Paper to be presented at

DRUID15, Rome, June 15-17, 2015

(Coorganized with LUISS)

Private Sector Spillovers in Chinese Manufacturing

gordon Walker
cox school of business, smu, dallas
strategy and entrepreneurship
gwalker@smu.edu

Frank Xia
ESC Rennes School of Business
Strategy
frankxia@gmail.com

Abstract

A firm?s type of owner is an important institutional variable in comparative research on countries with emerging markets. A central theme in this research is the importance of the private sector as a source of greater innovation and productivity. Here we examine the uniqueness of the private sector, compared with state and foreign owned firms, for product innovation in Chinese manufacturing firms from 1998 to 2007. We first speculate that private sector firms, which have no formal ties within a bureaucracy, will have a higher percentage of weak ties in local search and therefore benefit more from regional agglomeration economies. Second, we test a central issue in the debate about the effects of private sector growth: specifically, do large private firms exhibit hegemonic behavior by dampening regional innovation within the private sector itself or act as innovation hubs by supporting it? Third, we argue, consistent with observations of small firm networks in other countries, that small firm agglomeration has a positive effect on innovation within the private sector. Last, we split the private sector into privatized firms and entrants and test whether privatized firms, because of the imprinting of prior state ownership, are more similar to state-owned firms than entrants, both in their agglomeration effects and in their receptivity to spillovers. We discuss the implications of these findings for research on emerging markets.

Jelcodes:O33,R11

Private Sector Spillovers in Chinese Manufacturing

Abstract

A firm's type of owner is an important institutional variable in comparative research on countries with emerging markets. A central theme in this research is the importance of the private sector as a source of greater innovation and productivity. Here we examine the uniqueness of the private sector, compared with state and foreign owned firms, for product innovation in Chinese manufacturing firms from 1998 to 2007. We first speculate that private sector firms, which have no formal ties within a bureaucracy, will have a higher percentage of weak ties in local search and therefore benefit more from regional agglomeration economies. Second, we test a central issue in the debate about the effects of private sector growth: specifically, do large private firms exhibit hegemonic behavior by dampening regional innovation within the private sector itself or act as innovation hubs by supporting it? Third, we argue, consistent with observations of small firm networks in other countries, that small firm agglomeration has a positive effect on innovation within the private sector. Last, we split the private sector into privatized firms and entrants and test whether privatized firms, because of the imprinting of prior state ownership, are more similar to state-owned firms than entrants, both in their agglomeration effects and in their receptivity to spillovers. We discuss the implications of these findings for research on emerging markets.

Introduction. Over the past twenty years, the political economy of emerging markets has become an important research topic in strategy, organizational sociology and economics (Nee, 1996; Fligstein, 2002; Khanna and Palepu, 2010). Sociologists have been attuned to the workings of influence and resource networks across the economy and to the continuing role of the state and other institutions as primary factors in economic growth and change (Davis, 2005a, 2005b). This research, along with the burgeoning study of comparative capitalism in political science, has argued strongly for the importance of institutional forces on firm outcomes, especially innovation (Hall and Soskice, 2001; Hancke, Rhodes and Thatcher, 2007; for one perspective on China, see Witt and Redding, 2012).

Our focus in this paper is on the ownership of the firm as an institutional variable in emerging economies and specifically on the uniqueness of the private sector as a central owner type in the study of product innovation induced by regional agglomeration economies, which for simplicity we will also call spillovers. Examining the role of the private sector links our study to an ongoing debate regarding the transition of previously socialist or communist economies to capitalism. This debate centers on the relative value for economic growth of continuing state involvement in or oversight of enterprises producing goods and services compared to local networks of entrepreneurs (see Keister and Zhang [2009] and Fligstein and Zhang [2009] for comprehensive reviews). As a major proponent of the state's beneficial role, Walder (1995, 2003) argues for the importance of maintaining local state ties to production in order to prevent the economically destructive appropriation of newly privatized assets by entrepreneurs. On

the other side of the debate, Nee (1992, 1996; Nee and Ingram, 1998; Cao and Nee, 2000) in a wide range of papers has proposed that the emergence of a vibrant private sector, free of state control, is critical for the economy.

To investigate comparative private sector effects on product innovation through spillovers, we examine manufacturing firms in China from 1998 to 2007. China during this period presents a particularly rich opportunity for research on owner type because of the persistent presence of three kinds of owner: the state, foreign corporations, and a rapidly growing private sector. Research on these three types indicates that they have strong differences in their governance practices and resource networks (Villalonga, 2000; Megginson and Netter, 2001; Meyer and Sinani, 2009). Therefore, their effects on innovation through owner-specific regional spillovers within industries may differ substantially.

Fligstein and Zhang (2009) suggest that only an analysis of comprehensive data on the development of Chinese capitalism can begin to address this debate in a convincing way. This is in part our purpose here. The ten years we study postdate most of the literature on Chinese industrial expansion and allow us to examine how the issues played out empirically during a period of extensive privatization and new firm entry (see Xu, Lu and Gu, 2014). Thus we are able to test our theory on the relative roles of state and private (and foreign) ownership in affecting innovative activity in an era quite different from that observed in earlier studies when privatization was not yet pervasive across China. Although our data come from only the manufacturing sector, they are comprehensive geographically and temporally and thus avoid the biases of partial

windows onto Chinese development that Fligstein and Zhang (2009) observe in earlier research.

Theory

Overview. We speculate that there is an important difference between the resource networks of private sector firms on the one hand and state and foreign owned firms on the other. First, private sector firms are vulnerable to market forces and therefore have strong incentives to support regional cooperation when they are small and dampen competition through innovation when they are large. In contrast, the state system and foreign multinationals embed their firms in strong tie networks of bureaucratic relationships both for financing and for technology planning and transfer. These institutional platforms are not available to private sector firms which must search for regional spillovers through networks composed more of weak ties (for strong and weak ties, see Granovetter, 1973). Since research has shown that weak tie networks engender more effective search (Boorman, 1975), spillover effects on innovation should be stronger for private sector firms. Further, we argue that state ownership has imprinted privatized firms with state goals and practices and a reliance on bureaucratic ties for resource acquisition. Because of this imprinting, privatized firms should differ from entrants into the private sector in their spillover effects on the innovations of other firms, and in their susceptibility to spillovers. A summary of each owner type's characteristics as they relate to technological spillovers is as follows.

The Private Sector. Unlike state or foreign-owned firms, privately held organizations are beholden only to the individuals and financial institutions that have

supplied them with capital (for a wide review of private firm characteristics in China, see the papers in Tsui, Bian and Cheng, 2006). The governance practices of these organizations are therefore unconstrained by systematic external bureaucratic rules and procedures. This lack of constraint may lead to higher efficiency and profitability (for China, see Keister, 1998; Dougherty, Herd and He, 2007; Bai, C-E, J. Lu, and Z. Tao, 2009), and these higher performance levels are a necessary condition for sustained innovation (Nelson and Winter, 1982). But unlike state and foreign-owned firms, privately-held companies must develop their external sources of technology from scratch. So even though their governance routines may be less constrained, firms in the private sector face the costly process of building regional networks for mutual support, a problem their state- and foreign owner competitors do not have.

State Ownership. State-owned firms are controlled to a large extent by regional and central bureaucracies and have a goal of supporting employment in the regions where their facilities are located. Because of these constraints, state-owned firms are less profitable than the private sector (Dougherty et al, 2007; Bai et al, 2009). Cuervo and Villalonga (2000) argue that their performance deficit is due to less effective corporate governance, management, business strategy and routines and that their lower performance persists because they are captive to political interests. At the same time, state-owned firms have well-developed networks of both technological and financial resources on which they can draw (Nee, 1992). These networks occur at various bureaucratic levels – central, regional and local – enabling state-owned firms to draw on pools of support unavailable to companies outside the walls of state control. Although

firms with other types of owner may have some access through managerial connections (in China, guanxi), state ownership should provide a stronger attachment to government-based resources (Peng and Luo, 2000).

Foreign Owned Firms. The policies and objectives of foreign-owned firms are determined in part by their corporate parents (for a broad review of the literature on multinational control of foreign subsidiaries, see Rosenzweig and Nohria, 1994). The governance of a foreign-owned unit will be determined in the context of parental objectives for its growth and profitability. These multinational units, like those owned by the state, have networks within the parent corporation for technical knowledge and financial support. But these networks are different from the state bureaucracy in two ways. First, they have developed in competitive global markets. Second, the network of each foreign owner is specific to it alone and is disconnected from those of other foreign owned firms within the region. To the extent its parent has superior governance practices and technological resources, a wholly owned foreign enterprise may innovate more effectively than local firms. But this is not assured, especially as foreign firms must learn local mores and tastes and develop a local infrastructure to compete more effectively.

All firms are embedded in local networks of interactions that shape their decisions and therefore determine in part the types of resources and capabilities they develop, particularly regarding innovative activity (for the seminal statement on embeddedness, see Granovetter, 1985). The development and structure of this context is a function partly of individual agency and partly of institutional factors (Oliver, 1991; Emirbayer and Goodwin, 1994). Local networks may consist of both labor mobility between firms in the

region and other mechanisms such as industry associations and informal contacts. Through these means, knowledge inflows to the firm are strengthened the more firms in an industry are located in the same region, an effect called agglomeration or localization economies (Feldman, 1999; see also Audretsch and Feldman, 1996; Audretsch, 1998; Shaver and Flyer, 2000). Regional technical and managerial inflows from other firms in the same industry were one of Marshall's (1920) benefits from locating in an industrial district.

We argue therefore that state, private and foreign owners face and create different constraints on technology diffusion. For state owned firms, diffusion through labor mobility to non-state firms is in part limited by the opportunity structure of the state bureaucracy (Estrin et al., 2009; for China, see Guthrie, 1997). At the same time state-owned firms have a mission to promote regional growth, which should increase their propensity to share knowledge across their boundaries. This mission and the support of state financing inures these firms are to an extent protected from the rigors of competition.

As for foreign-owned firms, labor mobility is based on their parents' policies for the transfer of managers or technical personnel, either regionally or globally. Foreign firms may leak knowledge to local competitors, but the logic for building strong regional networks is weak because the foreign firm has a substitute in its parent's technical networks (Ghoshal and Bartlett, 1990). At the same time, the state may require foreign enterprises to share technology with local firms as a condition of market entry. Presumably because of these conflicting constraints, the literature on the impact of

foreign firms on local innovation has widely varying results (see Aitken and Harrison, 1999; Eden, Levitas and Martinez, 1997; Meyer and Sinani, 2009). Further, because of their resistance to forgoing sunk costs associated with host country relationships, foreign firms may endure poor performance longer than a local firm would be able to.

Private sector firms, in contrast, do not have the same kind of incentives and administrative controls as state and foreign firms. These firms are likely to be conflicted about sharing knowledge since they cannot rely on bureaucratic or parent resources to protect them from the pressures of competition, which sharing technology within the region would only increase. At the same time, because they cannot rely on technology transfer from or within a parent institution, they are dependent on regional spillovers as the only extramural source of knowledge and skills. This dependence increases their motivation to establish stronger regional mechanisms for joint knowledge sharing. Also, among the three owner types, private sector firms are the most vulnerable to market forces and therefore have the greatest incentive to support regional systems for product innovation. (For a summary of these differences among state, foreign and private firms, see Table 1.)

Private Sector Receptiveness to Spillovers. Because of variation in their institutional constraints on extra-mural relationships, owner types are likely to differ how strongly they experience spillovers in the region. We focus here on the private sector as qualitatively different from the state and foreign sectors in terms of the distribution of weak and strong ties in the region. As we have argued, state and foreign firms are embedded in institutional networks that support and direct their governance and

investment policies. Private sector firms in contrast have no such mandated connections or backing. Although privately-owned companies may have contacts within the state that smooth their relationships with regulators and may themselves be a residue of earlier state ownership, they are not embedded in a formal institution and so lack the strong ties that are inherent in firms tied to state or foreign parent bureaucracies. Therefore, private sector firms have a relatively higher proportion of weak ties and are dependent on these ties to build networks of resources and information.

We argue that the strong ties that the state bureaucracy and offshore corporate parents impose on the firms they own limit their regional interactions with other firms and institutions. A high proportion of strong ties represents a time constraint on forming relationships that private firms do not have (Boorman, 1975; Marsden and Campbell, 1984). The prevalence of strong ties also may lock in state and foreign firms to technologies that reduce their responsiveness to local innovations (Grabher, 1993). In contrast, their higher proportion of weak ties enables private sector firms to connect with a more extensive array of organizations in the region. Private firms may thus have broader networks that expose them to regional spillovers. Our hypothesis is the following:

H1: The effects of regional agglomeration economies, from all sources, on product innovation in the private sector will be greater than on product innovation in firms with the other owner types.

Spillovers Within the Private Sector: Large and Small Firms. To investigate spillover effects within the private sector, we examine large and small firms separately. The reason is that the literature has shown repeatedly that firm size has a strong influence

on both spillover generation and reception. Acs and Audretsch (1988) show that large and small firms innovate at different rates, consistent with Nelson and Winter's (1982) evolutionary theory of growth and obviously with Schumpeter's (1950) proposition that large firms are the engines of innovation. This finding has been supported in a number of other studies (Almeida and Kogut, 1997; Shaver and Flyer, 2000; Alcacer and Chung, 2010).

Shifting the focus shifts to regional spillovers, Feldman (1999) in her review of the literature makes the similar assertion that large firms in a region can be significant factors in creating a medium of technological progress, either as enablers or as constraints. Similarly, in her extensive studies of the different growth rates of Boston's Route 128 corridor and Silicon Valley south of San Francisco, Saxenian (1991) argues for the importance of Digital Equipment and Hewlett Packard as large firm hubs supporting or constraining small firm innovation. HP was open but DEC was essentially a closed shop; and their effects on regional development were correspondingly positive and negative. These observations are consistent with two of Fligstein and Zhang's (2011) potential economic scenarios in China. One is based on the beneficial effects of liberalization, where large firms act like HP. Another is large firm hegemony, driven by predatory behavior.

We extend these arguments here by proposing that spillovers by larger private sector firms are likely to have stronger effects, positive or negative, on other private sector firms than on firms with state or foreign owners. Our approach is based on institutional differences among the owner types. Privately owned firms are formally

excluded from state and foreign bureaucratic networks and so may be seen as operating outside them. These bureaucracies act as both institutional sources of technical and managerial knowledge and as barriers to absorbing sources of knowledge from outside the firm. It is the combination of these two functions that leads to the private-to-private spillover hypothesis. For large firm spillovers we hypothesize:

> H2: The regional agglomeration of large private firms will influence product innovation, whether positively or negatively, more in the private sector than in the state or foreign-owned sectors.

Likewise, there is a large body of research that focuses on the importance of small firm agglomeration for regional innovation (Acs and Audretsch, 1990; Almeida and Kogut, 1997). The difference between large and small firms agglomeration is that research on the latter emphasizes only positive spillovers. Small firms lack the resources to develop new products regularly. However, they can benefit from local institutions, such as universities and technical colleges, as well as receive spillovers from large firms and collectively from each other. Fligstein and Zhang (2009) thus postulate the potential emergence of local networks of small and medium sized privately held enterprises that share information to support regional growth. Since the private sector has only itself to rely on for extramural knowledge inputs, it must both generate more and be more receptive to positive agglomeration economies. The hypothesis is:

> H3: The regional agglomeration of small private firms will have a stronger positive effect on product innovation in the private sector than on innovation in the state or foreign-owned sectors.

The Legacy of State Ownership for Private Sector Firms. Our last hypotheses concern the effect of prior state ownership on the behavior of private sector firms. As an institutional variable, a firm's type of owner is likely to imprint routines for search that

are slow to erode and be replaced when a new type of owner buys the organization. This argument follows research that posits the persistence of routines formed when a firm is founded (Stinchcombe, 1965; Boeker, 1989; Carroll and Hannan, 1989) and research that studies the persistence of routines in incumbents, as an organizational cohort, defined by an industry disruption (Madsen and Walker, 2007).

Our focus here is on organizations in the private sector that have either entered with private investors or been privatized by the state. The comparison of entrants and privatized firms contrasts with earlier studies on Chinese privatization (Bai, Lu and Tao, 2009; and Li, Xia, Long and Tan, 2011) but follows Walder's (2011) recommendation for research on the implications of state and private ownership in China. Entrants develop routines without reference to a prior owner, although they may obviously have financial and technical connection through the entrepreneur and his or her partners. They have no formal experience of state governance constraints or exposure to state networks for technology transfer. From their inception, therefore, these firms are not hampered in their search for external sources of potential innovations by legacy routines associated with strong ties to the state bureaucracy. But privatized firms are so encumbered. They must replace governance and search routines associated with state ownership with new practices, potentially slowing their responsiveness to opportunities in the region. Further, privatized firms may have kept some ties to the state for technology and personnel transfer. Based on the distinct ownership histories of privatized firms and private sector entrants, we hypothesize:

H4: Regional agglomeration will have a greater positive influence on product innovation in entering firms in the private sector than in privatized firms.

H5a: Privatized firms will be more like state-owned firms than entrants in sending spillovers.

H5b: Privatized firms will be more like state-owned firms than entrants in receiving spillovers.

Data. Our data come from a database released by the National Bureau of Statistics of China and covers manufacturing firms with annual sales no less than five million RMB (about 600-700,000 U.S. dollars) in 27 two-digit manufacturing industries from 1998 to 2007. During this period the country grew at between 8 to 10% per year, an extraordinary rate, and the national government privatized many firms that were owned by the state and by regional and local collectives, a trend that has been analyzed extensively (see e.g., Bai, Lu and Tao, 2009). The data cover the 31 regions in Mainland China (27 provinces plus the four municipalities directly under Central Government control – Beijing, Shanghai, Tianjin and Chongqing) from 1998 to 2007. The total sample exceeds 330000 firms (see Chang and Wu, 2009 for analysis of the data up to 2005). We analyze firms that are owned more than 50% by a specific owner type and control for partial ownership in order to address the problem of conflict among majority and minority shareholders (see Demsetz and Villalonga, 2001).

A number of Chinese companies issued equity to public shareholders on both Chinese and foreign stock exchanges during the period we examine. In our data, we count 237 firm-years for companies with public shares. This is, needless to say, a miniscule percentage of the firm-years in the sample. Yet it is important to test whether public ownership biases our results. To assess this potential bias we ran the models with and

without the firms with publicly traded shares and found no difference in the results. We report therefore the estimates for all companies in the sample.

Table 2 shows the changes in owner type for all regions from 1998 to 2007. The categories are 100% owned firms and the varieties of joint ventures, which are named with the dominant partner (larger shareholder) first; e.g., state-private means that the state owns more equity in the joint venture than private shareholders. Two clear patterns are evident. First, the number of state-owned firms drops precipitously. Some of these firms leave the data set, but many are privatized. Second, the number of firms in the private sector sky-rockets.

Measurement. Product Innovation. The data set contains a variable that indicates the revenues from new products introduced in a year. Since there is no indication of how many new products produced these revenues, we use this variable to measure whether a firm introduced at least one new product in a year, a dichotomous variable. In this way, we capture the actual commercialization of an innovation as opposed to the antecedent development of technology underlying the product. This focus on commercialization is appropriate for our data in that the industries we study are in the mature stage of the industry life cycle and therefore may be less oriented towards investing in radical innovation (see Almeida and Kogut, 1997). We do include a regional patenting variable from a separate data set to measure the effect on new product introduction of local investments in innovative technology (see below).

Firm Ownership Type. This variable is indicated by four types of owner: 1) state; 2) collective; 3) private sector, both by individuals and institutions; and 4) foreign, either

Hong Kong, Macao or Taiwan or other foreign organization. Owner type is measured both as 100% equity ownership and controlled (50% or greater) equity joint ventures. In China, state-owned firms are part of the government bureaucracy at various levels of regional control (Beijing, province, city, town, village) whereas collective-owned firms are owned by the residents of the local community. Xu, Lu and Gu (2014) make the argument that these two owner types played different roles in large scale privatization in China, and for this reason, we measure them separately for spillover contributions and receptivity.

Spillovers by Owner Type and Organizational Size. We separate the agglomeration economies associated with a specific owner type from the extent to which the industry is clustered in the region (discussed below). Consistent with the literature on spillovers with firms as the unit of analysis (Feldman, 1999; Shaver and Flyer, 2000), as distinct from regions or industries, our measure is a count of the number of firms with an owner type in an industry/region/year. This is the Marshall-Arrow-Romer externality, as described by Glaeser, Kallal, Scheinkman and Schleifer, (1992) in their study of the growth of cities, and studied in a wide ranging literature on the effects of the geographical agglomeration of organizations on regional and organizational outcomes (Rosenthal and Strange, 2003; Alcacer and Chung, 2010; Audia and Rider, 2010). The intuition behind this measure is that a higher number of a type of firm (here based on ownership), the more likely technological spillovers are to occur within the region, whether through labor mobility, informal networks, local industry associations, and other mechanisms of knowledge transfer. We create this variable separately for large and small

firms. Large firms in an industry/year are defined as those in the 1st quartile in terms of revenue across all regions; small firms are in the bottom three quartiles. We then count the number of firms by size category for each type of owner/region/year.

Our measure is necessarily a regional count since we do not have data on a more refined geographical location of each firm (see e.g., Sorenson and Audia, 2000; Whitington, Owen-Smith and Powell, 2009). Further, we do not have measures of regional networks that might indicate within-region variation in the access of firms to knowledge transfer. However, we are able to identify whether the firm is incorporated at the state, province or lower levels (see below), indicating the relative political strength of the local institutional context in which the firm was founded and therefore to a degree the reach of its network within the region. Moreover, variation among firms due to network effects is captured as an unobserved firm-specific characteristic through our fixed effects design.

Regional Industry Concentration. The presence of a regional concentration of firms in an industry in year t is indicated by the proportion of firms in the firm's industry that are located in the firm's region in that year. The denominator of this proportion is the number of firms in the industry in all regions in the year. This variable is obviously correlated with owner-related regional agglomeration economies since a higher proportion of firms means more firms in general and thus more firms with the three owner types. Yet it is important to control for the geographical distribution of an industry as a regional, not a firm-level, variable.

Government Level. Firms in China are located within regions at a specific level of government bureaucracy: central state (essentially above the region), province, city, county, town, village, and other. We control for the institutional location of the firm within this hierarchy by including dummy variables for each level.

Financial Performance. The performance measure is Return on Assets, which is defined as the ratio between Net Profit after tax to Total Assets.

Size. Size is measured as the firm's natural log of revenues.

Age. Age is calculated as the natural log of the time since the firm's origination date in years.

Regional Educational and Patenting. Two regional characteristics – patenting activity and the prevalence of institutions of higher education – have been shown to influence the rate of local innovation (Acs, Audretsch and Feldman, 1994; Audretsch, 1998). To control for these variables, we used data on them from the China Statistical Yearbook compiled by the National Bureau of Statistics of China for 1998 to 2007. The Yearbook contained six indicators of higher education:

1. Number of graduates from institutes of higher education
2. New student enrollment in institutes of higher education
3. Currently enrolled students in institutes of higher education
4. Total teachers and staff in institutes of higher education
5. Number of full time teachers in institutes of higher education
6. Number of institutes of higher education

and two indicators of patenting activity:

1. Number of patents examined
2. Number of patents granted.

These eight variables (in natural logs) were factor analyzed using the entire data set, producing two distinct factors with eigenvalues greater than one. These factors were

rotated using the standard VARIMAX technique. The educational variables loaded together on the first factor (lowest loading, .76), and the patent variables together on the second factor (lower loading, .82). The cross factor loadings of these variables were not as high (highest loading, .55), indicating good convergent and discriminant validity for the two constructs. We therefore felt confident in labeling the factors as Regional Education and Regional Patents. An average value for each factor was then calculated for each region/year.

Year and Industry Effects. Dummy variables were included to control for year and industry effects.

Method. The unit of analysis is the firm/year. Since our dependent variable is dichotomous (the incidence of one or more new products) and our data contain repeated measures, we regress it on the independent variables using fixed effects (conditional) logit. In the fixed effects logit, firms that have no innovation across the time periods or that innovate in all time periods do not contribute to the log likelihood and are therefore dropped from the analysis (see Woolridge, 2002, p. 492). The method produces consistent estimates and standard errors that are asymptotic with the conditional maximum likelihood estimator (see Maddala, 1987). The fixed effects allow us to control for unobserved firm effects, which is a necessary design feature given the wealth of research on the influence of firm characteristics on new product innovation. Even with the dropped cases, our sample size remains very large (over 195,000 firm years); we therefore set the criterion for statistical significance in the logit regressions at .01 (Royall, 1986). We cluster the errors by firm. All independent variables are lagged one year.

H1 is tested by estimating the spillover effects for each type of owner on firms that were 100% owned and 50%+ controlled joint ventures. This produces four different regressions, one for each owner type. If the owner types vary significantly in their receptivity to spillovers, we then need to observe whether the private sector is affected the most. To do this, we calculate, by owner type, the percentage increase in the Akaike Information Criterion (AIC) (divided by the sample size), when spillovers are added to the control variables in the equation. We interpret a higher percentage increase in the AIC as evidence of greater receptivity. To test for differences in receptivity among the four owner types, we jackknife the percentage increase in AIC for each type and then test for differences among the jackknife means using analysis of variance.

H2 and H3 are tested by stacking the owner types in a single data set so that all the spillover variables (large and small firms estimated separately) and the control variables are interacted with the owner of the firm. In this way, we have four separate sets of variables, one for each type of owner, in the regression. Because there is a single regression, we have one scale factor and can compare the coefficients across owner type. To test for differences between the separate spillover effects for large and small privately-held firms on the private sector and their effects on the other owner types (H2 and H3, respectively), we assess first whether these differences exist across all owner types, then whether the private sector spillovers are greater than the average of the other types, and finally, whether they are different from each of the other owner types individually.

To examine H4, we follow the same procedure as the one for H1. The model is run on entrants and privatized firms separately for both control variables alone and then for the controls and the spillover effects. The percentage contribution of spillovers to the AIC values is calculated for each sample. Jackknife values of these contributions are then compared statistically.

The tests for H5a and H5b follow the same methods as described above for comparing the owner types in sending and receiving spillovers. For H5a, we stack the entrant and privatized firm subsamples and compare the difference in the coefficients between privatized firms and entrants on the one hand, and the difference between privatized firms and state-owned firms on the other hand. If the hypothesis is correct, these two differences should not be the same statistically and the one between entrants and privatized firms should be greater than that between the state and privatized firms. For H5b, we run the conditional logit regressions on the entrant and privatized firm subsamples separately for the controls and for the controls plus the spillovers, calculate the percentage contribution of spillovers to the AICs and test for a difference in the contribution between the two subsamples. If the hypothesis is correct, the contribution of spillovers to privatized firm product innovation should be closer to the contribution of state-owned firms than to that of entrants.

Results.

Table 3 shows the means, standard deviations and correlations among the variables. As one might expect, there are high correlations among the regional variables,

especially the counts. Fortunately, our very large sample size renders irrelevant the effects of these correlations on the standard errors of these variables.

Table 4 presents summary results for spillover coefficients for all owner types, with and without control variables. Notably, aggregates of large and small private sector firms have the opposite effect on product innovation in a region. Large private firms have a strong negative influence, supporting Fligstein and Zhang's (2009) argument for hegemonic behavior. That is, once a private sector firm grows to a certain size (which here means it enters the first quartile), it begins to dampen competition through innovation. In contrast, smaller private sector firms have a strong positive effect on innovation, consistent with the theory and evidence of local small firm networks.

State- and collective-owned firms, interestingly, have the same effects, but these differ for large and small firms. Large state and collective-owned firms increase the likelihood of product innovation in the region, supporting Xu, Lu and Gu's (2014) hypothesis about the supporting role of collective firms in regional development. But smaller collective-owned firms have a consistently negative effect on innovation. State-owned small firms have no effect. Interestingly, foreign-owned firms (small but not large) also have a negative effect, but it is unstable across specifications.

The control variables are generally strongly significant and predictive in an intuitive direction. Size, age, and the regional variables (patents, education, and clustering percentage) raise the likelihood of new product introduction as one might expect. It is also apparent that the level (jibie) of state bureaucracy (province and city vs.

county, town and village) in which a firm is incorporated has a significant effect on new product introduction. Both year and industry are significant.

Finally, the owner type of the firm itself, as opposed to the count of owner types in the region, does not influence the firm's propensity to introduce new products. This result suggests that whatever owner-related agency there may be in generating or inhibiting spillovers in a region, it is unlikely to be motivated by owner-specific appropriation of returns associated with innovation. Agency differences among owners must therefore be related to the value of spillovers.

Table 5 presents the spillover coefficients for the regressions testing H1. Shown towards the bottom of Table 5 are the percentage in change in the AIC from adding spillovers to a regression with controls only. It is clear the improvement in fit (AIC percentage change) is much larger for the private sector and that the standard deviations of the jackknife means for all owner types are quite low. Table 7A reports the results of testing for differences among the jackknife values and shows convincingly that the private sector is much more sensitive to spillovers than the other owner types.

Table 7B presents the tests for H2. In this case, the variables for the owner types have been stacked in a single regression and their coefficients compared. The spillover coefficients of this stacked run are remarkably close to those shown in Table 5 (results not shown), indicating that differences in the heterogeneity of the owner types is not a strong factor influencing the estimates (see Allison, 1997). It is not unreasonable then to use the stacked run to assess inter-owner differences. Comparing the stacked coefficients shows that, for H2, spillovers from large private sector firms are stronger within the

private sector than outside it. Moreover, looking at the large private sector firm effects in Tables 4 and 5, one can see that they dampen innovation (a negative spillover), supporting H2b and Fligstein and Zhang (2001). That is, large private sector firms act more like Digital Equipment in Saxenian's narrative than like HP.

Table 7C shows that this kind of private sector inbreeding occurs for smaller firms as well. Here, however, the effect is positive, consistent with the empirics of small firm networks in regional economies. Thus large privately-held firms and small privately-held firms have opposite influences on product innovation within the private sector itself. These influences extend significantly to firms with other owner types but are just not as strong (see Table 5).

Table 6 shows that spillovers contribute strongly to both privatized firms and entrants (see the percentage change in the AIC values), but the effect on entrant product innovation is higher (3.49% to 3.07%). Moreover, analyzing the jackknife values shows that this difference is statistically significant for both large and small firm spillovers (see Table 7D). One can infer that the routines and connections associated prior state-ownership endure to an extent, reducing the ability of privatized firms to absorb local knowledge inputs due to agglomeration.

Table 7E presents the results for H5a and H5b. Here the imprinting effect of prior state ownership disappears. Privatized firms look more like entrants than firms currently owned by the state. This is evidenced in two ways. First, they resemble entrants more in the extent to which spillovers increase the likelihood of innovation; second, they are more similar to entrants than state-owned firms in their contributions to spillovers. It appears

then that, although privatized firms are less affected by and contribute less to regional spillovers than entrants, privatization has moved these firms somewhat out from under the umbrella of state control.

Discussion.

Our paper has shown that the role of the private sector is unique, in both positive and negative ways. Large private sector entrants are damaging to new product introduction in the region. Competition from these large firms may have forced rivals to lower prices, which in turn reduced the profits needed to support product innovation. Small privately-owned entrants in contrast increase the incidence of regional innovation, possibly in an effort to enhance their prospects in the face of large private firm pressures.

Further analysis using a nonlinear comparison of large and small private sector firms (with the coefficient on lag log size used again to form the ratio) shows that the prevalence of large private sector firms in an industry/region is much more damaging to innovation in private firms (χ^2=28.9 , 2 df) than other owner types (for reference see the coefficients in Table 5). Further, large entrants damage small private firms more than large private firms (χ^2=156.35 , 2 df). Interestingly, a comparable pattern can be shown for the number of small private sector firms: more of them in an industry/region enhances innovation in the private sector more than other types of owner (χ^2=18.96 , 2 df) and in small private firm much more than that in large private firms (χ^2=135.96 , 2 df). There is thus substantial evidence that the private sector operates almost as a separate institutional entity when it comes to spillover effects and receptivity. Large firms are hegemonic, but mostly within the private sector, and small firm regional networks are effective but,

again, mostly within the private sector. These results support our argument that private sector firms must overcome their lack of attachment to the technical bureaucracies within the state and foreign multinationals by cooperating with each other in weak tie networks.

Nee's (2000) emphasis on the importance of the private sector is thus supported, however in a highly qualified way. Once these firms grow and become large, they impede innovation in other private sector firms. The results are more consistent with Fligstein and Zhang's framework (2009) in which local networks of small and medium sized private sector firms emerge to share information to support regional growth and simultaneously defend against competitive pressure from large firms trying to perpetuate their dominant positions, although again only in the private sector (see also Fligstein, 1996).

There is also evidence that the practices and networks of state ownership endure in privatized firms, supporting an argument for institutional imprinting. The conditions of a type of owner can thus linger, in this case positively since privatized firms act more like state-owned firms than entrants do. But at the same time, they have moved significantly away from the kinds of practices and connections state-ownership requires.

Looking now at state ownership per se, the results for state-owned firms are consistent, with a significant qualification, with Walder's (2003) argument that state owned firms play an ongoing, important role in the expansion of the economy. Large state firms act like Saxenian's (1991) positive regional hubs. One can speculate therefore that the public mission of these large state owned firms raises their incentive to support general regional spillovers.

Last, in these data large foreign firms influence the private sector only, perhaps suggesting greater private sector need. Both large and small foreign firms constrain innovation. This negative effect may indicate these firms simply crowd the market place with little incentive to share or absorb, given the global infrastructures in which they are embedded.

How might our results generalize to other emerging markets? Of key importance is the role of the state as the private sector emerges. Wilson (2007) argues that the persistence of state ownership makes China different from Eastern Europe. Also, in Witt and Redding's (2012) comparison of emerging economies on many dimensions China stands virtually alone by virtue of the multiple effects of state control over the economy independent of firm ownership. Yet in our manufacturing data the very strong trend of privatization is striking, perhaps decreasing China's uniqueness on the dimension of state control. We cannot assess how these effects might influence the generalizability of our results other than to note that the independence of the private sector firms in their participation in regional spillovers stands at odds with statist interpretations of the Chinese economy. Of course, the Chinese central bureaucracy controls to a large extent a range of other economic sectors such as financial services, telecommunications, and energy, which together distinguish China institutionally from other emerging markets.

Conclusion. It seems clear then that owner type spillovers have more to do with the tradeoff between the weak access to regional spillovers of state and foreign firms because of their strong tie networks and the benefits of these networks on the private sector. The effects of institutions on firm outcomes may be therefore more a function of

the limits they impose as well as the resources and opportunities they provide. In the absence of these strong ties, private sector firms are constrained to cooperate with each other, if small, or damage each other, if large, which makes sense in a model of size-driven innovation and large firm hegemony. Thus, there appears to be no easy path to innovation-driven growth as these sectors expand – that is, as private firms grow and become larger through innovation, they begin to constrain innovation in other firms through negative externalities, perhaps forcing smaller firms to cooperate in order to innovate. These results should give pause to those who predict superior regional or country growth, here measured as product innovation, based on the dominance of any one of the types of owner we study.

References

Acs, Z. J. and D. B. Audretsch
1988 "Innovation in large and small firms: An empirical analysis." American Economic Review, 78(4): 678-690.

Acs, Z. J. and D. B. Audretsch
1990 Innovation and Small Firms. Cambridge, MA: MIT Press.

Acs, Z. J., D. B. Audretsch, and M. P. Feldman
1994 "R&D spillovers and recipient firm size." Review of Economics and Statistics, 76(2): 336-340.

Aitken, B. J. and A. E. Harrison
1999 "Do domestic firms benefit from direct foreign investment? Evidence from Venezuela." American Economic Review, 89(3): 605–618.

Alcacer, J. and W. Chung, 2010, "Location strategy for agglomeration economies." Unpublished manuscript, Harvard University.

Almeida, P. and B. Kogut, 1997, "The exploration of technological diversity and the geographic localization of innovation." Small Business Economics, 9(1): 21-31.

Audia, P. G and C. I. Rider, 2010, "Close, but not the same: Locally headquartered organizations and agglomeration economies in a declining industry," Research Policy, 39:360–374.

Audretsch, D. B., 1998, "Agglomeration and the location of innovative activity." Oxford Review of Economic Policy, 14(2):18-29.

Audretsch, D. B. and M. P. Feldman, 1996, "R&D spillovers and the geography of innovation and production." American Economic Review, 86(3): 630-640.

Bai, C.-e, J. Lu and Z. Tao, 2009, "How does privatization work in China?" Journal of Comparative Economics, 37(3):453-470.

Berle, A. A. and G. C. Means, 1938, The Modern Corporation and Private Property. New York, NY: Macmillan.

Brown, S. L. and K. M. Eisenhardt, 1995, "Product Development: Past research, present findings and future directions." Academy of Management Review, 20(2):343-378.

Boeker, W., 1989, "Strategic change: The effects of founding and history." The Academy of Management Journal, 32(2):489-515

Boisot, M., & Child, J., 1996, "From fiefs to clans and network capitalism: Explaining China's emerging economic order." Administrative Science Quarterly, 41(4): 600–628.

Boorman, S. A., 1975, "A combinatorial optimization model for transmission of job information through contact networks." Bell Journal of Economics, 6(1):216-249.

Buckley, P. J., J. Clegg, and C. Wang, 2002, "The impact of inward FDI on the performance of Chinese manufacturing firms." Journal of International Business Studies, 33(4):637-655(19).

Cao, Y. and V. G. Nee, 2000, "Comment: Controversies and evidence in the market transition debate." American Journal of Sociology, 105(4):1175-1189.

Carroll, G. R. and M. T. Hannan, 1989, "Density Delay in the Evolution of Organizational Populations: A Model and Five Empirical Tests." Administrative Science Quarterly, 34(3): 411-430.

Chang, S. J. and D. Xu, 2008, "Spillovers and competition among foreign and local firms in China." Strategic Management Journal 29(5): 495-518.

Chang, S. J. and B. Wu, 2009, “Post-liberalization industry shakeout in China, 1998-2006. ” working paper, National University of Singapore.

Coase, R. H., 1960, “The Problem of Social Cost. ” Journal of Law and Economics 3:1-44.

Cuervo, A. and B. Villalonga, 2000, “Explaining the variance in the performance effects of privatization.” The Academy of Management Review, 25(3): 581-590.

Davis, G. F., 2005a, “Firms and environments.” In N. Smelser and R. Swedberg (eds.), Handbook of Economic Sociology, 2nd ed.: 478-502. Princeton, NJ: Russell Sage/Princeton University Press.

Davis, G. F., 2005b, “New directions in corporate governance.” Annual Review of Sociology, 31:143-162.

Demsetz, H., 1990, Ownership, Control and the Firm: The Organization of Economic Activity, Cambridge, MA: Basil Blackwell.

Demsetz, H. and B. Villalonga, 2001, “Ownership structure and corporate performance.” Journal of Corporate Finance, 7(3): 209–233.

Dougherty, D. and C. Hardy, 1996, “Sustained product innovation in large, mature organizations: overcoming innovation-to-organization problems.” Academy of Management Journal, 39(5):1120-1153.

Dougherty, S., R. Herd and P. He, 2007, “Has a private sector emerged in China's industry? Evidence from a quarter of a million Chinese firms.” China Economic Review, 18(3):309-334.

Douma, S., R. George, and R. Kabir, 2006, “Foreign and domestic ownership, business groups, and firm performance: evidence from a large emerging market.” Strategic Management Journal, 27(7): 637–657.

Eden, L., E. Levitas & R. J. Martinez, 1997, “The production, transfer and spillovers of technology: Comparing large and small multinationals as technology producers.” Small Business Economics, 9(1): 53-66.

Emirbayer, M. and J. Goodwin, 1994, “Network Analysis, Culture and the Problem of Agency,” American Journal of Sociology, 99:1411-154.

Estrin, S., 2002, "Competition and corporate governance in transition." Journal of Economic Perspectives, 16(1): 101-124.

Estrin, S., J. Hanousek, E. Kočenda and J. Svejnar, 2009, "The Effects of privatization and ownership in transition economies," Journal of Economic Literature, 47(3):699-728.

Feldman, M. P., 1999, "The new economics of innovation, spillovers and agglomeration: A review of empirical studies." The Economics of Innovation and New Technology, 8(1-2): 5-25.

Fligstein, N., 1996, "Markets as Politics: A Political-Cultural Approach to Market Institutions." American Sociological Review, 61:656-673.

Fligstein, N., 2002, The Architecture of Markets: An Economic Sociology of Twenty-First Century Capitalist Societies, Princeton, NJ: Princeton Univ. Press.

Fligstein, N. and J. Zhang, 2009, "A new agenda for the trajectory of research on Chinese capitalism." Management and Organization Review, 7: 39-62.

Ghoshal, S. and C. Bartlett, 1990, "The multinational corporation as an interorganizational network." The Academy of Management Review, 15: 603-625.

Glaeser, E., H. Kallal, J. Scheinkman, and A. Shleifer, 1992, "Growth of cities." Journal of Political Economy, 100**:** 1126–52.

Grabher, G., 1993, "The weakness of strong ties: The lock-in of regional development in the Ruhr area." In G. Grabher (ed.), The Embedded Firm:255-278. London, UK: Routledge.

Granovetter, M., 1973, "The strength of weak ties."American Journal of Sociology, 78:1360-1380.

Granovetter, M., 1983, "Economic action and social structure: The problem of embeddedness." American Journal of Sociology, 91: 481-51.

Guthrie, D., 1997, "Between markets and politics: Organizational responses to reform in China." American Journal of Sociology, 102: 1258–1304.

Hall, P. and D. Soskice, 2001, "An introduction to varieties of capitalism." In P. Hall and D. Soskice (eds.), Varieties of Capitalism: The Institutional Foundations of Comparative Advantage. Oxford: Oxford University Press.

Hancké, B., M. Rhodes and M. Thatcher (eds.), 2007, Beyond Varieties of Capitalism, Conflict, Contradiction and Complementarities in the European Economy. Oxford: Oxford University Press.

Henderson, R. and K. Clark, 1990, “Architectural innovation: The reconfiguration of existing product technologies and the failure of established firms.” Administrative Science Quarterly, 35:9-30.

Hoetker, G., 2007, “The use of logit and probit models in strategic management research: Critical issues,” Strategic Management Journal, 28:331-343.

Javorcik, B., 2004, “Does foreign direct investment increase the productivity of domestic firms? In search of spillovers through backward linkages? ” American Economic Review, 94: 605-627.

Kang D. L. and A. B. Sorenson, 1999, “Ownership organization and firm performance.” Annual Review of Sociology, 25: 121-144.

Keister L., 1998, “Engineering growth: Business group structure and firm performance in China's transition economy.” American Journal of Sociology, 104(2): 404-440.

Keister, Lisa and Yanlong Zhang, 2009, “Organizations and Management in China,” Academy of Management Annals, 3:377-420.

Khanna, T. and K. Palepu, 2010, Winning in Emerging Markets, Cambridge: Harvard Business Press.

Khanna T. and J. Rivkin, 2001, “Estimating the performance effects of business groups in emerging markets.” Strategic Management Journal, 22(1): 45–74.

Konings J., 2001, “The effects of foreign direct investment on domestic firms: Evidence from firm-level panel data in emerging economies.” Economics of Transition, 9:619-633.

Maddala, G. S., 1987, “Limited Dependent Variable Models Using Panel Data,” Journal of Human Resources, 22:307-338.

Madsen, T. and G. Walker, 2007, “Incumbent and entrant rivalry in a deregulated industry.” Organization Science, 18:667-687.

Marsden, P. and K. Campbell, 1984, “Measuring tie strength.” Social Forces, 63: 482-501.

Marshall, A., 1920, Principles of Economics. 8th edn. London: Macmillan.

Mascarenhas, B., 1989, “Domains of state-owned, privately-held and publicly traded firms in International competition.” Administrative Science Quarterly, 34:582-597.

Megginson, W., and J. Netter, 2001, "From state to market: A survey of empirical studies on privatization." Journal of Economic Literature, 39: 321-389.

Meyer, K. E. and E. Sinani, 2009, "When and where does foreign direct investment generate positive spillovers? A meta-analysis." Journal of International Business Studies. 40: 1075-1094.

Nee, V., 1992, "Organizational dynamics of market transition: Hybrid forms, property rights, and mixed economy in China." Administrative Science Quarterly, 37:1-27.

Nee, V., 1996, "The emergence of a market society: Changing mechanisms of stratification in China." American Journal of Sociology, 101: 908-949.

Nee, V., 2000, "The role of the state in making a market economy," Journal of Institutional and Theoretical Economics, 156:64–88.

Nee, V., & Ingram, P., 1998, "Embeddedness and beyond: Institutions, exchange, and social structure." In The New Institutionalism in Sociology. M. C. Brinton & V. Nee (Eds.). pp. 9–45. New York: Sage.

Nelson, R. R. and S. G. Winter, 1982, An Evolutionary Theory of Economic Change, Cambridge, Mass.: Harvard University Press.

Oliver, C., 1991,m "Strategic responses to institutional processes." Academy of Management Review, 16:145-179.

Peng, M. W. and Y. Luo, 2000, "Managerial ties and firm performance in a transition economy: The nature of a micro-macro link." Academy of Management Journal, 43:486-501.

Peng, M. W., D. Wang and Y. Jiang, 2008, "An institution-based view of International business strategies: A focus on emerging economies." Journal of International Business Studies, 39:920-936.

Rosenthal, S. and W. Strange, 2003, "Geography, Industrial Organization and Agglomeration," Review of Economics and Statistics, 85: 377-393.

Rosenzweig, P. M. and N. Nohria, 1994, "Influences on human resource management practices in multinational corporations." Journal of International Business Studies, 25: 229-251.

Royall, R. M., 1986, "The effect of sample size on the meaning of significance tests." The American Statistician, 40: 313-315.

Rumelt, R. P., 1991,"How much does industry matter?" Strategic Management Journal **12**:167–185.

Saxenian, A., 1991, "The origins and dynamics of production networks in Silicon Valley." Research Policy, 20: 423-437.

Schumpeter, J. A., 1950, Capitalism, Socialism and Democracy. 3rd ed. New York: Harper Collins.

Shaver, J. M. and F. Flyer, 2000, "Agglomeration economies, firm heterogeneity, and foreign direct investment in the United States." Strategic Management Journal, 21(12): 1175-1193.

Stinchcombe, A. L., 1965, "Social Structure and Organizations," In J. G. March (ed.) Handbook of Organizations. 153-193. IL: Rand McNally.

Sorenson, O. and P. G. Audia, 2000, "The social structure of entrepreneurial activity: geographic concentration of footwear production in the United States, 1940–1989. American Journal of Sociology 106:424–462.

Tsui, A., Bian, Y., & Cheng, L. (Eds.), 2006, China's domestic private firms: Multidisciplinary perspectives on management and performance. Armonk, NY: Sharpe.

Villalonga, B., 2000, "Privatization and efficiency: differentiating ownership effects from political, organizational, and dynamic effects." Journal of Economic Behavior and Organization, 42:43–74.

Villalonga, B. and R. Amit, 2006, "How do family ownership, control and management affect firm value?" Journal of Financial Economics, 80: 385-417.

Walder, A. G., 1995, "Local Governments as Industrial Firms: An Organizational Analysis of China's Transitional Economy," American Journal of Sociology, 101:263-301.

Walder, A. G., 2003, "Elite opportunity in transitional economies," American Sociological Review, 68: 899–916.

Walder, A. G., 2011, "From control to ownership: China's managerial revolution," Management and Organization Review, 7:1 19–38.

Whittington, K. B., J. Owen-Smith, and W. Powell, 2009, "Networks, propinquity and innovation in knowledge-intensive industries," Administrative Science Quarterly," 54: 90–122.

Wilson, J., 2007, “China’s transformation towards capitalism.” In D. Lane and M. Myant (eds.), Varieties of Capitalism in Post-Communist Countries: 239-258. New York, NY: Palgrave Macmillan.

Witt, M. A., & Redding, G., 2012, “China: Authoritarian Capitalism.” working paper, INSEAD.

Woolridge, J. M., 2002, Econometric Analysis of Cross Section and Panel Data, MIT Press: Campbridge, MA.

Xu, D., J. Lu, and Q. Gu, 2014, “Organizational Forms and Multi-population Dynamics: Economic Transition in China,” Administrative Science Quarterly, 59:517-546.

Zhang, Y, H. Li, Y. Li, and L-A Zhou, 2010, “FDI spillovers in an emerging market: The role of foreign firms’ country origin diversity and domestic firms’ absorptive capacity.” Strategic Management Journal, 31:969-989.

Table 1

Summary of Owner Type Characteristics

Type of owner	Characteristics			
	Contribution to Spillovers from Agglomeration Economies		Receptivity to Spillovers	
	Labor mobility	**Knowledge spillovers**	**Existing resource networks**	**Vulnerability to market forces**
Private	External to state networks and foreign owners' internal corporate networks	Tension between competition and awareness of potential joint returns over time	No external institutional sources of financing or technology – must rely on other local organizations	Highly vulnerable to market competition – no systematic institutional support in periods of poor performance
State	Constrained to an extent within state apparatus	May support diffusion within region based on public mission	Financial and technological resources available within state bureaucracy	Protected by state ownership from failure – mission to preserve regional employment levels
Foreign	Constrained by foreign owner's internal corporate network	Constrained by foreign owner's goals and internal corporate network	Financial and technological resources available within the multinational parent	Foreign parent may subsidize local unit in periods of poor performance – evidence of hysteresis in entry and exit rates of foreign firms

Table 2

Number of Firms in Each Governance Type – All Regions

1998-2007

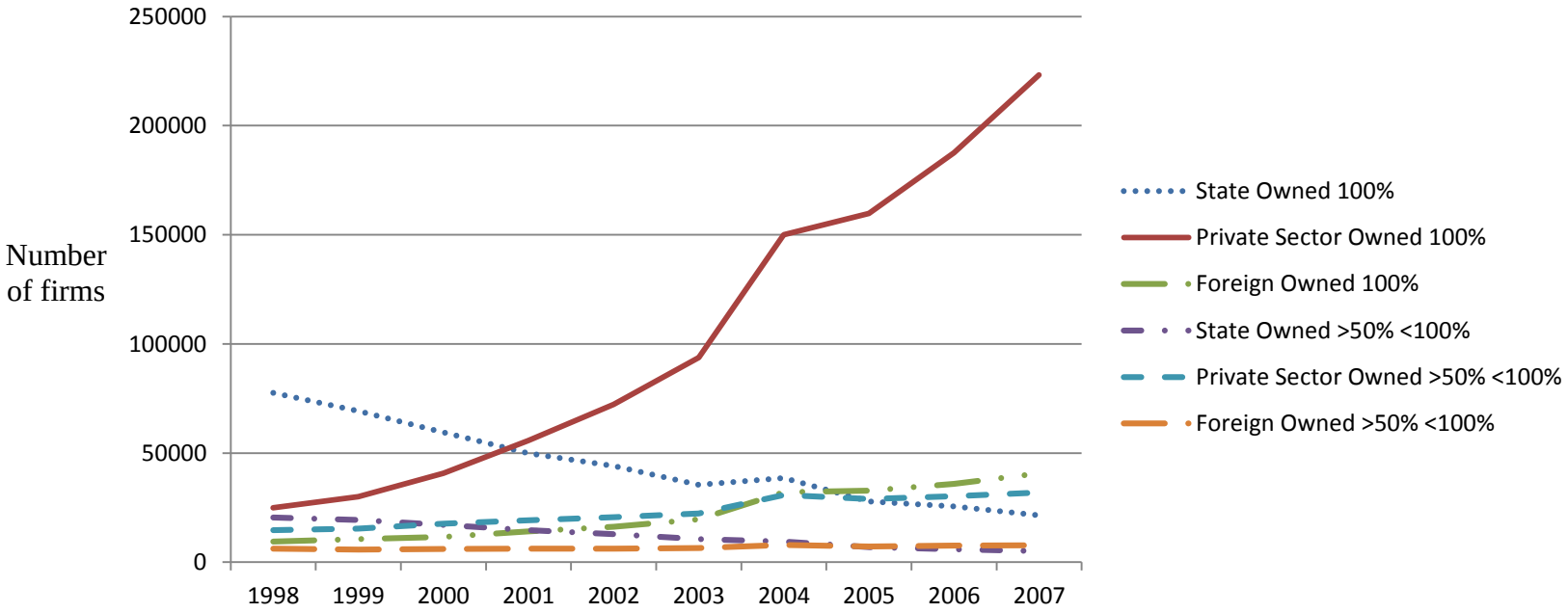

Table 3
Correlations, Means and Standard Deviations

Variable	Mean	Std. dev.										
Prod Innov	0.391	0.488	1.00									
State Own	0.167	0.373	-0.02	1.00								
Privatized	0.056	0.231	0.00	-0.18	1.00							
Entrants	0.331	0.471	0.04	-0.59	-0.31	1.00						
Foreign Own	0.091	0.288	-0.03	-0.23	-0.12	-0.40	1.00					
Num Top St	13.394	16.082	-0.04	0.18	-0.01	-0.11	-0.06	1.00				
Num Bot St	30.157	33.905	-0.06	0.26	-0.03	-0.20	-0.04	0.69	1.00			
Num Top Priv	357.735	594.163	0.02	-0.16	0.06	0.14	-0.04	0.30	0.00	1.00		
Num Top Entr	35.493	36.460	0.06	-0.22	-0.01	0.21	-0.01	0.04	-0.19	0.73	1.00	
Num Bot Priv	109.189	166.294	0.02	-0.18	0.05	0.14	-0.01	0.27	0.03	0.81	0.70	1.00
Num Bot Entr	18.418	23.544	0.08	-0.21	-0.02	0.21	-0.01	-0.02	-0.21	0.57	0.94	0.68
Num Top For	59.275	101.792	0.02	-0.18	-0.03	0.01	0.24	0.02	-0.09	0.28	0.45	0.40
Num Bot For	86.279	156.755	0.03	-0.19	-0.04	0.04	0.22	-0.04	-0.13	0.24	0.49	0.37
Ln Firm Size	10.333	0.563	0.13	-0.07	0.07	-0.07	0.14	0.00	-0.11	0.08	0.06	0.06
Ln Firm Age	10.396	1.613	-0.03	-0.32	-0.25	0.28	0.19	-0.05	-0.04	-0.01	0.07	0.02
ROA	2.679	0.703	0.00	-0.12	-0.01	0.12	-0.02	-0.01	-0.03	0.12	0.06	0.07
Reg Edu Index	0.059	0.230	0.08	-0.30	0.06	0.23	0.02	-0.05	-0.26	0.45	0.40	0.42
Reg Pat Index	9.130	1.096	0.06	-0.35	-0.01	0.21	0.16	-0.09	-0.27	0.38	0.53	0.48
Reg Cluster	0.092	0.077	0.01	-0.22	-0.06	0.15	0.12	0.10	-0.11	0.40	0.65	0.51

Variable										
Num Bot Entr	0.68	1.00								
Num Top For	0.40	0.45	1.00							
Num Bot For	0.37	0.50	0.97	1.00						
Ln Firm Size	0.06	0.05	0.11	0.09	1.00					
Ln Firm Age	0.02	0.07	0.09	0.11	-0.10	1.00				
ROA	0.07	0.03	-0.03	-0.03	0.11	0.12	1.00			
Reg Edu Index	0.42	0.35	0.32	0.30	0.13	0.02	0.14	1.00		
Reg Pat Index	0.48	0.53	0.59	0.59	0.14	0.13	0.04	0.68	1.00	
Reg Cluster	0.51	0.67	0.67	0.68	0.07	0.15	0.01	0.32	0.69	1.00

Table 4
Conditional Logit Results for All Types of Owner[1]

	A	B
Regional Spillovers - Large Firms		
Private Sector – 100% owned and controlled joint ventures	-0.0059*	-0.0064*
State-owned – 100% and controlled joint ventures	0.0142*	0.0137*
Collective-owned – 100% owned and controlled joint ventures	0.0062*	0.0070*
Foreign-owned – 100% owned and controlled joint ventures	-0.0030*	-0.0014
Regional Spillovers - Smaller Firms		
Private Sector – 100% owned and controlled joint ventures	0.0019*	0.0018*
State-owned – 100% and controlled joint ventures	-0.0005	-0.0013
Collective-owned – 100% owned and controlled joint ventures	-0.0073*	-0.0073*
Foreign-owned – 100% owned and controlled joint ventures	-0.0007	-0.0020*
Control Variables:		
Direct effect of Owner Type on Firm Innovation		
Private Sector – 100% owned and controlled joint ventures		0.0585
State-owned – 100% and controlled joint ventures		0.0137
Collective-owned – 100% owned and controlled joint ventures		0.0219
Foreign-owned – 100% owned and controlled joint ventures		-0.0104
Other Control Variables:		
Log Revenues		0.2790*
Log Age		0.7911*
ROA		-0.4486*
Regional Higher Education Index		1.6340*
Regional Patenting Index		0.4316*
Regional Industry Concentration		2.3873*
Year	Sig	Sig
Administrative Level (central bureaucracy to village)	Sig	Sig
Industry	Sig	Sig
Pseudo- R^2	.244	.254
Sample size	196028	196028

[1]All regressors lagged one year *p<.01

Table 5

Conditional Logit Regressions by Owner Type[1]

	Privately-Owned Firms	State-Owned Firms	Collective-Owned Firms	Foreign-Owned Firms
Regional Spillovers - Large Firms				
Private Sector – 100% owned and controlled joint ventures	-0.0077*	-0.0022*	-0.0047*	-0.0025*
State-owned – 100% and controlled joint ventures	0.017*	0.0028	0.0099	0.0067
Collective-owned – 100% owned and controlled joint ventures	0.0042*	0.0150*	0.0090*	0.0059*
Foreign-owned – 100% owned and controlled joint ventures	0.0027	-0.0075	-0.0113*	0.0000
Regional Spillovers - Smaller Firms				
Private Sector – 100% owned and controlled joint ventures	0.0022*	0.0011*	0.0018*	0.0007*
State-owned – 100% and controlled joint ventures	0.00038	-0.0036	-0.0019	-0.0009
Collective-owned – 100% owned and controlled joint ventures	-0.0071*	-0.0077*	-0.0053*	-0.0030*
Foreign-owned – 100% owned and controlled joint ventures	-0.0049*	-0.0011	0.0011	-0.0008
Pseudo- R^2	.29	.297	.189	.217
Sample size	109379	23559	12959	24707
% change in AIC due to spillovers	3.64	.077	.99	.46
Jackknife mean estimate of % AIC change	3.61	.10	1.01	.45
Jackknife std. dev. of % AIC change	.24	.53	.43	.23

[1]The coefficients are from conditional logit regressions for each Receiving Owner Type separately, each including control variables except Direct Effects. * $p < .01$

Table 6

Conditional Logit Regressions for Entrants and Privatized Firms[1]

	A Entrants	B Privatized Firms	C All Firms
Regional Spillovers - Large Firms			
Private Sector Entrants -100% and controlled joint ventures	-0.0090*	-0.0090*	-0.0073*
Private Sector Privatized Firms -100% and controlled joint ventures	-0.0017	0.0033	0.0003
State-owned – 100% and controlled joint ventures	0.0167*	0.0244*	0.0149*
Collective-owned – 100% owned and controlled joint ventures	0.0022	0.0082	0.0071*
Foreign-owned – 100% owned and controlled joint ventures	0.0045*	-0.0027	-0.0018*
Regional Spillovers - Smaller Firms			
Private Sector Entrants -100% and controlled joint ventures	0.0024*	0.0027*	0.0020*
Private Sector Privatized Firms -100% and controlled joint ventures	0.0015	0.0056*	0.0009
State-owned – 100% and controlled joint ventures	0.0014	-0.0012	-0.0013
Collective-owned – 100% owned and controlled joint ventures	-0.0054*	-0.0103*	-0.0068*
Foreign-owned – 100% owned and controlled joint ventures	-0.0056*	-0.0014	-0.0016*
Pseudo- R^2	.279	.405	.255
Sample size	89954	13873	196028
% change in AIC due to spillovers	3.49	3.07	2.5
Jackknife estimate of % AIC change	3.52	3.06	
Jackknife std. dev. of % AIC change	.16	.299	

[1]The coefficients are from conditional logit regressions for each Receiving Owner Type separately, each including control variables except Direct Effects. * $p < .01$

Table 7

Tests of Hypotheses

A. H1: The regional agglomeration of firms, grouped by owner type, will influence product innovation in the private sector more than in the state, collective or foreign-owned sectors.

All types of owner: F = 1489.42 , df 3,39 , p < .001
Private sector versus State, Collective and Foreign owned firms: F= 4220.31, df 1, 36, p < .001

B. H2: The regional agglomeration of large private firms will have a stronger effect, whether positive or negative, on product innovation in the private sector more than in the state, collective or foreign-owned sectors.

All Types of Owner: χ^2= 72.29 df 3, p < .001
Private Sector compared to average of other owner types: χ^2= 62.22 df 3, p < .001
Private Sector compared to State Owned Firms: χ^2= 39.08 df 1, p < .001
Private Sector compared to Collective Owned Firms: χ^2= 3.97 df 1, p =.046
Private Sector compared to Foreign Owned Firms: χ^2= 39.1 df 1, p < .001

C. H3: The regional agglomeration of small private firms will have a stronger positive effect on product innovation in the private sector more than in the state, collective or foreign-owned sectors.

All Types of Owner: χ^2= 79.4 df 3, p < .001
Private Sector compared to average of other owner types: χ^2= 67.08 df 3, p < .001
Private Sector compared to State Owned Firms: χ^2= 36.59 df 1, p < .001
Private Sector compared to Collective Owned Firms: χ^2= 5.45 df 1, p =.0195
Private Sector compared to Foreign Owned Firms: χ^2= 46.45 df 1, p < .001

D. H4: The regional agglomeration of firms, grouped by owner type, will have a greater influence on product innovation in entering firms in the private sector than in privatized firms.

Entrants compared to Privatized firms: F-value = 167.37 df 1,18, p<.001

E. H5a: Privatized firms will be more like state-owned firms than entrants in sending spillovers. (Comparison of large and small private sector coefficients influencing all types of owner – column C in Table 6)

Large Entrants compared to large Privatized firms: χ^2= 49.84 df 1 p < .001

Smaller Entrants compared to smaller Privatized firms: χ^2= 4.38 df 1 p = . 036

F. H5b: Privatized firms will be more like state-owned firms than entrants in receiving spillovers.

Entrant difference with State-owned firms compared to Privatized firm difference with State-owned firms: F-value = 1018.34 df 1,18, p < .001