Labor Market Imperfections and the Effects of FDI Presence in China

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Abstract

We study the relevance of labor market competition effects of FDI presence. We develop a theoretical model to specify the implications of such effects and then apply it to China where some firms face restrictions on wages they can pay. The results from empirical analysis of firm–level data are consistent with the model predictions and suggest that foreign firms compete with domestic firms for skilled labor. Specifically, we find that when the FDI presence is higher, average wages of engineers and managers in private domestic firms are higher, while average quality of engineers in state–owned enterprizes facing wage constraints is lower. In addition to providing the first piece of direct evidence of FDI–related competition effects on the host country's labor market, these findings highlight the relevance of labor market institutions in determining FDI spillovers.

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1 Introduction

Both researchers and policy-makers have long touted foreign direct investment (FDI) as an important factor in promoting developing countries' economic growth. However, despite the rapid growth in international capital flows in recent decades, there is no consensus regarding the impact of FDI inflows on domestic firms. As a result, it is still unclear whether the appropriate government policy is to promote FDI inflows, to restrict them, or to adopt a laissez–faire stance towards them: empirical studies searching for such positive spillovers have produced mixed evidence.[1]

One of the reasons that have been cited to explain the failure in finding positive FDI spillovers is the competition effects on domestic firms. By competing away market share from domestic firms, foreign firms are believed to impose negative effects on indigenous firms in the host country (Aitken and Harrison, 1999), which may dominate the positive technological spillovers transferred from foreign firms to domestic firms. In addition to the output market, the competition effects may take place on the input market. In particular, foreign firms may compete for labor inputs with indigenous firms on the domestic labor market and drive up the wage bill. However, to our knowledge, there has been no direct evidence supporting either type of competition effects discussed above.

Previous studies on the spillover effects of FDI use productivity as the measure and thus have focused on the output side of the story. In contrast, our paper focuses on the effects of FDI presence on the labor market of the host country, i.e., the input side of the production process. Our focus on the labor market effects also provides insight to specific mechanisms through which FDI affects domestic firms, such as competition over skilled labor.

In this paper, we conduct a study of FDI effects on the host country's market for heterogeneous skilled labor. We begin with a model of a domestic firms' demand for skilled labor and then study how it is affected by the presence of FDI. We then use a World Bank firm

[1] For a critical evaluation of studies that find no or negative FDI spillovers, see Moran (2007).

survey data set to empirically test the labor market competition effects in China, which has been extremely successful in attracting FDI in the past two decades.

Our model assumes there is ample supply of production workers (homogeneous unskilled labor) in the host country. As a result, the presence of FDI does not affect the wage and quality of production workers in domestic firms. In contrast, skilled labor is heterogeneous and is supplied inelastically, thus foreign invested firms drive up the wage of skilled labor in the host country.

Although China has a rich endowment of unskilled labor, the shortage of skilled labor in China is well documented. For example, according to the *Report on Chinese Entrepreneurs* issued by the Survey System for Chinese Entrepreneurs in 2003, 80% of the entrepreneurs surveyed report a shortage of technical personnel, over 50% report a shortage of managerial personnel, and 74% report a shortage of sales personnel. Hence, the model applies well to the case of China, where the competition effects on the labor market for skilled labor are particularly important, while such effects on the unskilled labor market may not be as substantial.

As shown in Table 1, indeed, wages paid to engineers and managers in domestic firms are higher in city-industry combinations with higher FDI presence. In contrast, wages paid to production workers are not significantly influenced by the FDI presence. The insignificant effect on production workers is possibly due to the surplus unskilled labor in China. The significantly higher wages for engineers and managers, however, suggest that foreign firms are competing with domestic firms for talents, possibly mitigating or eliminating positive FDI technological spillovers in these countries.

The context of China calls for the extension to the model that would include different firm types. When domestic firms face restrictions on wages paid to their skilled employees, our model predicts that they will experience a decline in the quality of their skilled labor. State owned enterprises (SOEs) in China face wage restrictions that put an upper limit on wages

paid to their employees. According to our model, these restrictions imply that the labor market competition effects of FDI presence for the SOEs will manifest themselves as a decline in quality of skilled labor rather than an increase in wages.

These predictions are largely confirmed by our empirical findings. Specifically, we find higher wages for engineers and managers in private firms if there is more FDI around them, but not in SOEs. Regarding quality of skilled labor, we find that more FDI presence corresponds to lower quality of engineers in both SOEs and domestic private firms, while it appears to increase the difference in the quality of managers (measure by education) between private firms and SOEs and actually improve the quality of managers in private firms, as measure by age and foreign experience. In contrast, we obtain no robust evidence that either the average wage or the average quality of unskilled labor in domestic firms is affected significantly by the FDI presence.

Our paper contributes to the literature in several other ways. First, we use a unique firm-level data set to study the effects of FDI in China, which has caught the attention of the literature and the media for its record–setting growth and FDI inflows.[2] Second, the contrasting outcomes we find for SOEs and for private firms add evidence to the advantages of private ownership over state ownership documented in previous studies.[3] Last, in our model and empirical findings suggest that the inability of SOEs to benefit from FDI technological spillovers may be due to the wage constraints that forbid them from hiring high quality skilled labor. To the extent that labor market institutions are restrictive in many developing countries, our findings suggest an explanation for why positive FDI spillovers are more difficult to find in developing countries.

The structure of the paper is as follows: Section 2 provides institutional background on FDI–related government policies and wage policies in China. Section 3 presents the theoretical

[2]For a review of previous studies on FDI spillovers in China, see Hale and Long (2007).

[3]See Megginson and Netter (2001) for a summary of empirical evidence showing superior performance of private firms over SOEs.

model and its application to China. Section 4 describes the data and the methodology, and presents the empirical findings. Section 5 concludes.

2 Institutional Background

In this section we describe the institutional environment in China that is relevant to our analysis — the FDI–related policies and trends as well as the differences between private firms' and SOEs' wage and personnel policies.

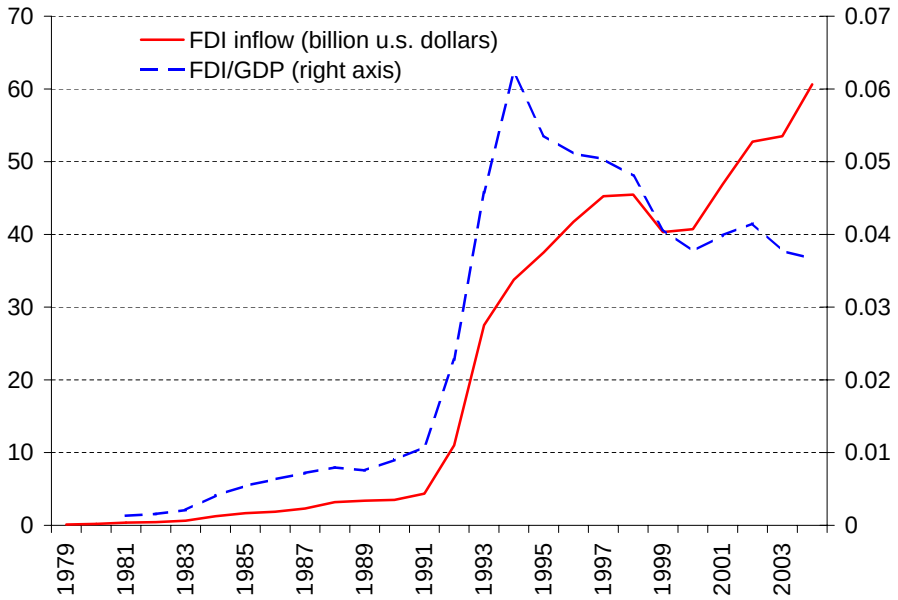
2.1 Foreign direct investment and FDI policies in China

China's FDI policies developed from restrictive before 1978 to permissive in the early 1980s, then to encouraging between the mid-1980s and the mid-1990s, and finally matured in the mid-1990s to link FDI to domestic development priorities. With the country's accession into the World Trade Organization (WTO) in 2001, substantial changes were made to its FDI policies largely to unify the treatment of domestic and foreign firms.[4]

Since the beginning of the reform era in the mid-1980s, when FDI was allowed only in a limited number of Special Economic Zones (SEZs), the geographic scope was gradually expanded to cover more coastal cities and regions, and then finally to cover the whole country by the mid-1990s. Along with the expansion of geographic areas open to FDI, government policies toward FDI also evolved from permitting it to encouraging it through favorable treatment in taxes, tariffs, foreign exchange regulations, and licensing requirements. These early measures, largely embodied in the *Provisions of the State Council of the People's Republic of China for the Encouragement of Foreign Investment* (1986), prompted the rapid growth in FDI inflow into China, especially between the mid-1980s and the mid-1990s. Illustrating the breathtaking speed of FDI growth in China, the annual FDI inflow was $100

[4]See Fung, Iizaka, and Tong (2004) for a detailed review of the trend, policy, and impact of FDI in China.

Figure 1: FDI inflows into China



Source: Statistical Yearbook, various issues (Chinese National Bureau of Statistics)

million in 1979, $1 billion in 1984, and then reached close to $40 billion in 1995. As shown in Figure 1, the annual FDI inflow has remained above $40 billion since 1995, while the FDI/GDP ratio has surpassed 3% since 1992. Between 1994 and 1997, the ratio exceeded 5%.[5]

Due to the limited geographic regions open to foreign capital and favorable tax policies in the early stages of China's opening up, FDI was largely concentrated in coastal areas and labor intensive industries. Since the mid-1990s, in addition to further expanding the geographic regions open to foreign investment and maintaining a favorable investment environment, government policies began to focus more on linking FDI to domestic development priorities. For instance, the *Provisional Guidelines for Foreign Investment Projects*, which took effect in 1995, classified all FDI projects to one of four categories: encouraged, restricted, prohibited, and permitted. Priority was given to FDI in the agriculture, energy, transportation,

[5]Dollar, Hallward-Driemeier, and Mengistae (2004) show that the investment climate in China is superior to that of South Asian or Latin American countries and that this advantage helps explain large FDI inflows into China.

telecommunications, basic raw materials, and high-technology industries. FDI projects that could take advantage of the rich natural resources and relatively low labor costs in the central and northwest regions were also vigorously encouraged.[6] As a result, investment from large multinational corporations has increased rapidly and FDI started to shift toward capital– and technology–intensive industries since the mid-1990s. While the coastal areas continue to attract the most FDI inflows, certain inland regions have also become more popular among foreign investors.

In spite of China's great success in attracting FDI, the effects of FDI on domestic firms are far from clear. For instance, Huang (2003) argues that the large FDI inflow into China is accompanied by the repressive policies toward domestic private firms, implying that foreign firms have captured resources, markets, and policy preferences from domestic firms. From the viewpoint of the government, the goal in encouraging FDI has been clearly stated from the very beginning to be obtaining advanced technology as well as management skills from foreign partners. But the government's early reluctance to allow solely foreign–owned firms (till the passage in 1986 of the *Law of the People's Republic of China on Enterprises Operated Exclusively with Foreign Capital*) suggests that it had doubts about FDI spillover effects on domestic firms. In addition, restrictions on domestic sales of foreign–invested firms that existed during much of the pre-WTO period seem to reflect the government's concern that foreign firms might crowd out domestic firms in their competition for domestic market share.

2.2 Labor market restrictions for domestic firms

Before economic reform began in the late 1970s, employee compensation in China followed a rigid grid system based on factors that reflected neither firm performance nor individual contributions. The bulk of the industrial labor force was employed in SOEs and their compensation was determined by the region, industry, level of supervising government agency,

[6]The new *Guiding Catalogue of Foreign Investment Projects* published in 2002 further combined the categories into three: encouraged, prohibited, and permitted.

the size of the enterprise, in addition to the job title, occupation, and seniority of the individual. Even in the post–reform era, compensation mechanisms in SOEs are still subject to government guidelines that restrict wage differentials among employees and that often set a limit on the maximum salary for executives.[7]

In contrast, private firms in China have always enjoyed more freedom in setting their own compensation policies and they show great flexibility in adopting more effective incentive systems. One telling example is the different pace at which different firms adopt the "yearly salary system" for executive compensation. Consisting of a fixed component (the base salary) and a variable component (the risk salary) that relates the executive's salary to firm performance, this new system resembles the typical cash compensation package in Western firms. The mechanism was initially conceived by the central government as a way to improve SOE performance. In reality, however, the new compensation system was adopted by private firms at a much faster pace, once it proved to provide an effective incentive mechanism for executives.

Furthermore, even in SOEs that have adopted the new compensation system for executives, there is more emphasis on egalitarian concerns. As recently as 1999, the highest ratio between CEO compensation and that of an average production worker was 6 among the 40 largest enterprises owned by the central government.[8] At present both the central government and several provincial governments in China have set or are considering setting limits on the ratio between CEO salary and production worker compensation. The current limit being contemplated by the central government is 15, while provinces such as Jiangxi have recently adopted 10 as the ratio limit.[9]

[7]See, for instance, Kato and Long (2006a) for discussion of executive salary policies in Chinese firms and Kato and Long (2006b) for executive turnover policies.

[8]See the "Research report on Chinese manager incentive mechanisms and policies," cited in the Jan. 14, 2002, issue of the *Market Daily* (accessed online on July 26, 2006 at $http://news.xinhuanet.com/newscenter/2002-01/24/content252489.htm$) .

[9]See the March 25, 2005, Issue of *China Industry and Commerce Times*, and "The Rules for Administrating CEO Compensation in SOEs in Jiangxi Province," government document issued by the Jiangxi State Asset Supervision and Administration Commission (accessed online on July 21, 2006 at $http://jiangxi.jxnews.com.cn/system/2006/07/07/002290697.shtml$) .

We are not aware of any data on the ratio between CEO salary and production worker compensation for private Chinese firms in general. However, compensation data for private listed firms in China and worker compensation data from the International Labor Organization suggest that the ratio was close to 15 between 1998 and 2002. The 1996-1997 Tower Perrin Compensation Survey gives the range of CEO–worker compensation ratio of 11 for Germany and 24 for the United States. To the extent that these numbers reflect the efficient outcomes of labor market competition, the limits currently implemented and contemplated in China may impose artificial restrictions on SOEs' ability to hire and retain talent.

In reality, the rigid compensation system in SOEs has long been known as the main reason for the large number of skilled workers leaving SOEs to join private firms with or without foreign ownership share.[10] As a result, labor market activities may be an important channel through which FDI presence affects domestic firms.

3 Model

We present a model that would allow us to better understand the effects of FDI on labor markets in China.[11] To describe the structure of the labor market, assume that there are two types of labor: unskilled, L, and skilled, H. Assume, for simplicity, that capital K and unskilled labor L are homogeneous and are supplied elastically at unit prices of r and s, respectively. We will focus on the market for skilled labor, which we assume to be heterogeneous. Each of the two types of skilled labor is supplied inelastically, with the wage for each type determined in equilibrium.

[10] See, for example, the "Research report on Chinese manager incentive mechanisms and policies," cited in the Jan. 14, 2002, issue of the *Market Daily,* ibid.

[11] Theoretical models studying the labor mobility channel for FDI spillovers include Kaufmann (1997), Haaker (1999), Fosfuri, Motta, and Rønde (2001) and Glass and Saggi (2002).

3.1 Benchmark equilibrium

There exists a continuum of firms, with each firm i maximizing profit in a monopolistically competitive free entry environment facing input markets as described above. The production function exhibits constant returns to scale and uses capital and two types of labor as inputs in the following fashion:

$$Y_i = A_i K_i^{\alpha} H_i^{\beta} L_i^{1-\alpha-\beta},$$

where $\alpha \in (0;1)$, $\beta \in (0;1)$, Y_i is output, and A_i is total factor productivity of firm i.

The type of skilled labor lcan take two values: b for the "bad" type, while g for the "good" type. The skilled labor employed by firm i is aggregated with constant elasticity of substitution (CES) of $\rho \in (0;1)$ as follows:

$$H_i = \left[N_{bi}^{\rho} + (1+e)N_{gi}^{\rho}\right]^{1/\rho},$$

where $e > 0$ measures the efficiency of the use of skilled labor of high quality, and N_{ki} is the amount of skilled labor of type $k = b, g$ employed by firm i. We assume e to be the same for all domestic firms, but may differ for foreign firms. Note that since $e > 0$, type g workers are more productive than type b workers.

The firm's decision to hire skilled labor can be derived in two steps. Because skilled labor of various types is combined into H_i in a CES fashion, the composition of H_i will be the same regardless of the total amount of H_i employed. Thus, given total expenditures a firm chooses to allocate to skilled labor E_i, we can derive each firm's demand for each type of skilled labor, N_{ki}. Because the production function is Cobb-Douglas, E_i will be equal to share β of total expenditures of the firm, which, under zero profit condition implies that $E_i = \beta P_i Y_i = \beta P_i A_i K_i^{\alpha} H_i^{\beta} L_i^{1-\alpha-\beta}$.

Given E_i, the firm will maximize H_i over N_{ki}, subject to

$$c(H_i) = w_b N_{bi} + w_g N_{gi} \leq E_i.$$

This gives a set of first order conditions

$$\frac{\partial H_i}{\partial N_{ki}} = \lambda \frac{\partial c(H_i)}{\partial N_{ki}},$$

where λ is the Lagrange multiplier.

The solution is therefore

$$N_{bi} = \frac{E_i}{w_b} \cdot \frac{1}{1 + (1+e)^{\frac{1}{1-\rho}} (w_b/w_g)^{\frac{\rho}{1-\rho}}},$$

$$N_{gi} = \frac{E_i}{w_g} \cdot \frac{(1+e)^{\frac{1}{1-\rho}} (w_b/w_g)^{\frac{\rho}{1-\rho}}}{1 + (1+e)^{\frac{1}{1-\rho}} (w_b/w_g)^{\frac{\rho}{1-\rho}}}.$$

Intuitively, for both types of skilled labor, the demand will be increasing in total expenditure allocated to skilled labor, E_i. Since each firm is small, we can assume that it takes the wage of each type of skilled labor, w_k, as given. Thus, each firm's demand for skilled labor of type k is decreasing in its wage and is increasing in the wage of the other type.

Moreover, the number of workers of each type that firms demand will be proportional to the ratio of the per dollar productivity of this type to the average per dollar productivity of all skilled workers. The higher the e (i.e., the relative productivity of labor type g), the more type g workers and the fewer type b workers will be demanded. Essentially, the model implies that the composition of skilled labor is determined by e, the relative value of skilled workers for a given firm.

Aggregating demand for each type of labor over firms, we get total demand for skilled labor

as follows:

$$N_b^d = \frac{E}{w_b} \cdot \frac{1}{1 + (1+e)^{\frac{1}{1-\rho}} (w_b/w_g)^{\frac{\rho}{1-\rho}}},$$

$$N_g^d = \frac{E}{w_g} \cdot \frac{(1+e)^{\frac{1}{1-\rho}} (w_b/w_g)^{\frac{\rho}{1-\rho}}}{1 + (1+e)^{\frac{1}{1-\rho}} (w_b/w_g)^{\frac{\rho}{1-\rho}}},$$

where $E = \int_{i=o}^{1} E_i \mathrm{d}\, i$. Assume that the total supply of the labor of type k is $\overline{N_k}$, and, for simplicity, that $\overline{N_b} \geq \overline{N_g}$. Then the equilibrium wage w_k^*, as required by $N_k^d = \overline{N_k}$, implies that $w_b^* < w_g^*$. Because demand is increasing in E, both wages will increase in E. Since e has positive effect on the demand for labor of type g and a negative effect on the demand for labor of type b, w_g will increase in e, while w_b will fall in e.[12]

Proposition 1 summarizes these results.

Proposition 1 ***Benchmark comparative statics.*** *If labor supply is such that $w_b^* < w_g^*$, then*

1. *a higher e leads to higher demand for skilled labor of type g and lower demand for skilled labor of type b, and therefore higher average wage of skilled labor,*

2. *a higher E (due to higher A, K, or L) leads to higher demands for both types of skilled labor, and therefore higher average wage of skilled labor,*

3. *a decline in supply of labor of either type increases the equilibrium wage of that type of labor, which leads to an increase in demand for the other type of labor and therefore an increase in its wage.*

[12] In the previous versions of the paper we presented the model with continuum of types. While the predictions of the models are qualitatively identical, we found the two–types model more transparent and intuitive to present.

3.2 Effects of constrained wage structure

Suppose that share ϕ of the firms are constrained to pay wages that do not exceed $\overline{w}$. Without loss of generality, assume that $w_b^* < \overline{w}$ so that no firms are constrained on the market for skilled labor of type b. The market demand for skilled labor of type g will be

$$N_g^{cd} = \begin{cases} \frac{E}{w_g} \cdot \frac{(1+e)^{\frac{1}{1-\rho}} (w_b/w_g)^{\frac{\rho}{1-\rho}}}{1+(1+e)^{\frac{1}{1-\rho}} (w_b/w_g)^{\frac{\rho}{1-\rho}}} & \text{if} \quad w_g \leq \overline{w} \\ \frac{E_c}{w_g} \cdot \frac{(1+e)^{\frac{1}{1-\rho}} (w_b/w_g)^{\frac{\rho}{1-\rho}}}{1+(1+e)^{\frac{1}{1-\rho}} (w_b/w_g)^{\frac{\rho}{1-\rho}}} & \text{if} \quad w_g > \overline{w} \end{cases},$$

where $E_c = \int_{i=0}^{1-\phi} E_i \mathrm{d}\, i$ is total expenditure on skilled labor by unconstrained firms.

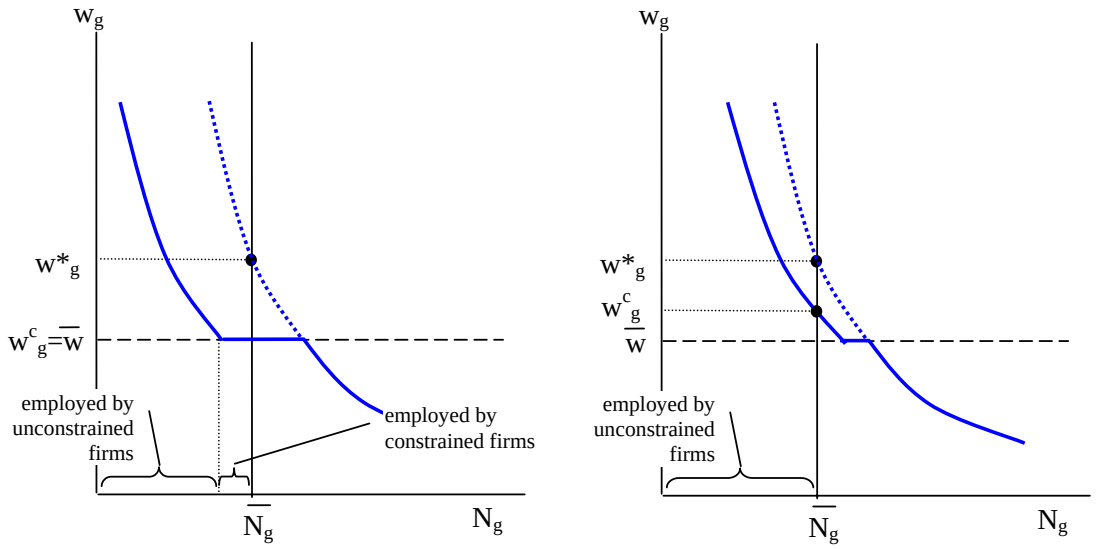
If the demand for labor of type g by unconstrained firms is insufficient to employ $\overline{N_g}$ workers at a wage higher than $\overline{w}$, the equilibrium wage will be equal to $\overline{w}$ and a fraction of the constrained firms will hire type g workers, so that the total demand for type g labor is equal to $\overline{N_g}$ at $w_g = \overline{w}$. This fraction will fall if the constrained demand rises due to an increase in E, e, or a decline in ϕ. Such a constrained equilibrium is illustrated on the left–hand side of Figure 2.

If the demand for labor of type g by unconstrained firms is sufficient to employ $\overline{N_g}$ workers at a wage higher than $\overline{w}$, none of the constrained firms will employ type g labor and the constrained equilibrium wage will be above $\overline{w}$ but below the unconstrained wage w_g^*. Such a constrained equilibrium is illustrated on the right–hand side of Figure 2. Note that the higher is the share ϕ of constrained firms, the lower will be the constrained equilibrium wage w_g^c, and the more likely will constrained firms hire skilled workers of type g.

The propositions below summarize the differences between constrained and unconstrained firms (*Proposition 2*) and how constrained and unconstrained firms are differentially affected by changes in parameter values (*Proposition 3*).

Proposition 2 ***Constrained and unconstrained firms.*** *If the supply of labor is such that $w_b^* < w_g^*$ and the wage constraint is binding in the market for type-g skilled workers,*

Figure 2: Equilibrium with constrained firms



then

1. *the average wage of workers will be lower in constrained than in unconstrained firms;*

2. *the average quality of workers (measured by the share of type g workers) will be lower in constrained than in unconstrained firms.*

Proof. Given that the constraint is binding only on the g market, $w_b^c < \overline{w}$ and $w_g^c \geq \overline{w}$. All unconstrained firms and only some constrained firms employ g-type workers, thus the average quality of workers is higher in unconstrained firms. Since $w_b^* < w_g^*$, average wage of skilled labor in unconstrained firms is higher than in constrained firms.

Proposition 3 ***Effects of factor changes on constrained and unconstrained firms.*** *Under the same conditions as in Proposition 2,*

1. *an increase in E (due to an increase in A, K, or L) will increase the average wage of workers in unconstrained firms, may increase or decrease the average wage in con-*

strained firms, while increasing average quality of workers in unconstrained firms and decreasing the average quality of workers in constrained firms;

2. *an increase in e will have an ambiguous effect on the average wage in constrained and unconstrained firms, but will increase the difference in average wage between the two types of firms, while the average quality of workers will rise in unconstrained firms and will fall in constrained firms;*

3. *a decline in $\overline{N_b}$ will increase the wage of type-b workers and will increase the demand for type-g workers by both types of firms, increasing w_g^c or lowering the share of constrained firms that hire type-g workers in equilibrium, the latter leads to a higher average quality of workers in unconstrained firms and lower average quality of workers in constrained firms;*

4. *a decline in $\overline{N_g}$ will increase the wage of type-g workers or will lower the share of constrained firms hiring type-g workers in equilibrium and leave $w_g^c = \overline{w}$ unchanged. In the first case, the demand for type-b workers and their equilibrium wage will increase, while in the second case it will not be affected, but the average quality of workers in constrained firms will decline. In both cases the average quality of workers in unconstrained firms will decline.*

Proof. An increase in E will push up demand for both types of skilled labor, rising both wages in the unconstrained equilibrium. Thus, w_b^c will rise, increasing average wage in both types of firms. w_g^c may either rise or remain at $\overline{w}$. In either case, the fraction of constrained firms that hire type g labor will fall (because the demand for this type of labor from unconstrained firms will increase if the wage remains at $\overline{w}$ or because w_g^c rises above $\overline{w}$ in which case the fraction of constrained firms that can hire type-g workers will fall to zero). Since $w_b^* < w_g^*$ and fewer constrained firms hire type-g workers, the overall effect on the average wage in constrained firms is ambiguous (the composition effect offsets the rise in w_b^c). The average wage in unconstrained firms will unambiguously increase. The average quality of workers in

constrained firms will fall, while the average quality of workers in unconstrained firms will increase because w_b^c will increase by more than w_g^c.[13]

An increase in e will increase demand for type-g workers and lower demand for type-b workers, thus lowering w_b^c and either raising w_g^c or lowering the fraction of constrained firms that are hiring type-g workers. The average quality of workers in constrained firms will fall and in unconstrained firms will rise. The effect on average wage in both constrained firms and unconstrained firms is ambiguous. The difference in average wage between these two types of firms, however, will unambiguously increase due to composition effects.

The effects of change in the supply of labor are immediately obvious from the equations and from Figure 2.

3.3 Application to China and the effects of FDI presence

We now apply the model to the context of China. For the labor market in China, we interpret constrained firms as SOEs because these firms are restricted in the wages they can offer their employees. In contrast, private firms do not have such wage restrictions. The model then predicts the following testable differences between SOEs and private firms:

Corollary 1 ***SOE versus private domestic firms***

1. *Compared with private domestic firms, SOEs will on average pay lower wage to skilled workers and employ skilled workers of lower quality;*

2. *There is no difference in wages paid to or quality of unskilled workers between SOEs and private firms.*

These predictions are implied by *Proposition 2* and the assumption that unskilled labor is homogeneous and is supplied elastically.

[13]Moreover, since $\overline{N_g}$ and $\overline{N_b}$ are unchanged and constrained firms employ relatively more b workers, unconstrained firms must employ relatively fewer b workers.

Consider now the possible effects of FDI inflow on domestic firms' labor market. We begin by comparing foreign firms with unconstrained domestic private firms and focus on the following two implications of foreign firms' advantage in capital and technology.

First of all, foreign firms' potential advantage in access to cheap capital and advanced technology can be represented by a higher value of K or A for foreign firms compared to domestic firms. Both higher K and higher A would lead to higher E and therefore higher demand for skilled labor of each type (b and g) by foreign firms. This would raise the wages of both types of skilled workers. The implied composition of skilled labor and thus average wage and quality of skilled workers will be the same for unconstrained domestic private and for foreign firms.

In addition, foreign firms' usage of superior technology may lead to higher efficiency of skilled labor in foreign firms through technology–skill complementarity (Griliches, 1969; Krusell, Ohanian, Rios-Rull, and Violante, 2000), which could be represented by a greater value of e in our model. Thus, *Proposition 1* implies that foreign firms' demand for skilled labor will be tilted towards high–quality labor. As a result, we have the following result:

Corollary 2 ***Foreign firms versus private domestic firms***

1. *The average quality and wage of skilled labor will be higher in foreign firms than in private domestic firms;*

2. *There is no difference in wage and quality of unskilled labor between foreign firms and private domestic firms.*

We now turn to the effects of the entry of foreign firms on domestic firms and the difference between SOEs and private domestic firms. There are two main forms in which FDI can enter the host country: through mergers and acquisitions, and as greenfield FDI.

If FDI takes the form of mergers and acquisitions, it is likely to increase capital and productivity in the firms that received foreign capital investment (Arnold and Javorcik, 2005).

In our model, this is equivalent to larger K or A, and thus higher demand for both types of skilled labor by these firms, which we assume to be unconstrained. Greenfield FDI will have the same effect as they will increase demand for both types of skilled labor. The effect of this will be a proportional decline in the supply of both types of labor available to domestic firms, which is equivalent, it terms of its implications, to an increase in E. Thus, according to part 1 of *Proposition 3*, the average wage and quality of skilled workers in unconstrained firms will increase while the average quality of skilled labor in constrained firms will fall.

Foreign invested firms may also have higher productivity of type g skilled labor due to capital–skill complementarity (i.e., a greater value of e in our model), which will further reduce the supply of type g skilled labor available to domestic firms. As a result, as follows from part 3 of *Proposition 3*, the average wage of skilled workers in unconstrained firms may or may not increase (due to the opposing effect of a decline in the share of type g workers they hire), the average wage of skilled workers in constrained firms will either increase or stay unchanged, while the average quality of skilled labor will unambiguously fall in unconstrained firms and may fall or stay unchanged in constrained firms.

Combining the above two effects, we get the following predictions regarding the effects of FDI presence on different types of domestic firms, where the result on unskilled labor is due to the assumption of infinitely elastic supply of unskilled labor:

Corollary 3 ***FDI effects on SOEs versus private domestic firms***

1. *An increase in FDI presence will increase the average wage of skilled workers in private domestic firms and may or may not increase the average wage of skilled workers in SOEs; it will also lower the average quality of skilled workers in SOEs and may increase or lower the average quality of skilled workers in private firms.*

2. *There are no effects of FDI presence on the average wage or quality of production workers.*

The implications of our model are summarized on the left–hand side panel in Table 2. As shown in the table, the model has specific predictions on the average quality and average wage of skilled labor in the following three comparisons: private domestic firms versus SOEs, foreign firms versus private domestic firms, and the effects of FDI on private firms versus SOEs. We will now conduct empirical analysis to test these predictions.

4 Empirical Analysis

In this section, we present empirical evidence to test whether the predictions of Corollaries 1-3 hold in the data. In particular, we will study the existence of labor market competition effects. But first we discuss the data and the empirical methodology.

4.1 Data

We use data from the Study of Competitiveness, Technology and Firm Linkages conducted by the World Bank in 2001 described in more detail in Hale and Long (2007). The survey consists of two questionnaires, one filled out by the Senior Manager of the firm's main production facility, and the other filled out by the accountant and/or the personnel manager of the firm. The survey collects detailed information on firms and their operation environment. For most of the variables, the firms were requested to provide information as of year 2000. However, for many accounting measures, information from up to three previous years was also collected. In this study, we use a small portion of the survey that gives accounting information on firms' input (including wages and the composition of the labor force), output, and ownership structure. The list of variables used in our study is presented in the Appendix.

The methodology of the survey is stratified random sampling with the stratification based on subsectors including accounting and related services, advertising and marketing, apparel and leather goods, business logistics services, communication services, consumer products,

electronic equipment and components, information technology (IT), and auto parts. A stratified random sample of 300 establishments is drawn from each of five cities in China: Beijing, Chengdu, Guangzhou, Shanghai, and Tianjin, giving a total sample size of 1500. Table 3 gives the city and sector distribution of firms included in the survey.[14]

Based on the information on firms' foreign ownership, we construct the measure of FDI presence as follows: For each domestic firm, we identify the city–sector cell where the firm is located. We then compute the weighted average of the largest foreign partner's share in each firm located in the same city–sector, as of 1999, with firm employment as the weight. The average foreign share thus obtained is referred to as the "FDI presence" in the city–sector cell. Our focus, therefore, is the effect of FDI presence within the same geographic location and industry. Table 4 gives the average foreign share by city and industry sector. For the part of the analysis where we study FDI spillovers in the same location but possibly across different industries, the same method is used to compute average foreign share for each city, also presented in Table 4.

Table 5 shows summary statistics of the variables used in the analysis. Domestic firms with private ownership of less than 20% are listed as SOEs, while others are listed as private.[15] This split is only done for the purpose of comparing our variables for domestic firms with different ownership, while in the regression analysis that follows, we use a continuous measure of the share of private ownership. The table shows that SOEs are quite different from private firms in many aspects: They tend to be larger and have a longer history; their workers tend to be older and less educated, and tend to get lower wages; and their managers tend to have less foreign work experience. These differences are all statistically significant.

[14]For a detailed description of the survey, see Hallward-Driemeier, Wallsten, and Xu (2003).

[15]This split corresponds most closely to the ownership characterizations provided by the firms.

4.2 Empirical approach

To test the differences between SOEs and private firms, we restrict our analysis to firms with no foreign partners, and use the following specification:

$$Y_{jik} = \alpha_{ik} + \beta_1 PR_{jik} + Z'_{jik}\,\Gamma + \epsilon_{jik}, \tag{1}$$

where Y_{jik} is an outcome variable, such as average production worker education or wage, in the firm j operating in industry i and city k, α_{ik} are city–industry fixed effects, PR_{jik} is the share of private ownership of the firm j, Z_{jik} is a set of firm–level control variables specific to the outcome variable, while ϵ_{jik} is a robust error term. The coefficient β_1 on PR_{jik} measures the difference between SOEs and private firms.

Next, we analyze differences between domestic and foreign firms, this time excluding SOEs from our sample, where SOEs are defined as firms with less than 100 percent of private ownership share. We use a similar specification:

$$Y_{jik} = \alpha_{ik} + \beta_2 FOR_{jik} + Z'_{jik}\,\Gamma + \epsilon_{jik}, \tag{2}$$

where FOR_{jik} is the share of foreign ownership in firm j that operates in industry i and city k.

Finally, to measure effects of FDI on domestic private firms and SOEs, we use the following specification, again limiting our sample to the firms with zero foreign ownership:

$$Y_{jik} = \alpha_i + \alpha_k + \beta_3 FDI_{ik} + \beta_4 PR_{jik} + \beta_5 FDI_{ik} \cdot PR_{jik} + Z'_{jik}\,\Gamma + \epsilon_{jik}, \tag{3}$$

where FDI_{ik} is a measure of FDI presence in industry i and city k and α_i and α_k are city and industry fixed effects.[16] The coefficient β_3 measures the effect of FDI presence on firms

[16] Because our measure of FDI presence does not vary within city–industry cell, we cannot include a full set of city–industry fixed effects, but rather include city and industry fixed effects.

with zero private ownership, i.e. SOEs, while the sum $\beta_3 + \beta_4$ measure the effect of FDI presence on firms with 100 percent private ownership.

The above specification, if estimated by the OLS, maybe subject to the omitted variable bias, especially when the omitted variables affect the FDI presence and the outcome variable in the same direction. Thus, we estimate the same relationship using the instrumental variables approach. Blonigen (2005) argues that multinational corporations make overseas investment for several reasons, including securing access to domestic market, and using cheap local resources, such as labor, to produce for other markets.[17] We therefore use the following two instruments for FDI, which are not correlated with productivity of domestic firms: the percentage of firms in the industry that exported in year 2000 multiplied by the berth capacity of the city's seaport ($Port * EX$) and the average transportation cost as a percentage of sales in the industry multiplied by the sum of population of all other provinces weighted by the inverse of the distance between the provincial capital and the city squared ($Dist * Tr$).[18]

The capacity of the seaport affects the cost of exporting, while the percentage of firms that export serves as a proxy for the importance of exporting in a particular industry. Thus, $Port * EX$ measures the access to overseas market and the attractiveness to FDI of the particular city–industry cell. The sum of population of all other provinces weighted by the square of the inverse of their distance to a city gives a measure of how centrally located the city is, while the average transportation cost as a percentage of sales measures the bulkiness of the industry. $Dist * Tr$ therefore measures the access to the domestic market and thus the attractiveness to FDI of the city–industry.

[17] Empirical studies demonstrating the importance of these factors include de Mooij and Ederveen (2003) (tax rate), Coughlin, Terza, and Arromdee (1991) (tax rate and infrastructure), Ma (2006) (access to international market), Bagchi-Sen and Wheeler (1989) (population size, population growth, and per capita sales), and Kravis and Lipsey (1982) and Blomstrom and Lipsey (1991) (size of domestic market). Other studies on location of FDI in China include Cheng and Kwanb (2000) and Sun, Tong, and Yu (2002).

[18] See Hale and Long (2007) for the full description and the values of these variables for each city–industry cell.

Specifically, we estimate, using generalized method of moments (GMM), the following system:

$$\begin{cases} FDI_{ik} &= \delta_i + \delta_k + \delta_1\ Port * EX_{ik} + \delta_2\ Dist * Tr_{ik} + \overline{Z'}_{ic}\,\Phi + \omega_{ik} \\ FDI_{ik} \cdot PR_{jik} &= \zeta_i + \zeta_k + (1 + \zeta_0\, PR_{jik}) \cdot (\zeta_1\ Port * EX_{ik} + \zeta_2\ Dist * Tr_{ik}) \\ & \quad + \overline{Z'}_{ic}\,\Psi + \varpi_{ik} \\ Y_{jic} &= \alpha_i + \alpha_k + \beta_3' FDI_{ik} + \beta_4' PR_{jik} + \beta_5' FDI_{ik} \cdot PR_{jik} + Z_{jik}'\,\Gamma + \epsilon_{jik}, \end{cases}$$

where $\overline{Z'}_{ic}$ is a matrix of firm characteristics, averaged for each city–industry cell.

4.3 Empirical results

Table 6 reports results from testing the predictions of *Corollary 1*. Effectively, we test the assumption that SOEs in China face wage constraints by comparing the wage and the quality of different types of labor in SOEs and in domestic private firms. As the results show, private firms tend to hire skilled labor of higher quality and pay them higher wages. Specifically, if the share of private ownership is higher, wages paid to engineers and managers, but not to production workers, are higher. We also find that employees of all types tend to be younger, the share of engineers and managers with foreign experience larger, and the managers more educated if the private share is higher. These results are consistent with the prediction of our model and the conventional view that SOEs face wage constraints in competing with other types of firms.

To discuss the magnitude of the differences, we can compare firms with zero private share with those that have 100 percent private ownership share. The coefficients in the regressions reported in Table 6 indicate that wages of engineers are higher in private firms than in SOEs by about 17 percent, while the wages of managers are higher in private firms by about 20 percent. Note that some wage differences are due to differences in quality — when controlling for age, education, and foreign experience, the coefficients on PR_{jik} in wage regressions for

engineers and managers become smaller, with private firms paying wage by 12 and 15 percent higher for engineers and managers, respectively, than SOEs.[19] In addition, private firms hire engineers and managers that are on average 2 and 4 years younger, respectively, when we control for firm age. The differences in education level are modest: private firms hire managers that on average have 4 additional months of education, compared to SOEs.[20] The average shares of engineers and managers with foreign experience are 1 and 7 percentage points higher, respectively, in private firms than in SOEs.

Next, we test *Corollary 2* by comparing foreign firms with domestic private firms. As illustrated by the results presented in Table 7, foreign firms are quite different from domestic firms. We exclude SOEs from our analysis to abstract from the difference in ownership.[21] As shown in Table 7, firms with higher share of foreign ownership share pay higher average wages to their engineers and managers. Again, part of the wage premium is explained by the higher quality of managers, as the coefficient of private share is smaller once quality is controlled for, while the rest may be due to unobserved variation in quality not controlled for by age and education. In fact, once we control for the quality or working conditions, there is no longer significant difference in engineers' wage between foreign and domestic private firms. In addition, firms with higher share of foreign ownership tend to hire younger workers of all types, as well as more educated managers who are also more likely to have foreign working experience.

In terms of magnitudes of these effects, firms with 100 percent foreign ownership would hire engineers and production workers that are on average 2.3 years younger and managers that on average 1.6 years younger, have 8.5 more months of education and are 12 percentage point more likely to have foreign experience, compared to domestic private firms. Managers in fully foreign firms would get paid 51 percent more than in fully domestic private firms,

[19]The remaining average differences reflect the fact that age, education, and foreign experience only measure some of the quality aspects, with many others not observed by an econometrician.

[20]Note that average education of managers in SOEs is 12.6 years — see Table 5.

[21]The reported results exclude all the domestic firms with private ownership share less than 100%. As a robustness test we instead excluded firms according to their legal status and obtained similar results.

with 9 percentage points due to their observable quality advantage. A 30 percent difference in engineers' wage seems to be almost entirely explained by the observed quality differences.

The higher average wages paid to skilled labor in foreign firms are consistent with the view that the better technology used by foreign firms is captured in the higher productivity of high quality (or type g) skilled labor (a greater value of e in our model). In particular, we find the results to be more pronounced for managers than for engineers. This is consistent with the belief that foreign firms have superior managerial practices. In other words, foreign firms use high quality skilled labor more effectively.

We now study the effects of foreign firm presence on domestic firms, as summarized in *Corollary 3*. Table 9 presents our main results from IV estimations, while Table 8 presents the results from OLS estimation for comparison. The columns give coefficient estimates for private share, FDI presence, and the interaction term between private share and FDI presence.[22]

The top panel of Table 9 shows that private firms pay higher wages to both engineers and managers where there is more FDI. In contrast, FDI presence has no effect on the average wages of production workers, homogeneous unskilled labor. These results are consistent with the labor market competition story where foreign firms drive up wages for skilled labor, while the wages for unskilled labor remain unaffected due to elastic supply of such labor. As we expected, there are no effects of FDI on the wages of skilled labor in SOEs, potentially due to wage restrictions.

The bottom panel of Table 9 summarizes the effects of FDI on average labor quality. For unskilled labor such as production workers, FDI presence has no significant effects on either their average age or their average education. In contrast, for skilled labor, there is evidence for labor market competition effects, especially for engineers. Specifically, the presence of FDI reduces the average quality of engineers, exhibited by their average education level,

[22]Table 9 also reports the fit statistics from the first stage regression, which demonstrate the validity of our instruments.

both in SOEs and in private firms. For SOEs, the average education of managers also tends to decrease in the presence of FDI; but such effect is not present for private firms. There is also evidence that the average age of engineers hired by SOEs increases in the presence of FDI, although these last two effect are not statistically significant.

Two results on managers are a bit different from those on engineers. With FDI presence, the average age of managers tends to decrease for private firms, while the percentage of managers with foreign work experience tends to increase for these firms. In other words, the average quality of managers for private firms tends to be higher where FDI is present. Since there is no robust evidence for deteriorating quality of managers in SOEs, these results seem to suggest that the supply of managers is more elastic than we assume in the model. In particular, the inflow of FDI may have increased the pool of managers, especially those with foreign work experience. But it is interesting that only private domestic firms benefit from the larger pool of managerial talent, but not SOEs. Our explanation for the difference is the wage restriction faced by SOEs.

To understand the magnitudes of these effects, we compare the effects of an increase in FDI presence from zero to 20 percent in the city–industry cell on fully private and fully state–owned firms. Such an increase in FDI presence would lead to 60-70 percent increase in wages of both engineers and managers in private firms, but not in SOEs. It would also lower average education of engineers in SOEs and private firms by about 7 months, lower the average age of managers in private firms by 5.7 years, and increase the share of managers with foreign experience in private firms by 18 percentage points.

Taking account of the results reported above, summarized on the right panel of Table 2, the predictions from our model have been largely supported. In particular, we have found evidence that foreign firms have been competing with domestic firms for skilled labor, especially engineers. As a result, the average wage for engineers as well as managers has increased for private firms. In addition, consisted with out model, the presence of FDI leads to lower

average quality of engineers in both types of firms. In addition, if the presence of foreign firms enlarges the pool of managerial talents (as some of the results suggest), only private domestic firms benefit from it through hiring managers of higher quality. The wage restrictions seem to prevent the SOEs from hiring high quality managers, which is consistent with our finding that the wages of managers in SOEs are not affected by FDI presence.

4.4 Robustness tests

Our main concern with the data we use is that the measure of FDI presence is constructed using a small sample of the firms. Thus, we are concerned that one large firm with or without foreign presence will substantially affect the average foreign share we calculate for the city–industry cell. We therefore construct the alternative measure, for five manufacturing sectors only, using the census of manufacturing firms. We are comforted to find that the new measure is very similar to our original one: for the manufacturing sectors the simple correlation coefficient between the two FDI measures is 0.54, the adjusted R^2 of the regression of one measure on the other and city and industry fixed effects is 0.84, and the Spearman rank correlation coefficient is 0.64.[23]

Since the new measure seems to be substantially higher than our original one for three sectors in Guangzhou and one sector in Tianjin, to test whether our results are sensitive to the small differences in the FDI measure, we replace our original measure with the new measure for manufacturing sectors, while leaving the original measure for the service sectors.[24] All our results on labor quality hold both qualitatively and quantitatively. For the wage results, the P-values tend to increase because the new measure of FDI presence has higher variance, while qualitatively our results hold. We recover the statistical significance of the results if we use instead the $log(1 + new\ measure)$ which better matches the mean and the variance

[23]See Hale and Long (2007) for additional details and the tabulations of the alternative measure.

[24]We are unable to estimate the model for manufacturing sector only, because a small number of degrees of freedom is left when the sample is cut by half.

of our original measure.

We attempted alternative definitions of the FDI presence coming from our original data set. First, we used the same measure of FDI presence as in main specification, but for 2000 rather than for 1999. Our results are unchanged. Alternatively, we weighed the FDI share in each firm by the number of years since the firm first acquired a foreign partner, thus giving higher weight to FDI that was around for longer. We found that such modification does not affect our results much. We are thus fairly comfortable with the results reported in our main specification.

We reestimated the wage regressions controlling for the hiring conditions of the firms, specific to each type of labor, such as minimum age, education, and experience of new hires, as well as the number of job applications per vacancy. While this restricts our sample, we found that our results are robust to including such controls.

5 Conclusion

In this paper we found that the FDI presence in China increases the competition in the market for skilled labor. Such competition effects are reflected in an increase in wages that private firms pay to their skilled workers and in a decline in quality of skilled labor in SOEs that appear to be constrained in terms of wages they can pay to their employees. We find no such competition effects in the market for unskilled production workers.

These findings suggest that labor market institutions such as wage constraints have important implications on how FDI affects domestic firms. To the extent that many developing countries have rigid labor market conditions, our findings help explain why it is particularly difficult to find positive FDI spillovers in these countries.

These findings also suggest one reason why Hale and Long (2007) fail to find positive productivity spillovers from FDI into China, at least for the SOEs. If FDI leads to a lower quality

of skilled workers in SOEs, SOEs may lack human capital necessary for absorbing potential technological spillovers. This in turn implies that quicker privatization may be necessary in order to capture potential positive spillovers from FDI.

References

Aitken, B., and A. Harrison (1999): "Do Domestic Firms Benefit from Direct Foreign Investment? Evidence from Venezuela," *American Economic Review*, 90(3), 605–618.

Arnold, J., and B. S. Javorcik (2005): "Gifted Kids or Pushy Parents? Foreign Acquisitions and Plant Performance in Indonesia," CEPR Discussion Papers: 5065.

Bagchi-Sen, S., and J. Wheeler (1989): "A spatial and temporal model of foreign direct investment in the United States," *Economic Geography*, 65(2), 113–129, population size, population growth, and per capita retail sales.

Blomstrom, M., and R. Lipsey (1991): "Firm size and foreign operations of multinationals," *Scandinavian Journal of Economics*, 93(1), 101–107, domestic market size.

Blonigen, B. A. (2005): "A Review of the Empirical Literature on FDI Determinants," *NBER Working Paper*, 11299.

Cheng, L. K., and Y. K. Kwanb (2000): "What are the determinants of the location of foreign direct investment? The Chinese experience," *Journal of International Economics*, 51, 379–400.

Coughlin, C., J. Terza, and V. Arromdee (1991): "State characteristics and the location of foreign direct investment within the United States," *Review of Economics and Statistics*, 73(4), 675683, tax rate and infrastructure.

de Mooij, R. A., and S. Ederveen (2003): "Taxation and Foreign Direct Investment: A Synthesis of Empirical Research," *International Tax and Public Finance*, 10(6), 673–693, tax rate.

Dollar, D., M. Hallward-Driemeier, and T. A. Mengistae (2004): "Investment Climate and International Integration," WB Policy Research Working Paper 3323.

Fosfuri, A., M. Motta, and T. Rønde (2001): "Foreign Direct Investment and Spillovers through Workers Mobility," *Journal of International Economics*, 53(1), 205–222.

Fung, K. C., H. Iizaka, and S. Y. Tong (2004): "FDI in China: Policy, Recent Trend and Impact," *Global Economic Review*, 32(2), 99–130.

Glass, A., and K. Saggi (2002): "Multinational Firms and Technology Transfer," *Scandinavian Journal of Economics*, 104(4), 495–514.

Griliches, Z. (1969): "Capital-Skill Complementarity," *The Review of Economics and Statistics*, 51(4), 465–468.

Haaker, M. (1999): "Spillovers from Foreign Direct Investment through Labour Turnover: The Supply of Management Skills," Discussion Paper, London Scool of Economics.

Hale, G., and C. Long (2007): "Are there Productivity Spillovers from Foreign Direct Investment in China?," Pacific Basin Working Paper 2006-13.

Hallward-Driemeier, M., S. J. Wallsten, and L. C. Xu (2003): "The Investment Climate and the Firm: Firm-Level Evidence from China," World Bank Policy Research Working Paper No. 3003.

Huang, Y. (2003): *Selling China: Foreign direct investment during the reform era*, Cambridge Modern China Series. Cambridge; New York and Melbourne: Cambridge University Press.

Kato, T., and C. Long (2006a): "Executive Compensation, Firm Performance, and Corporate Governance in China: Evidence from Firms Listed in the Shanghai and Shenzhen Stock Exchanges," *Economic Development and Cultural Change*, 54(4).

——— (2006b): "Executive Turnover and Firm Performance in China," *American Economic Review: Papers and Proceedings*, 96(2).

Kaufmann, L. (1997): "A Model of Spillovers trough Labor Recruitment," *International Economic Journal*, 11(3), 13–34.

Kravis, I., and R. Lipsey (1982): "The location of overseas production and production for export by U.S. multinational firms," *Journal of International Economics*, 12(3/4), 201–223, domestic market size.

Krusell, P., L. E. Ohanian, J.-V. Rios-Rull, and G. Violante (2000): "Capital-Skill Complementarity and Inequality: A Macroeconomic Analysis," *Econometrica*, 68(5), 1029–53.

Ma, A. C. (2006): "Geographical Location of Foreign Direct Investment and Wage Inequality in China," *The World Economy*, 29(8), 1031–1055, access to international market.

Megginson, W. L., and J. M. Netter (2001): "From state to market: A survey of empirical studies on privatization," *Journal of Economic Literature*, 39, 321–389.

Moran, T. H. (2007): "How to Investigate the Impact of Foreign Direct Investment on Development, and Use the Results to Guide Policy," Paper prepared for the Brookings conference.

Sun, Q., W. Tong, and Q. Yu (2002): "Determinants of foreign direct investment across China," *Journal of International Money and Finance*, 21, 79–113.

Table 1: Wage effects of FDI on domestic firms

	Production workers	Tech. and mgmt.	Engineers	Managers
FDI	0.678	1.336*	1.376**	0.902
	(0.620)	(0.671)	(0.664)	(0.548)
Log(K/L)	0.126***	0.083***	0.069**	0.072***
	(0.039)	(0.027)	(0.031)	(0.025)
Constant	2.538***	2.597***	2.685***	2.556***
	(0.292)	(0.229)	(0.249)	(0.223)
Observations	793	819	828	1076
Adjusted R^2	0.06	0.12	0.11	0.12

Robust standard errors clustered on city–industry are in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 2: Model predictions and empirical results. Skilled labor.

	Model predictions		Test	Emprical results	
	Wage	Quality		Wage	Quality
Private vs. SOEs	higher	higher	Table 6	higher	higher
Foreign vs. private	higher	higher	Table 7	higher	higher
Effects of FDI: labor market competition channel					
Private firms	rises	ambiguous	Table 9	rises	rises[a] or falls[b]
SOEs	ambiuous	falls	Table 9	same	falls[b]
SOEs vs. private	differences increase		Table 9	differences increase	

[a] managers only
[b] engineers only

Table 3: Distribution of Foreign and Domestic Firms

	All	Foreign	Domestic	Private share[a]
Number of firms	1500	382	1118	1118
by city:				
1. Beijing	300	75	225	0.31
2. Chengdu	300	32	268	0.39
3. Guangzhou	300	84	216	0.46
4. Shanghai	300	122	178	0.16
5. Tianjin	300	69	231	0.39
by industry:				
1. Accounting etc.	104	11	93	0.41
2. Advertising and marketing	89	15	74	0.39
3. Apparel and leather	222	63	159	0.36
4. Business logistics services	110	22	88	0.14
5. Communication services	71	3	68	0.12
6. Consumer products	165	40	125	0.39
7. Electronic components	203	77	126	0.36
8. Electronic equipment	192	65	127	0.37
9. IT services	128	21	107	0.49
10. Vehicles and parts	216	65	151	0.37

[a] For domestic firms only

Table 4: FDI presence by city and industry sector in 1999

Sector, city	Beijing	Chengdu	Guangzhou	Shanghai	Tianjin	Overall
Accounting and related services	0.186	0.000	0.011	0.000	0.022	0.048
Advertising and marketing	0.036	0.008	0.013	0.095	0.193	0.074
Apparel and leather goods	0.162	0.009	0.212	0.174	0.311	0.172
Business logistics services	0.006	0.000	0.032	0.040	0.044	0.024
Communication services	0.000	0.008	0.000	0.000	0.008	0.003
Consumer products	0.097	0.061	0.108	0.185	0.324	0.161
Electronic components	0.149	0.038	0.207	0.302	0.458	0.231
Electronic equipment	0.253	0.014	0.065	0.353	0.240	0.189
Information technology services	0.052	0.068	0.020	0.154	0.009	0.054
Vehicles and vehicle parts	0.123	0.096	0.125	0.238	0.121	0.139
Overall	0.129	0.036	0.104	0.186	0.209	0.133

Table 5: Summary statistics

	Domestic			
Variable	Mean (SOE)	Mean(private)	Diff.	Foreign
Log of Wage (prod.worker)	2.07	2.01	0.06	2.37
Log of Wage (engineer)	2.52	2.70	-0.18**	3.09
Log of Wage (manager)	2.54	2.68	-0.14*	3.16
Age (prod. worker)	34.6	30.5	4.0***	29.1
Age (engineer)	37.5	34.2	3.4***	32.8
Age (manager)	39.2	35.9	3.3***	35.1
Education (prod.worker)	9.84	9.56	0.28**	9.78
Education (engineer)	13.1	13.5	-0.32***	13.6
Education (manager)	12.6	12.7	-0.19*	13.1
Engineers with foreign experience	0.004	0.11	-0.006**	0.020
Managers with foreign experience	0.030	0.064	-0.034***	0.15
Skill ratio	0.31	0.36	-0.056***	0.35
Wage spread	0.44	0.58	-0.14**	0.66
Firm age	23.7	9.92	13.8***	8.30
Log of capital stock	9.63	8.21	1.42***	10.0
Log of labor force	5.60	4.76	0.84***	5.4
Observations[a]	326	792		382

Note: SOE is defined as private share<1, private$=not(SOE)$

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

[a] Due to missing values, the number of observations for each variable may be smaller

Table 6: Differences between domestic private firms and SOEs

Dependent var.	β(private share)	Robust S.e.	Controls	Adj.R^2	N.(obs)
Wage					
Log (avg. wage)					
production workers	0.012	(0.093)	Log(K/L)	0.07	793
engineers	0.17**	(0.080)	Log(K/L)	0.13	828
managers	0.18***	(0.070)	Log(K/L)	0.14	1076
production workers	0.022	(0.10)	Log(K/L), quality[b]	0.07	778
engineers	0.10	(0.081)	Log(K/L), quality[b]	0.13	790
managers	0.13*	(0.074)	Log(K/L), quality[b]	0.15	1013
Labor quality					
Avg. age					
production workers	-5.00***	(0.59)	Log(K), firm age	0.38	784
engineers	-2.33***	(0.61)	Log(K), firm age	0.27	830
managers	-3.90***	(0.48)	Log(K), firm age	0.27	1075
Avg. education					
production workers	-0.28**	(0.13)	Log(K)	0.21	789
engineers	0.042	(0.12)	Log(K)	0.18	831
managers	0.29**	(0.11)	Log(K)	0.25	1077
Avg. foreign experience					
engineers	0.012**	(0.005)	Log(K)	0.18	820
managers	0.073***	(0.013)	Log(K)	0.11	1050

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

[b] quality controls include avg. age, avg. age squared, and avg. education of the relevant group as well as controls for foreign experience for engineers and managers

Estimated by OLS. City*sector fixed effects included in all regression

Sample limited to domestically owned firms

Table 7: Differences between foreign and domestic private firms

Dependent var.	β(foreign share)	Robust S.e.	Controls	Adj.R^2	N.(obs)
Wage					
Log (average wage)					
production workers	0.16	(0.12)	Log(K/L)	0.06	791
engineers	0.29**	(0.13)	Log(K/L)	0.12	832
managers	0.50***	(0.11)	Log(K/L)	0.15	1075
production workers	0.14	(0.13)	Log(K/L), quality[b]	0.06	776
engineers	0.24*	(0.13)	Log(K/L), quality[b]	0.12	801
managers	0.36***	(0.12)	Log(K/L), quality[b]	0.16	1017
Labor quality					
Avg. age					
production workers	-2.33***	(0.79)	Log(K), firm age	0.33	782
engineers	-2.32***	(0.76)	Log(K), firm age	0.26	837
managers	-1.63**	(0.70)	Log(K), firm age	0.22	1071
Avg. education					
production workers	0.15	(0.19)	Log(K)	0.21	782
engineers	0.11	(0.17)	Log(K)	0.20	839
managers	0.73***	(0.15)	Log(K)	0.28	1074
Avg. foreign experience					
engineers	0.009	(0.007)	Log(K)	0.12	815
managers	0.12***	(0.033)	Log(K)	0.09	1027

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

[b] quality controls include average age, average age squared, and average education of the relevant group as well as controls for foreign experience for engineers and managers

Estimated by OLS. City*sector fixed effects included in all regression

Sample limited to private firms

Table 8: Effect of FDI on domestic private firms and SOEs. OLS

	Coefficient on					
Dependent var.	Private shr.	FDI	FDI*Prv.shr.	Controls	Adj.R^2	N.(obs)
Wage						
Log (average wage)						
production workers	-0.079	0.60	0.20	Log(K/L)	0.06	793
engineers	0.057	1.17*	0.69	Log(K/L)	0.11	828
managers	-0.016	0.46	1.35**	Log(K/L)	0.12	1076
production workers	-0.075	0.58	0.25	Log(K/L), quality[b]	0.06	778
engineers	0.008	1.33*	0.50	Log(K/L), quality[b]	0.11	790
managers	-0.11	0.47	1.76***	Log(K), quality[b]	0.13	1013
Labor quality						
Avg. age						
production workers	-4.89***	3.31	-3.62	Log(K), firm age	0.38	784
engineers	-2.62**	3.22	0.56	Log(K), firm age	0.27	830
managers	-3.21***	1.40	-7.96	Log(K), firm age	0.27	1075
Avg. education						
production workers	-0.47*	-0.023	0.56	Log(K)	0.20	789
engineers	-0.066	-0.324	0.83	Log(K)	0.17	831
managers	0.046	-0.896	1.95*	Log(K)	0.24	1077
Avg. foreign experience						
engineers	0.003	-0.027	0.036	Log(K)	0.001	820
managers	0.049**	-0.001	0.30**	Log(K)	0.08	1050

* significant at 10%; ** significant at 5%; *** significant at 1%. S.e. are clustered on city*sector cells

[b] quality controls include avg. age, avg. age squared, and avg. education of the relevant group as well as controls for foreign experience for engineers and managers

Estimated by OLS. City fixed effects and sector fixed effects included in all regression

Sample limited to domestically owned firms

Table 9: Effect of FDI on domestic private firms and SOEs. IV

Dependent var.	Coefficient on Private shr.	$\widehat{FDI}$	$\widehat{FDI \cdot PR}$	Prob($>F$) $\widehat{FDI} + \widehat{FDI \cdot PR} = 0$	Adj.R^2	N.(obs)	Shea $R^2(1)$	Shea $R^2(2)$	J-test Prob($>\chi^2$)
Wage									
Log(average wage)									
production workers	-0.19	2.71	0.99	0.17	0.06	793	0.12	0.29	0.60
engineers	-0.079	1.95	1.60**	0.033**	0.12	828	0.11	0.45	0.69
managers	-0.17	0.32	2.67**	0.064*	0.13	1076	0.13	0.30	0.61
production workers	-0.22	1.75	1.29	0.17	0.08	778	0.12	0.29	0.57
engineers	-0.10	2.60	1.08	0.04**	0.13	790	0.11	0.46	0.60
managers	-0.27**	-0.11	3.02***	0.06**	0.15	1013	0.13	0.30	0.35
Labor quality									
Avg. age									
production workers	-4.36**	-7.21	-7.47	0.17	0.36	784	0.12	0.30	0.25
engineers	-1.86	4.17	-5.14	0.93	0.28	830	0.13	0.51	0.13
managers	-2.34*	-11.2	-17.1**	0.003***	0.23	1075	0.15	0.34	0.15
Avg. education									
production workers	-0.12	-2.21	-2.04	0.16	0.19	789	0.12	0.31	0.17
engineers	0.061	-2.85*	-0.25	0.10*	0.17	831	0.13	0.52	0.95
managers	-0.51	-3.13	2.83*	0.89	0.24	1077	0.15	0.34	0.56
Avg. foreign experience									
engineers	-0.003	0.039	0.11	0.27	-0.01	820	0.12	0.52	0.28
managers	0.0001	0.24	0.67**	0.006***	0.06	1050	0.15	0.34	0.19

* significant at 10%; ** significant at 5%; *** significant at 1%. S.e. are clustered on city*sector cells
Estimated by GMM. City FEs and sector FEs included in all regression
Sample limited to domestically owned firms. Controls are the same as in Table 8.