Essays on Firm Ownership, Performance and Value

by

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to Chris and my Parents

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Abstract

This dissertation studies the relationship between firm ownership and firm performance as measured by firm productivity and profitability. Given the vast dispersion in owner and firm characteristics, changes in ownership have the potential to translate into differences in firm performance. Chapter 2 focuses on differences in performance between foreign-owned and domestic-owned enterprises. It uses firm-level micro data from India to study the direct impact of foreign ownership on firm productivity. There appears to be no significant difference in the performance of foreign-acquired versus non-acquired firms over the short run, but there is evidence of a productivity improvement for foreign-acquired firms over a longer time horizon. Conversely, foreign divestitures do not lead to significant differences in performance between foreign-divested firms and firms that remain foreign-owned. Exploiting a unique longitudinal dataset of Chinese enterprises, Chapter 3 studies the importance of degrees of foreign ownership by examining the implications of full versus partial foreign ownership. Using a difference-in-differences matching estimator and three alternative measures of profitability, firm performance is found to neither improve nor deteriorate after foreign buyouts. Chapter 4 presents a model explaining how governments decide the order in which to privatize state owned enterprises. The model gives the clear testable prediction that firms which would experience the greatest improvement in profit levels after privatization should be privatized first. The validity of the theoretical result is tested on a firm level panel data set constructed from Bulgarian Privatization Agency documents. The empirical estimation confirms that firms with larger gaps between their average after privatization profit level and before privatization profit level get privatized sooner.

Chapter 1

Introduction

This dissertation studies the relationship between firm ownership and firm performance as measured by firm productivity and profitability. If the world were populated by identical owners and firms, ownership changes should have no implications for firm performance. However, given the vast dispersion in owner and firm characteristics, changes in ownership have the potential to translate into differences in firm performance. Chapter 2 focuses on differences in performance between foreign-owned and domestic-owned enterprises. Chapter 3 studies the importance of degrees of foreign ownership by examining the implications of full versus partial foreign ownership. Chapter 4 discusses the order in which assets should be divested to new owners.

The consensus in the literature is that foreign-owned firms perform better than domestic-owned firms. It is less clear if this perceived difference is due to foreign companies acquiring the best domestic firms or to an improvement in performance following the foreign acquisition. Chapter 2 uses firm-level micro data from India to study the direct impact of foreign ownership on firm productivity. To control for the endogeneity of the foreign acquisition decision, Chapter 2 implements a difference-in-differences matching estimator

using two alternative approaches to assigning a counterfactual time of acquisition to firms in the control group. Alternative definitions of foreign direct investment (FDI) are also explored. There is no significant difference in the performance of foreign-acquired versus non-acquired firms over the short run, but there is evidence of a productivity improvement for foreign-acquired firms over a longer time horizon. Conversely, foreign divestitures do not lead to significant differences in performance between foreign-divested firms and firms that remain foreign-owned.

Chapter 3 turns to the question of differentiation between degrees of foreign ownership. Venturing with a local partner was the predominant strategy for Multinational Enterprises (MNEs) entering the Chinese market in the 1980s and 1990s. However, rapid economic development and gradual legislation relaxation yielded a continuous decline of joint ventures (JVs) and a rising position for foreign wholly owned subsidiaries (WOSs). Chapter 3 investigates the factors affecting foreign buyout decisions and their performance implications. Exploiting a unique longitudinal dataset of Chinese enterprises, Chapter 3 reports that the foreign equity percentage, the number of foreign partners in the JV interacted with enterprise age, and relative labor intensity are important determinants of foreign buyouts. Although simple difference-in-differences estimates show that foreign buyouts yield an immediate negative impact on firm profitability rates and a sustained positive impact on firm profits relative to the industry mean, alternative propensity score matching methodology demonstrates that these results are biased and misleading. Using a difference-in-differences matching estimator and three alternative measures of profitability, firm performance is found to neither improve nor deteriorate after foreign buyouts.

Chapter 4 presents a model explaining how governments decide the order in which to

privatize state owned enterprises. Privatization of SOEs is an important economic decision faced by governments worldwide. The sequence of privatization needs careful consideration when the number of enterprises subject to privatization is non trivial. In the model, the government chooses the sequence of privatization that maximizes its profits from privatization. The model gives the clear testable prediction that firms which would experience the greatest improvement in profit levels after privatization should be privatized first. The validity of the theoretical result is tested on a firm level panel data set constructed from Bulgarian Privatization Agency documents. The empirical estimation confirms that firms with larger gaps between their average after privatization profits and before privatization profits are privatized sooner.

The papers in this dissertation use rigorous economic analysis to contribute to the understanding of the relationship between enterprise ownership and performance. The results presented in the following chapters challenge conventional thinking and highlight the importance of proper controls.

Chapter 2

Does Foreign Ownership Lead to Higher Firm Productivity?

2.1 Introduction

This study explores the causal relationship between foreign ownership and firm productivity. While it is generally assumed that foreign-owned firms perform better than domestic-owned firms, it is less clear if foreign ownership per se improves productivity. If foreign owners "cherry-pick" the best domestic firms for acquisition or enter high-productivity industries, foreign-owned firms would appear to have a productivity advantage that has little to do with the transfer in ownership. Examining how foreign ownership affects firm performance has important policy implications for governments worldwide, which spend considerable resources on incentive programs aimed at attracting foreign direct investment (FDI) in hopes of reaping the benefits of globalization (United Nations Conference on Trade and Development, 2000).

In this paper the effect of foreign ownership on firm performance is analyzed by examining events where firms switch from domestic to foreign ownership. The analysis focuses on

cross border mergers and acquisitions (M&A) events in the manufacturing sector and firm performance is defined as total factor productivity (TFP). The firm-level panel data used in the study are collected by the Center for Monitoring the Indian Economy (CMIE). India offers an especially suitable setting for addressing the research question, having attracted a substantial inflow of cross-border M&As since liberalizing its FDI regime in the 1990s.

To measure the foreign ownership effect on firm productivity, one would need data on the productivity of firms in the event that they receive foreign ownership treatment and the productivity of these same firms in the event that they do not receive such treatment. Unfortunately the counterfactual is not observed, creating a missing data problem. An easy solution would be to measure the difference in productivity between firms that are foreign-acquired and firms that are not and attribute this difference to foreign ownership. However this approach would be ignoring the selection bias issue inherent in the non-randomness of foreign acquisition decisions. To circumvent the endogeneity of the FDI decision, this study compares the productivity outcomes of foreign-acquired firms with the outcomes of a carefully selected group of non-acquired firms. The appropriate comparison group of firms that do not receive foreign ownership treatment is constructed using propensity score matching techniques. In particular, the causal effect of foreign acquisition on firm productivity is identified by implementing a difference-in-differences matching estimator using two alternative approaches to assigning a counterfactual time of acquisition to firms in the control group. In this analysis, the difference-in-differences matching estimator yields results that differ from results using the more prevalent difference-in-differences estimator, further underlining the importance of choosing a suitable comparison group.

This study explores two alternative definitions of FDI. One definition focuses on firms

that cross a 10% foreign ownership threshold, while the alternative definition considers firms that have received a significant foreign acquisition of 10% or above. Under either definition, there is no immediate improvement in performance attributable to foreign ownership. However, over a three-year horizon, the improvement in after-acquisition productivity compared with the before-acquisition productivity is greater for foreign-acquired than for non-acquired firms. The lag in productivity improvement is possibly a reflection of India's labor market rigidities and delays in the adoption of new technologies and production practices. The results are robust to different specifications of the propensity score estimation and to the use of alternative data on cross-border M&A events. This study also examines the reverse experiment, foreign divestitures, defined as reductions in foreign shareholding below a 10% threshold. Foreign divestiture events do not lead to significant differences in divested firm productivity compared with their foreign-owned counterparts. The result indicates that any foreign ownership advantage is retained after the foreign owners leave.

In contrast to earlier studies[1] examining the relationship between foreign ownership and firm performance by focusing on cross-sectional variation (Doms and Jensen, 1995; Barbosa and Louri, 2005; Chhibber and Majumdar, 1999), this study uses longitudinal ownership data to control for unobserved firm heterogeneity. There is a large body of literature exploiting longitudinal data to examine the spillover effects from foreign-owned companies to domestic firms, e.g., (Aitken and Harrison, 1999; Javorcik, 2005; Sabirianova et al., 2005). Even though the spillover question is important, a positive effect on other domestic firms is unlikely unless foreign buyers are able to generate performance gains for their acquisitions. This paper is one of a small number of studies measuring the change in

[1] See Section 2.2 for an overview of the related literature.

firm performance when domestic firms are acquired by foreign buyers (Pérez-González, 2005; Arnold and Javorcik, 2005; Girma, 2005). While the topic of the present study is analogous to the focus of this emerging literature, this research differs from previously completed work in several respects. Using carefully constructed variables, this study measures firm performance by a consistent productivity index estimated using the Levinsohn and Petrin (2003) methodology. The paper uses advances in propensity score matching methodology to address the selection bias issue and employs two methods for assigning counterfactual times of acquisition to the control group firms. The study also explores alternative definitions of FDI and sheds light on the reverse experiment by utilizing data on foreign divestitures.

The rest of the paper is structured as follows. Section 2.2 situates the study in the context of the existing literature. Section 2.3 gives a brief overview of FDI history and regulations in India, while Section 2.4 introduces the dataset. The difference-in-differences matching econometric approach and construction of variables are discussed in Sections 2.5 and 2.6 respectively. Section 2.7 describes some theoretical priors regarding the causality between FDI and productivity. Section 2.8 presents the results of balancing tests and discusses the matching estimation results. Section 2.9 concludes.

2.2 Related Literature

The international economics literature has accumulated some evidence that foreign-owned firms perform better than domestic-owned firms. A number of empirical studies document the performance of foreign-owned relative to domestic-owned firms in the cross-section.

Doms and Jensen (1995) find that foreign-owned companies in the U.S. are more productive than domestic-owned ones, but are on average less productive than U.S.-owned multinational companies (MNCs). Barbosa and Louri (2005) do not find conclusive evidence that MNCs in Greece and Portugal perform better than domestic-owned firms, except in the "highest performing firms" category where the MNCs outperform the domestic firms. In a cross-section study from India, Chhibber and Majumdar (1999) use data from the same source as the present paper to study the correlation between foreign ownership and firm performance, where performance is defined as return on assets or return on sales. The authors use foreign ownership data for a single year for each firm, but the year foreign ownership is observed differs among firms. Chhibber and Majumdar find no significant correlation between foreign ownership and firm performance at ownership levels below 51%. Foreign ownership above 51% has a positive and statistically significant effect on performance only after 1991, the start year of trade liberalization and FDI reforms in India. All the variation in these studies comes from the cross-section.

A separate strand of the literature exploits longitudinal data to study the spillover effects of FDI. While the focus of these studies is measuring the effect of FDI on the productivity of other firms, they provide some hints about the correlation between foreign ownership and own firm productivity. In a longitudinal study of Venezuelan firms, Aitken and Harrison (1999) conclude that there is a positive correlation between foreign ownership share and firm output after controlling for inputs to production, but the effect is significant for small enterprises alone. Using a firm-level Lithuanian panel dataset, Javorcik (2005) finds no evidence of foreign ownership share being correlated with productivity growth, but echoes Aitken and Harrison's finding of a positive correlation with the productivity level.

The nascent literature examining foreign acquisition of domestic establishments and its effects on acquired firm productivity produces mixed evidence. In a Mexican study of the effects of acquiring control rights on productivity, Pérez-González (2005) exploits a natural experiment: the lifting of foreign majority ownership restrictions. He finds that the TFP level, estimated through a standard log-linear Cobb-Douglas production function for each industry and year, improves after foreign acquisition, particularly in technologically advanced industries. Arnold and Javorcik (2005) use plant-level data from Indonesia to explore the causal relationship between foreign ownership and plant productivity, calculated using the Levinsohn-Petrin procedure to control for unobservables. The authors employ a difference-in-differences approach combined with propensity score matching and find that foreign ownership leads to significant improvements in productivity in the year of acquisition and in subsequent years. In a study of Italian firms, Benfratello and Sembenelli (2006) use a GMM-System estimator to estimate TFP and find that foreign ownership has no discernible effect on productivity. Most of the remaining evidence comes from United Kingdom studies. Using micro-level manufacturing data from the United Kingdom, Harris and Robinson (2002) conclude that foreign owners acquire domestic plants that perform better than average. The evidence from the post-acquisition period points to a decline in performance which the authors interpret to be due to difficulties in assimilating the target firm. In a series of papers using firm-level data from the United Kingdom, Girma et al. (Girma, 2005; Girma et al., 2007, 2006) document an improvement in the growth rate of firm performance, defined as the residual from a translog production function, following foreign acquisitions.

This research is also related to a rich finance literature studying the effect of domestic

M&As on target company performance. The important distinction is that in the domestic setup there is no international dimension. Finance scholars believe there is a link between the productivity of the establishment and the productivity of the parent firm. Lichtenberg and Siegel (1987), using U.S. Census Bureau data, establish that lower performing plants are more likely to be taken over, but improve their productivity after the takeover. The authors interpret their findings to be consistent with a matching theory of plant ownership, where good matches result in better performance. In a later study of leveraged buyouts (LBOs) Lichtenberg and Siegel (1990) conclude that LBOs in the 1980s led to improvements of efficiency in the acquired plants compared with the industry mean. McGuckin and Nguyen (1995) use the U.S. Longitudinal Research Database to study how transferred firms perform after domestic acquisition. The authors find the opposite of the Lichtenberg and Siegel studies: better performing plants are more likely targets of acquisition, indicative of "cherry-picking" behavior. The post-acquisition growth of the acquired plants is generally better than that of non-acquired plants, but non-acquired plants outperform large acquired plants. In a more recent study of M&As using the U.S. Longitudinal Research Database, Schoar (2002) shows that target plants increase productivity after takeover while the acquirer plants' productivity suffers. The domestic M&A literature pinpoints the presence of selection bias in the acquisition decision, defining a major issue to be addressed in the present study.

2.3 Indian Institutions and Regulations

Until independence in 1947, the Indian economy was dominated by large MNCs. In the following decades, the Indian government adopted policies targeted at economic self-sufficiency. The Foreign Exchange Regulation Act (FERA) of 1973 introduced rules requiring foreign owners to reduce their holdings in Indian companies to 40% of shares or else those firms would not be treated as Indian companies (Athreye and Kapur, 1999). Prompted by the balance of payments crisis of 1991, the Indian government engaged in trade liberalization and revisited the regulations governing FDI. The 1991 Industrial Policy Statement allowed foreign companies to own up to 51% of company shares in most industries and up to 100% of shares in some industries (Khanna, 2002). The list was further expanded in 1996 and 1997 when the government allowed 50% equity participation in some mining-related sectors and permitted automatic approval for investments of up to 75% in nine priority areas. The Foreign Investment and Promotion Board (FIPB) was created in 1997 to assist foreign investors and review applications for investment requiring government approval. In subsequent years, the law was modified to allow FDI in the financial sector and the list of industries on the automatic approval list was further expanded (Srinivasan, 2003).

Currently, FDI up to 100% is allowed automatically in all activities and sectors except in industries that require an Industrial License, in cases when the investor has an existing venture in India in the same field, when a foreign company intends a takeover of an existing Indian financial company, and when wanting to invest in certain strategic industries such as agriculture. FDI in the following sectors is prohibited: gambling and betting, lottery,

business of chit fund[2], Nidhi company[3], housing and real estate (except development of townships and infrastructure), trading in transferable development rights, retail trading, atomic energy, agriculture and plantation (except tea and a handful of other activities) (Department of Industrial Policy and Promotion, 2005). As a result of the improvements in its foreign investment climate, India is increasingly a host to both cross-border M&A activity and greenfield FDI as illustrated in Figure 2.1. This makes it a particularly appropriate setting for studying the effects of cross-border M&A on firm productivity.

2.4 Data

CMIE's Prowess database is an Indian firm-level panel dataset of balance sheets and income statements spanning nineteen years (1988-2006) with information on close to 9500 firms. The firms in Prowess account for 75% of corporate taxes and 95% of excise duties collected by the Indian Government. Many of the firms are publicly traded on one of India's stock exchanges and a number of them are public sector firms. The majority of Prowess firms are from the manufacturing sector. CMIE's dataset includes six years of foreign shareholding information from 2001 to 2006. The ownership information pinpoints the date of ownership change from domestic to foreign and thus offers a unique opportunity to study the causal relationship between foreign ownership and firm performance.

This study discusses two alternative definitions of FDI. Following the working definition of FDI suggested by the World Bank, foreign acquisition is defined as the crossing of a

[2]Under a chit fund scheme, members deposit a certain sum of money in periodical installments over a defined period of time and the money is auctioned at the end of each period. The proceeds of the auction are distributed between chit fund members.

[3]A Nidhi company is a mutual benefit company that accepts deposits and lends money to members only.

10% foreign ownership threshold.[4] A histogram of foreign shareholding among Prowess firms shows that the percentage of foreign shareholding is clustured around 10%. In addition, Indian company law specifies 10% shareholding as necessary to exercise important shareholder privileges such as the right to bring complaints to the Company Law Board.[5] All three factors motivate the use of a 10% foreign ownership threshold definition of FDI. An alternative view of FDI is that rather than the crossing of a threshold, it is the amount of incremental foreign investment that affects firm performance. The second definition of FDI used in this study is therefore defined as a change in the percentage of foreign shareholding equal to or exceeding 10%. Figure 2.2 shows histograms of the before and after FDI event distributions of foreign shareholding. The top two panels of Figure 2.2 use the 10% foreign ownership threshold definition of FDI. Firms that cross the 10% threshold are clustered at just above 10% of foreign ownership after the FDI event. The bottom two panels of Figure 2.2, illustrating the percentage of foreign ownership before and after a significant foreign acquisition of 10% or above, show a dispersed distribution of foreign ownership following the acquisition event.

The breakdown of manufacturing firms by two digit National Industry Classification (NIC) industry codes is given in Table 2.1. The number of firms classified as foreign-acquired according to the two distinct definitions of FDI are reported in columns 5 and 6 respectively. A significant portion of the changes in ownership occur in capital-intensive

[4]"Foreign direct investment are the net inflows of investment to acquire a lasting management interest (10% or more of voting stock) in an enterprise operating in an economy other than that of the investor". (World Development Indicator notes)

[5]The Company Law Board is an independent quasi-judicial body created by India's Central Government. The Second Amendment of the Companies Act (2002) seeks to replace the Company Law Board with the National Company Law Tribunal and National Law Appellate Tribunal. However, the new framework is facing court challenges.

industries such as chemical products and basic metals. Columns 1 and 2 of Table 2.2 break down the number of foreign acquisition events by type and year. Consistent with the pattern of cross-border M&As depicted in Figure 2.1, the number of cross-border M&As in the Prowess data increases over time with the greatest number of deals occurring in 2005 and 2006.

2.5 Econometric Approach

2.5.1 Difference-in-Differences Matching Estimator

The goal of this paper is to estimate the effect of foreign acquisition on target firm performance. MNCs do not acquire shares in domestic firms at random, which creates a selection bias problem. When comparing the productivity of foreign-acquired with non-acquired firms, it is important to carefully select a control group of firms with characteristics similar to those of the foreign acquisition targets. This is accomplished using a matching technique based on propensity scores.

Let $F_{i,t} \in \{0,1\}$ indicate if a domestic firm becomes foreign-owned at time t. $y^1_{i,t+u}$ denotes firm performance at time t+u, u periods after the foreign acquisition at time t, where $u \geq 0$. If the plant is not acquired at time t, its performance at time t+u would be equal to $y^0_{i,t+u}$. The effect of a change in foreign ownership at time t on firm performance at time t+u is measured by:

$$y^1_{i,t+u} - y^0_{i,t+u}. \tag{1}$$

$y^1_{i,t+u}$ is readily observed for firms that experience foreign acquisition, but the counterfactual

$y^0_{i,t+u}$ is not, creating a missing data problem. In general, for any firm one can only observe $y^1_{i,t+u}$ or $y^0_{i,t+u}$, but not both. The average effect of foreign acquisition on foreign-acquired firms (the average effect of treatment on the treated) is expressed as:

$$E(y^1_{t+u} - y^0_{t+u}|F=1) = E(y^1_{t+u}|F=1) - E(y^0_{t+u}|F=1). \tag{2}$$

Researchers often substitute $E(y^0_{t+u}|F=0)$ for the counterfactual $E(y^0_{t+u}|F=1)$, using the information available for firms that are not subject to foreign acquisition, for example by adopting a difference-in-differences estimator. However, this approach ignores potential selection bias issues, resulting in bias equal to $E(y^0_{t+u}|F=1) - E(y^0_{t+u}|F=0)$. A more appropriate construction of the counterfactual requires careful selection of the control group. There are several time-invariant as well as time-variant firm characteristics that could make a firm a suitable match for a firm that receives the foreign ownership treatment.

Matching would work well if both the control and treated firms have the same expected performance if they were domestic-owned (Rosenbaum and Rubin, 1983). This is known as the conditional independence assumption (CIA), formally:

$$E(y^0_{t+u}|X,F=1) = E(y^0_{t+u}|X,F=0) = E(y^0_{t+u}|X), \tag{3}$$

where X is a vector of firm characteristics. For the CIA to be satisfied X should contain all variables that affect both acquisition and outcome. The choice of variables to be included in X is guided by theory and institutional knowledge. An additional requirement for matching is that:

$$0 < Pr(F=1|X) < 1, \tag{4}$$

thus ruling out the perfect predictability of foreign acquisition and ensuring that the comparison group firms fall within the propensity score distribution of the acquired firms. In addition, short-run general equilibrium effects of foreign acquisition are assumed away.

Matching along all firm characteristics simultaneously creates an intractable dimensionality problem. A more elegant solution proposed by Rosenbaum and Rubin (1983) is to match firms based on an index capturing the information contained in the relevant variables. The index, also called a *propensity score*, is the probability of treatment based on the vector of firm characteristics X:

$$P_i = Pr(F_{i,t} = 1) = F(X_{i,t-1}). \tag{5}$$

Matching is then performed on the propensity score.

There are several important advantages to matching over standard regression analysis techniques. Matching does not assume a standard linear regression form. Instead, it determines the existence of an appropriate control group and in forming the counterfactual gives positive weight only to those observations that are close enough matches to treated observations.

A standard matching estimator is of the form:

$$\hat{\alpha}_M = \frac{1}{n_1} \sum_{i \in I_1 \cap S_P} [y_i^1 - \hat{E}(y_i^0 | F = 1, P_i)] \tag{6}$$

where

$$\hat{E}(y_i^0 | F = 1, P_i) = \sum_{j \in I_0} W(P_i, P_j) y_j^0. \tag{7}$$

$I_1 \cap S_P$ is the set of treated firms I_1 that fall within the common support S_P. I_0 is the set of control firms and n_1 is the number of treated firms in the support set. W is a weighing

function that depends on the propensity score distance between the treated and control firms. The analysis that follows uses a Gaussian kernel weighing function

$$W(P_i, P_j) = \frac{G\left(\frac{P_j - P_i}{a_n}\right)}{\sum_{k \in I_0} G\left(\frac{P_k - P_i}{a_n}\right)}, \tag{8}$$

where G is the Gaussian normal function $G(\alpha) = e^{\frac{\alpha^2}{2}}$ and a_n is a bandwidth parameter.

Matching eliminates differences between the matched foreign-acquired and domestic-owned plants due to the observable characteristics included in X. However, there might be other systematic differences between the treated and control groups that are not captured by observable characteristics. The difference-in-differences matching estimator alleviates the issue by eliminating unobservable time-invariant differences between the treated and control groups. It differs from the standard difference-in-differences estimator by including only treated firms within the common support and weighing the control firms according to the matching method rather than linearly (Smith and Todd, 2005; Heckman et al., 1997). The difference-in-differences matching estimator takes the form:

$$\hat{\alpha}_{DDM} = \frac{1}{n_1} \sum_{i \in I_1 \cap S_P} [(y^1_{i,t+u} - y^1_{i,t}) - \sum_{j \in I_0} W(P_i, P_j)(y^0_{j,t+u} - y^0_{j,t})]. \tag{9}$$

The key results discussed in the following sections are based on the difference-in-differences matching estimator.

2.5.2 Timing Issues

Typically, longitudinal matching studies analyze the effect of treatment when treatment occurs at the same point in time for all treated subjects. This is not the case here since treatment (foreign acquisition) occurs at different times for different firms. The different event dates alleviate concerns that outcomes observed after treatment are caused by factors related to the time of treatment rather than to the treatment itself. However, they pose the practical issue of how to assign counterfactual treatment dates to the firms in the potential control group, i.e. the domestic-owned firms that never receive treatment over the span of the data period. One possible approach to this problem is inspired by Eichler and Lechner's work (Eichler and Lechner, 2002). Counterfactual treatment dates are produced by examining the percentage of acquired firms that receive treatment in each calendar year and then proportionally assigning hypothetical acquisition dates at random to the firms that never receive treatment, making sure the assigned acquisition date comes after the year of incorporation of each firm. This approach will be referred to as *random acquisition time assignment*. Note that the group of treated firms consists of all firms that are subject to foreign acquisition, whereas the control group includes only those firms that are domestic-owned throughout the span of the data.

There exists an alternative way of addressing the timing issue. Rather than focusing on "What is the effect of being acquired at time t versus not being acquired at all?", one could shift the discussion to "What is the effect of being acquired at time t versus not being acquired up to and including time t?" In the first case, the control group consists of firms that are never subject to foreign acquisition. The second question suggests the use of an alternative control group, consisting of firms that are not subject to foreign acquisition up

to time t, but that could possibly be acquired later in the span of the data. The comparison between the acquired firms and the newly defined control group would measure the average productivity effect of being acquired at the time of acquisition versus being acquired at a later point in time, if at all. In contrast, when the control group is defined as in the random acquisition time assignment approach, the average treatment on the treated effect captures the difference in outcomes between firms that are foreign-acquired and firms that never are.

To implement the second approach, one has to think of the timing of foreign acquisitions as a dynamic process (Fredriksson and Johansson, 2004; Sianesi, 2004). Modifying the notation introduced earlier, let $F_{i,t}^{(d)} = 1$ if firm i experiences foreign acquisition at time t after a spell of domestic ownership of length d. Similarly, let $F_{i,t}^{(d)} = 0$ if firm i is not a foreign acquisition target at time t after being domestic-owned for duration d. The goal is to estimate:

$$E(((y_{t+u}^{1,(d)} - y_t^{1,(d)}) - (y_{t+u}^{0,(d)} - y_t^{0,(d)}))|F_t^{(d)} = 1, X_{i,t-1}) =$$

$$E((y_{t+u}^{1,(d)} - y_t^{1,(d)})|F_t^{(d)} = 1, X_{i,t-1}) - E((y_{t+u}^{0,(d)} - y_t^{0,(d)})|F_t^{(d)} = 1, X_{i,t-1}) \qquad (10)$$

When matching using the *dynamic acquisition time assignment* methodology, it is important that the treatment and control groups have a similar duration of domestic ownership distribution. For the matching procedure to work, the CIA assumption must hold conditional on both X and d, and as in the previous case $0 < Pr(F^{(d)}|X) < 1$. Matching between the treatment and control groups is performed both based on X and d.

2.5.3 Estimating Total Factor Productivity

The post-acquisition outcome variable that is of interest in this study is firm performance as measured by TFP. The traditional Ordinary Least Squares (OLS) approach of calculating TFP as the difference between actual and predicted output leads to omitted variable bias since the firm's choice of inputs is potentially correlated with unobserved productivity shocks. To calculate the TFP of company i, belonging to industry j at time t, this paper uses the Levinsohn and Petrin (2003) methodology which relies on firms' intermediate inputs to correct for the part of the unobserved productivity shock correlated with firms' inputs. Assuming a Cobb Douglas production function and taking logs, TFP is estimated by:

$$y_{i,j,t} = \alpha + \beta_l l_{i,j,t} + \beta_p e_{i,j,t} + \beta_m m_{i,j,t} + \beta_k k_{i,j,t} + \omega_{i,j,t} + \varepsilon_{i,j,t} \tag{11}$$

where y denotes output, l denotes labor, e denotes electricity consumption, m denotes raw material inputs, k denotes capital, and ω denotes the unobservable part of the productivity shock that is correlated with the firm's inputs.

The residuals from the Levinsohn-Petrin procedure are the unbiased TFP measures. To be able to compare productivity across firms in the cross-section as well as over time, this study uses the methodology originally suggested by Caves et al. (1982) and constructs a multilateral TFP index. Each industry has a hypothetical reference firm with the mean output and mean inputs at the beginning of the sample period. The reference firm's TFP is calculated using the coefficients from the respective industry's TFP regression. Log relative TFP is constructed by subtracting the reference firm's log TFP for each industry from the log TFP of each firm belonging to that industry. This TFP index is the outcome variable

used to examine the effect of foreign acquisition on firm productivity.

2.6 Construction of Variables

2.6.1 TFP Estimation

The Prowess dataset provides information on the value of output, gross fixed assets, salaries and wages, energy and fuel expenses and raw material expenses, which are all variables used in the estimation of TFP. The salaries and wages variable is used for lack of adequate data on the number of workers or worker hours. Other studies report qualitatively similar results when using either measure of labor inputs (Schoar, 2002) and the use of salaries and wages is advantageous to the extent that the variable reflects worker quality. Variables are deflated using the corresponding industry-specific deflators from India's National Accounts Statistics (Central Statistical Organization, 2001; Economic and Political Weekly Research Foundation, 2002; Ministry of Statistics and Programme Implementation, 2007). Value of output is deflated using appropriate industry-specific deflators. Energy and fuel expenses are deflated by a fuel and energy deflator. Salaries and wages as well as raw material expenses are deflated by the wholesale price index. The capital variable is constructed from data on gross fixed assets and depreciation using a modified perpetual inventory methodology as outlined in Appendix A. Nominal capital is deflated using a capital goods deflator.

The Levinsohn-Petrin procedure is executed by two digit NIC industry codes and over two time periods: before 1996 and after 1996, since the year 1996 marks a period of relative slowdown in India's manufacturing production (Ministry of Finance, 2007). Energy and

fuel consumption is used as the intermediate input proxying for unobserved productivity shocks.

2.6.2 Propensity Score

Random Foreign Acquisition Time Assignment

As outlined earlier, random foreign acquisition time assignment consists of randomly assigning counterfactual foreign acquisition dates to the firms that never experience foreign acquisition. The treatment group includes all firms that are acquired by foreign owners, while the control group is limited to only those firms that are always domestic-owned. Time is redefined to align the time series data for each firm, so that $t = 0$ in the year when acquisition (real or hypothetical) takes place, $t = 1$ in the year following the acquisition, $t = -1$ in the year before the acquisition, etc. The propensity score is the probability of receiving treatment in period $t = 0$ based on firm characteristics in period $t = -1$. It is estimated using a probit model based on equation (5). The dummy variable $F_{i,t}$ equals 1 in the year a firm's foreign shareholding increases from below 10% to above 10%, or in the case of the alternative definition of FDI, $F_{i,t}$ equals 1 in the year a firm experiences an increase in foreign ownership equal to or greater than 10%. Special care is taken to exclude firms that suffer a reduction in foreign ownership from the sample. In the case of the former definition of FDI, firms that meet the foreign ownership definition throughout the length of the sample period are also excluded.

Dynamic Foreign Acquisition Time Assignment

The treated group consists of firms that are targets of foreign acquisition at time t after being domestic-owned for duration d, while the control group includes all firms that do not experience foreign acquisition up to time t after domestic ownership of duration d. The dummy variable $F_{i,t}^{(d)}$ equals 1 in the year a firm becomes foreign-owned by either definition, after duration d of domestic ownership. $F_{i,t}^{(d)} = 0$ if the firm does not experience foreign acquisition up to time t, after a duration d of domestic ownership. One possible way of thinking about the duration of domestic ownership is as the time elapsed from the year of incorporation of the firm until time t. This definition of duration would implicitly assume that a company could have been potentially targeted for foreign acquisition over the entire span of its existence, which is not the case in the Indian context. India introduced a liberalized FDI regime in 1991, effectively making firms more likely to be targets of foreign acquisition after 1991.[6] Thus, the duration of domestic ownership, over which foreign acquisition is a possibility, is equal to $min(t-1991, t-year\_of\_incorporation_i)$. Since the number of firms incorporated after 1991 is relatively small, the analysis will focus on firms incorporated before 1991. Therefore, both the treatment and control groups have the same duration $t-1991$ at time t. The propensity score is estimated for each year t, calculating the probability of a firm experiencing foreign acquisition based on firm characteristics X, while conditioning on domestic ownership duration $t-1991$. Thus, a probit model is estimated for each year from 2003 to 2006.

[6] See Figure 2.1.

Control Variables

The vector of control variables X should include all factors that affect both treatment and outcome.[7] The choice of control variables is guided by institutional and theoretical knowledge. The variables included in X are log TFP and TFP growth rate, firm age, percentage of foreign shareholding, log capital stock, market share, spending on foreign capital relative to the capital stock, a foreign royalty payments dummy, exports to sales ratio, cash flow to sales ratio and sets of time, industry, and region dummies. The inclusion of log TFP is intended to control for any selection on productivity such as "cherry-picking" on the part of MNCs in acquiring domestic firms. The TFP growth rate is included because it is suggestive of the productivity growth trajectory of the firm. Firm age signals the stage of development of a firm and thus can potentially affect FDI decisions. The percentage of foreign ownership is important, because foreign owners often increase their ownership stake in a company incrementally. Log capital stock is a control for firm size as well as a measure of the potential productive capacity of the firm. Market share reflects the market power of the firm within its two digit NIC industry. The spending on foreign capital relative to the capital stock, the foreign royalty payments dummy and exports to sales ratio all gauge the firm's degree of integration with the world economy and could potentially influence both the foreign takeover decision and productivity outcome. The cash flow to sales ratio captures how effectively the firm uses its cash position to generate revenue and is a potential predictor of treatment. The industry dummies are based on India's two digit NIC codes. Regional dummies are defined based on the province the firm is based in.

[7] This implies that while some variables appear inconsequential to determining treatment, they should still be included in the propensity score estimation if they are believed to affect the outcome variable.

2.7 Theoretical priors

There are a number of good justifications for anticipating that target firms would experience enhanced productivity gains in the post-acquisition period.

Nocke and Yeaple (2007) propose a general equilibrium model in which heterogeneous firms face the decision of serving foreign markets through exports, greenfield FDI or cross-border M&A. Firms are heterogeneous in their capabilities and these capabilities differ in their degree of international mobility. The prediction of the model is that target firm performance improves following foreign acquisition. However, in industries where the source of firm heterogeneity is due to internationally mobile capabilities foreign acquisitions lead to a more substantial improvement in firm performance, compared with industries with internationally non-mobile factors. In this model, target firm productivity increases post-acquisition, because of the complementarities between the capabilities of the acquirer and target firms.

Acquisitions could also be motivated by a search for efficiency gains as originally pointed out by Marris (1963). Firms that are not profit-maximizing are takeover targets because of the potential gains that can be realized through better management. Assets are transferred to owners that are able to extract the assets' maximum profitability. In the context of cross-border M&A, the prediction is that MNCs acquire under-performing firms which have potential to be turned into better performers.

Economies of scale, both managerial and technological are another important motivation for M&As. In the presence of economies of scale, the target firm experiences lower costs and enjoys higher post-acquisition profits. If the economies of scale expectations are realized, the gains would be reflected in an improvement in the productivity both of the

target firm and the acquirer.

In the particular case of cross-border M&As, the target firm typically has a location advantage, years of experience in the local market, and an ability to navigate the local institutional environment (Markusen, 2000). When integrated with the know-how of the parent company, the country-specific advantages of the target could translate into enhanced productivity.

However, the synergies between target and acquirer could also fail to occur (Uhlenbruck, 2004), notably because of insufficient regional experience by the acquirer and a significant cultural distance between acquirer and target. Furthermore, the switch in ownership could be detrimental to the performance of the target if the acquirer cannot successfully assimilate the acquired firm (Harris and Robinson, 2003).

2.8 Results

Tables 2.3 and 2.4 display summary statistics by foreign acquisition status according to the two alternative definitions of FDI. The patterns in the data are consistent across both definitions of FDI. On average, foreign-acquired firms are larger in size, capture a higher industry market share, have more foreign capital spending relative to their capital stock, are more likely to make foreign royalty payments and export more as measured by the portion of exports in total sales. Treated firms appear to have lower productivity than non-treated firms, although the difference is not significant in the case of the significant acquisition of 10% or above definition of FDI.[8] There are no significant differences between foreign-

[8]The lower productivity of treated firms is reminiscent of the findings in the domestic M&A literature in support of the efficiency gains theory of M&A.

acquired and non-acquired firms in terms of TFP growth and the cash flow to sales ratio. The summary statistics confirm that there are systematic differences between treated and control group firms, rendering direct comparisons of firm performance without correcting for selection bias inappropriate.

2.8.1 Propensity Score Matching and Balancing Tests

The propensity scores are calculated by estimating a probit model with the covariates discussed in Section 2.6.2. Table 2.5 displays the results from the random acquisition time assignment propensity score estimation for both definitions of FDI. The probit results for the dynamic time assignment are found in Table 2.6. Table 2.6 reports probit results for each year 2003-2006. The propensity score estimation results in Tables 2.5-6 suggest a positive correlation between firm size as measured by the capital stock and the probability of experiencing FDI. Foreign firms appear to be focusing on domestic targets that are large in size and have a high productive capacity. Foreign shareholding is positively correlated with future foreign shareholding, suggesting a gradual process of foreign acquisition. This hypothesis is echoed in anecdotal evidence of MNCs in India acquiring small stakes in domestic-owned firms, where the shareholding is later adjusted depending on the quality of the owner-target experience. High foreign capital spending as a portion of capital is attractive to foreign acquirers, possibly because it reflects use of current production technology.

Matching is performed using the Gaussian kernel estimator with a bandwidth of .06. Following Smith and Todd (2005), a trim level of 2% is imposed, below which propensity score densities are excluded from matching. The purpose of the matching procedure is to

define an appropriate control group with which to compare the treated observations. The success of the matching procedure is measured by how closely the treated and matched observations fall to each other on the basis of the observable characteristics included in X. A test proposed by Dehejia and Wahba (2002) checks for the balancing of the covariates. The observations are stratified so that there is no significant difference in the propensity scores of treated and control firms within a stratum. Then, if for each stratum there are mostly no significant differences between the means of the covariates for the treated and control groups, the propensity score matching is considered balanced. The covariates are balanced for both the random foreign acquisition time assignment and dynamic foreign acquisition time assignment, as well as for the two alternative definitions of FDI.

The absolute standardized bias (ABS) is an alternative measure of the appropriateness of matching. ABS is defined as the difference in the means of the control and treatment group covariates scaled by the square root of the averaged sample variances of the covariates (Rosenbaum and Rubin, 1985). The ABS before matching is given by:

$$ABS = 100 \frac{\frac{1}{n_i}\sum_{i\in I_1} X_i - \frac{1}{n_0}\sum_{j\in I_0} W(P_i,P_j)X_j}{\sqrt{\frac{Var_{i\in I_1}(X_i)+Var_{j\in I_0}(X_j)}{2}}} \tag{12}$$

where n_1 is the number of treated firms and n_0 is the number of firms that are not treated. After matching, ABS is defined as:

$$ABS = \frac{\frac{100}{n_1}\sum_{i\in I_1}\left[X_i - \sum_{j\in I_0} W(P_i,P_j)X_j\right]}{\sqrt{\frac{Var_{i\in I_1}(X_i)+Var_{j\in I_0}(X_j)}{2}}} \tag{13}$$

Median ABS values along with further evidence of the appropriateness of the matching estimators are found in Tables 2.7-10. In most cases, the median ABS decreases after

matching. While there is no formal test of what value of ABS is appropriate, a value of under 20 is considered reasonable (Rosenbaum and Rubin, 1985). As reported at the bottom of Tables 2.7-10, the median ABS values after matching are well below 20.

Column 4 of Tables 2.7-10 reports the percentage reduction in bias attained through the matching procedure. The goal is to bring treated and control firms closer together by matching on the propensity score. The mean values of key variables are generally closer for the treated and kernel-matched control groups compared with the bias between the treated and unmatched control groups.

2.8.2 Difference-in-Differences Matching Estimator

Difference-in-differences estimation results of the impact of foreign acquisition on log TFP are presented in Tables 2.11-14. In the first column of each table, t denotes the period after acquisition. The difference-in-differences results report the difference in the before-after difference of log TFP levels, t periods after acquisition, between the treated and control group firms. In other words, the outcome variable is the before-after difference in the TFP index, which can be interpreted as TFP growth. The top panel of each table reports results from the comparison between the treated group and the Gaussian kernel-weighted matched control group. The middle panel reports the difference in the before-after difference in log TFP when the treated group is compared with a simply defined untreated group, where each firm in the untreated group is given equal weight. The bottom panel builds upon the simple difference-in-differences results by controlling for additional factors such as capital growth, region and industry. The bottom panel estimation is similar to the prevalent methodology in the literature.

Random Foreign Acquisition Time Assignment

The choice of control group determines the interpretation of the average treatment effect on the treated. With random acquisition time assignment, the control group consists of all firms that remain domestic-owned over the span of the data. Tables 2.11 and 2.12 summarize the impact of foreign acquisition on log TFP for the two definitions of FDI respectively. Irrespective of the definition of FDI, a significant productivity advantage due to foreign acquisition does not materialize until the third year after the FDI event. The difference-in-differences matching estimator results in the top panel of Table 2.11 indicate a significant 28.4% TFP growth advantage for foreign-acquired firms three years after the FDI event (defined as the crossing of a 10% foreign ownership threshold). The difference in the before-after productivity difference between treated and control firms reported in Table 2.12 is 23% for the third year after acquisition and statistically significant. The magnitude and the statistical significance of the difference in productivities is similar across the two definitions of FDI.

The interpretation of the results is that there is no immediate or short run productivity advantage attributable to foreign acquisitions. While there is evidence of an improvement in the performance of foreign-acquired firms three years after the FDI event, the results are based on a small number of firms due to data limitations.[9] The validity of these results is revisited and ultimately upheld in Section 2.8.4. The lack of an immediate productivity response following a FDI event is hardly surprising, given India's significant labor market rigidities, possible lags in implementing managerial and labor training, as well as delays in

[9]Firms that are foreign-acquired in the second half of the sample are not observed over the full three year horizon.

new technology investment and production retooling.

The simple difference-in-differences and the difference-in-differences with controls estimation results reported in the bottom two panels of Tables 2.11 and 2.12 demonstrate that failing to construct a careful counterfactual could lead to misleading conclusions. In particular, the bottom two panels suggest smaller and mostly statistically insignificant productivity effects. Figure 2.3 demonstrates the advantages of propensity score matching. Each panel in Figure 2.3 depicts the time path of the mean of a single variable, where the solid line with circles represents the path for the treated group, the smooth solid line is the path for the kernel-weighted control group, whereas the dashed line represents the path for the unweighted control group. The x-axis records time. The time of acquisition is at $t = 0$; $t = -1$ denotes the year before acquisition, etc. The propensity score matching technique ensures the construction of an appropriate counterfactual as evidenced by the proximity between the line with circles and the smooth line. The treated and kernel-matched paths are close even for variables that are not explicitly part of the propensity score estimation. The first panel in Figure 2.3 showcases the effect this paper set off to estimate: foreign-acquired firms experience an improvement in productivity following acquisition. A potential concern is that TFP might be impacted following foreign acquisition, but for reasons different from foreign ownership per se. For example, in the presence of discrepancies in accounting practices between domestic firms and MNCs, capital assets might be written off following foreign acquisition, leading to a perceived increase in TFP. This concern is unfounded as evidenced by the smooth path of capital. Other key variable paths are similarly well behaved. The results in Figure 2.3 are based on the 10% or above significant foreign acquisition definition of FDI. The 10% threshold definition of FDI produces similar paths,

but their discussion is omitted for the sake of brevity.

Dynamic Foreign Acquisition Time Assignment

Under dynamic acquisition time assignment the control group consists of firms with the same duration of domestic ownership that are not subject to foreign acquisition up to time *t*. The treatment effect of foreign acquisition is interpreted as the effect of being acquired at time *t* versus not being acquired up to time *t*, implying the possibility of becoming foreign-owned after *t*. Due to the small number of firms that are foreign-acquired in any given year, the effects are estimated with less precision. For the sake of brevity, the discussion will focus on the treatment effects estimated for year 2003. Tables 2.13 and 2.14 present results for the threshold crossing and significant foreign acquisition definitions of FDI respectively. Under both definitions of FDI, TFP improves significantly for the treated group compared with the kernel-matched group three years after acquisition. The size of the effect is 11.9% for firms crossing the 10% foreign ownership threshold and 12.5% for firms experiencing a significant foreign acquisition of 10% or above. The results suggest that the advantage of being foreign-acquired in year 2003 versus not being acquired up to then is reflected in a 11-12% productivity growth difference three years after foreign acquisition. The magnitude of the effect is different from the effect discussed in Section 2.8.2.1 because in this case the control group includes not only firms that are domestic-owned throughout the span of the data, but also firms that are foreign-acquired at a later date. The caveats and interpretation of the results put forward in Section 2.8.2.1 remain relevant here as well.

2.8.3 Robustness Checks

The results are robust to different specifications of the propensity score regressions. A baseline specification including lagged values of company age, foreign ownership holding, log capital, log TFP and TFP growth yields results similar to the version presented here. Incremental inclusion of additional control variables, as well as combinations of control variables does not lead to qualitatively different outcomes.

2.8.4 Additional Evidence

The Prowess ownership data span a period of 6 years, making it difficult to observe firm behavior over a long time horizon. To relax this limitation, the study supplements CMIE's dataset with data on Indian cross-border M&A, hand-collected from documents available from the Securities and Exchange Board of India (SEBI). Substantial acquisition or consolidation of holdings requires filing a formal announcement with SEBI as outlined in the Substantial Acquisition of Shares and Takeovers Regulations from 1997.[10] There are 241 Indian firms involved in cross-border M&A activity between 1997 and 2005 that are also present in the Prowess database. The dataset constructed from SEBI documents includes only firms that have received foreign ownership treatment. The control group is constructed from firms that have on average 0% foreign ownership for all 6 years of available Prowess ownership information. The implicit assumption is that if the control group firms have 0% foreign ownership for the period 2001-2006, they also have 0% foreign ownership for the preceding period. While this is an imprecise method of identifying firms that do not receive

[10]For more details, see `http://www.sebi.gov.in/Index.jsp?contentDisp=DataTakeOver`.

treatment, it is a reasonable approach. The foreign acquisition event is defined as any foreign acquisition or consolidation of holdings that triggers the SEBI takeover regulations.

There are significant differences between the untreated and treated firms as outlined in Table 2.15, suggesting the need for careful selection of the control group. For the sake of brevity, the discussion will only focus on the random acquisition time assignment results presented in Table 2.16. The balancing and stratification test results were satisfactory, confirming the validity of the matching procedure.[11] The top panel of Table 2.16 shows the effect of foreign acquisition on log TFP using the difference-in-differences matching estimator. Consistent with the results discussed in Section 2.8.2, there is no significant difference in the performance of treated versus non-treated firms in the period immediately following acquisition. However, in the third year after the FDI event, foreign-acquired firms gain a statistically significant 10.3% advantage over non-acquired firms. The three year lag is possibly a function of India's labor market rigidities, as well as a reflection of the time necessary to introduce alternative technologies and train management and production workers. Using information on completed Indian cross-border M&A collected from Thomson's SDC Platinum database in place of the SEBI M&A data, yields similar outcomes for log TFP, further establishing the robustness of the results.

2.8.5 Foreign Divestitures and TFP

The Prowess database includes a number of firms that experience reversals in foreign ownership holding. These firms were excluded from the analysis thus far, but it would be informative to explore the effect of foreign divestitures on productivity. For the purposes of

[11] These results can be obtained from the author upon request.

this experiment, foreign divestitures are defined as reductions in foreign ownership holdings from above 10% to below 10%. The control group consists of firms that remain above the 10% foreign ownership threshold for the span of the data. Table 2.17 reports significant differences between firms that are divested and those that remain foreign-owned. Divested firms have lower capital stock, market share and are less likely to make foreign royalty payments compared with their foreign-owned counterparts. The divested firms are more productive and export a higher portion of their total sales. Once again, these differences emphasize the importance of carefully matching treated firms and control group firms in order to construct an appropriate counterfactual. The difference-in-differences matching estimator results are presented in the top panel of Table 2.18. There are no significant differences in productivity between treated and non-treated firms at the time of divestiture up to three years after treatment. Any productivity advantages accrued in the time span of foreign ownership are not lost upon divestiture, i.e. there is no evidence for ”unlearning” after the foreign owners leave.

2.9 Conclusions

This paper explores the dynamic effect of changes in foreign ownership on firm productivity in the context of a detailed panel dataset of Indian manufacturing firms. In contrast to a number of previous studies, this study uses an improved measure of TFP. Rather than comparing foreign-acquired firms with the average of the whole population of domestic-owned firms, the paper implements a propensity score matching approach and adopts two different strategies for dealing with the counterfactual timing of acquisition for the control

group firms. The results show that foreign acquisition, defined in two alternative ways, improves foreign-acquired firm performance three years after the FDI event compared with non-treated firms. The results are robust to different propensity score estimation specifications and to the use of alternative M&A data. Importantly, standard estimation methods lead to misleading results compared with the difference-in-differences matching estimator results. The lag in productivity improvement following FDI is possibly due to labor market rigidities as well as to a slow pace of retooling, adoption of new technologies, and managerial and production practices. Divested firms retain any learning attained in the course of foreign ownership after the foreign owners leave. The results suggest that even in the absence of any spillover effects from FDI, there are still potential productivity gains from foreign acquisitions in the form of own firm effects, but the rewards are slow to arrive. Governments, hoping to reap immediate benefits from FDI, need to adjust their expectations and be patient or possibly consider introducing regulations that would facilitate the pace of firm restructuring.

Figures and Tables

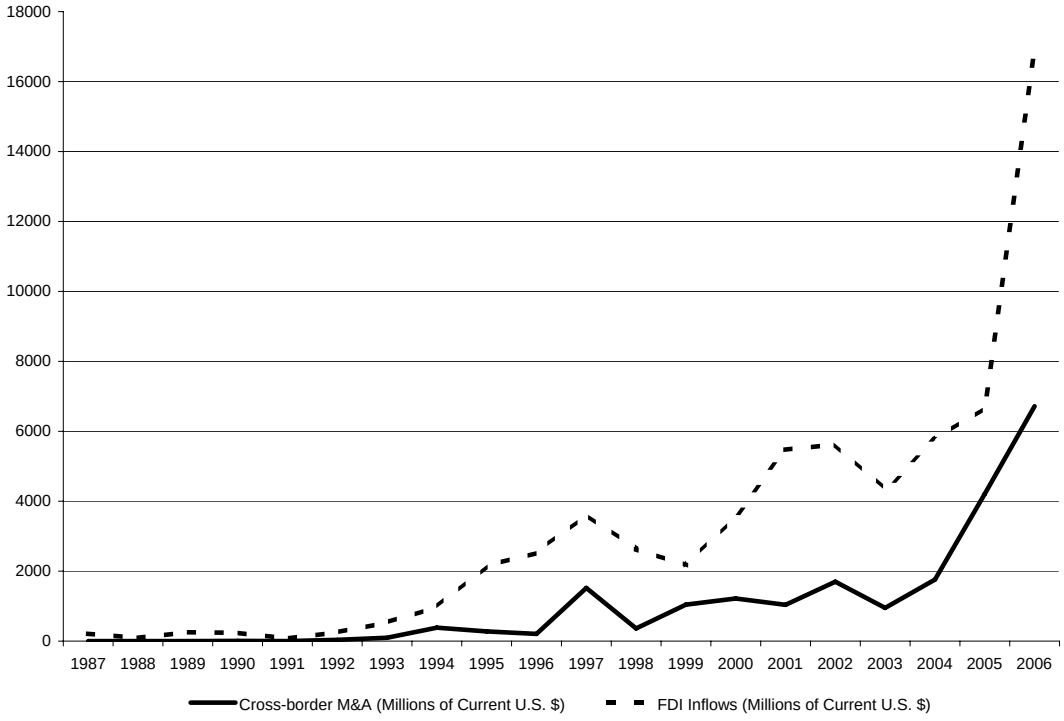

Figure 2.1 India FDI Inflows and Cross-border M&A Sales.
Source: UNCTAD Foreign Direct Investment Database.

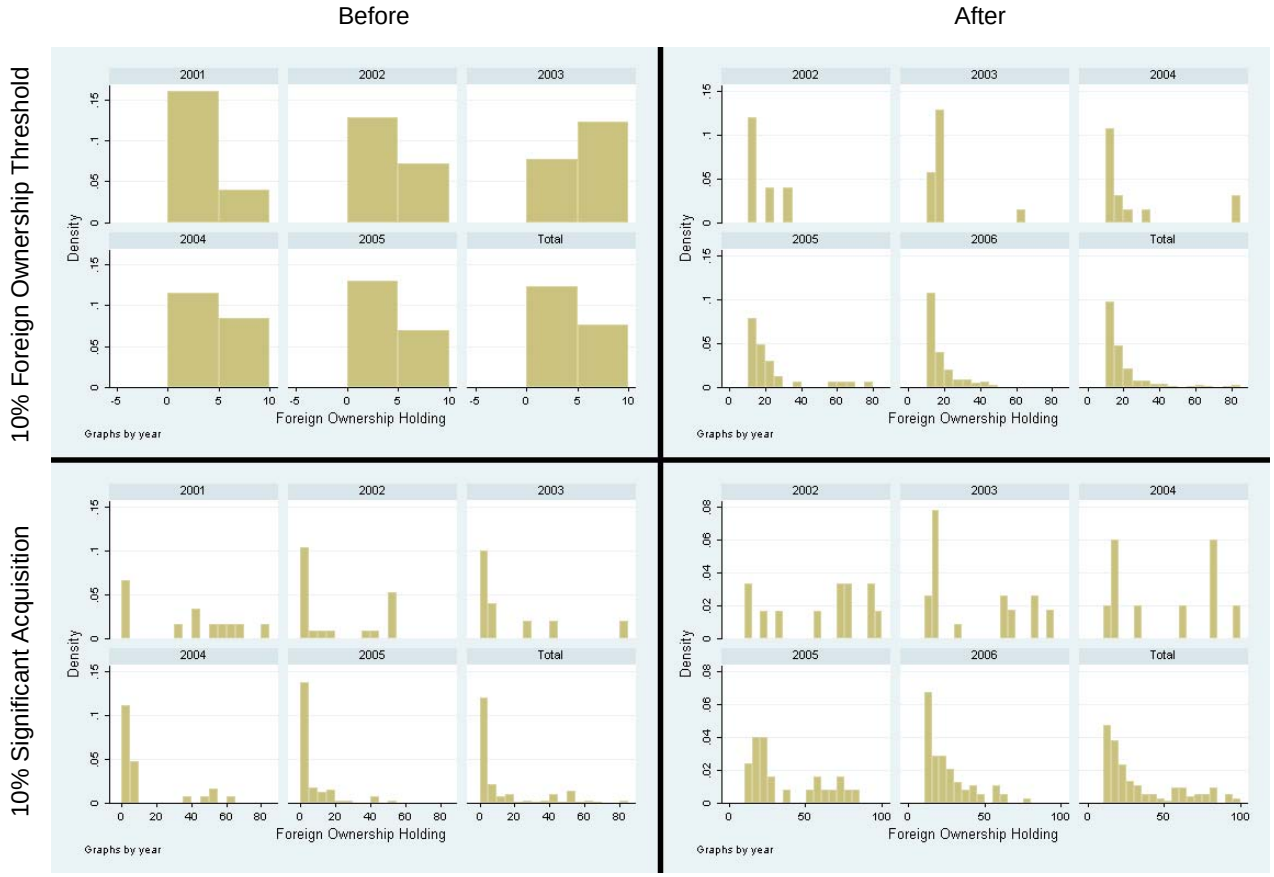

Figure 2.2 Distribution of Foreign Ownership Holding Before and After Change in Ownership.
Top Two Panels: FDI defined as crossing a 10% foreign ownership holding threshold.
Bottom Two Panels: FDI defined as a significant foreign acquisition of 10% or above.

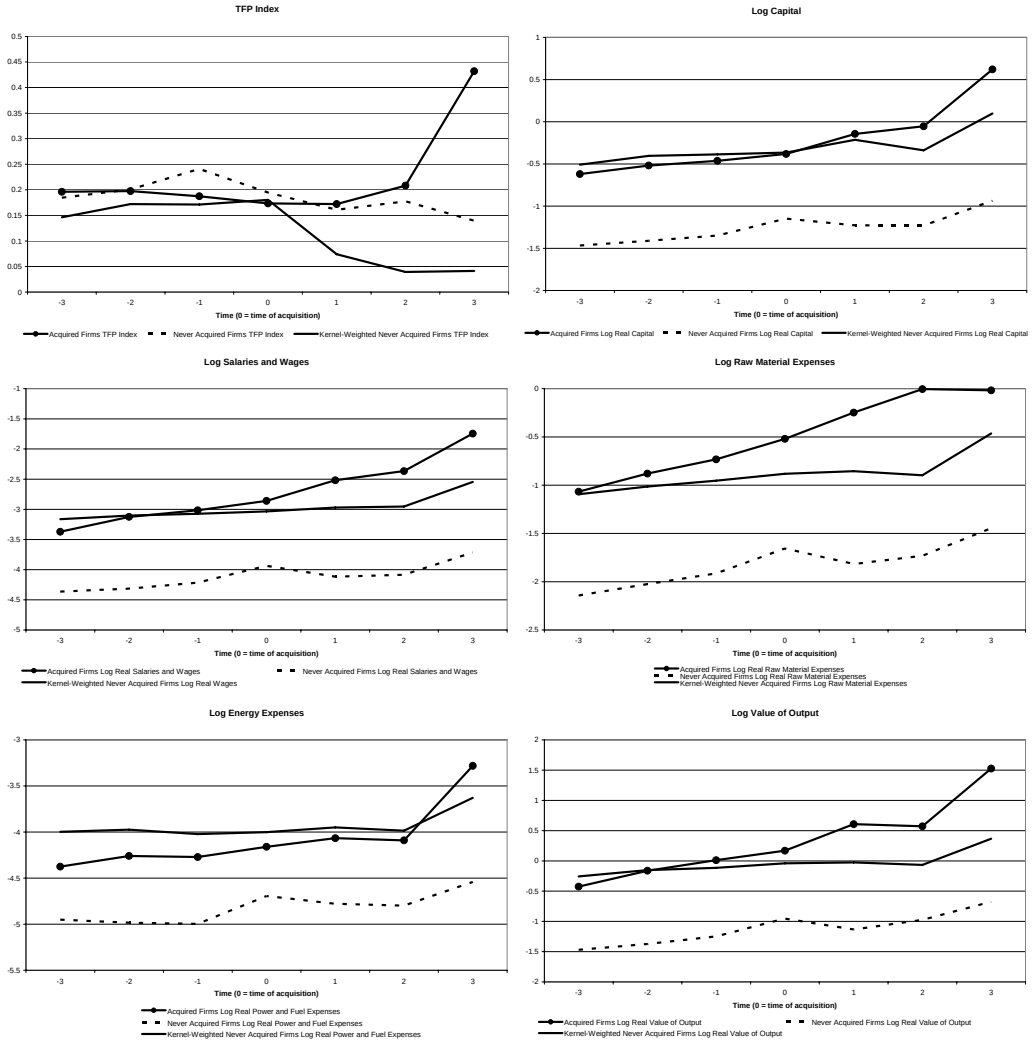

Figure 2.3 Key variables before and after a 10% significant foreign acquisition by treated, non-weighted and kernel-weighted control groups.

Table 2.1 Manufacturing Industries, number of acquisitions and industry characteristics.

Two Digit NIC Industry Classification		Freq.	Firms	FDI 10% Acq.	FDI 10% Thresh.	Mean Log Sales	Mean Log Capital	Mean Capital/Sales
15	Food	12027	633	5	10	-1.641	-1.956	8.441
16	Beverages, tobacco & tobacco products	209	11	0	0	0.233	-1.114	0.446
17	Textiles	9747	513	9	8	-1.416	-1.477	8.013
18	Wearing apparel	1748	92	0	2	-2.513	-2.993	6.445
19	Leather & leather products	931	49	1	2	-2.107	-2.393	8.277
20	Wood & wood products	342	18	0	0	-1.586	-1.485	5.850
21	Paper & paper products	2679	141	0	2	-1.744	-1.360	150.550
22	Publishing, printing & reproduction of recorded media	1045	55	1	2	-1.987	-1.983	10.231
23	Coke, refined petroleum products and nuclear fuel	1159	61	0	0	-0.461	-0.531	24.926
24	Chemical products	20083	1057	36	37	-1.469	-1.461	15.325
25	Rubber & plastics products	5643	297	8	9	-2.004	-1.948	7.047
26	Other non-metallic mineral products	3743	197	6	7	-1.220	-0.901	13.302
27	Basic metals	8702	458	17	25	-1.151	-1.322	22.469
28	Fabricated metal products, except machinery &equipment	2641	139	5	6	-1.669	-2.006	8.229
29	Machinery & equipment n.e.c.	5909	311	13	8	-1.567	-1.930	3.049
30	Office, accounting & computing machinery	912	48	4	3	-1.061	-2.537	4.386
31	Electrical machinery & apparatus n.e.c.	3363	177	8	8	-0.957	-1.709	2.699
32	Radio, television and communication equipment & apparatus	2299	121	11	6	-1.243	-1.716	7.423
33	Medical, precision and optical instruments, watches & clocks	1159	61	3	2	-2.101	-2.651	5.915
34	Motor vehicles, trailers & semi-trailers	4541	239	15	12	-1.027	-1.352	6.052
35	Other transport equipment	779	41	2	2	-0.451	-0.825	29.272
36	Furniture; n.e.c.	1691	89	3	3	-2.149	-3.469	2.261
	TOTAL	91352	4808	147	154			

Variables in levels are in billions of chained 1993 Indian Rupees.

Table 2.2 Foreign Acquisition and Divestiture Events in the Manufacturing Sector by Year.

Year	10% Threshold Crossings	10% Significant Acquisitions	Divestitures	SEBI Acquisitions
1997	-	-	-	13
1998	-	-	-	28
1999	-	-	-	25
2000	-	-	-	31
2001	-	-	-	30
2002	5	12	17	27
2003	14	23	8	32
2004	13	10	11	25
2005	33	25	15	45
2006	89	77	26	-
Total	154	147	77	256

Table 2.3 Summary Statistics. FDI defined as crossing a 10% threshold of foreign shareholding.

	Non-acquired Mean	Acquired Mean	t-statistic Diff. in means
Log Capital Stock	-1.287	0.007	-19.183***
Industry Market Share	0.006	0.019	-7.581***
Log Relative TFP	0.239	0.059	7.618***
TFP Growth	0.013	0.003	1.352
Foreign Capital Spend. Ratio	0.008	0.017	-6.528***
Foreign Royalties Dummy	0.099	0.235	-8.209***
Exports to Sales Ratio	0.140	0.179	-4.138***
Cash Flow to Sales Ratio	0.093	0.033	0.264
Firms	1470	150	
Observations	6013	688	
Unbalanced Panel	Yes	Yes	

* significant at 10%; ** significant at 5%; *** significant at 1%
Variables in levels are in billions of chained 1993 Indian Rupees.

Table 2.4 Summary Statistics. FDI defined as a significant foreign acquisition of 10% or above.

	Non-acquired Mean	Acquired Mean	t-statistic Diff. in means
Log Capital Stock	-1.097	-0.292	-12.193***
Industry Market Share	0.009	0.012	-2.586***
Log Relative TFP	0.198	0.175	1.020
TFP Growth	0.012	0.005	0.899
Foreign Capital Spend. Ratio	0.009	0.023	-6.966***
Foreign Royalties Dummy	0.143	0.293	-8.238***
Exports to Sales Ratio	0.141	0.176	-3.477***
Cash Flow to Sales Ratio	0.048	0.014	0.178
Firms	1762	142	
Observations	7274	655	
Unbalanced Panel	Yes	Yes	

* significant at 10%; ** significant at 5%; *** significant at 1%
Variables in levels are in billions of chained 1993 Indian Rupees.

Table 2.5 Probit Estimation of the Propensity Score. Random Acquisition Time Assignment.

	(1)	(2)
Lag Company Age	0.004	-0.007*
	[0.004]	[0.004]
Lag Log Capital	0.140**	0.207***
	[0.069]	[0.061]
Lag Industry Market Share	4.737	-3.197
	[4.25]	[3.81]
Lag Log Relative TFP	0.067	0.259*
	[0.20]	[0.15]
Lag TFP Growth	-0.584	-0.588
	[0.39]	[0.43]
Lag Foreign Share %	0.228***	0.011***
	[0.029]	[0.004]
Lag Foreign Capital Spending to Capital Stock Ratio	6.198**	3.775*
	[2.72]	[2.08]
Lag Foreign Royalty Payments Dummy	0.312	0.205
	[0.23]	[0.17]
Lag Exports to Sales Ratio	0.357	0.296
	[0.38]	[0.32]
Lag Cash Flow to Sales Ratio	1.12	-0.005
	[0.69]	[0.031]
Constant	-2.024	-0.772
	[1.31]	[0.762]
Observations	587	717
Pseudo R2	0.355	0.139

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Column 1: FDI defined as crossing a 10% threshold of foreign shareholding.

Column 2: FDI defined as a significant foreign acquisition of 10% or above.

All regressions contain industry, region and time dummies.

Table 2.6 Probit Estimation of the Propensity Score. Dynamic Acquisition Time Assignment.

	(1)				(2)			
	2003	2004	2005	2006	2003	2004	2005	2006
Company Age	0.004	0.011	-0.005	0.001	0.001	-0.004	0.001	-0.006
	[0.006]	[0.013]	[0.0071]	[0.009]	[0.006]	[0.017]	[0.007]	[0.009]
Log Capital	0.143	0.675**	0.210*	-0.359**	0.261**	0.128	0.309***	0.131
	[0.13]	[0.27]	[0.12]	[0.18]	[0.11]	[0.24]	[0.12]	[0.18]
Industry Market Share	4.186	3.305	2.753	3.172	0.366	-3.276	-10.23	-33.73
	[9.02]	[7.69]	[6.43]	[6.88]	[5.28]	[8.12]	[8.26]	[25.3]
Log Relative TFP	-0.313	1.068	0.172	-0.847	0.356	-0.303	0.0771	0.667
	[0.49]	[0.73]	[0.33]	[0.68]	[0.36]	[0.71]	[0.35]	[0.52]
TFP Growth	0.937	0.667	-0.872	-0.52	0.456	0.049	-0.802	-2.426
	[0.95]	[1.17]	[0.65]	[1.58]	[0.62]	[1.54]	[0.75]	[1.50]
Foreign Share %	0.162***	0.349***	0.245***	0.204***	0.002	0.015	0.004	-0.007
	[0.055]	[0.081]	[0.042]	[0.068]	[0.0059]	[0.014]	[0.006]	[0.011]
Foreign Capital Spend. Ratio	5.323	-59.23	2.911	7.965	6.853*	-16.06	-0.401	5.113
	[4.09]	[38.5]	[3.61]	[4.85]	[3.75]	[22.1]	[3.78]	[4.07]
Foreign Royalties Dummy	0.532	0.053	0.22	-0.244	0.4	1.392**	0.064	-0.467
	[0.37]	[0.61]	[0.33]	[0.45]	[0.30]	[0.71]	[0.30]	[0.46]
Exports to Sales Ratio	1.501**	1.032	-0.108	-0.088	0.326	-3.764	0.416	0.0204
	[0.61]	[1.25]	[0.61]	[0.74]	[0.64]	[4.97]	[0.62]	[0.65]
Cash Flow to Sales Ratio	3.423**	0.0113	0.274	1.019	-0.038	-0.025	0.329	2.169
	[1.56]	[0.27]	[0.52]	[1.95]	[0.20]	[0.22]	[0.33]	[1.79]
Constant	-2.92***	-5.467*	-2.479**	4.379	-2.573*	-0.435	-1.701**	-0.313
	[0.84]	[2.94]	[1.06]	[3.47]	[1.45]	[1.57]	[0.77]	[1.25]
Observations	539	319	662	208	454	258	777	244
Pseudo R2	0.311	0.569	0.368	0.341	0.172	0.391	0.170	0.251

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

(1): FDI defined as crossing a 10% threshold of foreign shareholding.

(2): FDI defined as a significant foreign acquisition of 10% or above.

All explanatory variables are lagged one period.

All regressions contain industry, region and time dummies.

Table 2.7 Balancing Tests from Kernel Matching. Random Acquisition Time Assignment. FDI defined as crossing a 10% threshold of foreign shareholding.

		Mean			% Reduc	t-test	
		Treated	Control	% Bias	Bias	t	$p > \|t\|$
Lag Company Age	Unmatched	31.744	27.200	22.2		2.03**	0.043
	Matched	31.051	36.328	-25.8	-16.1	-1.43	0.154
Lag Log Capital	Unmatched	0.165	-1.138	79.2		7.00***	0
	Matched	0.106	-0.037	8.7	89	0.52	0.604
Lag Industry Market Share	Unmatched	0.026	0.005	49.6		7.32***	0
	Matched	0.023	0.013	24.2	51.2	1.49	0.139
Lag Log Relative TFP	Unmatched	0.100	0.244	-26.5		-2.09**	0.037
	Matched	0.080	0.132	-9.6	63.9	-0.62	0.533
Lag TFP Growth	Unmatched	-0.012	0.017	-12.6		-1.00	0.318
	Matched	0.004	-0.005	3.8	70.3	0.31	0.756
Lag Foreign Share %	Unmatched	4.365	0.655	128.3		14.8***	0
	Matched	4.029	3.854	6	95.3	0.29	0.771
Lag Foreign Capital Spend. Ratio	Unmatched	0.021	0.007	41.9		4.93***	0
	Matched	0.020	0.024	-10.5	74.9	-0.56	0.577
Lag Foreign Royalties Dummy	Unmatched	0.279	0.114	42.4		4.16***	0
	Matched	0.282	0.274	2.1	95	0.11	0.909
Lag Exports to Sales Ratio	Unmatched	0.187	0.137	21.2		1.9*	0.058
	Matched	0.172	0.194	-9.6	54.7	-0.61	0.545
Lag Cash Flow to Sales Ratio	Unmatched	0.059	-0.054	20.6		1.36	0.175
	Matched	0.058	0.053	0.9	95.5	0.12	0.904
Number of Firms		78	501				
Number of Firms on Support		86	501				
Median ABS	Unmatched	7.436					
	Matched	7.528					

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 2.8 Balancing Tests from Kernel Matching. Random Acquisition Time Assignment. FDI defined as a significant foreign acquisition of 10% or above.

		Mean			% Reduc	t-test	
		Treated	Control	% Bias	Bias	t	$p > \|t\|$
Lag Company Age	Unmatched	27.190	29.769	-12.3		-1.06	0.290
	Matched	27.390	29.353	-9.4	23.9	-0.62	0.536
Lag Log Capital	Unmatched	-0.243	-0.871	39.2		3.36***	0.001
	Matched	-0.269	-0.355	5.4	86.2	0.34	0.733
Lag Industry Market Share	Unmatched	0.014	0.008	22.3		1.93*	0.054
	Matched	0.012	0.011	4	82.1	0.29	0.775
Lag Log Relative TFP	Unmatched	0.201	0.164	6.8		0.52	0.601
	Matched	0.191	0.171	3.6	47.3	0.22	0.829
Lag TFP Growth	Unmatched	-0.010	0.016	-14.1		-1.29	0.198
	Matched	-0.010	-0.001	-4.8	65.9	-0.31	0.756
Lag Foreign Share %	Unmatched	16.021	7.616	42.9		4.01***	0
	Matched	15.553	13.671	9.6	77.6	0.55	0.585
Lag Foreign Capital Spend. Ratio	Unmatched	0.027	0.010	37.4		4.84***	0
	Matched	0.024	0.018	12.3	67	0.88	0.38
Lag Foreign Royalties Dummy	Unmatched	0.345	0.177	38.9		3.68***	0
	Matched	0.329	0.291	8.9	77.2	0.53	0.598
Lag Exports to Sales Ratio	Unmatched	0.184	0.132	22.4		2.06**	0.04
	Matched	0.178	0.161	7.4	66.9	0.47	0.642
Lag Cash Flow to Sales Ratio	Unmatched	0.053	0.084	-1.4		-0.09	0.93
	Matched	0.051	0.047	0.2	88.1	0.02	0.988
Number of Firms		84	633				
Number of Firms on Support		82	633				
Median ABS	Unmatched	9.979					
	Matched	3.113					

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 2.9 Balancing Tests from Kernel Matching. Dynamic Acquisition Time Assignment (select year). FDI defined as crossing a 10% threshold of foreign shareholding.

Year=2003		Mean			% Reduc	t-test	
		Treated	Control	% Bias	Bias	t	$p > \|t\|$
Lag Company Age	Unmatched	35.684	29.192	24.4		1.35	0.177
	Matched	32.800	32.321	1.8	92.6	0.05	0.963
Lag Log Capital	Unmatched	0.645	-0.740	85.6		3.62***	0
	Matched	0.222	-0.069	18	79	0.49	0.631
Lag Industry Market Share	Unmatched	0.015	0.004	57.5		4.24***	0
	Matched	0.007	0.007	-2.2	96.1	-0.08	0.935
Lag Log Relative TFP	Unmatched	-0.065	0.101	-35.9		-1.44	0.151
	Matched	0.001	0.025	-5.3	85.2	-0.14	0.887
Lag TFP Growth	Unmatched	0.009	0.004	2.7		0.09	0.932
	Matched	0.021	0.010	5.7	-114.1	0.17	0.865
Lag Foreign Share %	Unmatched	2.714	0.436	79.6		6.27***	0
	Matched	1.274	1.216	2	97.4	0.06	0.952
Lag Foreign Capital Spend. Ratio	Unmatched	0.019	0.006	39		2.68***	0.008
	Matched	0.021	0.010	31.4	19.6	0.71	0.487
Lag Foreign Royalties Dummy	Unmatched	0.368	0.135	54.9		2.88***	0.004
	Matched	0.333	0.203	30.5	44.4	0.77	0.448
Lag Exports to Sales Ratio	Unmatched	0.249	0.130	49.2		2.44**	0.015
	Matched	0.227	0.174	21.8	55.6	0.56	0.581
Lag Cash Flow to Sales Ratio	Unmatched	0.067	-0.067	32.8		1.02	0.308
	Matched	0.072	0.005	16.5	49.7	0.56	0.583
Number of Firms		19	520				
Number of Firms on Support		15	520				
Median ABS	Unmatched	21.065					
	Matched	9.638					

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 2.10 Balancing Tests from Kernel Matching. Dynamic Acquisition Time Assignment (select year). FDI defined as a significant foreign acquisition of 10% or above.

Year=2003		Mean		% Reduc		t-test	
		Treated	Control	% Bias	Bias	t	$p > \|t\|$
Lag Company Age	Unmatched	34.263	30.078	17.1		0.87	0.384
	Matched	36.235	31.38	19.8	-16	0.54	0.591
Lag Log Capital	Unmatched	0.176	-0.882	68.5		2.83***	0.005
	Matched	0.022	-0.644	43.1	37	1.21	0.236
Lag Industry Market Share	Unmatched	0.022	0.007	46.7		2.46**	0.014
	Matched	0.014	0.008	18.5	60.4	0.68	0.5
Lag Log Relative TFP	Unmatched	0.118	0.092	6.0		0.24	0.807
	Matched	0.50	0.084	-7.9	-32.6	-0.24	0.815
Lag TFP Growth	Unmatched	0.046	0.018	16.6		0.55	0.579
	Matched	0.053	0.026	16.2	2.5	0.44	0.662
Lag Foreign Share %	Unmatched	13.731	8.952	23.8		1.04	0.298
	Matched	14.202	10.094	20.4	14	0.55	0.585
Lag Foreign Capital Spend. Ratio	Unmatched	0.035	0.008	42.4		4.34***	0
	Matched	0.007	0.009	-3.1	92.7	-0.34	0.737
Lag Foreign Royalties Dummy	Unmatched	0.474	0.228	52.5		2.48**	0.014
	Matched	0.412	0.271	30.1	42.6	0.84	0.408
Lag Exports to Sales Ratio	Unmatched	0.168	0.130	17.5		0.8	0.426
	Matched	0.136	0.133	1	94.2	0.03	0.974
Lag Cash Flow to Sales Ratio	Unmatched	0.000	-0.058	11.9		0.41	0.685
	Matched	-0.023	-0.053	6.2	47.8	0.17	0.868
Number of Firms		19	435				
Number of Firms on Support		17	435				
Median ABS	Unmatched	16.800					
	Matched	10.243					

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 2.11 Impact of Foreign Acquisition on Log Relative TFP. Random Acquisition Time Assignment. FDI defined as crossing a 10% threshold of foreign shareholding.

t	Log Relative TFP			Common Support		Off Support	
	Matching Estimate	Std. Err.	T-Stat	Untreated	Treated	Untreated	Treated
Difference-in-differences combined with Gaussian kernel matching estimates							
0	0.037	0.045	0.83	501	77	0	1
1	0.064	0.051	1.25	214	24	0	11
2	0.099	0.075	1.32	114	13	0	6
3	0.284**	0.137	2.08	44	4	0	4
Simple difference-in-differences estimates							
0	0.022	0.032	0.69	501	78	0	0
1	0.005	0.056	0.09	214	35	0	0
2	0.077	0.098	0.79	114	19	0	0
3	0.121	0.194	0.62	44	8	0	0
Difference-in-differences with controls estimates							
0	0.018	0.031	0.57	501	78	0	0
1	0.004	0.055	0.07	214	35	0	0
2	-0.005	0.088	-0.06	114	19	0	0
3	-0.272	0.206	-1.32	44	8	0	0

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 2.12 Impact of Foreign Acquisition on Log Relative TFP. Random Acquisition Time Assignment. FDI defined as a significant foreign acquisition of 10% or above.

t	Log Relative TFP			Common Support		Off Support	
	Matching Estimate	Std. Err.	T-Stat	Untreated	Treated	Untreated	Treated
Difference-in-differences combined with Gaussian kernel matching estimates							
0	-0.033	0.027	-1.2	633	81	0	1
1	-0.002	0.040	-0.04	333	45	0	2
2	0.050	0.059	0.85	233	30	0	2
3	0.230**	0.113	2.04	111	7	0	3
Simple difference-in-differences estimates							
0	-0.038	0.027	-1.39	633	82	0	0
1	0.014	0.047	0.3	333	47	0	0
2	0.035	0.058	0.6	233	32	0	0
3	0.133	0.122	1.08	111	10	0	0
Difference-in-differences with controls estimates							
0	-0.033	0.028	-1.17	633	82	0	0
1	0.011	0.047	0.24	333	47	0	0
2	0.034	0.056	0.61	233	32	0	0
3	0.149	0.124	1.2	111	10	0	0

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 2.13 Impact of Foreign Acquisition on Log Relative TFP. Dynamic Acquisition Time Assignment (select year). FDI defined as crossing a 10% threshold of foreign shareholding.

Year = 2003

t	Log Relative TFP			Common Support		Off Support	
	Matching Estimate	Std Err.	T-Stat	Untreated	Treated	Untreated	Treated
	Difference-in-differences combined with Gaussian kernel matching estimates						
0	0.015	0.041	0.38	520	15	0	0
1	-0.020	0.038	-0.53	491	15	0	0
2	-0.078	0.047	-1.64	462	14	0	0
3	0.119*	0.066	1.79	155	4	0	1
	Simple difference-in-differences estimates						
0	0.021	0.067	0.32	520	15	0	0
1	-0.027	0.077	-0.35	491	15	0	0
2	-0.088	0.098	-0.91	462	14	0	0
3	0.072	0.124	0.58	155	5	0	0
	Difference-in-differences with controls estimates						
0	0.025	0.067	0.37	520	15	0	0
1	-0.023	0.075	-0.31	491	15	0	0
2	-0.108	0.095	-1.14	462	14	0	0
3	-0.016	0.123	-0.13	155	5	0	0

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 2.14 Impact of Foreign Acquisition on Log Relative TFP. Dynamic Acquisition Time Assignment (select year). FDI defined as a significant foreign acquisition of 10% or above.

Year = 2003

t	Log Relative TFP			Common Support		Off Support	
	Matching Estimate	Std. Err.	T-Stat	Untreated	Treated	Untreated	Treated
	Difference-in-differences combined with Gaussian kernel matching estimates						
0	0.008	0.044	0.19	435	17	0	0
1	-0.010	0.041	-0.23	415	17	0	0
2	-0.036	0.049	-0.75	382	16	0	0
3	0.125*	0.075	1.67	137	4	0	0
	Simple difference-in-differences estimates						
0	0.007	0.056	0.12	435	17	0	0
1	-0.011	0.072	-0.15	415	17	0	0
2	-0.041	0.090	-0.46	382	16	0	0
3	0.125	0.145	0.86	137	4	0	0
	Difference-in-differences with controls estimates						
0	0.002	0.055	0.04	435	17	0	0
1	-0.037	0.072	-0.52	415	17	0	0
2	-0.078	0.089	-0.87	382	16	0	0
3	0.048	0.140	0.34	137	4	0	0

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 2.15 Summary Statistics. Foreign acquisition defined as an event recorded by the Securities and Exchange Board of India (SEBI).

	Non-acquired Mean	Acquired Mean	t-statistic Diff. in means
Log Capital Stock	-1.968	-1.186	-26.119***
Industry Market Share	0.003	0.011	-11.528***
Log Relative TFP	0.274	0.159	9.182***
TFP Growth	0.037	0.036	0.113
Foreign Capital Spend. Ratio	0.008	0.011	-4.294***
Foreign Royalties Dummy	0.059	0.280	-24.407***
Exports to Sales Ratio	0.105	0.089	3.915***
Cash Flow to Sales Ratio	-0.021	-0.031	0.083
Firms	1081	241	
Observations	11230	2955	
Unbalanced Panel	Yes	Yes	

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 2.16 Impact of Foreign Acquisition on Log Relative TFP. Random Acquisition Time Assignment. Foreign acquisition defined as an event recorded by the Securities and Exchange Board of India (SEBI).

t	Log Relative TFP			Common Support		Off Support	
	Matching Estimate	Std. Err.	T-Stat	Untreated	Treated	Untreated	Treated
Difference-in-differences combined with Gaussian kernel matching estimates							
0	0.016	0.044	0.37	633	150	0	3
1	0.036	0.060	0.59	492	126	0	2
2	0.035	0.070	0.5	409	104	0	2
3	0.103†	0.067	1.55	339	77	0	1
Simple difference-in-differences estimates							
0	-0.007	0.025	-0.28	633	153	0	0
1	-0.025	0.035	-0.71	492	128	0	0
2	-0.012	0.043	-0.28	409	106	0	0
3	0.014	0.052	0.27	339	78	0	0
Difference-in-differences with controls estimates							
0	-0.019	0.025	-0.77	633	153	0	0
1	-0.028	0.033	-0.83	492	128	0	0
2	-0.043	0.042	-1.03	409	106	0	0
3	-0.011	0.057	-0.19	339	78	0	0

† significant at 15%; * significant at 10%; ** significant at 5%; *** significant at 1%

Table 2.17 Summary Statistics. Foreign divestiture defined as a drop in foreign holdings below 10%.

	Non-divested Mean	Divested Mean	t-statistic Diff. in means
Log Capital Stock	-0.369	-0.621	2.723***
Industry Market Share	0.023	0.007	6.854***
Log Relative TFP	0.056	0.116	-1.666*
TFP Growth	0.007	0.011	-0.309
Foreign Capital Spend. Ratio	0.019	0.018	0.360
Foreign Royalties Dummy	0.407	0.221	6.943***
Exports to Sales Ratio	0.149	0.184	-2.300**
Cash Flow to Sales Ratio	-0.178	-0.024	-0.739
Firms	262	71	
Observations	1188	331	
Unbalanced Panel	Yes	Yes	

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 2.18 Impact of Foreign Divestiture on Log Relative TFP. Random Acquisition Time Assignment. Foreign divestiture defined as a drop in foreign holdings below 10%.

t	Log Relative TFP		Common Support		Off Support		
	Matching Estimate	Std. Err.	T-Stat	Untreated	Treated	Untreated	Treated
Difference-in-differences combined with Gaussian kernel matching estimates							
0	0.031	0.053	0.58	140	42	0	0
1	0.039	0.068	0.57	95	25	0	0
2	0.036	0.109	0.32	57	19	0	0
3	-0.057	0.146	-0.39	36	13	0	0
Simple difference-in-differences estimates							
0	-0.004	0.036	-0.12	140	42	0	0
1	0.016	0.059	0.26	95	25	0	0
2	-0.029	0.095	-0.31	57	19	0	0
3	-0.208	0.149	-1.39	36	13	0	0
Difference-in-differences with controls estimates							
0	-0.007	0.037	-0.19	142	42	0	0
1	-0.004	0.058	-0.07	95	25	0	0
2	-0.044	0.108	-0.41	57	19	0	0
3	-0.098	0.203	-0.48	36	13	0	0

* significant at 10%; ** significant at 5%; *** significant at 1%

Appendix

Gross fixed assets value capital goods at historic cost and as such are a poor measure of capital. A more reliable measure of capital is constructed following the methodology developed by Srivastava (1996). Gross fixed assets in a base year (in this case, the base year is 1997) are converted into assets at current prices, which are then deflated by an appropriate deflator. Then, using the perpetual inventory method, a real capital series is constructed by adding subsequent years' investment (obtained by taking the difference between gross fixed assets) and deflated by an appropriate deflator. There are several assumptions necessary for the implementation of this method:

1. The lifetime of capital is assumed to be 20 years in line with other recent Indian studies (Balakrishnan and Pushpangadan, 2000; Topalova, 2004). This implies that the oldest vintage of capital in the base year is from 1967. If firms are incorporated after 1967, then the oldest vintage of capital is assumed to date from the time of incorporation.
2. The price of capital is assumed to change at a constant rate $\pi = \frac{P_t}{P_{t-1}} - 1$, where P_t is the price of capital at time t. This means that each firm experiences a constant growth of capital prices determined by its year of incorporation or 1967, whichever comes later, until the base year 1997. Data on gross capital formation collected from India's National Accounts Statistics (Central Statistical Organization, 2001; Economic and Political Weekly Research Foundation, 2002; Ministry of Statistics and Programme Implementation, 2007) are used to calculate π.
3. Similarly, investment is assumed to grow at a constant rate $g = \frac{I_t}{I_{t-1}} - 1$, where I_t denotes gross fixed capital. g differs depending on the year of incorporation or 1967 (whichever is later). The investment growth series is constructed from gross fixed capital formation data taken from India's National Accounts Statistics (Central Statistical Organization, 2001; Economic and Political Weekly Research Foundation, 2002; Ministry of Statistics and Programme Implementation, 2007).

The revaluation factor is given by:

$$R^G = \frac{((1+g)^{\tau+1} - 1)(1+\pi)^{\tau}((1+g)(1+\pi) - 1)}{g(((1+g)(1+\pi))^{\tau+1} - 1)} \tag{1}$$

where τ is the age of the earliest vintage capital.[1] Gross fixed assets in the base year 1997 are adjusted by the appropriate revaluation factor to obtain base year capital at current costs. Note that firms incorporated after 1997 have a blank entry for gross fixed assets in 1997. This is not an issue, because assuming all firms buy new capital at inception, the exact vintage of the capital is known and gross fixed assets for the first available year after 1997 can be simply deflated using an appropriate deflator. A further complication arises with firms that are incorporated prior to 1997 but have a missing value for gross fixed assets in 1997. In this case, the last available value for gross fixed assets is used to fill in the missing observation. Once the real capital series is constructed, missing values corresponding to gross fixed assets' missing observations are introduced back into the capital series.

[1] For complete derivations see Srivastava (1996).

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Chapter 3

The Implications of Foreign Buyouts for Firm Profitability

3.1 Introduction

Venturing with a local partner was the predominant strategy for Multinational Enterprises (MNEs) entering the Chinese market in the 1980s and early 1990s. However, rapid economic development and gradual relaxation of the foreign direct investment regime have yielded a continuous decline of joint ventures (JVs) and a rising position of foreign wholly owned subsidiaries (WOSs). One of the driving forces behind the increasing dominance of foreign WOSs is that many MNEs decide to internalize their joint owned operations by buying out their Chinese partners. For example, China-FedEx Corporation, which set up a JV with Tianjin Datian W. Group Co., Ltd. (DTW Group) in 1999, bought out its JV partner in 2006 to take control of the venture's facilities in 89 locations throughout China. Procter & Gamble purchased the 20% stake held by its partner - Hutschison Whampoa China Ltd in 2004 in order to assume full ownership, although it claimed that it had 7 years of successful cooperation with its valuable local partner. These media-highlighted buyouts

demonstrate the important trend of strategic revisions of foreign firms in China, but they only represent a fraction of the phenomena: a vast majority of such buyouts involve micro- and middle-market companies, which do not attract significant media attention, but are crucial to a systematic analysis.

This study examines the effect of changes in firm structure on firm profitability by exploiting a unique longitudinal dataset. We start by exploring the factors that determine the transformation of JVs into foreign WOSs. Our research question is not only relevant to China, but also to a wide range of transition economies where MNEs are restructuring earlier investments to reflect their growing strategic importance (Luo, 2007; Steensma et al., 2008). The observed pattern of firm restructuring is consistent with the hypothesis that international JVs are merely a temporary organizational form (Porter, 1990; Williamson, 1991) and inherently unstable (Kogut, 1989). More importantly, we explore the causal relationship between foreign buyouts and firm performance. If firm characteristics remain largely unchanged upon a foreign buyout, then changes in performance could be attributed to the change in foreign shareholding. As such, we are able to examine the performance implications of full foreign ownership relative to partial foreign ownership arrangements.

There is a body of literature investigating whether foreign ownership, compared with domestic ownership, improves firm productivity and wages (Girma and Gorg, 2007; Lipsey and Sjoholm, 2002; Griffith and Simpson, 2003; Girma and Wakelin, 2001). Our research question is related to these earlier studies, but with an important distinction. Rather than comparing foreign-owned firms with domestically owned firms, we examine differences in the performance of Sino-foreign JVs which have undergone a foreign buyout and firms that remain Sino-foreign JVs. In other words, we examine the performance implications

of different degrees of foreign ownership. This exercise is particularly meaningful in the Chinese context since until recently China's foreign direct investment (FDI) regulations mandated Sino-foreign JVs as the preferred mode of foreign firm entry into the Chinese market. The government-sanctioned mode of entry for foreign firms came in the form of Sino-foreign JVs. Due to the particularities of the regulatory regime, all FDI into China is greenfield FDI rather than brownfield FDI, which is counter to the pattern observed in the rest of the developed and developing world. China's rapid economic development and gradual legislation relaxation has altered the landscape for MNEs. The emergence of foreign buyouts is an important phenomenon reflecting the strategic revisions of MNEs in China.

In contrast to earlier studies which merely investigate the one-off ownership choice of MNEs upon their entry to a foreign market (Ellis, 2008; Fisch, 2008; Chen, 2008), we focus on the ex-post strategic revision of MNEs. Improving upon previous research on the dynamic process of foreign operation (Xia et al., 2008; Steensma et al., 2008), we use longitudinal ownership data to examine not only the factors affecting JV buyouts, but also the performance implications of foreign buyout activity. To address the selection bias issue inherent in the restructuring decision, we use propensity score matching methodology that enables us to establish comparability between JVs which undergo a foreign buyout and JVs that do not experience such transformation.

Foreign buyouts could lead to better firm performance if foreign owners are able to improve the efficiency of their WOSs. Buyouts could also lead to no change in performance if the foreign partner has transfered know-how in the course of the Sino-foreign partnership and no additional efficiency gains are possible after the buyout. Under this scenario foreign

buyouts are motivated by a desire by the foreign partner to be entitled to the entire stream of profits rather than a part. It is also possible that foreign buyouts lead to a decline in profitability due to assimilation problems and the loss of a valuable local partner.

We consider three alternative measures of profitability as outcome variables - profits scaled by average industry profits, return on assets, and profits to sales ratio. We find that a high percentage of foreign ownership improves the odds of a buyout possibly because of the smaller additional investment required to achieve full ownership. On the other hand, the number of foreign partners in a JV has a marginally negative impact on the likelihood of a foreign buyout suggesting that it is potentially challenging to transform a JV with a large number of foreign partners into a WOS. However, the older the JV and the higher the number of foreign partners, the more likely the JV is to be transformed into a WOS implying that the advantages of partner collaboration decline with time. Firms which use a more labor-intensive production process relative to the industry mean are more likely to be taken over, signaling potential for cost cutting from shedding excess labor. After carefully matching JVs that receive wholly owned subsidiary treatment with firms that remain Sino-foreign JVs, we find that there are no statistically significant differences in performance across all three measures of profitability. This is in sharp contrast to results from naïve difference-in-differences estimates. In the absence of matching, foreign buyouts have a pronounced positive effect on firm profits relative to the industry mean, but appear to generate an immediate negative impact on the ratio of total profits to total sales. The difference in results underlines the importance of choosing an appropriate control group. After carefully matching JVs that receive wholly owned subsidiary treatment with firms that remain Sino-foreign JVs, we find that there are no statistically significant differences

in performance across all three measures of profitability.

The rest of the chapter is organized as follows. Section 3.2 reviews alternative theories of firm organization and generates hypotheses. Section 3.3 offers a brief overview of FDI history and regulations in China. Section 3.4 introduces the dataset. The difference-in-differences matching econometric approach and construction of variables are discussed in Sections 3.5 and 3.6 respectively. Section 3.7 presents the results of balancing tests and discusses the matching estimation results. Section 3.8 concludes.

3.2 Related Literature

This study is related to two interwoven branches of literature examining the formation and dissolution of JVs, and the performance differences between foreign and domestic firms. We review them in order to situate our study in their relative context.

Sinha (2001) uses a two-firm two-period model to theorize the formation and dissolution of JVs. In the first period, due to an ownership restriction in the host economy, the foreign MNE chooses between licensing and JV. In the second period it chooses between takeover and set-up of a new fully owned subsidiary. If the MNE develops a new technology after the JV formation and has information advantage over its local partner about the true value of the new technology, it tends to offer a buyout to reap the full benefit when the host ownership restriction relaxes. This is more likely to occur when setting up a new subsidiary involves substantial start-up cost and hence becomes a less favorable choice relative to transforming the JV to WOS.

Using an organizational learning approach, Chowdhury and Chowdhury (2001) suggest

that JV formation involves synergies between the two parent firms. However, with time there is organizational learning as the firms learn about each other's strengths. Thus, over time the value of the synergistic effect declines, leading to JV breakdown. Similarly, Habib and Mella-Barral (2006) theorize that the acquisition of knowhow makes every JV temporary. The more knowhow is acquired, the fewer the benefits of joint operations relative to separate operations. But JV dissolution is not necessarily an indicator of failure. The partner who is bought out at dissolution need not be viewed as the losing party since it shares in the ensuing increase in value through the buyout price it receives for its stake in the venture. Steensma et al. (2008) study JV buyouts and also consider which partner is likely to be the buyer. They find that learning alone does not determine the decision of the transformation of a JV to a full ownership arrangement in the context of Hungary. Conflict between two parent firms dictates the decision. When there are low levels of conflict, learning from the foreign parent increases the likelihood that the local parent internalizes the JV. When there are high levels of conflict, learning from the foreign parent increases the likelihood that the foreign parent will internalize the JV.

Marjit and Chowdhury (2004) focus on market demand as a determinant of subsequent takeovers. They demonstrate that when a JV is already in place, and there is an increase in demand, the MNE re-evaluates its options regarding subsidiary formation and buyout. If the increase in demand is large enough, opening a subsidiary becomes more profitable compared with remaining with the JV. If the MNE has superior access to capital compared with its local counterparts, then the threat of subsidiary formation is credible, and the MNE can drive down the payoff of its local partner in case of a buyout to its reservation level. Thus a buyout is profitable provided the aggregate payoff from a buyout exceeds that from

subsidiary formation.

Shleifer and Vishny (1986) discuss the potential for growth in value resulting from a takeover by a large stakeholder, where the rest of the shares are 'diffusedly' held. They demonstrate the role of a large stakeholder in bringing up the value of the firm in the context of a free-rider problem. As the initial shareholding of the large shareholder increases, the possibility of takeover increases. However, Svejnar and Smith (1984) suggest that MNE control over its host country operation could be lower under a full ownership arrangement compared with a JV in the presence of powerful local stakeholders (such as the State). First, if the foreign company collaborates with a number of widely diffused local shareholders, even minority shareholding could enable it with high control. Second, local partners do make useful contributions. For example, in the Chinese context, Chinese partners act as government liaisons for their foreign partners, providing a form of informal regulatory insurance, . A stand-alone foreign operation might become subject to cumbersome bureaucratic processes and even political intervention. As a result, if the value provided by the local partners, such as political connections and institutional knowledge, cannot be bought in the market, foreign MNEs may prefer to remain in a JV arrangement in order to utilize the intangible assets held by their local partners.

Our study also relates to a body of literature that documents the performance advantage of foreign firms relative to domestic firms. There is evidence that foreign MNEs perform better than domestic firms based on a number of indicators. Girma and Gorg (2007) study wages in the aftermath of foreign acquisitions in the UK. They find sizable post-acquisition wage effects on skilled and unskilled workers following an acquisition by a US firm. But such effects are absent for acquisitions by EU multinationals. Lipsey and Sjoholm (2002)

find that foreign firms in Indonesia pay 50% higher wages than domestic firms. This perceived advantage is partially eroded once worker education levels, industry and location of plants are taken into account. After controlling for firm characteristics, foreign ownership is associated with a 25% wage premium for blue-collar workers and a 50% wage premium for white-collar workers. Griffith and Simpson (2003) report that foreign firms in the UK pay higher wages than domestic firms for both administrative and technical employees based on 1980 and 1995 data. Girma and Wakelin (2001) find a 14% overall wage differential in favor of workers in foreign firms using 1991 to 1996 UK data. The foreign wage premium declines to 10% higher when industry and scale of operations are taken into account. In addition, the annual wage growth is 0.4 percent higher in foreign firms.

Focusing on output per employee or value added per employee, the following studies assemble evidence that foreign MNEs outperform local firms. Blomstrom and Wolff (1994) find that both value added and gross output per employee are more than twice as high in MNEs for 20 individual manufacturing industries in Mexico. Haddad and Harrison (1993) using 1985-89 data from Morocco, find that output per worker is higher in foreign firms than in domestic firms in 12 out of 18 industries. Ramstetter (1999) reports that value added per employee is higher in foreign firms than domestic firms in five East Asian countries over a 15-20 year period. Girma and Wakelin (2001) find that foreign firms in the UK in 1991-1996 have 10% higher labor productivity than domestic firms. Using predominantly cross-sectional analysis techniques, studies have achieved close to unanimity on the higher productivity of foreign firms in both developed and developing countries. None of these studies comment directly on the performance differences arising from partial versus full foreign ownership.

Our study aims to address the performance implications for firms transitioning from JVs to WOSs. Our work is distinct from previous research in a number of respects. First, we use a detailed longitudinal dataset of Chinese firms with foreign participation and focus on events where firms change their foreign shareholding. This allows us to examine the dynamic performance trajectory of firms rather than basing conclusions on average differences between WOSs and JVs. Second, since foreign shareholding changes do not occur at random, we control for potential selection bias issues by comparing the performance of firms that receive foreign WOS treatment with a carefully constructed control group of firms that remain Sino-foreign JVs. Finally, we study a variety of profitability variables giving us a detailed view into the performance of firms with varying degrees of foreign ownership.

3.3 FDI in China: Institutions and Regulations

China has been highly successful in attracting and absorbing large quantities of FDI as a result of policies developed over the past quarter of a century. The gradual relaxation of foreign ownership holding regulations has shaped the ownership choices of MNEs in China. At the beginning of reforms in the 1980s, over 70% of FDI was in the form of equity or cooperative JVs. This percentage descended to 50% in 1992. 1997 marks the turning point where the number of foreign WOSs exceeded that of JVs for the first time. China's accession to WTO deepened the trend and by 2001 equity and cooperative JVs accounted for only 30% of total FDI, which is almost a complete reversal of the 1980s. Chinese media has labeled this phenomenon "the dearth of Sino-foreign JVs".

According to Chinese JV regulations, the parties to the JV share the profits, risks and losses in proportion to their respective contribution to the registered capital. Most JVs have a built-in mechanism for potential buyouts. Under this mechanism the equity interest to be transferred is first offered to the other equity holders at the proposed sale price to the third party, before any transfer to a third party can be made (Zimmerman, 2004). Two trends have contributed to the increasing dominant role of fully foreign-owned enterprises. One is that many foreign firms choose to enter or re-enter the market by setting up full ownership projects upfront. Second, foreign firms either increase their shareholding in existing JVs or simply buyout their Chinese partners to assume full ownership. Sino-foreign JVs are taken over by their foreign parties not necessarily because the JVs failed, but possibly because they have achieved their purpose. Although buyouts by Chinese parties do occur, we only focus on the former type of takeover.

3.4 Data

This study uses a panel dataset of all enterprises with foreign participation located in Wuxi, China. The dataset is part of a larger nation-wide Foreign Direct Investment Survey launched by the Chinese government in 2001 to closely monitor foreign business activities. The dataset provided to us by the Wuxi Municipal Government includes seven years of foreign shareholding information between 2001 and 2007. The ownership information pinpoints the year of ownership change from partial foreign ownership to full foreign ownership, and offers a unique opportunity to study the causal relationship between foreign takeovers and firm performance. While our sample does not represent the universe of

all foreign-invested firms in China, it captures an important and representative portion of foreign-invested firms in east-coast China.

Wuxi is located in Jiangsu province, an east-coast Province of China. Although Guangdong Province (south-coast) was the first region to receive substantial FDI in earlier decades, Jiangsu topped the league in 2006 with a total 17.34 USD billions of FDI inflow. [1] Along with Shanghai and Zhejiang Province, Jiangsu is one of China's wealthiest and fastest growing provinces.

Our study focuses on foreign buyout events. We define foreign buyouts as events where a partially foreign-owned company is transformed into a fully foreign-owned subsidiary. Compared with increases in equity shareholding or non-equity cooperative arrangements, foreign buyouts represent the most important organizational change for foreign-invested firms in China.

3.5 Econometric Approach

Our goal is to estimate the effect of foreign buyouts on firm performance. If we adopted a naïve approach of comparing the performance of WOSs to Sino-foreign JVs, we would be ignoring any potential selection bias issues due to the non-randomness of the foreign buyout decision. Instead, when comparing the performance of firms which undergo foreign buyout with those that remain Sino-foreign JVs, we select a control group of firms that do not receive the foreign buyout treatment but have characteristics similar to those of the treated firms. There are numerous firm characteristics that potentially play a role in the foreign buyout decision. However, sorting and matching firms based on multiple characteristics

[1] See Table 3.1.

creates a dimensionality problem. We simplify the process by employing a matching technique based on propensity scores Rosenbaum and Rubin (1985).

We define a dummy variable $F_{i,t} \in \{0,1\}$ where $F_{i,t} = 1$ if a Sino-foreign joint venture is taken over by the foreign partner at time t and 0 otherwise. $y^1_{i,t+u}$ denotes firm performance at time t+u, u periods after the foreign buyout at time t, where $u \geq 0$. If the JV is not acquired at time t, its performance at time t+u would be equal to $y^0_{i,t+u}$. The effect of a change in foreign shareholding at time t on firm performance at time t+u is measured by:

$$y^1_{i,t+u} - y^0_{i,t+u}. \tag{1}$$

$y^1_{i,t+u}$ is readily observed for JVs that experience a foreign buyout, but the counterfactual $y^0_{i,t+u}$ is not, creating a missing data problem. In general, for any firm one can only observe $y^1_{i,t+u}$ or $y^0_{i,t+u}$, but not both. Our methodology offers a way to construct an appropriate counterfactual. The average effect of a foreign buyout on firms (the average effect of treatment on the treated) is expressed as:

$$E(y^1_{t+u} - y^0_{t+u}|F = 1) = E(y^1_{t+u}|F = 1) - E(y^0_{t+u}|F = 1). \tag{2}$$

Researchers often substitute $E(y^0_{t+u}|F = 0)$ for the counterfactual $E(y^0_{t+u}|F = 1)$, using the information available for firms that do not receive foreign buyout treatment, for example by adopting a difference-in-differences estimator. However, this approach ignores potential selection bias issues, resulting in bias equal to $E(y^0_{t+u}|F = 1) - E(y^0_{t+u}|F = 0)$. A more precise construction of the counterfactual requires careful selection of the control group. There are several time-invariant as well as time-variant firm characteristics that could

potentially make a firm a suitable match for a firm that receives foreign buyout treatment.

Matching would work well if both the control and treated firms have the same expected performance if they were Sino-foreign JVs (Rosenbaum and Rubin, 1985). This is known as the conditional independence assumption (CIA), formally:

$$E(y^0_{t+u}|X,F=1) = E(y^0_{t+u}|X,F=0) = E(y^0_{t+u}|X), \tag{3}$$

where X is a vector of firm characteristics. For the CIA to be satisfied X should contain all variables that affect both foreign buyout treatment and outcome. The choice of variables to be included in X is guided by theory and institutional knowledge. An additional requirement for matching is that:

$$0 < Pr(F=1|X) < 1, \tag{4}$$

thus ruling out the perfect predictability of foreign buyouts and ensuring that the comparison group firms fall within the propensity score distribution of the JVs that undergo a foreign buyout. In addition, any short-run general equilibrium effects of foreign buyouts are assumed away. This assumption is plausible since the fraction of firms that change status from Sino-foreign joint ventures to wholly owned subsidiaries in each industry and year is small, minimizing the likelihood of short-run general equilibrium effects on the control group firms.

Matching along all firm characteristics simultaneously creates an intractable dimensionality problem. A more straightforward approach proposed by Rosenbaum and Rubin (1985) is to match firms based on an index capturing the information contained in the relevant

variables. The index, also called a propensity score, represents the probability of treatment based on the vector of firm characteristics X:

$$P_i = Pr(F_{i,t} = 1) = F(X_{i,t-1}). \tag{5}$$

Matching is then performed based on the propensity score.

There are several important advantages to matching over standard regression analysis techniques. Matching does not assume a standard linear regression form. Instead, it determines the existence of an appropriate control group and in forming the counterfactual gives positive weight only to those observations that are close enough matches to treated observations.

A standard matching estimator is of the form:

$$\hat{\alpha}_M = \frac{1}{n_1} \sum_{i \in I_1 \cap S_P} [y_i^1 - \hat{E}(y_i^0 | F = 1, P_i)] \tag{6}$$

where

$$\hat{E}(y_i^0 | F = 1, P_i) = \sum_{j \in I_0} W(P_i, P_j) y_j^0. \tag{7}$$

$I_1 \cap S_P$ is the set of treated firms I_1 that fall within the common support S_P. I_0 is the set of control firms and n_1 is the number of treated firms in the support set. W is a weighing function that depends on the propensity score distance between the treated and control firms. The analysis that follows uses a Gaussian kernel weighing function

$$W(P_i, P_j) = \frac{G\left(\frac{P_j - P_i}{a_n}\right)}{\sum_{k \in I_0} G\left(\frac{P_k - P_i}{a_n}\right)}, \tag{8}$$

where G is the Gaussian normal function $G(\alpha) = e^{\frac{\alpha^2}{2}}$ and a_n is a bandwidth parameter. The choice of bandwidth is of limited importance.

Matching eliminates differences between the matched foreign buyout firms and the remaining Sino-foreign joint ventures due to the observable characteristics included in X. However, there might be other systematic differences between the treated and control groups that are not captured by observable characteristics. The difference-in-differences matching estimator alleviates the issue by eliminating unobservable time-invariant differences between the treated and control groups. It differs from the standard difference-in-differences estimator by including only treated firms within the common support and weighing the control firms according to the Gaussian kernel function rather than linearly (Smith and Todd, 2005; Heckman et al., 1997). The difference-in-differences matching estimator takes the form:

$$\hat{\alpha}_{DDM} = \frac{1}{n_1} \sum_{i \in I_1 \cap S_P} [(y^1_{i,t+u} - y^1_{i,t}) - \sum_{j \in I_0} W(P_i, P_j)(y^0_{j,t+u} - y^0_{j,t})]. \tag{9}$$

The key results discussed in the following sections are based on the difference-in-differences matching estimator.

3.6 Construction of Variables

The dataset provides information on the country of origin of the foreign investors, the year of entry, the 4-digit industry definition, Chinese and foreign registered capital, Chinese and/or foreign partners, total assets, total debts, total sales, income from services, total profits, number of employees, number of expatriate employees, tax bill, customs

payments, imports and exports. We deflated nominal variables using the corresponding industry-specific producer price indices from China's Statistical Yearbooks.

We construct three dependent variables to capture multiple aspects of performance. First, we use firms' profitability relative to the year and industry mean. Second, we use the ratio of total profits to total assets as a proxy for return on assets (ROA). Lastly, we use the ratio of total profits to total sales as an indicator of the profit rate. Different stakeholders may be interested in different performance indicators. Examining multiple indicators gives us a holistic view of the issue.

The vector of control variables X should include all factors that affect both treatment (foreign buyout) and outcome (performance). The choice of control variables is guided by theoretical priors. The individual significance of control variables is of limited importance, since variables should be good enough predictors of the event to meet the CIA but not too good, because this would exacerbate the common support problem (Smith and Todd, 2005). We justify the inclusion of these variables as follows.

Total Assets

Total assets reflect the size of the firm and control for the impact of capital scale on the probability of foreign buyout. Large total assets may reduce the desire of foreign MNEs to buy out their Chinese partners because of the substantial financial investment required to complete the transaction. In addition, Sino-foreign JVs set up in the 1980s and 1990s are known to have less advanced facilities because of foreign MNEs' concern over unintended technology spillovers. MNEs may be better off engaging in greenfield investment so that they can install upgraded facilities or equipment instead of committing large amounts of

financial capital to buy outdated facilities.

Ratio of Sales to Total Assets

The ratio of sales to total assets captures the degree of capital intensity of the firm and controls for the ability of assets to generate income. This variable has no straightforward impact on the decision of foreign buyout since it may vary significantly across different industries, but to the extent that there is variation in the sales to assets ratio within an industry, the ratio could be a determinant of treatment.

Ratio of Total Debt to Total Assets

The ratio of total debt to total assets reflects the degree of leverage of the firm. High debt levels saddle the firm with high interest payments; however, low debt levels may also indicate a credit constraint and lack of access to external financial resources. If MNEs have (asymmetric to their Chinese partners) superior internal or external financial resources, this variable can have positive impact on the likelihood of foreign buyout.

Enterprise Age and Age Squared

Firm age reflects the length of JV operations which could be a proxy for learning taking place between the joint venture partners and learning by the foreign partner about the local environment. Previous studies have found some evidence that the longer the foreign-invested firm has been in operation in China, the better its performance (Chen, 2008; Child and Yan, 2003). We expect a positive correlation between the age of the firm and the

probability of foreign buyout. To control for possible non-linear effects, we also include age squared as a control variable.

Number of Chinese and Foreign Partners

The number of Chinese and foreign partners reflect the dispersion of ownership and management control in the joint venture. Diversity in stakeholders may enrich the venture with a variety of resources and skills needed for market success. But dispersed ownership and/or management control could make the internal coordination expensive and inefficient. In this sense, dispersed ownership should encourage the unification of control by a single stakeholder to reduce inefficiency of multi-party cooperation. However, a practical difficulty arises when a foreign buyout is attempted: to assume sole control means buying out multiple partners, which could be costly. It is unclear which effect will dominate in practice, but the question merits an empirical investigation.

Number of Chinese and Foreign Partners Interacted with Enterprise Age

We include interaction terms of the number of Chinese and foreign partners and firm age in order to control for possible learning effects taking place. The benefit of having multiple partners in the JV may falter over time because the parties can no longer learn from each other (Habib and Mella-Barral, 2006). Thus as the number of partners increases and the duration of the JV partnership lengthens, the probability of foreign takeover would increase.

Foreign Ownership Percentage

The foreign ownership percentage measures the degree of control of the foreign MNE over the joint operation. Higher foreign ownership indicates high commitment on the part of the foreign MNE in the joint venture, which in turn may induce the MNE to buy out its Chinese partners in order to assume full control. Therefore we expect this variable to have a positive effect on foreign buyout.

Number of Employees and Labor-to-Capital Ratio Relative to Industry Mean

The number of employees variable provides another way of controlling for the size of the firm. A high number of employees might signal a large, well established enterprise which potentially could be attractive to foreign buyers. On the other hand, a high labor-to-capital ratio relative to the industry mean indicates the presence of excess labor and signals potential for cost-cutting. We would expect a positive effect of labor as well as the relative labor-to-capital ratio on the probability of receiving foreign buyout treatment.

Expatriate Dummy

We include an expatriate employee dummy variable as an indicator of foreign MNE involvement in the day-to-day operations of the firm. Gaur et al. (2007) found that if the general manager position is taken by a foreign partner representative, it reduces labor productivity because of high expatriate compensation cost. Similarly, if the foreign firm employs a high ratio of expatriate employees, its labor productivity suffers. We expect the presence of expatriate employees to negatively affect the foreign firm's performance. However we

hypothesize that the effect on the probability of foreign buyout is positive, because the presence of expatriate employees enhances the confidence of the parent MNE that it is capable of managing the joint venture without the participation of a Chinese partner.

Export and Import Dummies

Imports and exports dummy variables capture whether the firm is globally integrated. Although we do not have data on what portions of exports and imports are intra-firm transactions (between the jointly owned venture and the MNE parent company), the two variables should have positive association with the probability of foreign buyout.

Services Income Dummy

The services income dummy indicates if the firm collects income from services. We also include sets of industry and year dummies. To the extent that income from services indicates that the JV sells directly to the Chinese market, the JV might be valuable to the foreign partner as a sales platform to the growing Chinese market.

Market Share

We include an industry market share variable measured as the fraction of firm sales in total industry sales. Market share controls for market power. It is likely that foreign MNEs would prefer to buy out firms with higher market power since the potential for earning higher profit margins would be greater.

3.7 Results

We organize the results based on the different performance indicators used. First we report our findings from analysis employing profits scaled by the industry average as an outcome variable. Next, we turn to results where the outcome variable is return on assets. Lastly, we present the case where the ratio of total profits to total sales is used as the outcome variable.

3.7.1 Propensity Score Estimation

The propensity score estimation uses the control variables discussed in the previous section and three alternative measures of profitability as outcome variables: relative profits, return on assets and profits to sales ratio. All control variables are lagged one period. All variables are in natural logarithm form with the exception of ratios, dummy variables, enterprise age and ownership percentage. Table 3.2 presents propensity score estimation results from the three alternative models. The results are qualitatively consistent with our expectations and consistently stable across all three specifications.

Although the propensity score estimation is merely a means to an end, it is nontheless informative to consider the probit estimation results. The interaction term between the number of foreign partners and the age of the JV is positive and significant, consistent with a learning theory of JVs: the more mature the partnership and the higher the number of partners, the more likely the dissolution of the JV. The foreign ownership percentage has a significant positive effect on the probability of foreign buyout, suggesting that high initial commitment by the foreign partner enables a buyout by posing a lower hurdle to full ownership. A high labor-to-capital ratio relative to the industry mean increases the proba-

bility of foreign buyout. To the extent that a relatively high labor-to-capital ratio signals opportunities for efficiency gains and cost cutting, such enterprises would be particularly attractive targets for buyouts.

3.7.2 Balancing Tests

Matching is performed using the Gaussian kernel estimator with a bandwidth of .06. Following Smith and Todd (2005), a trim level of 2% is imposed, below which propensity score densities are excluded from matching. This ensures that outlier observations are not included in the matching procedure. The purpose of the matching process is to define an appropriate control group with which to compare the treated observations. The success of the matching procedure is measured by how closely the treated and matched observations fall to each other on the basis of the observable characteristics included in X and discussed in Section 3.6 of this chapter. A test proposed by Dehejia and Wahba (2002) checks for the balancing of the covariates. The observations are stratified so that there is no significant difference in the propensity scores of treated and control firms within a stratum. Then, if for each stratum there are mostly no significant differences between the means of the covariates for the treated and control groups, the propensity score matching is considered balanced. All three versions of our model pass this balancing test.

The absolute standardized bias (ABS) is an alternative measure of the success of the matching procedure. ABS is defined as the difference in the means of the control and treatment group covariates scaled by the square root of the averaged sample variances of

the covariates citeprosenbaum. The ABS before matching is given by:

$$ABS = 100 \frac{\frac{1}{n_i}\sum_{i\in I_1} X_i - \frac{1}{n_0}\sum_{j\in I_0} W(P_i,P_j)X_j}{\sqrt{\frac{Var_{i\in I_1}(X_i)+Var_{j\in I_0}(X_j)}{2}}} \tag{10}$$

while the bias after matching is defined as:

$$ABS = \frac{\frac{100}{n_1}\sum_{i\in I_1}\left[X_i - \sum_{j\in I_0} W(P_i,P_j)X_j\right]}{\sqrt{\frac{Var_{i\in I_1}(X_i)+Var_{j\in I_0}(X_j)}{2}}} \tag{11}$$

Tables 3.3, 3.5 and 3.7 show the results of balancing tests for each of the three models. The before and after matching ABS is reported at the bottom of each table. Matching greatly reduces the standartized bias, improving the compariability between treated and control group firms. Column 4 of each table reports the percentage reduction in bias for each control variable attained through the matching procedure. The goal is to bring treated and control firms closer together by matching on the propensity score. As is evident in the results reported in column 4, the mean values of the control variables are significantly closer for the treated and kernel-matched control groups compared with the bias between the treated and unmatched control groups. The matching procedure enables us to construct a good quality counterfactual.

3.7.3 Matching Estimates: Performance Is Measured by Profits Scaled by Average Industry Profits

Difference-in-Differences estimation results of the impact of foreign buyouts on relative profits are presented in Table 3.4. In the first column of each table, *t* denotes the time period

after foreign buyout ($t = 0$ in the period the foreign buyout occurs, $t = 1$ one period after, etc.). The difference-in-differences estimator measures the difference between the treated and control groups in the before and after event change in relative profits.

The top panel of the table presents the difference-in-differences matching estimates for the treated group and the Gaussian kernel-weighted matched control group. The bottom panel reports results of the before-after difference in profitability between the treated group and the untreated group, where each firm in the untreated group is given equal weight.

There are no significant differences in the relative profit performance of treated and matched firms over the four year period following the foreign buyout event. The differences between treated and matched groups reported in the top panel are smaller in magnitude than the differences between the treated and unmatched control group reported in the bottom panel. Turning to the bottom panel, we find a statistically significant positive effect of foreign buyouts. The discrepancy in results between the top and bottom panel is due to the use of matched versus unmatched control groups. The results further emphasize the importance of constructing an appropriate counterfactual.

3.7.4 Matching Estimates: Performance is Measured by Return on Assets (ROA)

Difference-in-Differences estimation results of the impact of foreign buyouts on ROA are presented in Table 3.6. The top panel difference-in-differences matching estimates are smaller than the bottom panel simple difference-in-differences estimates. Although there are variations in the coefficients across the two panels, the major results are static. Foreign buyouts do not exert significant impact on the ROA of the firm. This is the case for up

to three years after the buyout takes place. The result holds true both with and without matching.

3.7.5 Matching Estimates: Performance Is Measured by the Ratio of Total Profits to Total Sales

Without matching, the simple difference-in-differences estimates show that firms that receive foreign buyout treatment have significantly lower (at the 1% level of statistical significance) change in their profitability in the year of the buyout when compared with the control group firms. This negative impact diminishes the first year after the buyout takes place, and remains insignificant 2 and 3 years after. However, when we combine the difference-in-differences model with the Gaussian kernel matching weights, this negative and significant impact vanishes. The stark contrast between the two models highlights the pertinence of using propensity score matching to accurately capture the performance implications of foreign buyouts.

3.8 Discussion and conclusions

This chapter examines the factors affecting whether a JV will be taken over by its foreign partner and the performance implications of increases in foreign ownership. Rather than comparing JVs which have undergone foreign buyouts with the average of the whole population of firms without such treatment, we implement a propensity score matching approach that enables a robust comparison between treated and control group firms. The results show that foreign buyouts tend to take place when the JV has a high foreign equity

holding and a high number of foreign partners interacted with enterprise age. In addition, we find that JVs with high labor-to-capital ratios relative to their industry mean are more likely targets for buyouts, because of the potential for efficiency gains through reductions in excess labor.

Comparing before-after differences in performance between JVs which have undergone foreign buyouts and those without such treatment, we find stark contrasts between results generated by simple difference-in-differences estimation techniques and those based on propensity score matching methodology. When we measure performance as profits relative to the industry mean, the simple difference-in-differences estimation shows that JVs which undergo foreign buyouts experience a significant, positive and sustained performance improvement compared with those without such transformation. The seemingly robust results are challenged by results based on the propensity score matching approach, which demonstrates the absence of any significant before-after performance difference between treated and control groups.

We find no significant differences in the return on assets of treated and control group firms regardless of the choice of control group.

In the simple difference-in-differences estimation, we find that foreign buyouts generate immediate negative impact on firm performance, as measured by the ratio of total profits to sales. This negative effect is attenuated over the three years following the event. In contrast, estimation results based on propensity score matching show that the above results are biased. With a more robust comparison between treated and control groups, no significant difference is found in the before-after difference in performance between the treated and control groups.

Our empirical results highlight the importance of addressing the selection bias issue inherent in the foreign buyout decision. We have demonstrated that using propensity score matching to establish a reliable comparison between treated and control groups yields new and unexpected results. So does foreign buyout leads to higher performance? The simple answer from our data analysis is ”no”. Nor does it lead to lower performance as our results show.

The results are rather surprising because the literature has conditioned us to expect higher performance after foreign buyouts. We are able to replicate this conventional result in the absence of matching. However, our propensity score matching results suggest that previous studies might find a foreign ownership performance advantage because they ignore the selection bias issue and compare firms with different underlying characteristics. We offer three tentative explanations for the lack of profitability differences between the treated and matched control groups. First, the foreign partner provides the JV with valuable resources, such as a financial capital injection and technologies before the foreign buyout. As such, the foreign shareholding adjustment from partial to full foreign ownership is not sufficient to generate any noticeable performance improvements. Potential performance improvements may or may not take place over a longer time span, which is difficult to capture in our dataset horizon. A second possibility is that foreign buyouts do not take place at random. Instead, some observable and/or unobservable JV characteristics must motivate the foreign MNE to buy out its Chinese partners. If these characteristics have causal effect on performance, then foreign buyout will not produce noticeable performance improvements, at least in a relatively short span of time. Lastly, we can recast our results in a different light. Taking the Chinese partners out of the equation does not lead to significant

performance differences between Sino-foreign JVs and foreign WOS. Our results demonstrate that Chinese partners are not performance barriers or a liability for Sino-foreign JVs. If they were, their being bought out from the JV would have proven immediate performance panacea.

Our study documents a lack of any immediate performance changes as measured by three alternative profitability variables. However, this does not imply that foreign buyouts should not occur. If the cost of the buyout is relatively low while entitling the MNE to a whole rather than a partial stream of profits, it could still be beneficial for the foreign partner to internalize the JV.

Figures and Tables

Table 3.1 Top FDI recipient provinces in China 2006 (MOFCOM, 2008)

Rank	Province	FDI US$ billion
1	Jiangsu	17.34
2	Guangdong	14.51
3	Shandong	10.00
4	Zhejiang	8.89
5	Fujian	7.18
6	Shanghai	7.10

Table 3.2 Probit Estimation of the Propensity Score Using Various Measure of Profitability As Outcome Variable. Column 1 uses Profits Relative to Industry Mean, Column 2 uses Return on Assets and Column 3 uses Profits to Sales Ratio.

	(1)	(2)	(3)
Lag Profits Rel. to Industry Mean	-0.00		
	(0.00)		
Lag Return on Assets		0.25	
		(0.51)	
Lag Profits to Sales Ratio			0.00
			(0.01)
Lag Log Real Total Assets	0.05	0.05	0.09
	(0.05)	(0.05)	(0.05)
Lag Sales to Total Assets Ratio	-0.04	-0.05	-0.02
	(0.06)	(0.07)	(0.04)
Lag Total Debt to Total Assets Ratio	-0.02	-0.01	-0.06
	(0.07)	(0.07)	(0.16)
Lag Firm Age	-0.08	-0.08	-0.04
	(0.06)	(0.06)	(0.07)
Lag Firm Age Squared	0.00	0.00	-0.00
	(0.00)	(0.00)	(0.00)
Lag Number of Chinese Investors	-1.28	-1.29	-1.35
	(1.47)	(1.46)	(1.47)
Lag Number of Chinese Investors Squared	0.26	0.26	0.30
	(0.46)	(0.45)	(0.45)
Lag Number of Chinese Investors x Firm Age	0.01	0.01	0.01
	(0.04)	(0.04)	(0.04)
Lag Number of Foreign Investors	-0.90	-0.81	-0.76
	(1.17)	(1.18)	(1.19)
Lag Number of Foreign Investors Squared	0.03	0.01	0.02
	(0.34)	(0.35)	(0.35)
Lag Number of Foreign Investors x Firm Age	0.07*	0.07*	0.06
	(0.04)	(0.04)	(0.04)
Lag Foreign Ownership Percent	2.12***	2.11***	2.15***
	(0.26)	(0.26)	(0.27)
Lag Labor to Capital Ratio Rel. to Industry Mean	0.00***	0.00***	0.00***
	(0.00)	(0.00)	(0.00)
Lag Log Number of Employees	0.03	0.03	0.01
	(0.07)	(0.07)	(0.07)
Lag Expat Workers Dummy	0.16	0.16	0.13
	(0.13)	(0.13)	(0.14)
Lag Imports Dummy	0.08	0.08	0.02
	(0.16)	(0.16)	(0.17)
Lag Exports Dummy	-0.04	-0.04	-0.01
	(0.15)	(0.15)	(0.16)
Lag Service Income Dummy	0.28	0.29	0.28
	(0.35)	(0.36)	(0.37)
Lag Market Share	1.53	1.45	1.08
	(1.56)	(1.56)	(1.57)
Number of Observations	1252	1246	1160
Pseudo R2	0.20	0.20	0.21

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 3.3 Balancing Tests from Kernel Matching: Performance Is Measured by Profits Scaled by Industry Mean Profits

		Mean			% Reduc	t-test	
Variable	Sample	Treated	Control	% Bias	Bias	t	$p > \|t\|$
Lag Log Real Total Assets	Unmatched	7.33	7.18	6.50		0.75	0.45
	Matched	7.49	7.49	-0.20	97.40	-0.01	0.99
Lag Profits Rel. to Industry Mean	Unmatched	1.11	0.61	2.10		0.20	0.84
	Matched	1.08	-0.47	6.60	-206.60	0.30	0.76
Lag Sales to Total Assets Ratio	Unmatched	1.05	13.62	-4.20		-0.31	0.76
	Matched	1.05	5.86	-1.60	61.70	-0.18	0.85
Lag Total Debt to Total Assets Ratio	Unmatched	0.54	0.65	-10.40		-0.77	0.44
	Matched	0.55	0.58	-3.00	70.60	-0.29	0.78
Lag Labor to Capital Ratio Relative to Industry Mean	Unmatched	3763.40	419.72	19.80		4.13	0.00
	Matched	854.43	414.88	2.60	86.90	0.54	0.59
Lag Firm Age	Unmatched	5.65	5.32	8.30		0.84	0.40
	Matched	5.57	5.44	3.40	59.80	0.23	0.82
Lag Firm Age Squared	Unmatched	48.03	43.56	8.30		0.86	0.39
	Matched	46.83	45.86	1.80	78.20	0.12	0.90
Lag Number of Chinese Investors	Unmatched	1.06	1.16	-29.90		-2.53	0.01
	Matched	1.06	1.10	-11.60	61.20	-0.90	0.37
Lag Number of Chinese Investors Squared	Unmatched	1.19	1.53	-27.60		-2.35	0.02
	Matched	1.20	1.34	-11.40	58.60	-0.87	0.38
Lag Number of Chinese Investors x Firm Age	Unmatched	6.17	6.32	-2.60		-0.25	0.80
	Matched	6.12	6.31	-3.00	-18.90	-0.20	0.84
Lag Number of Foreign Investors	Unmatched	1.10	1.12	-5.20		-0.48	0.63
	Matched	1.10	1.12	-5.20	-0.80	-0.38	0.71
Lag Number of Foreign Investors Squared	Unmatched	1.33	1.40	-6.20		-0.57	0.57
	Matched	1.32	1.38	-5.00	18.70	-0.37	0.71
Lag Number of Foreign Investors x Firm Age	Unmatched	6.55	5.96	10.70		1.13	0.26
	Matched	6.40	6.26	2.60	75.80	0.17	0.86
Lag Foreign Ownership Percent	Unmatched	0.66	0.45	95.50		10.14	0.00
	Matched	0.66	0.61	24.40	74.50	1.57	0.12
Lag Log Number of Employees	Unmatched	4.41	4.23	15.70		1.48	0.14
	Matched	4.37	4.38	-0.70	95.20	-0.05	0.96
Lag Expat Workers Dummy	Unmatched	0.37	0.24	30.20		3.17	0.00
	Matched	0.35	0.33	4.00	86.90	0.27	0.79
Lag Imports Dummy	Unmatched	0.34	0.24	21.90		2.27	0.02
	Matched	0.34	0.32	3.60	83.50	0.24	0.81
Lag Exports Dummy	Unmatched	0.42	0.32	20.80		2.11	0.04
	Matched	0.41	0.39	5.10	75.30	0.36	0.72
Lag Service Income Dummy	Unmatched	0.04	0.02	11.60		1.35	0.18
	Matched	0.04	0.03	7.00	39.50	0.45	0.66
Lag Market Share	Unmatched	0.03	0.01	26.80		4.29	0.00
	Matched	0.02	0.02	-1.80	93.30	-0.15	0.88
Number of Firms		107	1145				
Number of Firms on Support		100	1145				
Median ABS	Unmatched	11.55					
	Matched	4.19					

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 3.4 Impact of Foreign Buyout on Profits Scaled by Industry Mean Profits

t	Profits Rel. to Industry Mean			Common Support		Off Support	
	Matching Estimate	Std. Err.	T-Stat	Untreated	Treated	Untreated	Treated
Difference-in-differences combined with Gaussian kernel matching estimates							
0	5.53	6.43	0.86	1145	100	0	7
1	0.03	1.62	0.02	757	80	0	5
2	3.04	5.73	0.53	555	64	0	2
3	-1.06	2.23	-0.5	377	50	0	2
Simple difference-in-differences estimates							
0	6.51	1.79	3.64***	1145	107	0	0
1	2.73	3.91	0.70	757	85	0	0
2	5.30	2.05	2.59***	555	66	0	0
3	1.02	1.25	0.82	377	52	0	0

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 3.5 Balancing Tests from Kernel Matching: Performance Is Measured by Return on Assets

		Mean			% Reduc	t-test	
Variable	Sample	Treated	Control	% Bias	Bias	t	$p > \|t\|$
Lag Log Real Total Assets	Unmatched	7.33	7.18	6.70		0.78	0.44
	Matched	7.37	7.34	1.40	79.50	0.09	0.93
Lag Return on Assets	Unmatched	0.04	0.01	18.60		1.83	0.07
	Matched	0.04	0.02	10.10	45.50	0.73	0.47
Lag Sales to Total Assets Ratio	Unmatched	1.05	13.69	-4.30		-0.31	0.76
	Matched	1.06	5.96	-1.70	61.20	-0.19	0.85
Lag Total Debt to Total Assets Ratio	Unmatched	0.54	0.65	-10.50		-0.78	0.43
	Matched	0.55	0.58	-3.20	69.50	-0.30	0.76
Lag Labor to Capital Ratio Rel. to Industry Mean	Unmatched	3763.40	421.92	19.80		4.12	0.00
	Matched	1970.30	1234.30	4.40	78.00	0.46	0.64
Lag Firm Age	Unmatched	5.65	5.35	7.80		0.78	0.44
	Matched	5.54	5.42	2.90	63.10	0.20	0.84
Lag Firm Age Squared	Unmatched	48.03	43.79	7.90		0.81	0.42
	Matched	46.73	45.50	2.30	71.10	0.15	0.88
Lag Number of Chinese Investors	Unmatched	1.06	1.16	-29.80		-2.53	0.01
	Matched	1.06	1.10	-10.90	63.50	-0.85	0.40
Lag Number of Chinese Investors Squared	Unmatched	1.19	1.53	-27.60		-2.35	0.02
	Matched	1.20	1.34	-10.60	61.50	-0.82	0.41
Lag Number of Chinese Investors x Firm Age	Unmatched	6.17	6.35	-3.00		-0.30	0.77
	Matched	6.09	6.26	-2.70	11.50	-0.17	0.86
Lag Number of Foreign Investors	Unmatched	1.10	1.12	-4.90		-0.46	0.65
	Matched	1.10	1.12	-4.40	10.50	-0.32	0.75
Lag Number of Foreign Investors Squared	Unmatched	1.33	1.40	-5.90		-0.55	0.59
	Matched	1.32	1.38	-4.30	27.90	-0.32	0.75
Lag Number of Foreign Investors x Firm Age	Unmatched	6.55	5.99	10.20		1.08	0.28
	Matched	6.37	6.23	2.60	74.70	0.17	0.86
Lag Foreign Ownership Percent	Unmatched	0.66	0.45	95.40		10.14	0.00
	Matched	0.65	0.60	22.00	76.90	1.41	0.16
Lag Log Number of Employees	Unmatched	4.41	4.22	15.80		1.50	0.14
	Matched	4.38	4.36	2.40	84.70	0.17	0.87
Lag Expat Workers Dummy	Unmatched	0.37	0.23	30.60		3.21	0.00
	Matched	0.34	0.33	3.00	90.30	0.20	0.84
Lag Imports Dummy	Unmatched	0.34	0.24	22.10		2.29	0.02
	Matched	0.33	0.31	5.30	75.90	0.36	0.72
Lag Exports Dummy	Unmatched	0.42	0.32	20.40		2.07	0.04
	Matched	0.41	0.37	8.80	57.10	0.61	0.55
Lag Service Income Dummy	Unmatched	0.04	0.02	11.50		1.34	0.18
	Matched	0.04	0.03	7.10	38.00	0.45	0.65
Lag Market Share	Unmatched	0.03	0.01	26.70		4.28	0.00
	Matched	0.02	0.02	-1.40	94.80	-0.12	0.91
Number of Firms		107	1,139				
Number of Firms on Support		99	1,139				
Median ABS	Unmatched	11.87					
	Matched	4.30					

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 3.6 Impact of Foreign Buyout on Total Profits to Total Assets Ratio

t	Total profits to total assets ratio			Common Support		Off Support	
	Matching Estimate	Std. Err.	T-Stat	Untreated	Treated	Untreated	Treated
Difference-in-differences combined with Gaussian kernel matching estimates							
0	0.20	0.22	0.91	1139	99	0	8
1	0.01	0.02	0.50	752	80	0	5
2	-0.01	0.02	-0.50	549	63	0	3
3	-0.00	0.02	-0.00	372	50	0	2
Simple difference-in-differences estimates							
0	0.30	0.93	0.32	1139	107	0	0
1	0.02	0.02	1.02	752	85	0	0
2	0.01	0.02	0.28	549	66	0	0
3	-0.00	0.02	0.00	372	52	0	0

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 3.7 Balancing Tests from Kernel Matching: Performance Is Measured by Total Profits to Sales Ratio

		Mean			% Reduc.	t-test	
Variable	Sample	Treated	Control	% Bias	Bias	t	$p > \|t\|$
Lag Log Real Total Assets	Unmatched	7.42	7.22	8.90		0.98	0.33
	Matched	7.58	7.65	-3.10	65.60	-0.23	0.82
Lag Profits to Sales Ratio	Unmatched	-0.78	-0.73	-0.50		-0.04	0.97
	Matched	-0.82	-0.62	-2.00	-333.70	-0.16	0.87
Lag Sales to Total Assets Ratio	Unmatched	1.10	14.72	-4.40		-0.31	0.75
	Matched	1.10	6.15	-1.60	62.90	-0.18	0.85
Lag Total Debt to Total Assets Ratio	Unmatched	0.57	0.66	-10.50		-0.76	0.45
	Matched	0.58	0.59	-1.80	83.30	-0.18	0.86
Lag Labor to Capital Ratio Rel. to Industry Mean	Unmatched	3832.70	441.19	19.60		3.92	0.00
	Matched	727.80	335.56	2.30	88.40	0.49	0.63
Lag Firm Age	Unmatched	5.92	5.43	12.50		1.21	0.23
	Matched	5.98	5.69	7.30	42.00	0.50	0.62
Lag Firm Age Squared	Unmatched	50.52	44.60	10.90		1.08	0.28
	Matched	51.42	48.17	6.00	45.20	0.39	0.70
Lag Number of Chinese Investors	Unmatched	1.06	1.16	-27.70		-2.32	0.02
	Matched	1.06	1.10	-9.30	66.40	-0.72	0.47
Lag Number of Chinese Investors Squared	Unmatched	1.20	1.51	-25.50		-2.14	0.03
	Matched	1.21	1.32	-9.20	63.90	-0.69	0.49
Lag Number of Chinese Investors x Firm Age	Unmatched	6.47	6.46	0.10		0.01	0.99
	Matched	6.55	6.54	0.20	-214.20	0.01	0.99
Lag Number of Foreign Investors	Unmatched	1.11	1.12	-3.80		-0.35	0.73
	Matched	1.11	1.13	-3.80	-1.40	-0.27	0.79
Lag Number of Foreign Investors Squared	Unmatched	1.35	1.41	-5.10		-0.46	0.65
	Matched	1.36	1.41	-3.80	25.10	-0.27	0.78
Lag Number of Foreign Investors x Firm Age	Unmatched	6.87	6.09	14.00		1.43	0.15
	Matched	6.98	6.58	7.10	49.10	0.46	0.64
Lag Foreign Ownership Percent	Unmatched	0.67	0.45	95.80		9.94	0.00
	Matched	0.67	0.62	20.50	78.60	1.28	0.20
Lag Log Number of Employees	Unmatched	4.46	4.30	14.80		1.37	0.17
	Matched	4.42	4.47	-4.00	73.00	-0.27	0.78
Lag Expat Workers Dummy	Unmatched	0.38	0.24	29.60		3.00	0.00
	Matched	0.36	0.35	3.60	87.90	0.24	0.81
Lag Imports Dummy	Unmatched	0.34	0.24	20.30		2.04	0.04
	Matched	0.34	0.34	1.10	94.40	0.07	0.94
Lag Exports Dummy	Unmatched	0.44	0.34	19.70		1.93	0.05
	Matched	0.43	0.40	4.80	75.40	0.33	0.74
Lag Service Income Dummy	Unmatched	0.04	0.02	11.60		1.31	0.19
	Matched	0.04	0.03	6.60	42.90	0.42	0.68
Lag Market Share	Unmatched	0.03	0.01	27.30		4.21	0.00
	Matched	0.02	0.02	-4.90	81.90	-0.42	0.68
Number of Firms		101	1,059				
Number of Firms on Support		96	1,059				
Median ABS	Unmatched	11.67					
	Matched	4.54					

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 3.8 Impact of Foreign Buyout on Total Profits to Sales Ratio

t	Total profits to sales ratio			Common Support		Off Support	
	Matching Estimate	Std. Err.	T-Stat	Untreated	Treated	Untreated	Treated
Difference-in-differences combined with Gaussian kernel matching estimates							
0	-2.13	2.23	-0.96	1059	96	0	5
1	-1.07	1.56	-0.69	711	78	0	4
2	0.07	0.09	0.78	522	60	0	2
3	-0.00	0.08	-0.00	362	48	0	2
Simple difference-in-differences estimates							
0	-1.98	0.70	-2.83***	1066	103	0	0
1	-0.94	1.07	-0.88	717	84	0	0
2	0.14	0.27	0.49	527	66	0	0
3	0.01	0.15	0.10	362	50	0	0

* significant at 10%; ** significant at 5%; *** significant at 1%

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Chapter 4

Deciding the Order Of Privatization: Theory And Evidence From Bulgaria

4.1 Introduction

Privatization is an important phenomenon worldwide, affecting developing as well as developed nations.[1] A number of OECD countries had active privatization programs through the 1990s (OECD, 2002). A current example, much discussed in the popular press, is the ongoing debate in the U.S. regarding the privatization of public infrastructure (Anderson, 2008). Over the past 20 years governments in transition economies have also engaged in a wide reaching effort to privatize all state property. In the years to come, large developing economies such as China and India are also expected to sell more of their state-held enterprises.

Most existing studies of privatization focus on productivity and profitability differences between state-owned and privatized firms. A problem with this line of research is that it takes privatization as a random assignment, ignoring any selection bias. There are few stud-

[1] See Table 4.1.

ies that specifically examine the selection of the order of privatization, a notable exception being the Gupta et al. (2008) study of Czech privatization. However, no country has chosen to privatize all of its state-owned enterprises (SOEs) simultaneously; in fact the privatization process usually occurs in waves. There are several explanations: administrative constraints restricting the privatization authorities to process only a limited number of deals in any given period, and political considerations such as fear of disrupting the economy and concerns about unemployment, among others. Given these constraints, governments face the sequencing decision of which enterprises to privatize first.

This chapter develops a theoretical model of how governments determine the sequence of privatization and tests the implications of the model on a firm level dataset of privatized firms from Bulgaria. Section 4.2 presents the theoretical model. Section 4.3 describes The specifics of the privatization process in Bulgaria and the available data sources are reviewed in Section 4.3. Section 4.4 addresses the estimation methodology and presents the estimation results while Section 4.5 concludes.

4.2 Model of Privatization

This section develops an intuitively appealing model that explains how the state chooses the order of privatization. In the model, the goal of the state is to maximize profits from privatization. The model requires several simplifying assumptions. The state owns N firms at the beginning of the privatization process and could privatize one firm per period. The length of the period should be thought of as short enough so that the administrative constraint binds. A week is a realistic period length, which would enable governments to

privatize several enterprises per year, consistent with what is observed in the data. The revenue the state receives from privatizing an enterprise is equal to the discounted stream of profits the firm would earn when privately-owned. If an enterprise is not privatized, then the government collects the profits the firm earns when operated by the state. For the sake of simplicity, firm i is assumed to be privatized in period i and earns some average profit Π_i^s for every period when state-owned and Π_i^p for every period when privately-held. There is a constant discount factor β such that $0 < \beta < 1$.

It follows that the state would sell firm i if and only if the discounted stream of profits when the firm is privately-owned exceeds the discounted stream of profits when it is state-owned:

$$\frac{1}{1-\beta}\Pi_i^p \geq \frac{1}{1-\beta}\Pi_i^s \tag{1}$$

Note that the model allows for the possibility that a firm could remain state-owned forever. Since the state is maximizing profits, its goal is to privatize firms in the order that would guarantee the maximum profit given by equation (2) below:

$$\sum_{i=0}^{N-1} \beta^i max[\frac{1}{1-\beta}\Pi_i^p, \frac{1}{1-\beta}\Pi_i^s] + \sum_{i=1}^{N-1} \frac{1-\beta^i}{1-\beta}\Pi_i^s \tag{2}$$

The first term in the sum reflects the state's decision whether to privatize based on the comparison of the profit firm i earns when state-owned versus the profit it could generate if privatized. The second term reflects the fact that each firm i earns profits Π_i^s in every period until period i when it is considered for privatization. From equation (2):

$$\frac{1}{1-\beta} max[\Pi_0^p, \Pi_0^s] + \sum_{i=1}^{N-1} \left(\beta^i max[\frac{1}{1-\beta}\Pi_i^p, \frac{1}{1-\beta}\Pi_i^s] + \frac{1-\beta^i}{1-\beta}\Pi_i^s \right)$$

$$= \frac{1}{1-\beta} max[\Pi_0^p, \Pi_0^s] + \sum_{i=1}^{N-1} \frac{1}{1-\beta} \left(\beta^i max[\Pi_i^p, \Pi_i^s] + \Pi_i^s - \beta^i \Pi_i^s\right)$$

$$= \frac{1}{1-\beta} max[\Pi_0^p, \Pi_0^s] + \sum_{i=1}^{N-1} \frac{1}{1-\beta} \left(\beta^i max[\Pi_i^p - \Pi_i^s, 0] + \Pi_i^s\right)$$

$$= \frac{1}{1-\beta} \left(\sum_{i=0}^{N-1} \Pi_i^s + \sum_{i=0}^{N-1} \beta^i max[\Pi_i^p - \Pi_i^s, 0] \right) \tag{3}$$

The state's problem is therefore equivalent to finding the order of privatization that would maximize equation (4):

$$\sum_{i=0}^{N-1} \beta^i max[\Pi_i^p - \Pi_i^s, 0] \tag{4}$$

To find which firms should be privatized first, consider two firms i and j. Assume that

$$\Pi_i^p - \Pi_i^s \geq \Pi_j^p - \Pi_j^s \tag{5}$$

Multiplying both sides by $(1-\beta)$ yields:

$$(1-\beta)\left(\Pi_i^p - \Pi_i^s\right) \geq (1-\beta)\left(\Pi_j^p - \Pi_j^s\right) \tag{6}$$

Regrouping terms leads to:

$$\left(\Pi_i^p - \Pi_i^s\right) + \beta\left(\Pi_j^p - \Pi_j^s\right) \geq \left(\Pi_j^p - \Pi_j^s\right) + \beta\left(\Pi_i^p - \Pi_i^s\right) \tag{7}$$

From equation (7), it follows that firm i should be privatized before firm j, since this would

maximize profits for the state. Firms for which the gap between profits when privately-owned and profits when state-owned is the greatest should be privatized the earliest. Such a privatization strategy not only maximizes state profits from privatization, but also leads to increased economic efficiency since firms that would see the largest profitability gain would be privatized first.

Focusing on profit maximization is a reasonable approach to modeling the state's decision processe when faced with the timing problem. Governments, especially in developing countries, often find themselves cash-constrained and struggling to repay mounting foreign debt. Privatization consistent with the goal of maximizing profits would therefore provide a reasonable and viable privatization strategy.

4.3 Privatization in Bulgaria and Data Sources

Bulgaria started its privatization efforts in 1991, but only 5 % of state assets were privatized by the end of 1996. This called for a major re-evaluation of the privatization program and the adoption of a two step privatization strategy in 1997. Step 1 involved the privatization of small and medium-scale enterprises in all sectors, and large enterprises in all sectors other than energy, transport, infrastructure and utilities. Step 2 required the privatization of enterprises in strategic industry sectors such as energy, transport, infrastructure and utilities. The task of privatizing was split among three separate authorities: the Privatization Agency, the Ministries, and the Municipalities. The Privatization Agency was formed in 1992 and was responsible for the privatization of medium and large enterprises with book value of more than 1 million Bulgarian leva. Ministries privatized enterprises with book value below

1 million Bulgarian leva. Municipal councils privatized all municipal property regardless of its value (World Bank, 2002).

The data used in this study comes from two sources: Bulgarian Privatization Agency documents and the AMADEUS (Analyze MAjor Databases from EUropean Sources) database. The Bulgarian Privatization Agency is required by law to keep a record of each completed privatization deal. Individual documents contain information on the name, location and industry of the company, date of privatization, sale price, percentage of enterprise sold, name and nationality of buyer firm, and other stipulations regarding debt absorption, investment obligations, employment level, and line of business. There are two categories of privatization deals that the Privatization Agency handles: companies and detached parts. There are more than 600 documents describing the former and 500 detailing the latter. The focus of this study is on privatization of whole enterprises only. A dataset of all firms privatized by the Privatization Agency is constructed using Bulgarian Privatization Agency documents. This data are then merged with the AMADEUS dataset which contains longitudinal firm-level financial data. It has information on 16,000 Bulgarian medium and large enterprises and provides annual balance sheets, income statements, profit/loss accounts, and ownership information.

Matching firms across the two datasets is challenging since firms have no common identification number allowing to easily track enterprises between datasets. A combination of company name, location, industry and ownership information is used to match firm records across datasets. A major issue is that newly privatized firms tend to change names after privatization. Despite these hurdles, the match rate between the more than 600 firms from the Privatization Agency dataset and AMADEUS firms is 85%. Not having a 100%

match rate could lead to a bias if the unmatched firms remain unmatched because of a shared characteristic. However, the 100 firms that remain unmatched do not have any identifiable pattern of similarities: they come from a mix of geographic regions, industries and sizes. To the extent that the unmatched firms share unobservable characteristics, this remains a potential problem.

In addition to the firms that were privatized, a sample of 350 firms that were entirely state-owned as of 2004 was also identified. The firms in this additional sample are not in strategic industries, i.e. they were potential candidates for privatization, but were not chosen for privatization. The outcome is a dataset that specifies the details of the privatization deal where relevant and provides an annual time series of firm performance indicators for each enterprise.

4.4 Empirical Methodology and Results

The model of privatization developed in Section 4.2 predicts that firms with larger profit level differentials $\Pi_i^p - \Pi_i^s$ would be privatized earlier in the sequence. A goal of this study is to empirically test if firms privatized earlier in the privatization sequence gain more in profitability compared with firms privatized later on. The proposed estimation strategy captures the difference between Π_i^p and Π_i^s as the contribution to firm profitability brought about by privatization and estimates if this contribution diminishes for later privatization cohorts. The question addressed in this chapter departs from the framework of the previous two chapters: this study answers what enterprises are selected for privatization, rather than what the performance of these enterprises is after controlling for selection.

The dataset is a firm-year panel spanning 9 years from 1995 to 2003 and encompassing 1020 firms, 152 of which are strategic industry firms [2]. Table 4.2 provides summary statistics of key variables for three categories of firm-year observations. The first three columns give the statistics for all firms in the years when state-owned. Note that this encompasses both firms which remain state-owned until the end of the sample time range, and firms which are privatized at some point over the span of the data. The second category comprises of firms that were privatized at some point within the sample time range, in the years when state-owned. In other words, columns 4-6 of Table 4.2 summarize key statistics for the firms in the years before their privatization. Columns 7-9 focus on the firms in the years after privatization. Post-privatization firms compared with their pre-privatization selves seem to be less profitable, larger in size and more in debt, although these differences are not statistically significant.

The dependent variable in all regressions is the firm's profit or loss level before tax. All regressions include a set of time dummy variables $\boldsymbol{t}$. The pool of privatized firms is divided into cohorts according to their year of privatization [3] and a set of dummy variables is defined indicating the privatization year cohort each firm belongs to. These are referred to as *privatization cohort* dummies and are denoted by a_y where y stands for the year of privatization. For each firm, $p_{i,t}$ is defined as 0 for all years leading up to privatization and 1 for each year after the firm is privatized. In the year of privatization, $p_{i,t}$ is defined as the fraction of the year during which the firm is privately owned. The coefficient on this variable captures the change in profitability after privatization common to all privatized firms. What the theory predicts is that firms privatized later on in the privatization process

[2] See Table 4.3 for a complete breakdown of the firms in the sample by sector and year of privatization.
[3] See Table 4.3.

would observe less of a change in profitability. To test this prediction, a variable $po_{i,t}$ is defined, denoting when the firm was privatized in the sequence as follows:

$$po_{i,t} = (Y_i - 1994)\frac{max[0, t - Y_i + 1]}{max[1, t - Y_i + 1]} \tag{8}$$

where Y_i indicates the privatization year of firm i, 1994 is the year the Bulgarian Privatization Agency made its first privatization deal and t denotes the year. Table 4.4 outlines the privatization dummies for a firm privatized on January 1, 1999. The following equation is estimated:

$$\Pi_{i,t} = \alpha + \boldsymbol{t'}\boldsymbol{\beta} + \boldsymbol{a}'_{i,t}\boldsymbol{\gamma} + \theta_1 p_{i,t} + \theta_2 po_{i,t} + \varepsilon_t \tag{9}.$$

This specification assumes that the profit level gaps $\Pi_t^p - \Pi_t^s$ follow a linear trend with θ_2 measuring the slope of the trend. For the theoretical model to be consistent with the empirical evidence, θ_2 needs to be negative. The baseline profitability of all firms belonging to a single privatization cohort is captured by the coefficient γ_y. The constant factor of the profitability change following privatization is common across all firms and is reflected in the value of θ_1. Different cohorts are allowed to differ in their profitability gaps and the difference from the common constant factor is measured by θ_2. Figure 4.1 offers a graphical interpretation of the key coefficients from Equation (9).

Only non-strategic firms are included in the sample. Equation (9) is estimated as a random effects (RE) model, controlling for the group structure of the data. The same specification is also estimated as an ordinary least squares (OLS) regression to serve as a robustness check for the RE results. The results from the two regressions are shown in columns 3 and 4 of Table 4.5 respectively. Both the RE and OLS regressions estimate

coefficients of interest that are close in magnitude and significance. Consistent with the theoretical priors, there is a positive and significant coefficient on $p_{i,t}$ and a negative and significant coefficient on $po_{i,t}$. These results are a strong indicator that later privatization cohorts enjoy lesser profit gaps compared with earlier ones.

Assuming that the profit gaps decline linearly for later privatization cohorts might be too restrictive of an assumption. To check whether the profit gaps follow a quadratic rather than a linear trend, the following equation is estimated:

$$\Pi_{i,t} = \alpha + \boldsymbol{t'}\boldsymbol{\beta} + \boldsymbol{a}'_{i,t}\boldsymbol{\gamma} + \theta_1 p_{i,t} + \theta_2 po_{i,t} + \theta_3 po^2_{i,t} + \varepsilon_t \tag{10}$$

Equation (10) is estimated as both a RE and an OLS model. The estimation results are presented in columns 5 and 6 of Table 4.5. The magnitudes and significance of the coefficients of interest are similar between the RE and OLS regressions. θ_1 is positive and significant, θ_2 is negative and significant, whereas θ_3 is not significant. Allowing for a quadratic trend does not seem to fit the data well. Thus, assuming a linear trend seems like a reasonable restriction.

However, it is possible that the trend is neither linear, nor quadratic. Taking an agnostic view of the trend followed by the profit gaps, the dummy variables are re-specified without embedding a linear or quadratic trend. The goal is to measure the profit gaps for each privatization cohort separately and detect the presence of any pattern. To this end another set of dummy variables is defined, which are referred to as *post privatization cohort* dummies (p_y). They track firms by privatization year cohort in the years after the firms are privatized. For each firm the post privatization cohort dummy is equal to 0 for the years leading up to the year of privatization, and becomes 1 after the year of privatization. For the year of

privatization itself, the post privatization cohort dummy takes a value between 0 and 1, indicating what portion of the year the firm spent in private hands. The following equation is estimated:

$$\Pi_{i,t} = \alpha + \boldsymbol{t'}\boldsymbol{\beta} + \boldsymbol{a}'_{i,t}\boldsymbol{\gamma} + \boldsymbol{p}'_{i,t}\boldsymbol{\theta} + \varepsilon_t \tag{11}$$

The coefficients of interest are the ones on the post privatization cohort dummies. The vector of coefficients $\boldsymbol{\theta}$ measures the effect privatization has on the profitability of the firm. For the theoretical model to be consistent with the data, the coefficients on the post privatization cohort dummies need to become smaller with later privatization cohorts. Figure 4.2 gives a graphical interpretation of the key coefficients. γ_y reflects the baseline profitability of the firm, whereas θ_y gives the profit gap particular to the specific privatization cohort.

The results from a Random Effects and an OLS regression are summarized in columns 7 and 8 of Table 4.5. The coefficients on the post privatization cohort dummies are larger for earlier cohorts and become smaller for later cohorts, forming a pattern consistent with the theory. The results suggest that the linear trend assumption of Equation 9 is a reasonable representation of the true pattern followed by the privatization gaps. However, the estimated $\boldsymbol{\theta}$ coefficients are not highly significant. The issue is that the number of firms within each privatization cohort is relatively small as shown in Table 4.3, precluding the precise estimation of every cohort's profit gap.

In the results described so far, the sample is restricted to non-strategic industry firms. As a robustness check, the same regressions are estimated on the entire sample of firms, including both non-strategic and strategic industry firms [4]. Table 4.6 presents the regression

[4] As outlined in Section 4.3, the Bulgarian government considered energy, transport, infrastructure and utilities to be strategic industries and firms in these industries were privatized at the end of the privatization process.

results. The coefficients of interest are similar in magnitude to those of Table 4.5, but the significance is lower. The lower statistical significance is hardly surprising given that the state treated the strategic industry firms very differently from the rest of the candidates for privatization. Furthermore, the privatization of strategic industry firms did not start occurring until the later part of the sample. Still, the similarity in the magnitude of the coefficients between tables 4.5 and 4.6 is encouraging.

To assuage concerns that the results in Table 4.5 are due to omitted variables bias, Table 4.7 presents regressions including additional firm characteristics as explanatory variables. The additional regressors are total assets and number of employees, which control for the size of the firm, and current ratio, which is a measure of the indebtedness and financial stability of the firm. The key coefficients are again similar in magnitude and significance to those in Table 4.5. The conclusion that follows from these results is that there is a robust downward trend in the gap between post-privatization and pre-privatization profits when moving toward later privatization cohorts.

The results suggest that firms privatized sooner enjoy higher profit gains from privatization compared with firms privatized later on. This indicates that the Bulgarian government conducted a privatization policy consistent with the goal of maximizing profits from privatization. The implication is that there is a systematic difference between firms privatized at different points in the privatization process, which poses a selection problem that should be carefully addressed in studies comparing a cross-section of state-owned and privately-owned enterprises.

4.5 Conclusion

This chapter examines how governments determine the order in which to sell state-owned enterprises in the presence of constraints not allowing the simultaneous privatization of all firms. A theoretical model is proposed where the state picks the sequence of privatization in a way consistent with maximizing privatization profits. The model gives a clear testable prediction: firms that would experience the greatest improvement in profit levels after privatization should be privatized first. This prediction is tested on a firm-level panel data set from Bulgaria. The empirical estimation confirms that firms with larger gaps between their average after privatization profit level and before privatization profit level are privatized sooner. This result is intuitively appealing from a historical perspective as well. The Bulgarian government was eager to privatize since privatization brought much needed funds to the state budget that could help service the foreign debt. To this end, most of the privatization deals were auctions, many of them seeking payment in hard currencies. Concerns about disruptions in employment were addressed directly in the privatization contract through strictly specified employment clauses, and therefore did not play a role in determining the order of privatization.

This study makes several important contributions: it proposes a realistic and intuitively appealing theoretical model and creates a way of empirically testing the model's prediction on a firm level panel dataset manually constructed from Bulgarian Privatization Agency documents, combined with financial information from AMADEUS.

Figures and Tables

Figure 4.1 Equation (9) Dummy Variable Structure.

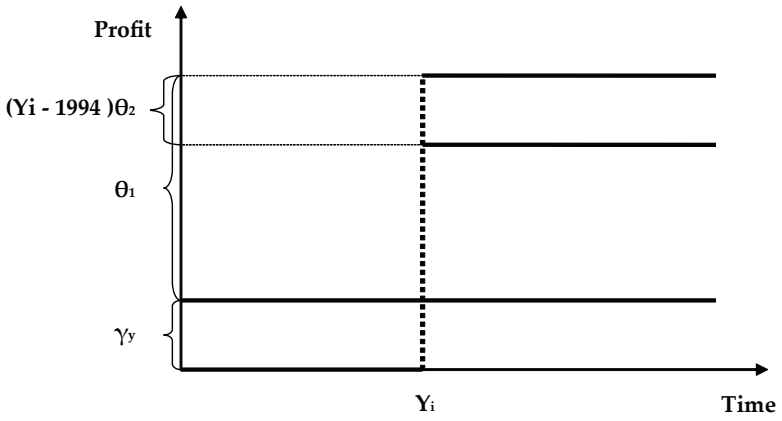

Figure 4.2 Equation (11) Dummy Variable Structure.

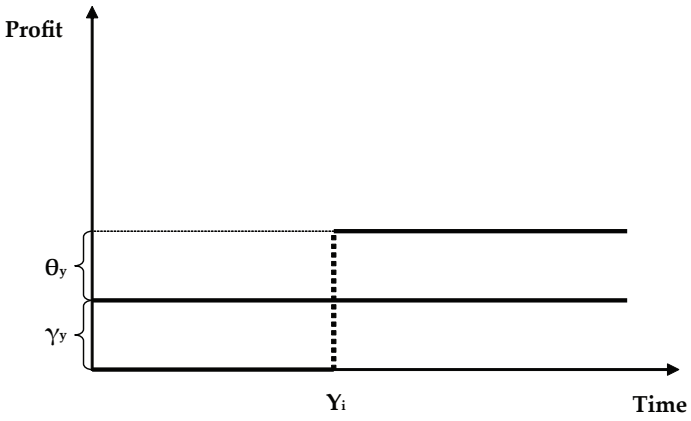

Table 4.1 Country Breakdown of Amounts Raised by Privatisation (1). Millions of USD.

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001 (p)**
Australia	19	1 042	1 893	2 057	2 055	8 089	9 052	16 815	7 146	15 220	6 273	396
Austria (2)	32	48	49	142	700	1035	1302	2438	2537	70	2086	833
Belgium	—	—	—	956	548	2745	1222	1842	2288	10	—	—
Canada (3)	1 504	808	1 249	755	490	3 998	1 768	—	11	—	—	—
Czech Republic (4)	..	59	877	837	1 065	976	902	395	437	737	520	1 603
Denmark	644	—	—	122	229	10	366	45	4 502	19	111	—
Finland	—	—	—	229	1 120	363	911	835	1 999	3 716	1 827	38
France	—	—	—	12 160	5 479	4 136	3 096	10 105	13 596	9 478	17 438	429
Germany (5)	11	351	—	73	678	191	1 421	3 125	11 357	2 754	1 750	3 343
Greece	—	—	—	35	73	44	558	1 395	3 960	4 880	1 384	1 305
Hungary	102	385	705	1 308	955	2 645	849	647	197	88	66	43
Iceland	—	—	21	10	2	6	—	4	128	228	1	14
Ireland (6)	—	515	70	274	—	157	293	—	—	4 846	1 458	773
Italy(7)	—	—	759	3 039	9 077	10 131	11 230	23 945	15 138	25 594	9 729	2 653
Japan	—	—	—	—	13 875	—	2 039	—	6 641	15 115	—	—
Korea	—	—	—	1 451	3 782	643	3 091	645	201	2 153	18	2 907
Luxembourg	—	—	—	—	—	—	—	—	—	—	—	—
Mexico	3 124	10 757	6 864	2 531	766	170	73	2 670	988	279	406	—
Netherlands	716	179	—	780	3 766	3 993	1 239	842	335	1 481	310	831
New Zealand	3 895	17	967	630	29	264	1 839	—	441	1 331	—	—
Norway	73	—	—	—	118	521	660	35	—	454	1 039	2 103
Poland	23	171	373	433	725	1101	1442	2043	2079	3422	6262	1586
Portugal	1 092	1 002	2 206	422	1 123	2 362	3 001	4 909	4 299	1 620	3 256	353
Slovak Republic (8)	—	—	—	63	415	1 004	486	11	..	..	1 313	508
Spain	172	—	830	3 222	1 458	2 941	2 680	12 532	11 618	1 128	1 079	741
Sweden	—	—	378	252	2 313	852	785	2 390	172	2 071	8 082	—
Switzerland	—	—	—	—	—	—	—	—	6 442	—	—	—
Turkey	486	244	423	566	412	572	292	466	1 020	38	2 712	123
United Kingdom (9)	4 219	5 346	7 923	8 114	4 632	5 648	2 426	4 500	—	—	—	—
United States	—	—	—	—	—	—	—	3 650	3 100	—	—	—
Grand Total	16 112	20 925	25 586	40 461	55 885	54 599	53 022	96 282	100 633	96 735	67 119	20 583

Source: OECD Privatisation Database.

Notes:

.. Not available.

Nil or insignificant.

p: provisional.

1. The amounts shown are gross proceeds from direct privatisations. These do not necessarily correspond to the net amount available to the government. The figures are on a calendar year basis and they may not add up to published budget figures.

2. Statistics refer only to privatisations by the central government.

3. There were no federal privatisations in 1997, 1999 and 2000. Provincial data are currently not available.

4. Proceeds from small-scale privatisation in 1990 are not available. Large scale privatisation started in 1991.

5. Up to 1997, information on trade sales is not available.

6. The amount raised from the sale by Irish National Petroleum Corporation (INPC) of two subsidiaries, some USD 100.6 millions, being the result of an indirect privatisation are included in the total gross proceeds raised in 2001. The 2001 proceeds also include USD 364.96 million arising from the sale of TSB Bank.

7. Including indirect privatisations since 1996-2000 raising million USD respectively 2 325; 2 018; 3 235; 5 791; 9 244.

8. Until 1999, the source is World Bank. Data for 2000 is provisional.

9. Debt sales for years 1990-97 (fiscal years) amounting to GBP 5 347 million, GBP 7 924 million, GBP 8 189 million, GBP 5 453 million, GBP 6 429 million, GBP 2 439 million, GBP 4 500 million, respectively. All the figures are provided in fiscal years.

Table 4.2 Summary Statistics

		State Ownership			Privatized, State Ownership			Privatized, Private Ownership		
		Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.
Profit/Loss Before Tax	Primary	356	456.54	4061.29	144	828.37	5093.55	92	95.36	1031.25
	Manufacturing	1251	264.97	4972.65	819	607.20	5267.92	1104	-113.91	5132.32
	Services	1066	577.40	6296.61	408	-44.12	2759.35	208	-240.78	4402.95
	Strategic	546	1911.79	19926.51	127	-9.37	335.96	41	-199.70	1536.13
	Non-Strategic	2673	415.09	5439.02	1371	436.60	4652.09	1404	-119.00	4862.38
	All Industries	3219	668.96	9598.24	1498	398.79	4453.19	1445	-121.29	4799.69
Profit Margin	Primary	342	-6.71	20.35	141	-2.47	18.91	88	-1.33	15.21
	Manufacturing	1190	-3.05	21.72	796	0.78	18.08	1059	-4.73	21.05
	Services	1040	-0.93	19.46	401	1.03	20.12	197	-4.96	26.37
	Strategic	535	0.21	14.52	124	1.73	11.25	41	-2.75	13.47
	Non-Strategic	2572	-2.68	20.73	1338	0.51	18.82	1344	-4.54	21.59
	All Industries	3107	-2.18	19.83	1462	0.62	18.30	1385	-4.49	21.40
Number of Employees	Primary	328	621.10	1522.20	213	310.32	405.44	91	383.967	482.4556
	Manufacturing	1202	644.44	1470.00	997	389.54	748.20	1094	561.77	960.01
	Services	973	592.02	2687.20	518	154.63	292.11	207	462.67	849.72
	Strategic	536	839.41	3445.36	288	84.76	63.01	40	746.88	1884.31
	Non-Strategic	4338	337.99	1352.57	1728	309.36	616.01	2214	415.88	671.44
	All Industries	5562	370.90	1367.36	2016	277.27	576.17	2313	403.04	659.93
Total Assets	Primary	365	6382.71	23024.94	147	5161.59	14366.21	94	7847.48	16213.25
	Manufacturing	1294	8817.06	40430.17	843	11247.07	49055.14	1111	10707.62	36244.38
	Services	1102	7062.88	34189.70	428	3654.88	10696.45	211	10492.99	22920.91
	Strategic	566	34765.81	169066.80	137	2694.11	16132.16	41	13611.07	33046.54
	Non-Strategic	2761	7795.093	36096.58	1418	8324.63	38708.74	1416	10485.77	33559.61
	All Industries	3327	12383.44	77714.60	1555	7828.56	37304.1	1457	10573.72	33538.08
Current Ratio	Primary	360	1.46	1.63	142	1.85	2.13	93	1.93	2.49
	Manufacturing	1270	2.00	3.04	826	1.89	2.70	1108	2.09	2.73
	Services	1089	2.47	5.63	424	2.15	2.60	209	2.55	4.15
	Strategic	561	1.57	1.18	136	1.48	0.69	40	1.31	0.79
	Non-Strategic	2719	2.12	4.18	1392	1.97	2.62	1410	2.15	2.97
	All Industries	3280	2.02	3.84	1528	1.92	2.51	1450	2.12	2.94

Table 4.3 Firms by Industry and Privatization Cohort.

	Strategic	Manufacturing	Services	Primary	Total
Firms Privatized in 1994	0	8	4	2	14
Firms Privatized in 1995	0	13	4	4	21
Firms Privatized in 1996	2	36	3	3	44
Firms Privatized in 1997	2	41	4	4	51
Firms Privatized in 1998	1	61	11	11	84
Firms Privatized in 1999	4	77	27	27	135
Firms Privatized in 2000	2	22	6	6	36
Firms Privatized in 2001	0	4	4	4	12
Firms Privatized in 2002	3	11	15	15	44
Firms Privatized in 2003	26	22	27	27	102
Firms Privatized in 2004	3	2	0	0	5
Privatized Firms	43	297	105	103	548
Non Privatized Firms	109	121	173	69	472
All Firms	152	418	278	172	1020

Table 4.4 Dummies for a Firm Privatized on January 1, 1999.

year	a94	⋯	a98	a99	a00	⋯	a03	p	po99
1995	0	⋯	0	1	0	⋯	0	0	0
1996	0	⋯	0	1	0	⋯	0	0	0
1997	0	⋯	0	1	0	⋯	0	0	0
1998	0	⋯	0	1	0	⋯	0	0	0
1999	0	⋯	0	1	0	⋯	0	1	5
2000	0	⋯	0	1	0	⋯	0	1	5
2001	0	⋯	0	1	0	⋯	0	1	5
2002	0	⋯	0	1	0	⋯	0	1	5
2003	0	⋯	0	1	0	⋯	0	1	5

Table 4.5 Profit Levels Regressions Non Strategic Firms.

	1 RE	2 OLS	3 RE	4 OLS	5 RE	6 OLS	7 RE	8 OLS
Time Dummies	yes	yes	yes	yes	yes	yes	yes	yes
Priv. Cohort Dummies	yes	yes	yes	yes	yes	yes	yes	yes
p_{95}							496.69	822.32
							[0.27]	[0.39]
p_{96}							509.20	647.72
							[0.67]	[0.74]
p_{97}							-80.93	-32.31
							[0.14]	[0.05]
p_{98}							-280.27	-164.66
							[0.59]	[0.30]
p_{99}							-475.90	-374.72
							[1.14]	[0.78]
p_{00}							-183.34	-103.08
							[0.23]	[0.11]
p_{01}							76.08	214.16
							[0.02]	[0.05]
p_{02}							-2,836.66	-811.81
							[0.78]	[0.21]
p	-235.50	-128.53	845.56	886.33	1,076.97	1,151.78		
	[0.80]	[0.38]	[1.94]*	[1.78]*	[2.17]**	[2.03]**		
po			-290.17	-272.81	-592.96	-622.00		
			[3.38]***	[2.76]***	[1.84]*	[1.68]*		
po^2					52.265	60.255		
					[0.97]	[0.98]		
Constant	224.93	1,382.41	809.15	1,405.15	745.24	1,325.82	261.49	1,430.03
	[0.32]	[1.01]	[0.66]	[1.02]	[0.60]	[0.96]	[0.37]	[1.02]
Observations	4077	4077	4077	4077	4077	4077	4077	4077
Number of Firms	731		731		731		731	
R-squared		0.01		0.01		0.01		0.01

Absolute Value of z statistics in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 4.6 Profit Levels Regressions All Firms.

	1 RE	2 OLS	3 RE	4 OLS	5 RE	6 OLS	7 RE	8 OLS
Time Dummies	yes	yes	yes	yes	yes	yes	yes	yes
Priv. Cohort Dummies	yes	yes	yes	yes	yes	yes	yes	yes
p_{95}							-118.81	469.34
							[0.05]	[0.14]
p_{96}							93.29	370.89
							[0.09]	[0.27]
p_{97}							-162.66	6.93
							[0.20]	[0.01]
p_{98}							-246.42	21.12
							[0.38]	[0.02]
p_{99}							-387.40	-137.13
							[0.68]	[0.18]
p_{00}							-79.77	138.13
							[0.07]	[0.10]
p_{01}							274.74	658.60
							[0.05]	[0.10]
p_{02}							-3,338.58	-707.15
							[0.64]	[0.11]
p	-245.72	7.04	798.49	937.88	1,137.85	1,306.52		
	[0.62]	[0.01]	[1.33]	[1.19]	[1.66]*	[1.46]		
po			-275.55	-246.11	-715.73	-727.98		
			[2.32]**	[1.57]	[1.60]	[1.24]		
po^2					75.91	83.05		
					[1.02]	[0.85]		
Constant	465.51	1,846.67	1,033.48	1,863.34	944.74	1,754.97	1,202.92	1,901.28
	[0.47]	[0.84]	[0.60]	[0.85]	[0.54]	[0.80]	[0.68]	[0.85]
Observations	4664	4664	4664	4664	4664	4664	4664	4664
Number	878		878		878		878	
R-squared		0.01		0.01		0.01		0.01

Absolute Value of z statistics in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 4.7 Profit Levels Regressions Non Strategic Firms (Extra Regressors).

	1 RE	2 OLS	3 RE	4 OLS	5 RE	6 OLS
Time Dummies	yes	yes	yes	yes	yes	yes
Priv. Cohort Dummies	yes	yes	yes	yes	yes	yes
p	-67.25	20.04	914.04	959.44	1,169.55	1,233.42
	[0.21]	[0.06]	[1.97]**	[1.95]*	[2.21]**	[2.20]**
po			-265.79	-254.22	-597.06	-610.76
			[2.90]***	[2.61]***	[1.73]*	[1.67]*
po^2					57.11	61.46
					[1.00]	[1.01]
Total Assets	-0.004	-0.01	-0.004	-0.01	-0.004	-0.01
	[1.07]	[3.11]***	[1.06]	[3.11]***	[1.05]	[3.11]***
Current Ratio	61.01	74.98	61.54	75.54	61.37	75.39
	[2.66]***	[3.32]***	[2.69]***	[3.35]***	[2.68]***	[3.34]***
Number of Employees	1.07	1.21	1.07	1.21	1.07	1.21
	[13.91]***	[17.61]***	[13.86]***	[17.61]***	[13.84]***	[17.60]***
Constant	-247.26	-768.53	-239.63	-754.22	-1,013.54	-835.68
	[0.34]	[0.56]	[0.33]	[0.55]	[0.76]	[0.60]
Observations	3776	3776	3776	3776	3776	3776
Number	730		730		730	
R-squared		0.13		0.13		0.13

Absolute Value of z statistics in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

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Chapter 5

Conclusion

The three papers of this dissertation address a host of issues surrounding ownership and firm performance. Changes in ownership typically occur when both seller and buyer expect to benefit from the transaction. Governments in developing countries often attempt to shape the composition of firm ownership in the hope of reaping economic benefits. Foreign ownership is often touted as a vehicle for higher firm productivity and efficiency gains. Many of the results presented in preceding chapters challenge the conventional wisdom and deliver unexpected insights.

Chapter 2 begins the analysis by studying cross-border mergers and acquisitions in India. Firms that experience foreign acquisition treatment are compared with a carefully selected group of domestic-owned firms. Addressing the selection bias issue inherent in the non-randomness of the foreign acquisition decision establishes a direct comparability between similar groups of foreign-acquired and domestic-owned firms. Once the comparability between the treated and control group firms is established, any advantage due to foreign ownership dissapears. It is possible that such an advantage emerges over the long run which is not observed over the span of data, especially when taking into consideration

that the studied firms are manufacturing enterprises that could take several years to retool. Nevertheless, this finding should adjust the expectations of governments and institutions with respect to foreign ownership.

Chapter 3 further examines the effect of varying degrees of foreign ownership on firm profitability in the context of Chinese firms with foreign participation. It compares directly the incremental change in profitability due to firm restructuring from Sino-foreign JV to foreign WOS. After constructing a comparison group of firms that remain Sino-foreign JVs with characteristics similar to the firms that undergo foreign buyout treatment, there appear to be few statistically significant differences in the profitability of these firms. A possible reason for the lack of change is that the foreign partner has provided the JV with the necessary know-how and is unable to squeeze further efficiency gains after the takeover. Another possibility is that it takes time for a change to take effect and given the limited horizon of the data, the results fail to capture the long-term trend. Viewing the results from a different angle, taking the Chinese partner out of the equation does not lead to significant changes in the profitability of the treated firms. This suggests that Chinese partners are not performance barriers or a liability to Sino-foreign JVs.

Turning to the motivation of the owner in selling assets, Chapter 4 discusses the optimal sale timing strategy in the context of a theoretical model and data from Bulgarian privatisation deals. The prediction of the model is that firms with larger gaps between their after-privatization and before-privatization profits should be sold first. The empirical tests of the hypothesis prove that the choice of the order in which to privatize state-owned enterprises is consistent with the state maximizing revenues from privatization.

The presented findings emphasize the importance of constructing appropriate counter-

factuals. Governments could benefit from revising their expectations with regards to foreign direct investment, given the lack of evidence for significant differences in the performance of domestic-owned versus foreign owned eneterprises, and between partially foreign-owned and fully owned foreign firms.