
TFP level	/	/	/	/	-0.213***	-0.150***	-0.145***	-0.220***
					(0.005)	(0.002)	(0.002)	(0.007)
Finance constraints (Bank loans/total assets)	-0.471***	-0.427***	-0.432***	-0.200***	-0.069***	-0.031***	-0.041***	-0.062***
	(0.030)	(0.023)	(0.027)	(0.018)	(0.020)	(0.012)	(0.011)	(0.022)
Foreign investment in total external finance	0.732**	0.751***	0.851***	-0.280	0.197	0.246	0.051	0.167
	(0.292)	(0.213)	(0.237)	(0.291)	(0.211)	(0.155)	(0.147)	(0.240)
Exporting participation (dummy)	0.243***	0.167***	0.187***	0.004	0.011	0.005	0.011	0.008
	(0.020)	(0.018)	(0.021)	(0.015)	(0.013)	(0.009)	(0.008)	(0.015)
Exporting intensity (exports/total sales)	0.011	0.018*	0.013	-0.005	-0.002	-0.007	0.001	-0.002
	(0.008)	(0.010)	(0.010)	(0.011)	(0.009)	(0.004)	(0.004)	(0.018)
Innovation participation (dummy)	0.226***	0.143***	0.145***	0.087***	0.020	0.017	0.005	0.020
	(0.026)	(0.024)	(0.028)	(0.022)	(0.016)	(0.011)	(0.011)	(0.016)
Innovating intensity (exports/total sales)	0.245***	0.275***	0.358***	0.120**	0.065*	0.033	0.047*	0.061
	(0.065)	(0.053)	(0.063)	(0.050)	(0.037)	(0.025)	(0.024)	(0.038)
labour quality	0.045***	0.325***	0.147***	0.034***	0.002	0.004***	0.004***	0.008***
	(0.006)	(0.002)	(0.002)	(0.005)	(0.002)	(0.001)	(0.001)	(0.002)
Ownership change to collectives	0.514***	0.485***	0.469***	0.127***	0.151***	0.105***	0.094***	0.139***
	(0.032)	(0.033)	(0.039)	(0.023)	(0.018)	(0.015)	(0.014)	(0.017)
Ownership change to private individual	0.422***	0.426***	0.458***	0.207***	0.172***	0.129***	0.110***	0.191***
	(0.031)	(0.036)	(0.042)	(0.018)	(0.023)	(0.016)	(0.015)	(0.018)
Ownership change to private company	0.508***	0.467***	0.485***	0.170***	0.163***	0.100***	0.089***	0.176***
	(0.019)	(0.020)	(0.024)	(0.015)	(0.013)	(0.009)	(0.009)	(0.015)
Ownership change to foreign-owned firms	0.469***	0.397	0.415***	0.255**	0.219**	0.124***	0.123***	0.225
	(0.112)	(0.100)***	(0.117)	(0.105)	(0.087)	(0.045)	(0.043)	(0.085)***
Regional dummy: central area	-0.070***	-0.154***	-0.146***	0.725***	-0.023***	-0.028***	-0.037***	0.002
	(0.013)	(0.012)	(0.014)	(0.012)	(0.009)	(0.006)	(0.005)	(0.012)
Regional dummy: west area	-0.233***	-0.309***	-0.299***	-0.256***	-0.001	-0.021***	-0.026***	0.003
	(0.014)	(0.013)	(0.016)	(0.011)	(0.010)	(0.007)	(0.006)	(0.009)
Constant	0.734***	0.458***	0.456***	-1.323***	-0.167***	-0.188***	-0.193***	-0.154***
	(0.029)	(0.024)	(0.028)	(0.023)	(0.019)	(0.012)	(0.011)	(0.021)
Observations	42917	42916	42917	42578	34097	34097	34097	33839

Note 1: Wooldridge's (2005) MCF method involves correction function (CF) for potential endogenous variables, i.e. ownership change binary choice variables in this paper; and interaction terms of the correction functions with the differences of exogenous covariates and their means. The correction functions are defined through proposed mechanism, specifically the normal density of the predicted probabilities obtained through Probit models. The significance of the correct function itself vindicates the appropriate application of this approach. We leave the lengthy details out from the table above, which are available under requests.
Note 2: All estimations involve industry dummy; Note 3: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Determination of Ownership Changes: **Private Firms**

Explained Variable: Choice of ownership change	To SOEs Coeff. (Standard. err.)	To COEs Coeff. (Standard. err.)	TO FIEs Coeff. (Standard. err.)
Age	0.0423*** (0.0093)	0.0853*** (0.0086)	-0.0217 (0.014)
Age-squared	-0.000413** (0.00017)	-0.00181*** (0.00022)	-0.0000777 (0.00033)
Size (log employment)	-0.640*** (0.10)	-0.0147 (0.068)	0.0216 (0.14)
Size-squared	0.104*** (0.010)	-0.00229 (0.0082)	0.0180 (0.014)
TFP level	-0.282*** (0.045)	0.156*** (0.030)	0.0506 (0.052)
Financial constraints	0.513* (0.26)	0.689*** (0.14)	0.230 (0.35)
Foreign investments	-5.309* (2.91)	0.0353 (0.41)	4.195*** (0.14)
Profitability	-0.000880* (0.00053)	-0.000620 (0.00067)	0.000610 (0.0011)
Exporting participation	0.336* (0.19)	-0.0432 (0.088)	1.190*** (0.10)
Exporting intensity	-0.723** (0.34)	0.0233 (0.068)	0.0572** (0.025)
Labour quality	0.0137 (0.014)	-0.00147 (0.012)	0.0180*** (0.0068)
Non-state share	-2.451*** (0.28)	-1.946*** (0.17)	-0.958** (0.39)
Central area	0.374*** (0.13)	-0.265*** (0.076)	-0.422*** (0.16)
West area	0.0428 (0.16)	-0.661*** (0.11)	-0.858*** (0.25)
Constant	-2.540*** (0.37)	-2.929*** (0.23)	-5.107*** (0.50)
Observations	78762		
Hausman test of IIA: H_0: Odds are independent of other alternatives			
Chi_squared (df)	-0.0264 (44)	-0.9741(44)	-0.713(40)

Note 1: Multinomial logit model for ownership changes (Choice set: 0: no change (base group); 1. change to SOEs; 2. change to COEs; 4. change to FIEs). The reported Hausman tests for IIA validate the application of multinomial tests by confirming the independence of alternatives.
Note 2: All estimations involve industry dummy.
Note 3: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table 6: Impacts of Ownership Change on TFP (and Growth): **Private Firms**

Explained variable	TFP Level				TFP growth			
Estimation method	Robust-OLS	Outlier Robust	Median	MCF	Robust-OLS	Outlier Robust	Median	MCF
	Coeff.(se.)	Coeff.(se.)	Coeff.(se.)	Coeff.(se.)	Coeff.(se.)	Coeff.(se.)	Coeff.(se.)	Coeff.(se.)
Age	-0.009***	-0.008***	-0.008***	-0.011***	-0.007***	-0.005***	-0.005***	-0.008***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)
Age-squared	0.00007***	0.00007***	0.00007***	0.00033***	0.00011***	0.00007***	0.00006***	0.00016***
	(0.001)	(0.001)	(0.001)	(0.004)	(0.002)	(0.002)	(0.001)	(0.003)
Size (employment)	-0.339***	-0.335***	-0.379***	-0.459***	0.005	0.048***	0.040***	-0.039***
	(0.010)	(0.008)	(0.008)	(0.010)	(0.008)	(0.005)	(0.005)	(0.009)
Size-squared	0.089***	0.093***	0.104***	0.132***	0.008***	-0.001	0.001	0.023***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)
TFP level	/	/	/	/	-0.321***	-0.226***	-0.224***	-0.335***
					(0.005)	(0.002)	(0.002)	(0.005)
Finance constraints (Bank loans/total assets)	-0.413***	-0.376***	-0.364***	-0.478***	-0.118***	-0.060***	-0.072***	-0.103***
	(0.026)	(0.020)	(0.022)	(0.025)	(0.020)	(0.014)	(0.014)	(0.022)
Foreign investment in total external finance	-0.073	-0.022	0.044	-0.678***	0.085	0.034	0.078	-0.054
	(0.092)	(0.063)	(0.069)	(0.169)	(0.109)	(0.049)	(0.050)	(0.125)
Exporting participation (dummy)	0.037***	0.014	-0.008	0.025	-0.043***	0.005	-0.005	-0.047*
	(0.009)	(0.009)	(0.009)	(0.016)	(0.012)	(0.008)	(0.006)	(0.024)
Exporting intensity (exports/total sales)	-0.000	0.001	-0.002	-0.028	0.062***	-0.034***	-0.011**	0.062+
	(0.007)	(0.008)	(0.005)	(0.019)	(0.016)	(0.010)	(0.005)	(0.037)
Innovation participation (dummy)	0.063***	0.029	0.015	0.178***	-0.001	-0.010	-0.010	0.022
	(0.022)	(0.018)	(0.020)	(0.020)	(0.016)	(0.012)	(0.013)	(0.014)
Innovating intensity (exports/total sales)	0.147***	0.154***	0.209***	0.084*	0.111***	0.100***	0.092***	0.097***
	(0.040)	(0.031)	(0.035)	(0.035)	(0.031)	(0.022)	(0.022)	(0.031)
labour quality	0.048***	0.178***	0.140***	0.084***	0.006***	0.003***	0.002*	0.009***
	(0.010)	(0.002)	(0.001)	(0.008)	(0.001)	(0.001)	(0.001)	(0.003)
Ownership change to SOEs	-0.385***	-0.353***	-0.318***	-0.173***	-0.164***	-0.097***	-0.076***	-0.145***
	(0.055)	(0.040)	(0.045)	(0.064)	(0.031)	(0.024)	(0.024)	(0.042)
Ownership change to collectives	0.121***	0.090***	0.060**	-0.004	-0.010	-0.014	-0.017	-0.017
	(0.021)	(0.021)	(0.024)	(0.020)	(0.014)	(0.012)	(0.013)	(0.018)
Ownership change to foreign-owned firms	0.091**	0.051	0.046	0.024	0.034	0.031	0.020	0.019
	(0.037)	(0.036)	(0.040)	(0.040)	(0.026)	(0.021)	(0.021)	(0.023)
Regional dummy: central area	-0.137***	-0.130***	-0.098***	-0.032***	-0.027***	-0.015***	-0.019***	-0.016
	(0.009)	(0.008)	(0.008)	(0.009)	(0.008)	(0.005)	(0.006)	(0.010)
Regional dummy: west area	-0.200***	-0.226***	-0.194***	-0.080***	-0.033***	-0.044***	-0.041***	-0.020**
	(0.011)	(0.010)	(0.011)	(0.013)	(0.010)	(0.007)	(0.007)	(0.010)
Constant	1.587***	1.445***	1.764***	1.615***	0.293***	0.123***	0.137***	0.455***
	(0.028)	(0.019)	(0.021)	(0.025)	(0.023)	(0.013)	(0.014)	(0.032)
Observations	78958	78957	78958	78697	48363	48362	48363	48052

Note 1: Wooldridge's (2005) MCF method involves correction function (CF) for potential endogenous variables, i.e. ownership change binary choice variables in this paper; and interaction terms of the correction functions with the differences of exogenous covariates and their means. The correction functions are defined through proposed mechanism, specifically the normal density of the predicted probabilities obtained through Probit models. The significance of the correct function itself vindicates the appropriate application of this approach. We leave the lengthy details out from the table above, which are available under requests.
Note 2: All estimations involve industry dummy; Note 3: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Appendix 1: The Classification and Definition of Different Types of Chinese Firms

Following the classification convention of Chinese National Statistics Bureau, and "The Regulation of the People's Republic of China (PRC) on the Management of Registration of Corporate Enterprises." (short for "Regulation"), as well as previous literature, we classify the firms into the state-owned enterprises, collectively owned enterprises, domestic private individual enterprises, domestic share-holding companies and limited companies, and foreign invested firms. It is noteworthy that the few work has made advances on a reasonable classification beyond the traditional breakdown, which is an attempt we are making here. The details are following.

State-owned enterprises (SOEs)

This group mainly includes registered SOEs according to the Regulation. They are non-corporation economic units where the entire assets are owned by the state. The state government therefore assigns managers to run the enterprise; and state banks (used to be government agent and now still under government control) construct and enforce the credit plans. Differentiated from state-owned enterprise in national registration system, three other types are also included in this group, which are joint state-owned enterprises that are established by two or more state-owned enterprises through joint investment on the basis of equality, voluntary participation, and mutual benefits; joint state and collectively owned enterprises that are established by two or more state-owned enterprises and collectively owned enterprises with similar principles; finally limited liability corporations solely funded by the state. The above-mentioned four types comprise respectively 93.7%, 1.1%, 2.6%, and 2.6% of the SOEs group.

Collectively owned enterprise (COEs)

COEs are the economic units such that the assets are owned by collectives. The collective here means the community in the city or rural area. COEs are normally under local governments' supervision. However, since local government can be considered as the agent of central government, any firm owned by local government is also owned by central government. Apart from registered COEs according to the Regulation, this group also includes joint collectively owned enterprises, cooperative enterprises, and other joint ownership enterprises. Meanwhile, township-village enterprises (TVEs) are included in this group that locate in rural areas and collectively owned or with most of its investment from residents in these rural areas. TVEs are not distinguished from other COEs in this paper.

Domestic private individual enterprises (PIEs)

Domestic private individual enterprises include four types of private firms, solely private funded enterprises, private cooperative enterprises, private limited liability corporations, and private share-holding corporation limited. These economic units are all registered as private individual enterprises according to the Regulation. Generally speaking, this type of firms are normally smaller and younger, possibly start with family business or group of individual investors, and are run in a relatively more flexible form, compared with PCOMs below.

Domestic private companies (PCOMs)

Domestic private companies include the rest of the private enterprises, mainly share-holding corporation limited and other limited companies. These economic units are all registered as private individual enterprises according to the Regulation. Share-holding companies limited are economic units registered in accordance with the Regulation, with total registered capital divided into equal shares and raised through issuing stocks. Each investor bears limited liability to the company depending to the holding of shares, and the corporation bears liability to its debt to the maximum of its total assets. Generally speaking, this type of companies are normally bigger than private individual enterprises, and in a relatively more mature stage of company development, also more strictly subject to regulations.

Foreign invested enterprises (FIEs)

Foreign-invested firms refer to the enterprises invested by foreign investments, and foreign investments must be more than 25% of registered assets according to the Regulation. This group includes FIEs with investments both from Hong Kong, Tai Wan and Macau and foreign countries.

Table A1. The classification of ownership

State-owned enterprises (SOEs)

State owned enterprises (*Guo you qi ye*)

Joint state-owned enterprises (*Guo you lian ying qi ye*)

Joint state and collective-owned enterprises (*Guo you yu ji ti lian ying qi ye*)

Limited liability corporations which are solely funded by the state (*Guo you du zi gong si*)

Collectively owned enterprises (COEs)

Collectively owned enterprises (*Ji ti qi ye*)

Joint collectively owned enterprises (*Ji ti lian ying qi ye*)

Cooperative enterprises (*Gu fen he zuo qi ye*)

Other joint ownership enterprises (*Qi ta lian ying qi ye*)

Private individual enterprises (PIEs)

Solely private funded enterprises (*Si ying du zi qi ye*)

Private cooperative enterprises (*Si ying he huo qi ye*)

Private limited liability corporations (*Si ying you xian ze ren gong si*)

Private share-holding corporations limited (*Si ying gu fen you xian gong si*)

Private companies (PCOMs)

Other Limited liability corporations (*Qi ta you xian ze ren gong si*)

Share holding companies (*Gu fen you xian dong si*)

Foreign invested enterprises (FIEs)

FIEs – invested by Hong Kong, Macau, and Tai Wan

FIEs - invested by foreign owned firms

Note: Chinese translations in parentheses.