The more the better? Foreign ownership and corporate performance in China

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Abstract

Using a panel of 21,582 Chinese firms over the period 2000-2005, we examine the relationship between the degree of foreign ownership and corporate performance in recipient firms. We find that foreign ownership is positively associated with firms' return on assets, return on sales, labor productivity, and total factor productivity. Yet, the relationship exhibits an inverted *U*-shaped pattern: corporate performance increases as foreign participation rises up to about 47%-64%, and declines thereafter. This suggests that in China, joint-ventures between domestic and foreign enterprises are the top performers.

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1. Introduction

A vast literature has investigated the effects of Foreign Direct Investment (FDI) on economic growth reaching a consensus that, especially in developing countries, FDI is an engine of growth (see De Mello, 1997, for a survey). Yet, there is still uncertainty about the exact channels by which FDI may foster growth. Factors such as knowledge spillovers from foreign owned to domestic enterprises or technological upgrading could represent possible channels. A wave of papers has tried to measure these spillovers by estimating regressions of the productivity of domestic firms on variables such as the share of foreign firms in a given sector's output or employment. Much of this work, however, fails to find positive horizontal spillovers, with some studies reporting negative effects of multinational presence on domestic productivity (see Blomström and Kokko, 1998; and Görg and Greenaway, 2004, for surveys).

One condition for spillovers to take place is that foreign owned firms are more productive than their domestic counterparts. A number of papers within the international economics literature, have tested whether or not this is the case, obtaining once again, mixed results. On the one hand, Globerman et al. (1994) analyze a cross-section of Canadian establishments and find that, once size, capital intensity, and workforce composition are controlled for, foreign owned firms do not exhibit superior performance compared to their domestic counterparts. Focusing on the UK car industry, Griffith (1999a, 1999b) finds low and insignificant differences in the total factor productivity (TFP) of foreign owned and domestic firms. Using a panel of Italian firms, Benfratello and Sembenelli (2006) show that, with the exception of US-owned firms, foreign ownership is not necessarily associated with higher productivity. On the other hand, based on a cross-section of US establishments, Doms and Jensen (1998) reach opposite conclusions. Similarly, Girma et al. (2001), Harris (2002), and Harris and Robinson (2003) find evidence that in the UK, foreign owned firms generally perform better than their purely domestic counterparts. Finally, Temouri et al. (2008) find that in Germany, foreign owned firms are more productive than their domestic counterparts, but argue that what really matters in testing productivity advantages is not being foreign owned, but being a multinational (foreign or domestic).

The issue of whether foreign owned firms are more productive than their domestically-owned counterparts has also been tackled within the privatization literature, which has analyzed the economic effects of ownership on corporate

performance in transition economies, including China (see Megginson and Netter, 2001; and Estrin et al., 2008, for surveys). Although their main focus is generally on the effects of state ownership or private ownership, most of the studies in this literature control for foreign ownership, and find that foreign owned firms tend to perform better than their domestic counterparts.

A shortcoming of many of these studies, especially those in the international economics literature, is that they focus on the effects of foreign ownership on firm performance, without considering the effects of different degrees of foreign ownership. In particular, most studies divide firms into foreign owned and purely domestic using some a priori criterion, and compare various measures of firm performance across the two groups[1]. Exception are Aitken and Harrison (1999), Blomström and Sjöholm (1999), and Takii (2004). Aitken and Harrison (1999) use a panel of Venezuelan manufacturing firms to analyze the extent to which foreign equity participation affects the performance of recipient firms, and find positive effects only for small plants. Blomström and Sjöholm (1999) focus on Indonesian establishments and show that although foreign ownership is always associated with higher labor productivity of recipient firms, whether firms are majority or minority owned by foreigners does not matter. Using Indonesian data, Takii (2004) finds that wholly foreign owned firms tend to be the most productive. Although they do consider different degrees of foreign ownership, neither of these studies provides a full investigation of the possible non-linearity of the relationship between the degree of foreign ownership and the corporate performance of recipient firms[2].

Our aim is to provide, for the first time, an in-depth analysis of the exact nature of the relationship between the degree of foreign ownership and the performance of recipient firms. For this purpose, we use a panel of 21,582 Chinese

[1] For instance, Girma et al. (2001) define a firm as foreign owned if the country of origin of its ultimate holding company is not the UK, while Benfratello and Sembenelli (2006) consider a firm as foreign owned when (a percentage of) its shares have been acquired by a foreign investor with the aim of managing – at least partially – the activities of the firm.

[2] Contrary to the international economics literature, many studies in the privatization literature use continuous measures of foreign ownership. Yet, to the best of our knowledge, Djankov (1999) is the only study that allows for a non monotonic relationship between the degree of foreign ownership and labor productivity growth in a sample of firms from Georgia, Kazakstan, the Kyrgyz Republic, Moldova, Russia, and Ukraine. Yet, his focus is on enterprise restructuring, rather than corporate performance. Moreover, he himself admits that his results might not be representative given the small number of foreign owned firms in his sample.

unlisted firms operating in the entire economy, over the period 2000-2005[3]. The Chinese case offers us a unique opportunity to perform sharp tests of the effects of the degree of foreign ownership on corporate performance for two reasons. First, China is among the top FDI recipients in the world. Over the past decade, it has accounted for about one-third of gross FDI flows to all emerging markets and about 60% of these flows to Asian emerging markets (Prasad and Wei, 2005). Together with a considerable decline in the number of state-owned and collective firms, and a rise of privately owned firms, the increasing number of foreign firms operating in China has contributed dramatically to changing the Chinese corporate landscape[4]. Second, joint-ventures and wholly foreign owned firms coexist, which makes a study of the degree of foreign ownership on corporate performance particularly relevant. In the early days of China's opening up, foreign agents invested mainly into large and well performing state owned enterprises (SOEs) in the form of joint-ventures. Fully foreign owned firms were only allowed to enter at a later stage. Until 2000, they were required to either provide advanced technology or to be primarily export-oriented, and were located mainly in the special economic zones, where they received a favorable tax treatment, and benefited from streamlined regulations (Dougherty and McGuckin, 2002). Our data show that in 2005, half of the foreign owned firms covered were wholly foreign owned, while the other half were joint-ventures. It should also be noted that in recent years, joint-ventures have more and more frequently become partnerships with private rather than state owned enterprises.

We measure the degree of foreign ownership characterizing a firm as the share of its equity owned by foreign investors. We make use of several measures of corporate performance and find that firms with some degree of foreign ownership generally perform better than domestic firms. Yet, the relationship between foreign ownership and corporate performance is non monotonic: corporate performance increases as foreign participation rises up to about 47%-64%, and declines thereafter. This suggests that in the Chinese context, the top performers are joint-ventures

[3] Also see Abraham et al. (2007) and Liu (2008) who investigate whether domestic firms benefit from horizontal spillovers from foreign firms, controlling respectively for whether or not firms are joint-ventures and for the percentage of the firms' equity owned by foreign investors. Neither of these studies allows for a non monotonic relationship between the degree of foreign ownership and the performance of recipient firms. Another related paper is Du and Girma (2008), who use data for Chinese firms to investigate the effects of foreign acquisitions on export markets dynamics.

[4] Specifically, while until 1993, state-owned enterprises still dominated the scenario, in 2005, they represented less than 5% of the total number of firms operating in China, while private firms represented 73.53%, collective firms 6.33%, and foreign firms, 15.38% (Guariglia et al., 2008).

between domestic and foreign enterprises, whereby the former bring in knowledge of the Chinese market and legal environment and political connections with local governments, while the latter bring in modern technologies, capital, better corporate governance through monitoring and market discipline, and managerial and international networking skills. Our results are robust to defining the degree of foreign ownership on the basis of the capital paid in by various foreign agents, and on the basis of registration information. Furthermore, it is those firms owned by investors other than those originating from Hong Kong, Macao, and Taiwan that benefit most from foreign ownership. Our findings contribute to the understanding of the link between FDI and economic growth: in countries where FDI inflows are large and mainly take the form of joint-ventures between domestic and foreign firms, the effect of FDI penetration on the performance of recipient firms could be another important channel through which FDI affects economic growth[5].

The remainder of the paper is organized as follows. In Section 2, we describe our data and present some descriptive statistics. Section 3 illustrates our baseline specification and our estimation methodology. Section 4 describes and evaluates our regression results. Section 5 presents a theoretical model, aimed at rationalizing our empirical findings, and Section 6 concludes.

2. Data and summary statistics

2.1 Data

Our data set is drawn from the annual accounting reports taken from the ORIANA database, published by Bureau Van Dijk Electronic Publishing (BvDEP). The database includes balance sheet and profit and loss information for over 23,000 Chinese companies, over the period 2000-2005. We dropped observations with negative sales; as well as observations with negative total assets minus total fixed assets and total assets minus liquid assets. Firms that did not have complete records on our main regression variables were also dropped. Finally, to control for the potential influence of outliers, we excluded observations in the one percent tails for each of our regression variables. Our final dataset covers 21,582 unlisted firms, which

[5] Based on survey evidence for 1995, Javorcik and Saggi (2004) document that in Eastern European countries, which are large FDI recipients, joint-ventures outnumber direct entries and account for 59% of all projects.

operate in the entire economy[6], and corresponds to 91,576 firm-year observations[7]. Our panel is unbalanced, with number of observations ranging from a minimum of 11,813 in 2000 to a maximum of 17,665 in 2004[8].

As ORIANA does not include complete time-varying ownership information, we have augmented it with information on the ownership of industrial firms obtained from the National Bureau of Statistics (NBS) of China. Specifically, ownership is defined on the basis of the fraction of paid-in-capital contributed each year by six different types of investors, namely the state; foreign investors (excluding those from Hong Kong, Macao, and Taiwan); investors from Hong Kong, Macao, and Taiwan; legal entities; individuals; and collective investors. The foreign ownership variable on which we will focus in this paper is given by the share of the firm's capital paid in by all foreign investors, including those from Hong Kong, Macao, and Taiwan. We will also provide specifications showing whether the effects of ownership by the two groups of foreign investors are different. We will verify the robustness of our results to the use of registration-based ownership measures. However, defining ownership categories on the basis of the fraction of capital paid in by various groups is preferable to using registration codes. The latter are in fact updated only with considerable delay (Dollar and Wei, 2007). Moreover, firms might have an incentive to falsely register as foreign simply to take advantage of the tax benefits accorded to the latter.

2.2 Summary statistics

We divide our observations into four categories on the basis of the fraction of their capital paid in by foreign investors[9]. Our first category encompasses those firm-years with no foreign participation, which make up 60.95% of our sample. Our second category contains those observations with a share of foreign capital, which is positive but lower than 50%. This category represents 10.47% of our sample. Our third category includes observations with a share of foreign capital higher than or equal to

[6] Most of the studies that tried to assess the effects of foreign ownership on firm performance focused on the manufacturing sector. In the Chinese context, it is important to consider other sectors as well, as non-manufacturing sectors also attract significant levels of foreign investment (see Table 2 for details). All our results were robust to considering only firms operating in the manufacturing sector.

[7] We have excluded listed firms from our analysis as information on their ownership was not available.

[8] See Appendix 1 for details about the structure of our panel, and complete definitions of all variables used.

[9] Our observations refer to firm-years. We therefore allow our firms to switch across ownership categories each year.

50% but lower than 100%, and makes up 8.61% of our sample. Our final category contains firms that are 100% foreign owned, and represents 19.07% of our sample.

Table 1 shows how our observations are distributed among the four categories in China's 30 provinces, which are in turn divided into three broad regions (Coastal, Central, and Western)[10]. We can see that most of the foreign owned firm-years are concentrated in the Coastal region, where only 50.62% of the firms are domestically owned. The corresponding figures in the Central and Western regions are 87.36% and 89.86%, respectively. This geographical concentration of foreign owned firms may have its root in the FDI promotion policies adopted in the past, and in the inadequate infrastructures characterizing the Central and Western regions (Dougherty and McGuckin, 2002). Focusing on specific provinces, Guandong contains the lowest percentage of domestically owned firm-years (25.74%), while Qinghai has the highest (98.61%). Guandong also contains the highest share of wholly foreign owned firms (52.73%), while the highest share of partially foreign owned firms is in Shanghai (34.79%). In sum, Table 1 indicates that although all Chinese provinces exhibit some degree of foreign ownership, there is a substantial heterogeneity in the degree of foreign presence across provinces.

Table 2 presents a similar analysis for 15 industrial groups[11]. Our sample is mainly made up of manufacturing firm-years (87.90%). Yet, because foreign ownership also characterizes other sectors in the economy, we include some of these in our analysis. The Table shows that except for "Mining" and "Transportation; Communication, Electric, Gas, and Sanitary Services", all sectors are characterized by a percentage of foreign owned firm-years in excess of 20%[12]. There is also considerable heterogeneity in the degree of foreign ownership across sectors. In particular, "Other Manufacturing" contains the highest share of wholly foreign owned firm years (45.95%)[13]. The highest percentage of partially foreign owned firm-years is

[10] China is administratively decomposed into 31 provincial units, which fall into three categories: 22 provinces or *sheng*; 4 autonomous regions or *zizhiqu* (Nei Monggol, Xinjiang, Tibet, Ningxia and Guangxi); and 4 municipal cities or *zhixiashi*, under direct supervision of the central power (Shanghai, Tianjin, Beijing, and, since 1997, Chongqing). Tibet is excluded from our dataset due to lack of data.

[11] These groups are based on two-digit SIC groups for the manufacturing sector, and on the broader SIC divisions for the non-manufacturing sector for which fewer observations are available.

[12] Note that 96.74% of the observations in the broad sector "Transportation, Communication, Electric, Gas, and Sanitary Services" comes from "Electric, Gas, and Sanitary Services". This broad sector is largely controlled by the State.

[13] "Other Manufacturing" contains, among others, measuring, analyzing, and controlling instruments; photographic, medical and optical goods; watches and clocks; jewellery, silverware, and plated ware;

in the wholesale and retail sector (30.84%). The Table also shows that foreign firms have entered both labor-intensive industries such as "Textiles, Clothing, and Leather", and capital-intensive industries such as "Chemicals, Petroleum, and Man Made Fibres", and "Electrical, Machinery and Computer Equipment".

Our empirical analysis focuses on four measures of corporate performance: the Return on Assets (*ROA*, the ratio of the firm's net income to total assets); the return on sales (*ROS*, the ratio of the firm's net income to its total sales); labor productivity (*PROD*, the ratio of the firm's net income to number of employees); and Total Factor Productivity (*TFP*, measured using the Levinsohn and Petrin, 2003, method)[14]. All four have been frequently used in the literature assessing the effects of government ownership on corporate performance (e.g. Tian and Estrin, 2008; Jiang et al., 2008)[15].

Table 3 presents summary statistics about the behavior of our performance variables and other relevant variables for our four categories of ownership. We can see that *ROA*, *ROS*, *PROD*, and *TFP*, all increase with the degree of foreign ownership, but decline for those observations that are 100% foreign owned. Foreign ownership appears to be most beneficial to corporate performance in firms with less than 100% foreign ownership. These are typically joint-ventures, a minority of which are between foreign and state firms. Specifically, those firm-years with a positive but lower than 100% share of capital paid in by foreign investors exhibit an average share of private capital of 35.74%, and an average share of state capital of 8.93%. Domestic investors have a widespread knowledge of the Chinese markets, and legal and political environment, while foreign investors bring in capital, modern technologies, better corporate governance through monitoring and market discipline, as well as managerial and international networking skills, which together are likely to lead to high performance. Firms that are fully owned by foreign investors are unlikely to

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musical instruments; dolls, toys, games, sporting and athletic goods; pens, pencils and other artists materials.

[14] A key issue in the estimation of production functions is the correlation between unobservable productivity shocks and input levels. Profit-maximizing firms respond to positive productivity shocks by expanding output, which requires additional inputs; and to negative shocks, by decreasing output and input usage. Olley and Pakes' (1996) estimator uses investment as a proxy for these unobservable shocks. This could cause problems as any observation with zero investment would have to be dropped from the data. Levinsohn and Petrin (2003), by contrast, introduce an estimator which uses intermediate inputs as proxies, arguing that these (which are generally non-zero) are likely to respond more smoothly to productivity shocks.

[15] Jiang et al. (2008) note that in the Chinese context, extraordinary income and income from non-core operations may be subject to manipulations: they therefore suggest an alternative measure of corporate performance, which excludes them, namely the ratio of operating profits to total assets. All our results were robust to using this alternative measure of firm performance.

perform as well as joint ventures, due to a limited knowledge of the Chinese market, legal, regulatory, and bureaucratic environment, and workers' attitudes towards incentives, as well as to a lack of political connections with local governments (*Guanxi*), which are often considered as a key factor in determining firm performance in China (Hsieh and Klenow, 2007).

Focusing on the other variables reported in Table 3, we see that firm size, measured by the log of its total assets, also increases with the degree of foreign ownership, and declines for 100% foreign owned firms. Leverage, defined as the ratio of the firm's total liabilities to total assets declines monotonically as the share of foreign ownership increases; and collateral, defined as the firm's ratio of tangible fixed assets to total assets, remains approximately constant across the four categories. Finally, only 36.7% of the purely domestic firm-years export, while the corresponding percentages for joint-ventures and fully foreign owned firm years are, respectively, 70.7% and 86.0%. In the Section that follows, we analyze the exact nature of the relationship between the degree of foreign ownership and firm performance.

3. Baseline specification and estimation methodology

3.1 Baseline specifications

We initially estimate the following equation:

$$(1) \quad PERF_{it} = a_0 + a_1 PERF_{i(t-1)} + a_2\, Foreign_{it}/[Foreign1_{it}\,/Foreign2_{it}/\,All\ foreign_{it}] + a_3\, Size_{it} + a_4\, Leverage_{it} + a_5\, Collateral_{it} + a_6\, Expdum_{it} + v_i + v_t + v_{jt} + e_{it}$$

where the subscript *i* indicates firms, and *t*, time. $PERF_{it}$ indicates in turn our four performance indicators. We initially control for foreign ownership by including $Foreign_{it}$, which is a dummy variable equal to 1 if the firm's share of capital paid in by foreign investors is positive, and 0 otherwise. Subsequently, we replace $Foreign_{it}$ with $Foreign1_{it}$, $Foreign2_{it}$, and $All\ Foreign_{it}$, where $Foreign1_{it}$ is a dummy equal to 1 if the share of foreign ownership is positive but lower than 50%, and 0 otherwise; $Foreign2_{it}$ is a dummy equal to 1 if same share is greater than or equal to 50% but lower than 100%, and 0 otherwise; and $All\ Foreign_{it}$ is a dummy equal to 1 if the firm is 100% foreign owned, and 0 otherwise. This exercise is aimed at determining the extent to which the performance of fully foreign owned firms and joint-ventures

characterized by different degrees of foreign participation differs from that of purely domestic firms[16].

The other regressors in equation (1) are motivated by the finance literature (e.g. McConnel and Servaes, 1990). *Size* is included to control for the fact, that as suggested by Chhibber and Majumdar (1999), larger firms may benefit from economies of scale and better access to external finance, which might enhance their profitability. $Collateral_{it}$ is expected to affect profitability negatively, as firms with more intangible assets are expected to have more investment opportunities and grow faster (Tian and Estrin, 2008). Finally, $Leverage_{it}$ is also expected to have a negative impact on firm performance, due to the debt overhang problem (Jensen and Meckling, 1976; Myers, 1977)[17]. Because more than 50% of the Chinese firms in our sample export, we also include a dummy $EXPDUM_{it}$, which is equal to 1 if the firm exports, and 0 otherwise[18].

The error term in equation (1) comprises three components: v_i, which is a firm-specific component; v_t, a time-specific component accounting for possible business cycle effects; v_{jt}, a time-specific component which varies across industries, accounting for industry-specific shifts in company performance; and e_{it}, an idiosyncratic component. We control for v_i by estimating our equation in first-differences; for v_t, by including time dummies in all our specifications; and for v_{jt}, by including time dummies interacted with industry dummies.

To better understand the relationship between foreign ownership and firm performance, we next estimate the following equations based on the actual percentage of the firm's capital paid in by foreign investors, $Foreigncap_{it}$:

$$(2) \quad PERF_{it} = a_0 + a_1 PERF_{i(t-1)} + a_2\, Foreigncap_{it} + a_3\, Size_{it} + a_4\, Leverage_{it} + \\ + a_5\, Collateral_{it} + a_6\, Expdum_{it} + a_7 Statecap_{it} + a_8\, Privatecap_{it} + \\ + v_i + v_t + v_{jt} + e_{it}$$

[16] One could argue that foreign ownership and other firm characteristics affect corporate performance with a lag. All our results were robust to using lagged values of our regressors.
[17] In the presence of a high debt to assets ratio, debt holders will share future investment returns, which might lead the firm to forego some profitable investment opportunities.
[18] All our results were robust to also including in our regressions the share of the firm's capital paid in by the state, or by private investors.

(3) $$PERF_{it} = a_0 + a_1 PERF_{i(t-1)} + a_2\, Foreigncap_{it} + a_3 Foreigncap^2_{it} + a_4\, Size_{it} + \\ + a_5\, Leverage_{it} + a_6\, Collateral_{it} + a_7 Expdum_{it} + a_8\, Statecap_{it} + \\ + a_9\, Privatecap_{it} + v_i + v_t + v_{jt} + e_{it}$$

Equation (2) assumes a linear relationship between $Foreigncap_{it}$ and $PERF_{it}$, and equation (3), a non-linear relationship. Considering the large literature on the effects of privatization on corporate performance (Estrin et al., 2008), in both equations, we add the percentage of the firm's total capital paid in by the state ($Statecap_{it}$) and by private investors ($Privatecap_{it}$)[19].

3.2 Estimation methodology

All equations are estimated in first-differences, to control for firm-specific, time-invariant effects. Given possible endogeneity, we use a first-difference Generalized Method of Moments (GMM) approach[20]. Two or more lags of each of the regressors are used as instruments.

To check whether the first-difference GMM estimator is likely to suffer from finite sample bias, we compared the GMM and the Within Groups estimates of the coefficient on the lagged dependent variable in equation (1). Because the Within Groups estimate is typically downward biased in short panels (Nickell, 1981), one would expect a consistent estimate of the coefficient on the lagged dependent variable to lie above this estimate. As our GMM coefficient was larger than its Within Groups counterpart, we concluded that the first-difference GMM estimates are unlikely to be subject to serious finite sample bias[21].

To evaluate whether our instruments are legitimate and our model is correctly specified, we use the test for second-order serial correlation of the residuals in the differenced equation (*m2*). The *m2* test is asymptotically distributed as a standard normal under the null of no second-order serial correlation of the differenced

[19] The squares of these additional variables did not attract precisely determined coefficients. For this reason, we decided to omit them.

[20] See Arellano and Bond (1991) on the application of the GMM approach to panel data. Most of our results were robust to using OLS or the Within Groups estimator. OLS, however, does not take into account unobserved firm heterogeneity and the possible endogeneity of the regressors, while the Within Groups estimator takes into account the former problem, but not the latter.

[21] If the estimates obtained using the first-difference GMM estimator lie close or below the Within Groups estimates, one could suspect the GMM estimate to be downward biased as well, possibly due to weak instruments. In such case, the use of a GMM system estimator (which combines in a system the original specification expressed in first differences and in levels) would be required (Blundell and Bond, 1998).

residuals, and provides a check on the specification of the model and legitimacy of variables dated *t*-2 as instruments in the differenced equation[22].

4. Evaluation of the results

4.1 Are foreign owned firms better performers?

Baseline specification

Estimates of equation (1) are reported in Table 4. In columns 1 and 5, *ROA* is used as our measure of corporate performance. Columns 2 and 6 refer to *ROS;* columns 3 and 7, to *PROD*; and columns 4 and 8, to *TFP*. We can see that the lagged dependent variable always has a positive and statistically significant coefficient, suggesting persistence. Furthermore, columns 1 to 4 show that the coefficient associated with *Foreign* is always positive and precisely determined: firms with positive foreign equity participation typically perform significantly better than their purely domestic counterparts[23]. This finding could be explained considering that foreign investors bring in scarce capital, modern technologies, better corporate governance through monitoring and market discipline, and managerial and international networking skills, which enhance private investors' capabilities. It is consistent with Wei et al. (2005) and Tian and Estrin (2008), who focus on the effects of state ownership on the performance of listed Chinese firms, but control for foreign ownership. It is also consistent with Yusuf et al. (2006), who use a panel of 736 firms over the period 1996-2001, and find that foreign ownership enhances productivity. Yet, it contrasts with Jefferson et al. (2000) who, based on data from the National Bureau of Statistics over the period 1980-1996, find that foreign-linked firms reveal only modest advantages over the state sector in terms of productivity and other performance indicators.

[22] If the un-differenced error terms are *i.i.d.*, then the differenced residuals should display first-order, but not second-order serial correlation. Note that the *m2* test does not allow to discriminate between bad instruments and model specification. We do not rely on the Sargan test (test for overidentifying restrictions) because when very large samples are used in estimation, it tends to systematically reject the null of instrument validity, whatever the instrument set and the specification chosen.

[23] It has been argued that comparing foreign firms with all domestic firms may lead to a selection problem as domestic firms may include domestic multinationals, which are likely to be as productive as foreign multinationals (Criscuolo and Martin, 2005). This is not an issue in the Chinese case considering the small size of China's outward FDI (Morck et al., 2008)

In columns 5 to 8, *Foreign1*, *Foreign2*, and *All foreign* are included in the regression. *Foreign1* always has a positive and precisely determined coefficient. The coefficient on *Foreign2* is also positive for all our measures of corporate performance, but it is only significant for *ROS* and *TFP*. In 3 out of 4 regressions, it is larger than the coefficient on *Foreign1*. Finally, the coefficient on *All Foreign* is never statistically significant, suggesting that being fully foreign owned is not associated with a performance advantage. These findings confirm that joint-ventures perform better than purely domestic and purely foreign owned firms. Foreign ownership is associated with improved firm performance only as long as it is accompanied by some degree of local investors' participation: without sufficient participation by private agents, foreign investors may be unable to perform optimally, as they might not have sufficient knowledge of the Chinese market; legal, regulatory, and bureaucratic environment; workers' attitudes towards incentives and so on. They may also lack the necessary political connections with local governments (*Guanxi*).

As for the other regressors included in Table 4, *Size* is positively associated with *ROS* and *PROD*, but negatively associated with *TFP*. *Leverage* is negatively linked with *ROA*, *ROS*, and *TFP*, suggesting evidence of debt overhang. *Collateral* has a negative and precisely determined coefficient for *ROA* and *TFP*, indicating that a relative prevalence of tangible assets in the firm's capital structure may hamper its performance. Finally, our export dummy (*EXPDUM*) is positively associated with *TFP*. This is in line with the vast literature, which has shown that exporters are typically more productive than non-exporters (see Greenaway and Kneller, 2007, for a survey). Surprisingly, however, in columns 6 and 7, *EXPDUM* is negatively associated with *ROS* and *PROD*. In all cases, the *m2* test does not indicate problems with the specification or choice of instruments.

Defining foreign ownership on the basis of registration

Next, because our ownership measures based on the share of capital paid in by various agents may suffer from miscoding problems, we verify the robustness of our results to the use of registration-based firm ownership characteristics. In particular, we replace the *Foreign* dummy with a new dummy, *Foreign-reg*, equal to 1 if, according to registration information, the firm is either a joint-venture or a wholly foreign owned firm, and 0 otherwise. Similarly, we replace the *Foreign1, Foreign2* and *All foreign* dummies in equation (1) with dummies indicating whether, according

to its registration code, the firm is a joint-venture (*JV*) or fully foreign owned (*WFO*). Joint-ventures can be either equity joint-ventures (*EJV*) or contractual joint-ventures (*CJV*). In the case of *EJV*s, the profit, control, and risks are divided according to the equity shares invested by the parties. On the other hand, the *CJV* parties' profit, control, and risks are divided according to negotiated contract terms (Folta, 2005). Focusing on these new definitions of foreign ownership, 15.95% of the firm-years in our sample are made up of equity joint-ventures; 2.78%, by contractual joint-ventures; and 17.28%, by wholly foreign owned firms. This leaves 63.98% of domestically owned firm-years. This number compares favorably with the corresponding number based on the capital paid in by non foreign agents (60.95%).

The estimates of equation (1), measuring foreign ownership on the basis of registration information, are reported in Table 5. In columns 1 and 5, *ROA* is used as our measure of corporate performance. Columns 2 and 6 refer to *ROS;* columns 3 and 7, to *PROD*; and columns 4 and 8, to *TFP*. Columns 1 to 4 show that *Foreign-reg* always has a positive, relatively large, and highly significant coefficient, which confirms our previous result that firms with some degree of foreign ownership perform better than their purely domestic counterparts. Columns 5 to 8 show that the *JV* dummy also has a positive and significant coefficient for all our measures of corporate performance, while the coefficient on the *WFO* dummy is generally smaller and only marginally significant[24]. In line with Abraham et al. (2007), Yusuf et al. (2006), and Pan et al. (1999), these findings indicate that while both joint-ventures and fully foreign owned firms perform better than purely domestic firms, the former have a larger advantage. Our main results are therefore robust to using registration-based ownership measures. It should be noted, however, that registration-based measures of ownership may be inaccurate, considering that they are typically updated with significant delay, and that firms may have incentives to falsely register as foreign to take advantage of tax benefits (Dollar and Wei, 2007).

[24] These results were robust to including two separate dummies for equity joint-ventures (*EJV*) and contractual joint-ventures (*CJV*).

4.2 Is the relationship between foreign ownership and corporate performance monotonic?

Baseline specifications

Table 6 provides estimates of equations (2) and (3), which are aimed at better understanding the precise nature of the relationship between the degree of foreign ownership and corporate performance. Columns 1, 3, 5, and 7 contain estimates of equation (2), respectively for *ROA*, *ROS*, *PROD*, and *TFP*. *Foreigncap* exhibits a positive and precisely determined coefficient both for *ROS* and *PROD*, but not for *ROA* and *TFP*. This suggests that a higher foreign equity leads to a higher *ROS* and a higher *PROD*. It is noteworthy that, except in the *TFP* regression, *Statecap* always displays a negative and precisely determined coefficient, which suggests the higher the state's participation in a firm's capital, the lower its performance. This is consistent with the findings in many of the studies on privatization surveyed by Estrin et al. (2008). *Privatecap*, on the other hand, does not affect corporate performance, whatever the measure used. As in the previous specifications, *Leverage* and *Collateral* display either negative or poorly determined coefficients. *Size* is positively associated with *ROS* and *PROD*, but negatively associated with *TFP*, and *EXPDUM* only displays a positive and significant coefficient in the *TFP* regression.

Columns 2, 4, 6, and 8 refer to the estimates of equation (3), respectively for *ROA*, *ROS*, *PROD*, and *TFP*. In all specifications *Foreigncap* attracts a positive and statistically significant coefficient, while $Foreigncap^2$ is associated with a negative and precisely determined coefficient. This suggests that foreign ownership and corporate performance in China are linked by an inverted *U*-shaped relationship. The turning points are 47.33% for *ROA*, 55.23% for *ROS*, and 58.79% for *PROD*, and 59.54% for *TFP*: foreign ownership enhances corporate performance if it is below these thresholds, and decreases it thereafter. These findings confirm the results obtained in Section 2.2, which showed that it is the partially foreign owned firms which are the top performers in the Chinese economy. The coefficients associated with the other regressors are similar to those obtained when estimating equation (2). The *m2* tests do not highlight problems with the specification of the model or the choice of instruments.

Accounting for provincial effects

We have shown in Table 1 that foreign presence varies considerably across provinces. As none of the results reported so far takes into account the provincial dimension, we next verify whether estimates of equation (3) are robust to replacing the industry dummies interacted with time dummies, with province dummies interacted with time dummies[25]. The results are reported in Table 7. Once again, *Foreigncap* has a positive and statistically significant coefficient, while $Foreigncap^2$ has a negative and precisely determined coefficient, suggesting an inverted *U*-shaped relationship between foreign ownership and corporate performance, with turning points of 52.31%, 64.24%. 55.65%, and 46.79%, respectively for *ROA*, *ROS*, *PROD*, and *TFP*.

Are investors from Hong Kong, Macao and Taiwan different from other foreign investors?

Our data indicate that the average share of foreign capital paid in by all foreign investors is 28.92%. A share of 14.51% is paid in by investors from Hong Kong, Macao, and Taiwan (*HMT*), while a share of 14.36% is paid in by other foreign investors. It has been argued that although investors from *HMT* may enjoy an advantage based on cultural and geographical proximity to China, they are likely to be fundamentally different from investors from other parts of the world. Specifically, it may be that investment by firms owned by *HMT* agents simply represents "round-tripping" by domestic Chinese investors hoping to take advantage of the favorable tax and regulatory treatment received by foreign investors[26]. In such cases, one would not necessarily expect firms owned by investors originating from Hong Kong, Macao, and Taiwan to perform better than domestic firms.

Tables A1 and A2 in the Appendix present descriptive statistics similar to those presented in Table 3, where observations are partitioned on the basis of the share of total capital paid in by investors originating from countries other than *HMT*, and by *HMT* entrepreneurs, respectively. Like Table 3, Table A1 indicates that corporate performance increases with the share of non-*HMT* capital participation, but declines for 100% non-*HMT* owned firms. The pattern in Table A2 is less clear, as very little difference in corporate performance is observed among firms with *HMT*

[25] These dummies also control for factors such as the prevalence of foreign owned firms in a given region and year.
[26] Huang (2001) provides a full account of these benefits.

participation between 1% and 49.99%, and between 50% and 99.99%. Moreover 100% *HMT* owned firms (column 4 of Table A2) exhibit weaker performance than purely domestic firms (column 1 of Table 3). This can be seen as evidence in favor of the round-tripping hypothesis.

To shed further light on this issue, we estimate a new versions of equation (3), in which we replace *Foreigncap* and $Foreigncap^2$ with corresponding variables for non *HMT* investors (*Non HMT Foreigncap* and *Non HMT* $Foreigncap^2$), and *HMT* investors (*HMT Foreigncap* and *HMT* $Foreigncap^2$). The estimates are reported in Table 8. When focusing on ownership by foreign investors other than those from *HMT*, *Non HMT Foreigncap* always attracts a positive and statistically significant coefficient, while *Non HMT* $Foreigncap^2$ attracts a negative and precisely determined coefficient. The turning points are 50.00%, 60.68%. 55.03%, and 48.73%, respectively for *ROA*, *ROS*, *PROD*, and *TFP*. These turning points are comparable to those reported in Table 6. On the other hand, ownership by investors from *HMT* has less clear-cut effects on corporate performance: the coefficients on both foreign ownership variables are in fact poorly determined for *ROA* and *TFP*. In the regression for *PROD*, *HMT Foreigncap* attracts a significant coefficient, which is much smaller in magnitude compared to the corresponding coefficient in Table 6, and *HMT* $Foreigncap^2$ has a negative but marginally significant coefficient. The turning point is 73%. For *ROS*, both the coefficients on *HMT Foreigncap* and *HMT* $Foreigncap^2$ are precisely determined at conventional levels, and the turning point of 57.85%. Although the importance of "round-tripping" cannot be quantified, these results, together with the descriptive evidence in Tables A1 and A2, may be interpreted as further indirect evidence in its favor.

Overall, our findings indicate that foreign ownership is beneficial to the performance of Chinese firms, as long as it does not pass a certain threshold. Top performers in the Chinese economy are therefore joint-ventures between domestic and foreign firms. We next construct a simple theoretical model aimed at rationalizing these empirical findings.

5. Theoretical model

We now construct a simple theoretical model which can generate predictions of a non-monotonic relationship between a firm's degree of foreign ownership and its performance similar to the one we found in the previous sections[27].

5.1. The model

We assume that the market is made up of *I* firms labeled with the subscript *i* (*i = 1...I*), each of which produces a different product, also labeled with *i*. Each firm produces a quantity q_i of its product. q_0 denotes the quantity of a competitively supplied numeraire good. Consumers maximize the following utility function:

$$U = q_0 + \sum_{i=1}^{N} \gamma_i q_i^{\rho} \quad , \ \rho < 1 \ , \ \gamma_i > 0 \tag{4}$$

Utility maximization yields the following downward sloping demand curve:

$$q_i = A_i p_i^{-\sigma}, \quad \sigma \equiv \frac{1}{1-\rho} > 1, \quad A \equiv \left(\frac{\gamma_i}{\rho} \right)^{\sigma}, \tag{5}$$

where p_i represents the price of good *i*, and A_i is a demand shifter, which is exogenous to individual firms. Labor is the only factor of production, and the production technology exhibits constant returns to scale, with total labor costs given by $c_i = \frac{q_i w}{v_i}$, where *w* and v_i represent respectively, the wage (common to all firms) and productivity (firm-specific).

Each firm is potentially a joint-venture between two owners: a foreign owner (*F*) and a domestic owner (*D*). Each owner may contribute non-contractible inputs (such as effort) to affect the productivity of the joint-venture (v_i). Productivity can hence be expressed as follows (for simplicity, we hereafter suppress the firm subscript *i*):

$$v = (x+a)^{\alpha} (y+b)^{\beta} \ , \ \ a \geq 0, b \geq 0, \alpha + \beta = 1 . \tag{6}$$

x≥0 and y≥0 represent non-contractible inputs such as effort supplied by *F* and *D*, respectively. *x* may be interpreted as the foreign owner's effort aimed at improving

[27] Some features of this model resemble the "property rights" approach to the analysis of firms' behavior pioneered by Hart and Moore (1990) and Grossman and Hart (1986), where business partners choose their relation-specific investments on the basis of the allocation of the project's joint surplus. Also see Chapter 5.2 in Barba Navaretti and Venables (2006). We thank Arijit Mukherjee for offering inspiring ideas for this section.

the quality of the design of the product, or any other form of "knowledge capital" brought in to improve the manufacturing of the product. *y* could be seen as the domestic owner's effort aimed at promoting the sale and marketing of the product in the local market (e.g. through the organization and monitoring of a sales team), or at facilitating the political connection (*Guanxi*) with the local government, which is often considered as a key factor in determining firms' performance in China (Hsieh and Klenow, 2007).

The parameter $\alpha(\beta)$ captures the "relative importance" of the contribution of $x(y)$ to productivity. The relative marginal return to effort *x* is in fact given by: $\frac{\partial v/\partial x}{\partial v/\partial y} = \frac{\alpha}{\beta}\frac{y+b}{x+a}$, which is increasing in α. In the extreme case in which $\alpha = 0$, *x* is totally "unimportant" to *v*, which is purely determined by *y*.

The parameter $a(b)$, on the other hand, inversely captures the "absolute indispensability" of effort *x* (*y*): when $a = 0$ (*b*=0), *v*=0 if *x*=0 (*y*=0), indicating that *x* (*y*) must be positive in order to achieve a positive production.

We further assume that there are implicit costs borne by each party to increase their inputs. These can be expressed as:

(7) $$G^F(x) = \frac{rx^k}{k}\ , \qquad G^D(y) = \frac{ty^k}{k}\ ,\ \text{where } k \geq 1,\ r > 0, t > 0.$$

Note that these implicit costs are assumed not to be incurred by the joint-venture, but only by the individual owners. For example, the domestic party may need to devote some of his own time to monitor the local sales team, incurring a disutility. Finally, the ownership shares of the firm allocated to parties *F* and *D* are *S* and 1-*S*, respectively. *S* is assumed to be exogenous, depending on the bargaining power of the foreign party and other factors that are beyond the control of individual investors (such as government interventions).

5.2 Nash equilibrium

Firms' profits are given by $\pi(v) = pq - c$. Profit maximizing leads to optimal pricing rule: $p = \frac{(1-\sigma)w}{v}$, which yields the following optimal profit:

(8) $$\pi = Bv^{\sigma-1}\ ,\quad B \equiv A\left(\rho/w\right)^{\sigma-1}\sigma^{-1}\ ,\quad \rho \equiv \frac{\sigma}{\sigma\text{-}1}$$

Parties *F* and *D* receive shares *S* and *1-S* of the total profits, respectively. Each party simultaneously chooses its inputs to maximize his/her individual net payoffs, taking the other party's input as given. The two parties' maximization problems can therefore be expressed as follows:

(9) F: $\max_x \left[S\pi(x,y) - G^F(x) \right] \quad \Leftrightarrow S\alpha\left(x+a\right)^{u-1}(y+b)^{1-z} = \frac{r}{B(\sigma-1)}x^{k-1}$

(10) D: $\max_y \left[(1-S)\pi(x,y) - G^D(y) \right] \Leftrightarrow (1-S)\beta\left(x+a\right)^{u}(y+b)^{-z} = \frac{t}{B(\sigma-1)}y^{k-1}$

$$, \; z \equiv 1-\beta(\sigma-1), \; u \equiv \alpha\left(\sigma-1\right).$$

Equations (9) and (10) imply a standard Nash equilibrium problem, where each party of the joint-venture strategically chooses his/her effort level, depending on the choice made by the other party. For the purpose of the presentation, in the following analysis we will focus on the simple case in which the cost functions of *x* and *y* are symmetric ($r = t$) and linear in effort (k=1) [28]. The equilibrium is therefore determined by:

(11) $$S\alpha\left(x+a\right)^{u-1}(y+b)^{1-z} = Q$$

(12) $$(1-S)\beta\left(x+a\right)^{u}(y+b)^{-z} = Q,$$

where $Q \equiv r[B\left(\sigma-1\right)]^{-1}$. To ensure that the second order conditions for each party's optimisation problem hold, we assume that $\sigma < 2$ [29]. As shown in figure 1, equations (11) and (12) define *y*, respectively as a concave and a convex function of *x*, ensuring the existence of a unique Nash equilibrium. The equilibrium values of *x* and *y* are thus given by:

(13) $$x_1 = s^{\frac{z}{2-\sigma}}(1-s)^{\frac{1-z}{2-\sigma}}M^{\frac{1}{2-\sigma}} - a$$

(14) $$y_1 = S^{\frac{u}{2-\sigma}}(1-S)^{\frac{1-u}{2-\sigma}}N^{\frac{1}{2-\sigma}} - b,$$

where $M \equiv \beta^{1-z}\alpha^{z}Q^{-1}$ and $N \equiv \beta^{1-u}\alpha^{u}Q^{-1}$. Inspection of these two equations reveals that both x_1 and y_1 are inverse *U*-shaped functions of *S* (since $\frac{\partial x_1}{\partial S} \geq (<)0$ if $S \leq (>)$ *z*

[28] The qualitative results and simulations were largely unaffected in more general cases, but the example allows us to derive simple closed form solutions to the problem.

[29] The second order conditions associated with (11) and (12) are, respectively, $u-1 = \alpha\left(\sigma-1\right)-1 < 0$ and $-z = (1-\alpha)(\sigma-1)-1 < 0$. Since $\alpha < 1$, $\sigma < 2$ ensures that both of these inequalities hold.

and $\frac{\partial y_1}{\partial S} \geq (<)0$ if $S \leq (>)u$). The non-negativity assumption of x and y implies that neither of them can take a value below zero[30]. Hence,

(15) if $x_1 < 0,\ x = 0 \Rightarrow y = y_2 \equiv \arg\max\left[(1-S)\pi(0,y) - ry\right] = \left[\beta(1-S)a^u Q^{-1}\right]^{\frac{1}{z}} - b$

(16) if $y_1 < 0,\ y = 0 \Rightarrow x = x_2 \equiv \arg\max\left[S\pi(x,0) - rx\right] = \left[\alpha S b^{1-z} Q^{-1}\right]^{\frac{1}{u}} - a$

Note that x_2 (y_2) is monotonically increasing in $S(1\text{-}S)$. Again, using the non-negativity assumption and combining equations (13) to (16), the equilibrium effort levels x^* and y^* are given by :

$$(17) \quad x^* = \begin{cases} 0 \quad , & x_1 < 0 \\ x_1 \quad , & x_1 > 0, y_1 > 0 \\ \max(0, x_2), & y_1 < 0 \Leftrightarrow y^* = 0 \end{cases}$$

$$(18) \quad y^* = \begin{cases} 0, & y_1 < 0 \\ y_1, & x_1 > 0, y_1 > 0 \\ \max(0, y_2), & x_1 < 0 \Leftrightarrow x^* = 0 \end{cases}$$

Figure 2a illustrates the equilibrium values of x and y as a function of S. The example is constructed so that the values of S that maximize x and y are strictly between 0 and 1[31]. Several patterns worth noting emerge. First, when $S(1\text{-}S)$ is very small (i.e. <5%), $x^*(y^*)$ is equal to zero and $y^*(x^*)$ is decreasing (increasing) in S. Intuitively, when the share of profits allocated to party F (D) is very small, this party would find the net payoff too low to induce her to exert a positive effort. On the other hand, the other party D (F) would exert a positive effort since her share of profit would be very large, but the level of her effort would decrease in the share of F (D).

[30] In other words, we assume that neither party can exert a negative effort to incur "damage" to the productivity of the joint-venture by making v fall below its benchmark level given by $v(0,0) = a^\alpha b^\beta$.

[31] This requires that a and b are small relative to B. Specifically, the parameters used to construct the figure are as follows: $\sigma = 1.5,\ \alpha = 0.6,\ r = 1, B = 10, a = 0.05, b = 0.08$.

Second, when *S* (*1-S*) is intermediate (i.e. between 5% and 95%), both parties have incentives to exert a positive effort, and there is an inverse *U*-shaped relationship between S (*1-S*) and *x* (*y*). This can be explained as follows. The setup of our model implies that an increase in *S* has two opposing effects on *x*. On the one hand, *F* tends to exert a greater effort *x* when his/her share in total profit *S* increases. We call this the "share effect". On the other hand, an increasing share *S* means a decreasing share of *D* in total profits (1-*S*), leading to a decreasing effort from *D*, which in turn tends to reduce productivity and therefore total profit. This decreases the marginal return to *F*'s efforts, and hence induces *F* to exert less effort. We call this the "strategic effect". The overall effect turns out to depend on the value of *S*: when *S* is small (large), the share effect (strategic effect) dominates, leading to a positive (negative) relationship between *S* and *x*.

5.3 Relationship between ownership and productivity

We now investigate the central issue of the model, i.e. its predictions regarding the relationship between the share of foreign ownership *S* and firm productivity *v** [32]. Substituting (17) and (18) into (6), we obtain the equilibrium value of productivity as a function of *S*, i.e.:

$$(19)\qquad v^* = \begin{cases} v_2 = \left[S^{\alpha}(1-S)^{\beta}\alpha^{\alpha}\beta^{\beta}Q \right]^{\frac{1}{2-\sigma}} & , \ x_1 > 0, y_1 > 0 \\ v_1 = a^{\alpha}(y_2+b)^{\beta} = a^{\alpha}\left[\beta(1-S)a^{u}Q \right]^{\frac{\beta}{z}} & , \ x_1 < 0 \Leftrightarrow x^* = 0 \\ v_3 = (x_2+a)^{\alpha}b^{\beta} = \left[\alpha S b^{1-z}Q \right]^{\frac{\alpha}{u}} b^{\beta} & , \ y_1 < 0 \Leftrightarrow y^* = 0 \end{cases}$$

From (19), it is straightforward that $\frac{\partial v_2}{\partial S} \geq (<) 0$ if $S \leq (>) \alpha$. In words, v_2 is a inverse *U*-shaped function of *S*, maximized at $S = \alpha$. Furthermore, $\frac{\partial v_1}{\partial S} < 0$ and $\frac{\partial v_3}{\partial S} > 0$. Based on the same parameters used to construct figure 2a, figure 2b illustrates the relationship between *v** and *S*. Two important features, which are broadly consistent with the evidence presented in the previous sections, emerge. First, for a joint-venture with $0 < S < 1$, there exists a quasi-inverse *U*-shaped relationship between the foreign ownership share and the firm's productivity, with maximum productivity level at

[32] These predictions can be generalized to other types of firm performance indicators such as profitability (π), which are all monotonically increasing in *v** (see Equation 8).

$S = \alpha$ [33]. The intuition behind this relationship is that the firm's productivity depends on the joint efforts of both parties. When the foreign ownership share is very low, the foreign owner exerts a very low effort, whilst when the share is very high, the domestic party exerts low effort. It is only when the share is at an intermediate level (which equals the foreign owner's share in the productivity function, α), that the joint efforts from both parties will lead to the highest productivity of the joint-venture.

Second, the best performing joint-venture outperforms the wholly foreign owned company, which is in turn more productive than the wholly domestic company. This can be expressed as follows:

(20) $$v^*(\alpha) > v^*(1) > v^*(0)$$

Using (19), it can be shown that (20) requires both a and b to be sufficiently small, and a to be sufficiently small relative to b (given α, β and Q)[34]. Recall that a and b capture the degree of "indispensability" of the inputs from both parties. Hence, the above pattern of productivity ordering implies that both the foreign and the domestic party's efforts are crucial to the joint-venture's productivity performance, with the foreign party's inputs relatively more "indispensable". This is consistent with the fact that, in developing countries, the foreign parties of joint-ventures usually provide core technology and design of the products, which are often regarded as "key inputs" to production[35].

It is important to point out that the specific results presented above hinge on the specifications of the functional forms and parameter ranges of the model. Specifically, depending on the parameters *a* and *b*, the relationship between foreign ownership and productivity could take other forms. The key merit of this theoretical model is to provide a rationale for why there could exist an inverse *U*-shaped relationship between ownership and performance similar to the one illustrated in the previous sections. This rationale hinges on the strategic interactions between the owners' inputs.

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[33] This feature requires that the functional form of *v*(S)* is dominated by the inverse *U*-shaped function $v_2(S)$, which in turn requires that both parameters *a* and *b* are sufficiently small. See Appendix 2a for a proof.

[34] See Appendix 2b for details of the proof.

[35] Also note that this result mirrors a well-known conclusion from the "property rights" theory of the firm, according to which the optimal allocation of property rights should assign more assets to the party whose investment has greater impact on production (Grossman and Hart 1986, Hart and Moore 1990).

6. Conclusions

We have used a panel of 21,582 unlisted Chinese firms over the period 2000-2005 to analyze the extent to which the degree of foreign ownership is beneficial to corporate performance. Focusing on the return on assets, the return on sales, labor productivity, and *TFP*, we have found that firms with some degree of foreign ownership generally perform better than purely domestic firms. Yet, the relationship between foreign ownership and corporate performance is non monotonic and exhibits an inverted *U*-shaped pattern: corporate performance increases as foreign participation rises up to about 47%-64%, and declines thereafter. This suggests that in the Chinese context, the top performers are joint-ventures between domestic and foreign enterprises, whereby the former bring in knowledge of the Chinese market and legal environment, as well as important political connections with local governments; and the latter, modern technologies, capital, better corporate governance through monitoring and market discipline, and managerial and international networking skills. Our results are robust to defining ownership on the basis of the capital paid in by various agents, and on the basis of registration information. Furthermore, it is those firms owned by investors other than those originating from Hong Kong, Macao, and Taiwan that beneficiate most from their foreign ownership. Finally, we have presented a simple theoretical model able to generate predictions of a non-monotonic relationship between a firm's degree of foreign ownership and its performance, similar to those found with our Chinese data.

Our findings contribute to understanding the link between FDI and economic growth: in countries where FDI inflows are large and mainly take the form of joint-ventures between domestic and foreign firms, the effect of FDI penetration on the performance of recipient firms could be an important channel through which FDI affects economic growth.

Our data show that while the percentage of (partially or totally) foreign owned firm-years remained approximately constant at around 40% between 2000 and 2005, the percentage of fully foreign owned firm-years increased from 17.18% to 23.27%, while that of partially foreign owned firm-years declined from 22.51% to 16.17%. Reversing this trend by attracting more FDI in the form of joint-ventures, and less in the form of fully foreign owned firms, could be beneficial to the long-run growth of the Chinese economy.

Appendix 1: Data

Structure of the unbalanced panel

Number of obs. per firm	*Number of observations*	*Percent*	*Cumulative*
2000	11,813	12.77	12.77
2001	13,864	14.98	27.75
2002	15,822	17.10	44.84
2003	16,564	17.90	62.74
2004	17,665	19.09	81.83
2005	16,814	18.17	100.00
Total	91,139	100.00	

Number of obs. per firm	*Number of observations*	*Percent*	*Cumulative*
1	1,404	1.52	1.52
2	5,922	6.40	7.92
3	8,052	8.70	16.62
4	12,616	13.63	30.25
5	18,630	20.13	50.38
6	45,918	49.62	100.00
Total	91,139	100.00	

Definitions of the variables used

Ownership variables

Foreign: dummy variable equal to 1 if the share of the firm's total capital owned by foreign investors is greater than 0, and 0 otherwise.

Foreign1: dummy variable equal to 1 if the share of the firm's total capital owned by foreign investors is positive but lower than 50%, and 0 otherwise.

Foreign2: dummy variable equal to 1 if the share of the firm's total capital owned by foreign investors is greater than or equal to 50% but lower than 100%, and 0 otherwise.

All foreign: dummy variable equal to 1 if the share of the firm's total capital owned by foreign investors is equal to 100%, and 0 otherwise.

Foreigncap: share of the firm's capital paid in by foreign investors (including investors from Hong Kong, Macao, and Taiwan).

HMT Foreigncap: share of the firm's capital paid in by investors from Hong Kong, Macao, and Taiwan.

Non HMT Foreigncap: share of the firm's capital paid in by foreign investors excluding investors from Hong Kong, Macao, and Taiwan.

Statecap: share of the firm's capital paid in by the state.

Privatecap: share of the firm's capital paid in by private investors (including legal entities).

EJV: dummy variable equal to 1 if the firm is registered as an equity joint-venture (registration codes 210 or 310), and 0 otherwise.

C JV: dummy variable equal to 1 if the firm is registered as a contractual joint-venture (registration codes 220 or 320), and 0 otherwise.

JV: dummy variable equal to 1 if the firm is registered as an *EJV* or as a *CJV*, and 0 otherwise.

WFO: dummy variable equal to 1 if the firm is registered as wholly foreign owned (registration codes 230 or 330), and 0 otherwise.

Corporate performance variables

Return on Assets (ROA): ratio of the firm's net income to total assets.

Return on Sales (ROS): ratio of the firm's net income to total sales.

PROD: labor productivity, calculated as the ratio of the firm's net income to total number of employees.

TFP: total factor productivity calculated using the Levinsohn and Petrin (2003) method, applied separately to different industrial groups.

Other variables

Total assets: sum of the firm's fixed and current assets, where fixed assets include tangible fixed assets, intangible fixed assets, and other fixed assets; and current assets include inventories, accounts receivable, and other current assets.

Size: log is the firm's total assts.

Leverage: ratio of current liabilities plus non-current liabilities to total assets, where current liabilities include loans, accounts payable, and other current liabilities; and non-current liabilities include long-term debt and other non-current liabilities.

Collateral: ratio of tangible assets to total assets.

Employees: total number of people employed by the firm.

EXPDUM: dummy equal to 1 if the firm reports a positive value of firm's overseas sales, and 0 otherwise.

Deflators: all variables except the capital stock are deflated using provincial GDP deflators, taken from various issues of the China Statistical Yearbook. The capital stock is deflated using provincial deflators for fixed capital formation, also taken from various issues of the China Statistical Yearbook.

Appendix 2: Proofs

(a) Conditions for the quasi inverse-U shaped ownership-productivity relationship

Recall that v_2 is an inverse *U*-shaped function of S, while ν_1 and ν_3 are respectively monotonically decreasing and increasing in *S* (equation 19). Let Δ_i represent the sets of *S* that correspond to $v^* = v_i$, $i \in \{1,2,3\}$. If the non-monotonic part ν_2 dominates *v**, Δ_2 must be large. Moreover, $S \in \Delta_2$ should satisfy the following conditions: $x_1 > 0$ and $y_1 > 0$. Using (13) and (14), we obtain:

(A.1a) $$J^x(S) \equiv S^z(1-S)^{1-z} > a^{2-\sigma}M^{-1}$$

(A.1b) $$J^y(S) \equiv S^u(1-S)^{1-u} > b^{2-\sigma}N^{-1}$$

Since $\frac{\partial J^x(S)}{\partial S} > (<)0$ if $S > (<)z$, it can be shown that (A1.a) holds if and only if $S \in \Delta_2^x \equiv \left[0, S_L^x\right] \cup \left[S_H^x, 1\right]$, where $S_H^x > S_L^x > 0$ are such that $J^x(S_j^x) = a^{2-\sigma}M^{-1}$, $j = H, L$, and $\frac{\partial S_H^x}{\partial a}\left(\frac{\partial S_L^x}{\partial a}\right) < (>)0$. This implies that Δ_2^x increases as *a* declines.

Reasoning analogously, it can be shown that (A1.b) holds if and only if $S \in \Delta_2^y \equiv \left[0, S_L^y\right] \cup \left[S_H^y, 1\right]$, where $S_H^y > S_L^y > 0$ are such that $J^y(S_j^y) = b^{2-\sigma}N^{-1}$, $j = H, L$, and $\frac{\partial S_H^y}{\partial b}\left(\frac{\partial S_L^y}{\partial b}\right) < (>)0$. This also implies that Δ_2^y increases as *b* declines. Hence, $\Delta_2 = \Delta_2^x \cap \Delta_2^y$ will be large, as long as *a* and *b* are sufficiently small. To see this, consider the extreme case in which $a = b = 0$. This implies that $\Delta_2 = [0,1]$, and $\Delta_1 = \Delta_2 = \varnothing$, i.e. $v^* = v_2 = \left[S^\alpha (1-S)^\beta \alpha^\alpha \beta^\beta Q\right]^{\frac{1}{2-\sigma}}$ for $S \in [0,1]$, which represents a purely inverse *U*-shaped relationship between *v** and *S*.

(b) Conditions for the productivity ordering $v^*(\alpha) > v^*(1) > v^*(0)$ *to take place*

From (19), it follows that $v^*(0) = v_1(0) = a^{\frac{\alpha}{z}}\left[\beta Q\right]^{\frac{\beta}{z}}$, which is increasing in a, and that $v^*(1) = v_3(1) = b^{\frac{\beta}{u}}\left[\alpha Q\right]^{\frac{\alpha}{u}}$, which is increasing in b. Furthermore, $v^*(\alpha) = v_2(\alpha) = \left[\alpha^{2\alpha}\beta^{2\beta}Q\right]^{\frac{1}{2-\sigma}}$ is independent of a and b. Hence, $v^*(0) < v^*(1) < v^*(\alpha)$ requires the following condition to be satisfied:

(A.2) $$b < \alpha^{\frac{\alpha}{\beta}\left(\frac{u}{2-\sigma}-1\right)}\beta^{\frac{2u}{2-\sigma}}Q^{\frac{\alpha}{\beta}\left(\frac{\sigma-1}{2-\sigma}-1\right)}$$

(A.3) $$a < \alpha^{\frac{2z}{2-\sigma}}\beta^{\frac{\beta}{\alpha}\left(\frac{2z}{2-\sigma}-\frac{1}{\alpha}\right)}Q^{\frac{1}{2-\sigma}}$$

(A.4) $$a < b^{\frac{\beta}{\alpha}}\left(\alpha^{\frac{z}{u}}\beta^{\frac{\beta}{\alpha}}Q^{\frac{z}{u}-\frac{\beta}{\alpha}}\right)$$

(A.2)-(A.4) imply that for given values of α, β, and Q, both a and b must be sufficiently small. Moreover, a must be sufficiently small relative to b, for the inequality chain $v^*(\alpha) > v^*(1) > v^*(0)$ to hold.

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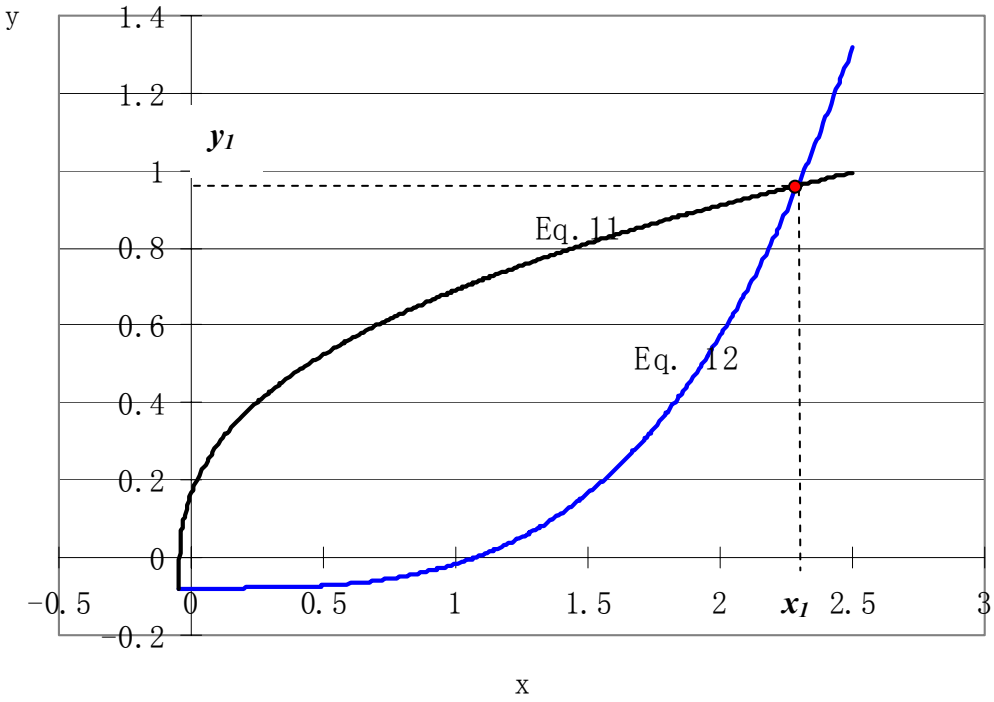
Figure 1: Nash equilibrium of efforts exerted by foreign and domestic owners



Note: S=60%, $\sigma = 1.5$, $\alpha = 0.6$, $r = 1, B = 10, a = 0.05, b = 0.08$

Figure 2a: Ownership and effort

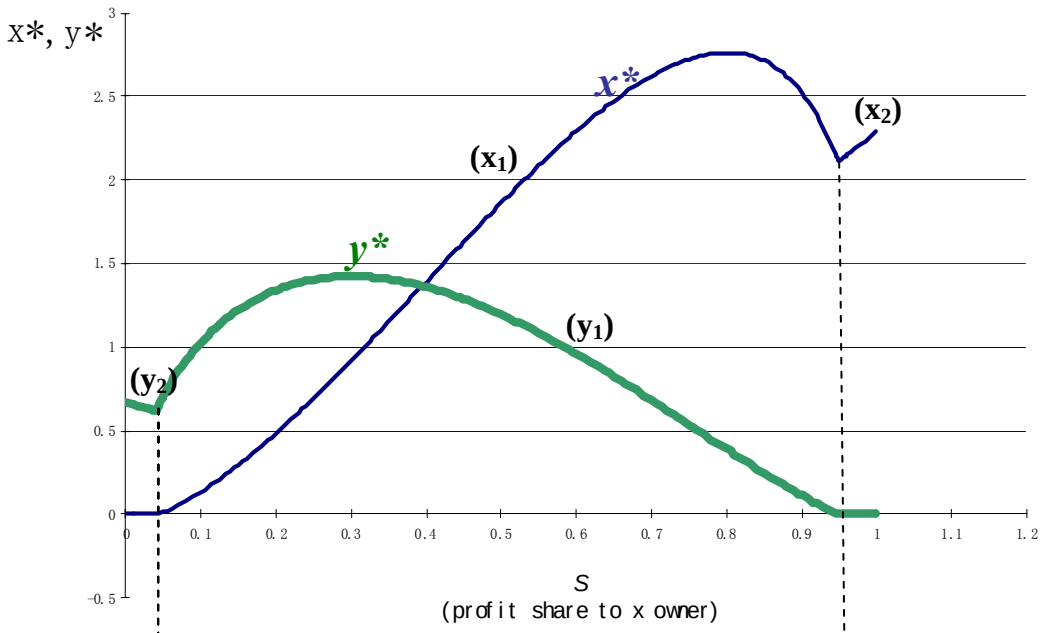


Figure 2b: Ownership and productivity

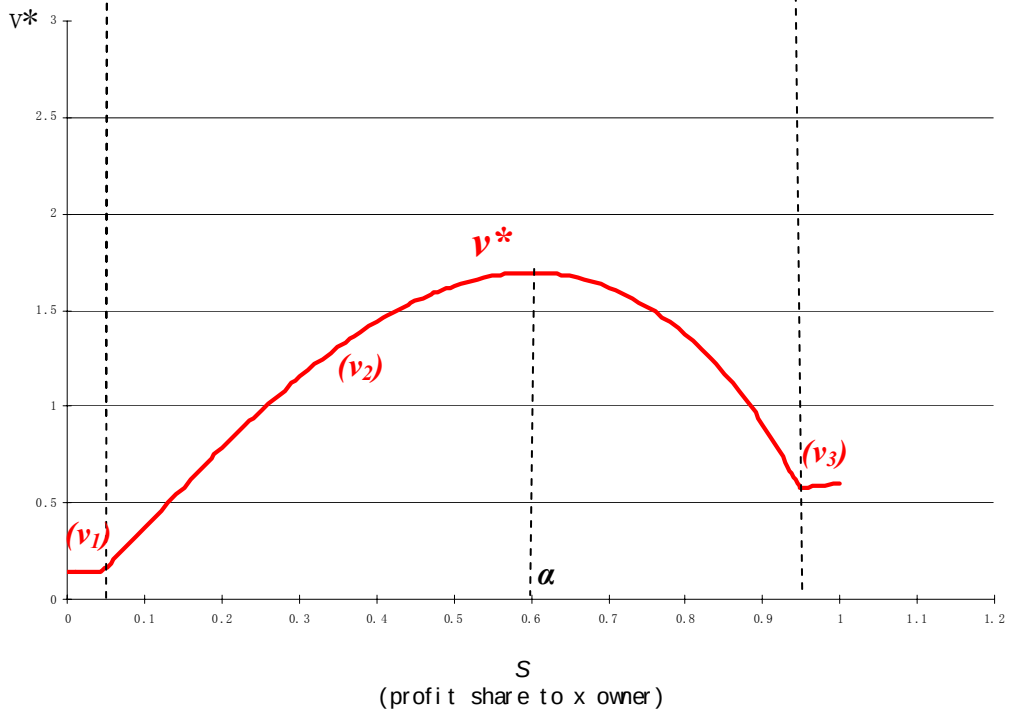


Table 1: Foreign ownership by region

Provincename	*Foreigncap=0%* (1)	*0%<Foreigncap<50%* (2)	*50% ≤Foreigncap<100%* (3)	*Foreigncap=100%* (4)
Coastal				
Beijing	54.29129	12.41873	18.98569	14.30429
Fujian	28.11617	10.25443	11.33385	50.29556
Guangdong	25.73669	8.540097	12.99393	52.72928
Hainan	81.36646	3.10559	7.453416	8.074534
Hebei	82.67504	9.335727	5.116696	2.872531
Jiangsu	56.70476	14.62857	8.961905	19.70476
Liaoning	64.70788	8.933424	9.103261	17.25543
Shandong	71.76608	12.6646	4.870255	10.69907
Shanghai	34.72512	13.03062	21.76409	30.48017
Tianjin	46.20075	9.803001	17.72983	26.26642
Zhejiang	66.229	19.17557	6.045802	8.549619
Total	*50.62489*	*12.36288*	*10.44776*	*26.56447*
Central				
Anhui	83.86648	7.649513	3.894298	4.589708
Heilongjiang	86.46543	5.160662	4.868549	3.505355
Henan	90.63361	4.683196	3.236915	1.446281
Hubei	85.53086	6.419753	4.493827	3.555556
Hunan	87.86181	4.388422	2.894491	4.855276
Jiangxi	83.26118	7.792208	3.318903	5.627706
Jilin	81.23711	7.216495	8.556701	2.989691
Shanxi	92.86182	4.256712	1.899149	.9823183
Total	*87.36165*	*5.705706*	*3.921064*	*3.011583*
Western				
Chongqing	86.882	7.119315	4.482532	1.51615
Gansu	91.27517	6.040268	.8053691	1.879195
Guangxi	81.02288	7.806191	8.008076	3.162853
Guizhou	93.19797	3.350254	3.045685	.4060914
Neimenggu	90.17857	6.760204	1.020408	2.040816
Ningxia	90.22801	6.514658	3.257329	0
Qinghai	98.61111	1.388889	0	0
Shaanxi	91.95711	3.552279	2.613941	1.876676
Sichuan	91.07827	4.21456	3.475643	1.231527
Xinjiang	93.5743	2.409639	.4016064	3.614458
Yunnan	90.96346	4.784053	3.056479	1.196013
Total	*89.86276*	*5.072409*	*3.449845*	*1.614982*

Notes: Foreigncap represents the fraction of the firm's capital paid in by foreign investors. All numbers in the Table are percentages.

Table 2: Foreign ownership by industrial group

Industry	*Foreigncap=0%* (1)	*0%<Foreigncap<50%* (2)	*50% ≤Foreigncap<100%* (3)	*Foreigncap=100%* (4)
Manufacturing				
Food, drink, tobacco	65.90055	9.48251	11.63631	12.98063
Textiles, clothing, leather	50.32337	15.84503	8.81025	25.02135
Wood, furniture	45.72468	13.4627	9.763493	31.04912
Paper, printing, publishing	63.06897	11.72414	9.655172	15.55172
Chemicals, petroleum, man made fibres	64.79431	10.04607	7.64568	17.51394
Electrical, machinery, computer equipment	49.91	9.286759	10.75487	30.04837
Stone, clay, glass, concrete products	78.81558	7.352941	7.492051	6.339427
Metal, metal goods	70.75137	10.31155	5.803299	13.13378
Transport equipment	70.28352	9.614155	8.015348	12.08698
Other manufacturing	33.09529	11.11359	9.841554	45.94957
Total	*58.23227*	*11.03524*	*8.9767*	*21.75579*
Non manufacturing				
Mining	94.24577	2.990897	.8777633	1.885566
Construction	50.70422	18.30986	4.225352	26.76056
Transportation; communication; electric, gas, sanitary services	90.19159	4.269054	3.519367	2.019992
Wholesale and retail trade	49.6677	13.55782	17.27958	19.49491
Finance, insurance, real estate, and other services	74.80916	10.1145	5.343512	9.732824
Total	*81.61281*	*6.31423*	*5.74021*	*6.33275*

Notes: Foreigncap represents the fraction of the firm's capital paid in by foreign investors. All numbers in the Table are percentages.

Table 3: Summary statistics

	Foreigncap=0%	*0%<Foreigncap<50%*	*50% ≤Foreigncap<100%*	*Foreigncap=100%*
	(1)	(2)	(3)	(4)
ROA	0.037	0.056	0.060	0.046
ROS	0.025	0.042	0.047	0.032
PROD	0.058	0.112	0.185	0.091
TFP	0.027	0.033	0.037	0.028
Size	6.58	6.74	6.83	6.31
Leverage	0.616	0.595	0.512	0.505
Collateral	0.398	0.337	0.355	0.360
Expdum	36.69	70.40	71.10	85.96
Foreigncap	0	27.00	71.06	100
Statecap	26.16	10.49	7.04	0
Privatecap	62.27	51.23	16.90	0
Observations	55817	9584	7884	18291

Notes: Foreigncap represents the fraction of the firm's capital paid in by foreign investors. *ROA* represents the firm's returns to assets and is given by its net income over its total assets. *ROS* represents the firm's returns to sales and is given by its net income over its total sales. *PROD* represents labor productivity, i.e. the ratio of the firm's net income to its number of employees. *TFP* is total factor productivity calculated using the Levinsohn and Petrin (2003) method. *Size* is the log of the firm's total assets. *Leverage* is given by the sum of the firm's current and non-current liabilities to its total assets. *Collateral* is given by the ratio of the firm's fixed tangible assets to its total assets. *Expdum* is a dummy equal to 1 if the firm exports, and 0 otherwise. *Statecap* represents the fraction of the firm's capital paid in by the state. *Privatecap* represents the fraction of the firm's capital paid in by individual investors and legal entities. See Appendix 1 for complete definitions of all variables.

Table 4: Relationship between foreign ownership and firm performance

	ROA	*ROS*	*PROD*	*TFP*	*ROA*	*ROS*	*PROD*	*TFP*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lagged dep. variable	0.380 (20.16)***	0.372 (23.46)***	0.420 (10.33)***	0.195 (4.30)***	0.386 (21.81)***	0.376 (25.26)***	0.430 (11.26)***	0.197 (4.36)***
Foreign	0.034 (2.51)**	0.045 (3.91)***	0.127 (3.78)***	0.014 (2.37)**				
Foreign1					0.018 (1.94)*	0.023 (2.91)***	0.045 (2.01)**	0.008 (1.93)*
Foreign2					0.017 (0.81)	0.037 (2.10)**	0.060 (1.16)	0.018 (1.93)*
All foreign					-0.012 (0.43)	0.011 (0.51)	-0.017 (0.27)	0.015 (1.32)
Size	0.004 (0.92)	0.012 (2.97)***	0.044 (4.00)***	-0.010 (3.48)***	0.001 (0.43)	0.012 (3.30)***	0.033 (3.09)***	-0.009 (3.23)***
Expdum	-0.001 (0.17)	-0.009 (1.35)	-0.008 (0.46)	0.006 (1.98)**	-0.007 (1.19)	-0.018 (3.19)**	-0.030 (1.90)*	0.005 (1.80)*
Leverage	-0.035 (2.44)**	-0.035 (2.84)***	-0.019 (0.65)	-0.010 (1.86)*	-0.032 (2.74)***	-0.040 (3.81)***	0.024 (0.93)	-0.007 (1.29)
Collateral	-0.057 (3.87)***	-0.004 (0.28)	-0.056 (1.55)	-0.013 (2.07)**	-0.042 (3.25)***	-0.004 (0.31)	-0.022 (0.69)	-0.013 (2.11)**
m2	0.66	-0.10	1.32	1.30	0.52	-0.09	1.26	1.25
Observations	47149	47149	47149	33749	47149	47149	47149	33749

Notes: Foreign is a dummy variable equal to 1 if the share of the firm's total capital owned by foreign investors is positive, and 0 otherwise. *Foreign1* is a dummy equal to 1 if the same share is positive but lower than 50%, and 0 otherwise. *Foreign2* is a dummy equal to 1 if the share of foreign ownership is greater than or equal to 50% but lower than 100%, and 0 otherwise. *All foreign* is a dummy variable equal to 1 if the share of the firm's total capital owned by foreign investors is equal to 100%, and 0 otherwise. All specifications were estimated using a GMM first-difference specification. The figures reported in parentheses are asymptotic *t*-statistics. Time dummies and time dummies interacted with industry dummies were included in all specifications. Standard errors and test statistics are asymptotically robust to heteroskedasticity. The instrument set includes two or more lags of all explanatory variables, time dummies, and time dummies interacted with industry dummies. *m2* is a test for second-order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. Also see Notes to Table 3. * indicates significance at the 10% level. ** indicates significance at the 5% level. *** indicates significance at the 1% level.

Table 5: Relationship between foreign ownership and firm performance: using registration-based definitions of foreign ownership

	ROA	*ROS*	*PROD*	*TFP*	*ROA*	*ROS*	*PROD*	*TFP*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lagged dep. variable	0.380 (20.06)***	0.374 (23.42)***	0.408 (10.21)***	0.192 (4.27)***	0.389 (21.77)***	0.379 (23.54)***	0.421 (11.17)***	0.198 (4.72)***
Foreign-reg	0.094 (3.90)***	0.110 (5.14)***	0.312 (5.09)***	0.031 (3.02)***				
JV					0.079 (2.93)***	0.090 (3.89)***	0.203 (3.16)***	0.216 (2.05)**
WFO					0.070 (1.82)*	0.080 (2.43)**	0.157 (1.80)*	0.246 (1.72)*
Size	0.004 (0.91)	0.013 (3.31)***	0.044 (3.98)***	-0.010 (3.55)***	-0.0002 (0.04)	0.008 (2.16)**	0.032 (3.05)***	-0.009 (3.89)***
Expdum	0.005 (0.69)	-0.002 (0.32)	0.013 (0.69)	0.008 (2.60)***	0.001 (0.17)	-0.012 (1.87)*	-0.010 (0.58)	0.007 (2.47)**
Leverage	-0.035 (2.46)**	-0.031 (2.49)**	-0.025 (0.81)	-0.011 (1.93)*	-0.036 (2.96)***	-0.041 (3.85)***	0.015 (0.57)	-0.006 (1.11)
Collateral	-0.058 (3.92)***	-0.000 (0.03)	-0.054 (1.46)	-0.016 (2.54)**	-0.047 (3.60)***	0.005 (0.39)	-0.026 (0.78)	-0.019 (3.22)***
m2	1.28	0.57	1.53	1.52	1.27	0.55	1.46	1.43
Observations	47763	47763	47763	34133	47763	47763	47763	34133

Notes: Foreign-reg is a dummy variable equal to 1 if the firm is registered as wholly foreign owned, as an equity joint-venture, or as a contractual joint-venture, and 0 otherwise. *JV* is a dummy variable equal to 1 if the firm is registered as an equity joint-venture, or as a contractual joint-venture, and 0 otherwise. *WFO* is a dummy variable equal to 1 if the firm is registered as wholly foreign owned, and 0 otherwise. All specifications were estimated using a GMM first-difference specification. The figures reported in parentheses are asymptotic *t*-statistics. Time dummies and time dummies interacted with industry dummies were included in all specifications. Standard errors and test statistics are asymptotically robust to heteroskedasticity. The instrument set includes two or more lags of all explanatory variables, time dummies, and time dummies interacted with industry dummies. *m2* is a test for second-order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. Also see Notes to Table 3. * indicates significance at the 10% level. ** indicates significance at the 5% level. *** indicates significance at the 1% level.

Table 6: Relationship between foreign ownership and firm performance: allowing for non-linearities

	ROA	*ROA*	*ROS*	*ROS*	*PROD*	*PROD*	*TFP*	*TFP*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lagged dep. variable	0.382 (20.71)***	0.378 (20.49)***	0.370 (23.60)***	0.368 (23.65)***	0.424 (10.49)***	0.415 (10.40)***	0.222 (4.98)***	0.214 (4.78)***
Foreigncap	0.048 (1.27)	0.142 (2.36)**	0.073 (2.35)**	0.169 (3.36)***	0.242 (2.90)***	0.595 (3.86)***	0.0194 (1.30)	0.057 (2.21)**
Foreigncap^2		-0.150 (3.23)***		-0.153 (3.88)***		-0.506 (3.86)***		-0.048 (2.29)**
Size	0.005 (1.23)	0.007 (1.54)	0.012 (3.15)***	0.013 (3.59)***	0.046 (4.32)***	0.048 (4.66)***	-0.006 (2.11)**	-0.007 (2.35)**
Expdum	-0.002 (0.35)	-0.005 (0.71)	-0.011 (1.73)*	-0.014 (2.20)**	-0.012 (0.66)	-0.019 (1.04)	0.005 (1.90)*	0.005 (1.80)*
Leverage	-0.033 (2.35)**	-0.032 (2.32)**	-0.034 (2.80)***	-0.034 (2.77)***	-0.007 (0.24)	-0.008 (0.26)	-0.011 (2.02)**	-0.011 (1.86)*
Collateral	-0.055 (3.78)***	-0.053 (3.62)***	-0.005 (0.37)	-0.003 (0.22)	-0.048 (1.31)	-0.045 (1.24)	-0.015 (2.38)**	-0.014 (2.31)**
Statecap	-0.019 (2.28)**	-0.017 (2.09)**	-0.019 (2.33)**	-0.018 (2.17)**	-0.034 (2.00)**	-0.028 (1.64)	0.003 (0.88)	0.004 (1.09)
Privatecap	-0.001 (0.09)	0.000 (0.05)	-0.003 (0.58)	-0.002 (0.36)	0.037 (2.56)**	0.041 (2.78)***	-0.003 (0.77)	-0.003 (0.79)
Turning points		47.33%		55.23%		58.79%		59.54%
m2	0.88	0.67	0.14	-0.06	1.32	1.21	1.14	1.20
Observations	47149	47149	47149	47149	47149	47149	33749	33749

Notes: All specifications were estimated using a GMM first-difference specification. The figures reported in parentheses are asymptotic *t*-statistics. Time dummies and time dummies interacted with industry dummies were included in all specifications. Standard errors and test statistics are asymptotically robust to heteroskedasticity. The instrument set includes two or more lags of all explanatory variables, time dummies, and time dummies interacted with industry dummies. *m2* is a test for second-order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. Also see Notes to Table 3. * indicates significance at the 10% level. ** indicates significance at the 5% level. *** indicates significance at the 1% level.

Table 7: Relationship between foreign ownership and firm performance: allowing for non-linearities and including time dummies interacted with provincial dummies

	ROA	*ROS*	*PROD*	*TFP*
	(1)	(2)	(3)	(4)
Lagged dep. Variable	0.371 (20.29)***	0.363 (23.30)***	0.409 (10.23)***	0.174 (0.049)***
Foreigncap	0.136 (2.36)**	0.194 (3.99)***	0.498 (3.38)***	0.049 (1.93)
Foreigncap^2	-0.130 (2.83)***	-0.151 (3.79)***	-0.447 (3.50)***	-0.052 (2.40)**
Size	0.005 (1.19)	0.012 (3.10)***	0.049 (4.51)***	-0.012 (3.26)***
Expdum	-0.002 (0.34)	-0.011 (1.75)*	-0.025 (1.32)	0.010 (3.18)***
Leverage	-0.028 (2.02)**	-0.036 (2.98)***	-0.001 (0.05)	-0.006 (1.14)
Collateral	-0.061 (4.13)***	-0.009 (0.67)	-0.049 (1.29)	-0.014 (2.11)**
Statecap	-0.018 (2.18)**	-0.018 (2.19)**	-0.016 (0.98)	0.013 (0.31)
Privatecap	0.001 (0.08)	0.001 (0.14)	0.042 (2.88)***	-0.008 (2.17)**
Turning points	52.31%	64.24%	55.65%	46.79%
m2	0.82	-0.04	1.21	1.34
Observations	47349	47349	47349	33749

Notes: All specifications were estimated using a GMM first-difference specification. The figures reported in parentheses are asymptotic *t*-statistics. Time dummies and time dummies interacted with provincial dummies were included in all specifications. Standard errors and test statistics are asymptotically robust to heteroskedasticity. The instrument set includes two or more lags of all explanatory variables, time dummies, and time dummies interacted with provincial dummies. *m2* is a test for second-order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. Also see Notes to Table 3. * indicates significance at the 10% level. ** indicates significance at the 5% level. *** indicates significance at the 1% level.

Table 8: Relationship between foreign ownership and firm performance: allowing for non-linearities and distinguishing foreign investors into those originating from Hong Kong, Macao, and Taiwan, and others.

	ROA	*ROS*	*PROD*	*TFP*
	(1)	(2)	(3)	(4)
Lagged dep. var.	0.377	0.366	0.415	0.207
	(20.41)***	(23.50)***	(10.50)***	(4.63)***
Non HMT Foreigncap	0.171	0.172	0.749	0.062
	(2.62)***	(3.06)***	(4.00)***	(2.28)**
Non HMT Foreigncap^2	-0.171	-0.142	-0.680	-0.064
	(2.96)***	(2.82)**	(3.87)***	(2.65)**
HMT Foreigncap	0.091	0.132	0.330	0.039
	(1.42)	(2.50)***	(2.02)**	(1.42)
HMT Foreigncap^2	-0.094	-0.114	-0.226	-0.026
	(1.93)*	(2.84)***	(1.70)*	(1.17)
Size	0.005	0.012	0.045	-0.008
	(1.30)	(3.31)***	(4.36)***	(2.65)**
Expdum	-0.004	-0.012	-0.018	0.005
	(0.56)	(1.94)*	(0.96)	(1.74)*
Leverage	-0.033	-0.036	-0.011	-0.009
	(2.41)**	(2.98)***	(0.36)	(1.65)
Collateral	-0.055	-0.005	-0.050	-0.014
	(3.73)***	(0.40)	(1.37)	(2.26)**
Statecap	-0.018	-0.018	-0.030	0.005
	(2.17)**	(2.28)**	(1.80)	(1.26)
Privatecap	-0.0007	-0.003	0.036	-0.003
	(0.10)	(0.56)	(2.48)**	(0.94)
Non HMT Foreigncap turning points	50.00%	60.68%	55.03%	48.73%
HMT Fireigncap turning points		57.85%	73.00%	
m2	0.77	0.03	1.36	1.51
Observations	47146	47146	47146	33748

Notes: HMT stands for Hong Kong, Macao, and Taiwan. All specifications were estimated using a GMM first-difference specification. The figures reported in parentheses are asymptotic *t*-statistics. Time dummies and time dummies interacted with industry dummies were included in all specifications. Standard errors and test statistics are asymptotically robust to heteroskedasticity. The instrument set includes two or more lags of all explanatory variables, time dummies, and time dummies interacted with industry dummies. *m2* is a test for second-order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. Also see Notes to Table 3. * indicates significance at the 10% level. ** indicates significance at the 5% level. *** indicates significance at the 1% level.

Table A1: Summary statistics: partitioning observations on the basis of the degree of ownership by investors other than those from Hong Kong, Macao, and Taiwan

	Non HMT Foreigncap=0%	*0%<non HMT Foreigncap<50%*	*50% ≤non HMT Foreigncap<100%*	*Non HMT Foreigncap=100%*
	(1)	(2)	(3)	(4)
ROA	0.039	0.061	0.065	0.057
ROS	0.027	0.047	0.053	0.039
PROD	0.063	0.13	0.227	0.13
TFP	0.027	0.035	0.041	0.032
Size	6.51	6.86	7.05	6.54
Leverage	0.60	0.58	0.51	0.51
Collateral	0.39	0.34	0.36	0.37
Expdum	46.59	72.62	71.77	85.77
Non HMT Foreigncap	0	25.96	70.16	100
HMT Foreigncap	17.93	3.21	0.51	0
Statecap	20.86	10.40	7.66	0
Privatecap	51.36	49.47	17.62	0
Observations	73016	5350	4846	8362

Notes: Non HMT Foreigncap represents the fraction of the firm's capital paid in by foreign investors other than those from Hong Kong, Macao, and Taiwan. *HMT Foreigncap* represents the fraction of the firm's capital paid in by foreign investors from Hong Kong, Macao, and Taiwan. *ROA* represents the firm's returns to assets and is given by its net income over its total assets. *ROS* represents the firm's returns to sales and is given by its net income over its total sales. *PROD* represents labor productivity, i.e. the ratio of the firm's net income to its number of employees. *TFP* is total factor productivity calculated using the Levinsohn and Petrin (2003) method. *Size* is the log of the firm's total assets. *Leverage* is given by the sum of the firm's current and non-current liabilities to its total assets. *Collateral* is given by the ratio of the firm's fixed tangible assets to its total assets. *Expdum* is a dummy equal to 1 if the firm exports, and 0 otherwise. *Statecap* represents the fraction of the firm's capital paid in by the state. *Privatecap* represents the fraction of the firm's capital paid in by individual investors and legal entities. See Appendix 1 for complete definitions of all variables. Note that column 1 may include observations with positive capital paid in by investors from *HMT*.

Table A2: Summary statistics: partitioning observations on the basis of the degree of ownership by investors from Hong Kong, Macao, and Taiwan

	HMT Foreigncap=0%	*0%<HMT Foreigncap<50%*	*50% ≤HMT Foreigncap<100%*	*HMT Foreigncap=100%*
	(1)	(2)	(3)	(4)
ROA	0.042	0.051	0.052	0.037
ROS	0.030	0.039	0.037	0.026
PROD	0.081	0.11	0.116	0.060
TFP	0.029	0.033	0.031	0.025
Size	6.61	6.77	6.46	6.10
Leverage	0.59	0.60	0.52	0.50
Collateral	0.39	0.34	0.34	0.35
Expdum	46.73	69.31	70.71	86.16
HMT Foreigncap	0	25.05	72.21	100
Non HMT Foreigncap	17.57	3.90	0.90	0
Statecap	20.97	10.88	5.75	0
Privatecap	51.63	4.55	14.73	0
Observations	73521	5224	3063	9766

Notes: HMT Foreigncap represents the fraction of the firm's capital paid in by foreign investors from Hong Kong, Macao, and Taiwan. *Non HMT Foreigncap* represents the fraction of the firm's capital paid in by foreign investors other than those from Hong Kong, Macao, and Taiwan. *ROA* represents the firm's returns to assets and is given by its net income over its total assets. *ROS* represents the firm's returns to sales and is given by its net income over its total sales. *PROD* represents labor productivity, i.e. the ratio of the firm's net income to its number of employees. *TFP* is total factor productivity calculated using the Levinsohn and Petrin (2003) method. *Size* is the log of the firm's total assets. *Leverage* is given by the sum of the firm's current and non-current liabilities to its total assets. *Collateral* is given by the ratio of the firm's fixed tangible assets to its total assets. *Expdum* is a dummy equal to 1 if the firm exports, and 0 otherwise. *Statecap* represents the fraction of the firm's capital paid in by the state. *Privatecap* represents the fraction of the firm's capital paid in by individual investors and legal entities. See Appendix 1 for complete definitions of all variables. Note that column 1 may include observations with positive capital paid in by investors other than those from *HMT*.