

# **The Impact of Foreign Direct Investment on State-Owned Enterprises Reform**

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December 2003

## **Abstract**

The increasing speed of globalisation has created both opportunities and challenges to many transitional economies. This paper analyses the impact of foreign direct investment (FDI) on the productivity of the State-Owned Enterprises (SOEs) and concludes that SOE reform is inevitable. The SOEs' obligations to provide social welfare should be removed to enable them to compete on an equal footing with foreign firms. Moreover, it is essential to build a social safety net to assist the losers in this reform. These policies will facilitate the transition from central planning to open market economy without triggering devastating unemployment and social instability.

JEL classification: F23, O19, O53, P33

Key words: labour market reform, transitional economy

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## 1. Introduction

As many transitional economies embraced free trade and welcomed foreign direct investment (FDI), there has been an increasing literature on how trade and FDI can influence the product market and the organization of firms in China and Eastern Europe. There is also a rich literature on the impact of different types of economic and political reforms on a country's social welfare in the transition from a planned economy to a market economy. However, studies focusing on reforms in the labour market have received increasing attention only very recently as reform usually first starts in the product market where competition is more noticeable. However, it becomes more apparent that labour market reform can be the key and the last hurdle to a successful transition to a market economy.

In the labour market, the employment system in the state sector in most transitional economies is inherited from the command-and-control system originated in the former Soviet Union. Under this system before reform, government officials allocated jobs in the state sector to people entering the urban labour force via a central placement system, and monitored closely internal promotions and external job transfers. Migration between rural and urban sectors was, and is still to some degree, restricted by regulations such as the Household registration (*Hu Kou*) system in China. Under this system, the State Owned Enterprises (SOEs) had an advantage in choosing its employees first from the job candidates. Job seekers entering the labour force had few legitimate ways, except via connection and corruption, to approach potential employers. On the other hand, jobs of formal employees in the state sector were extremely secure, and were called "iron rice bowls" (*Tie Fan Wan*) in China.

Since most SOEs had to meet an employment target set by the government and could not commit on future firing *ex ante* in a transitional economy, this command-and-control system, over the years, has created a lot of surplus labour (Fella, 2000). For example, the latest population census conducted in November 2000 in China (*Major Figures on 2000 Population Census of China*, 2000) estimates that as much as 25 percent of the 711.5 million workers was redundant (including disguised unemployment). Besides reducing productivity and creating disguised unemployment, the command-and-control system has brought another pitfall. Most SOEs have covered all medical expenses, housing and food subsidy, and social security of their employees. Some firms even have had their own day care centres, kindergartens, and pre-schools

offering high quality education service at heavily subsidized rates. The state sector was all three: a firm, an insurance company, and a social welfare provider.

Due to various government restrictions and insufficient demand and funding, private medical and unemployment insurance providers rarely existed in most transitional economies before economic reform. Thus, most of the fringe benefits offered by the SOEs were available only for employees in the state sector. Also, most of these benefits were distributed among workers according to their seniority, regardless of their effort spent on acquiring experience on the job. In a sense, the gap between wage and marginal productivity was a premium paid to receive a uniform welfare package designed for all employees with the same number of years in service. Due to the disadvantages in acquiring human, physical, and financial capital, many collective owned domestic enterprises in the non-state sector had “backward” technology and failed to compete for the best workers in the labour force.<sup>1</sup>

This situation is changing rapidly with the increasing influx of FDI into these transitional economies as they gradually adopt more favourable policies toward international trade and investment. Foreign firms have opened many new job search channels, including private employment agencies, job fairs, newspaper advertisements, and Internet job boards. These channels have enabled effective information exchange between job seekers and potential employers, offered more job opportunities to qualified workers, increased productivity, and led to faster wage increase in the non-state sector, especially in foreign firms either wholly foreign-owned or joint ventures. Meanwhile, hiring and firing as well as wage setting in the state sector is still largely under government control. Thus, on the one hand, growth in the non-state sector definitely provides more employment opportunities for the surplus labour in the state sector. On the other hand, faster growth outside the state sector also facilitates foreign firms to recruit (or compete for) high-calibre workers from the SOEs. This can hinder the productivity in the state sector, increase the number of non-profitable SOEs, and hence create more difficulties to reform the state sector.

Gordon and Li (1999) conducted the first study on the potential wage distortions and labour migration between the state and the non-state sectors due to the above disparities in these

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<sup>1</sup>For example, in China, SOEs received most of their raw materials, capital, and loans at discounted prices (Gordon and Li, 1991). Even now, non-state-owned enterprises still have less access to loans because a majority of financial institutions are still owned by the government or managed by government-appointed officials.

two sectors. They found two interesting results: (1) the skills of workers in the state sector declined as the most able workers leave; (2) productivity was higher in the non-state sector with more able workers. Based on these findings, they further examined the implications of higher wages in the non-state sector on government income tax policies.

This paper will extend their study to focus on the impact of increasing FDI inflow on the productivity in and labour migration between the state and the non-state sectors. The paper will then discuss the urgency for SOE reform, and draw policy implications and recommendations to carry out SOE reform facing the challenges from increasing globalisation. Since the two biggest advantages of jobs in the state sector are security and fringe benefits, this paper will incorporate unemployment into the model developed by Gordon and Li (1999), but take the tax policy as given to isolate out any revenue and income redistribution incentives already examined in their paper. Hence, more FDI inflow creates more job opportunities outside the state sector and hence increases the probability of getting a job in the non-state sector. In Gordon and Li (1999), migration between sectors becomes possible only after economic reform. Since such reform has started in most countries before the rise in FDI, this paper will analyse the case where migration is possible but may not be chosen by state employees before FDI surges.<sup>2</sup>

The paper will demonstrate that, while reforms in Eastern Europe and China are often contrasted as comprehensive versus partial; rapid versus gradual; “big-bang” versus experimental; central control versus local flexibility (Qian, Roland and Xu, 1999), the SOEs in both Eastern Europe and China may indeed face similar problems inherited from the same command-and-control system originated in the former Soviet Union. In all these transitional economies, more FDI inflow will decrease the productivity and hence competitiveness of the SOEs under the old compensation system in the state sector, which will make SOE reform inevitable. Hence, they may need the same remedies as follows.

To carry out SOE reform successfully, governments should reduce the social service burdens (including employment targets) imposed on the SOEs and enable them to compete on an equal footing with foreign firms. Meanwhile, it is also essential to provide a social safety net in order to accommodate potential losers. Otherwise, reform can receive very damaging resistance from workers although it can eventually cause a possible subsequent increase in jobs after an initial reduction as studied in Aghion, Blanchard and Burgess (1994) and Kenway (1996). Hence,

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<sup>2</sup>Details of other modifications to the model in Gordon and Li (1999) are discussed in the next section.

corresponding reforms in the private insurance market and establishment of separate government welfare agencies should accommodate SOE reform to facilitate the transition from central planning to a more open economy without triggering dangerous unemployment problems leading to social instability.

In the literature, Gordon and Li (1991) show that decentralized decision making and revised reward schemes to managers of the SOEs can increase efficiency because price distortions in the final and intermediate good markets evade government tax revenue and result in increasing corruption and rent-seeking behaviour. Li (1997) examines the total factor productivity growth due to improved managerial incentives, intensified product market competition, and improved factor allocation. This paper will, instead, examine the compensation scheme for all workers rather than focus on the reward scheme for managers. Qian, Roland, and Xu (1998) also discuss the urban unemployment problem during SOE reform. They draw attention to the municipal governments as a new channel of job search in China's state sector.

Other related works on China's SOE reform in providing the right managerial incentives include Che and Qian (1998), Groves, et al. (1994, 1995), Lau, Qian, and Roland (2000), and Masking, Qian, and Xu (2000). A parallel study on restructuring the SOEs in Central and Eastern Europe is discussed in Blanchard, et al. (1991), Commander and Coricelli (1995), and Roland and Sekkat (2000). A comparison between China's economic reform with that in Eastern Europe is outlined in Qian and Xu (1993) and Qian, Roland, and Xu (1999).

The rest of the paper is organized as follows. Section 2 incorporates the asset-value approach in Davidson and Matusz (2000a, 2000b) and Shapiro and Stiglitz (1984) into Gordon and Li (1999), and develops a job search model to capture unemployment in two partially integrated markets: one for the state sector and one for the non-state sector. The equilibrium in this segmented job market is derived to model labour migration and productivity differences between these two sectors. Section 3 uses this theoretical framework to examine the impact of more FDI inflow on labour productivity and migration. The theoretical findings are supported by the empirical data for the Chinese economy. Section 4 concludes with policy implications and SOE reform recommendations for a transitional economy in the globalisation process.

## 2. Theoretical Model

### 2.1 Compensation schemes

This section develops a job search model to analyse the impact of FDI on the compensation scheme (wage and fringe benefits) offered in the state sector and the market equilibrium wage in the non-state sector. The paper will then examine the productivity and labour migration between these two sectors as FDI inflow increases.

Following Gordon and Li (1999), this study allows for productivity and non-productivity differences among workers by considering an economy with a continuum of workers of different ages ( $a$ ) and different levels of skills or ability ( $b$ ).  $a$  reflects a worker's non-productive idiosyncrasy such as "pure" seniority regardless of the level of experience accumulated on the job, while  $b$  reflects a worker's ability as a result of education, health, job training/experience, and any other factors that directly or indirectly affect productivity.<sup>3</sup> As in Gordon and Li, both  $a$  and  $b$  are assumed to be distributed uniformly over the interval  $[0,1]$ , and the two distributions are independent of each other.

Suppose that a worker's marginal product equals  $be$ , i.e., each worker with ability  $b$  and effort  $e$  produces one unit of the final product. Normalize the price of the good to one. Hence,  $b$  measures a worker's productivity at a given effort level. Each worker's utility per period is assumed to be  $U(m) + f - V(e)$ , where  $m$  is for monetary income and  $f$  for fringe benefits. In the state sector,

$$m_s = \alpha be, \quad f_s = aB, \quad (1)$$

where  $\alpha \in [0,1]$  is the percentage return to productivity and  $B$  gives the additional fringe benefits that a worker receives as her seniority on the job advances one more year. Hereafter, a "younger" worker refers to one who qualifies for fewer fringe benefits due to her lack of non-productive characteristics. Both  $\alpha$  and  $B$  are determined by the elected or assigned government

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<sup>3</sup>In reality, age is related to experience and hence to productivity. However,  $a$  here only represents one's number of years in service, and one's experience should be captured in  $b$  as most fringe benefits are distributed purely according to one's seniority regardless of one's effort in making any progress or obtaining any experience on the job.

officials in the state sector, who represent the collective interest of all employed workers in the state sector as modelled in most studies on unions and SOEs.

Since most fringe benefits modelled in this paper, such as housing, medical care, and recreational facilities, are non-monetary in-kind transfers,  $f$  provides specific goods or services that increase a worker's utility but are not convertible to other goods or services as money could. Hence,  $U(m) \geq f$  for any given  $m = f$ . Also,  $U(\cdot)$  is assumed to be strictly concave and  $V(\cdot)$  strictly convex with  $U(0) = V(0) = 0$ . Suppose the cost of providing fringe benefits in a competitive market is one, the same as the price of the final good, then firms in the non-state sector will allocate all money to wage payments and spend nothing to provide fringe benefits because monetary wages provide more flexibility and hence higher utility to workers at the same cost. Thus, in the competitive non-state sector,

$$m_n = be, \quad f_n = 0. \quad (2)$$

The trade-off between a state-sector job and a non-state-sector job is that workers in the state sector receive a wage lower than their marginal productivity in exchange for higher benefits.<sup>4</sup>

On the other hand, government officials in the state sector have an incentive to provide in-kind fringe benefits because of the monetary and/or non-monetary subsidies or “soft” budget on subsidy payments that bring their cost ( $\beta$ ) of providing fringe benefits ( $f$ ) below the market cost, i.e.,  $0 < \beta < 1$ .<sup>5</sup> In the first stage, the officials choose  $\alpha$  and  $B$  to maximize the aggregate expected lifetime utility of all workers (currently employed in the SOEs) subject to the budget constraint,

$$\iint_A (\alpha be^* + \beta aB) dadb = \iint_A be^* dadb, \quad (3)$$

where  $A$  is the set of all workers in the state sector. Given  $\alpha$  and  $B$ ,  $e^*$  is chosen in the second stage as each worker's optimal choice of effort level to maximize her own discounted expected

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<sup>4</sup>  $B$  can be interpreted as the extra fringe benefits offered in the state sector compared to the non-state sector if firms in the non-state sector also offer positive fringe benefits. Also, the monetary payment in the non-state sector could be also less than one if some taxes are levied to provide social welfare. The following analysis will remain unaffected by these fine adjustments as long as the state sector offers a lower wage to exchange for a higher fringe benefit exceeding what can be purchased at the market rate, which is true in most cases.

<sup>5</sup> There is an interesting literature on the “soft” versus “hard” budget constraints on subsidies, taxes, loans, etc. in transitional economies. The more recent work by Kornai (2001) provides a good overview of this literature.

lifetime utility. Clearly,  $\alpha < 1$  if  $B > 0$  and  $B = 0$  if  $\alpha = 1$  at any given level of effort. Facing different compensation schemes, a worker will choose different effort levels,  $e_s^*$  if employed in the state sector and  $e_n^*$  if employed in the non-state sector, depending on her age and ability. The next section will solve for  $e_s^*$ ,  $e_n^*$ ,  $\alpha$ , and  $B$  by backward induction.

The above assumptions are similar to that in Gordon and Li (1999) except that  $f$  increases with seniority as shown in Lau, Qian, and Roland (2000) and contributes directly to utility while  $m$  is converted to utility through  $U$ . As the analysis here studies the impact of FDI on labour migration between the state and non-state sectors rather than examining government distributional tax policies as in Gordon and Li (1999), there are three other modifications to their model. First, workers can become unemployed and reemployed after a job search. Hence, an increase in FDI increases job opportunities and the probability of reemployment in the non-state sector. Second, workers discount their future wage and benefits. As FDI increases, it becomes easier to get a job in the non-state sector once unemployed and hence the value of security from state sector jobs decreases. Third, the following analysis separates the government's budget in subsidizing the SOEs from its other objectives so that tax revenues do not enter into budget constraint (3) directly. Instead, taxes are treated exogenous so that government revenues including tax revenues reflect the "softness" of a firm's budget, and affect wage in the state sector only through an exogenous change in the cost of government-subsidized provision of fringe benefits ( $\beta$ ).

## 2.2 *Expected lifetime utilities*

The following analysis adopts the approach in Davidson and Matusz (2000a, 2000b) and Shapiro and Stiglitz (1984) to model the hiring and firing as a Poisson process. It is assumed that the probability that a worker gets laid off each period is the same for all workers,  $p_s$  in the state sector and  $p_n$  in the non-state sector.  $p_s \leq p_n$  as jobs in the state sector are in general more secure than those in the non-state sector.

Under the command-and-control system in a planned economy, many transitional economies still, to a large extent, administratively allocate workers to available positions that are limited due to the high percentage of redundant labour in the state sector. Usually, there are

many legal barriers for people outside the state sector to get a job inside the state sector. For example, the household registration (*HuKou*) system in China is still very effective in preventing rural labour getting a job in the urban state sector. However, most of these restrictions do not apply to the non-state sector. Hence, it is assumed that the probability of finding a job in the state sector via job search is zero. For people entering the labour force, they are either assigned a job in the state sector or become job seekers in the non-state sector with probability  $q$  of being employed each period.

We now derive a worker's expected lifetime utility (asset-value),  $V_i^E(a, b)$  for one who is currently employed in sector  $i$  and  $V_i^S(a, b)$  for one who is laid off from sector  $i$  and is searching for a job, where  $i = s$  for the state sector and  $i = n$  for the non-state sector. Workers who become unemployed from the state sector receive a sustainable wage ( $\underline{w}$ ) while those from the non-state sector receive nothing when they remain unemployed.<sup>6</sup>

Following Davidson and Matusz (2000a, 2000b) and Shapiro and Stiglitz (1984), the asset-value equation for a worker who is employed in the state sector can be written as<sup>7</sup>

$$rV_s^E(a, b) = U(\alpha be_s) + \left( a + \frac{1}{p_s + r} \right) B - V(e_s) + p_s [V_s^S(a, b) - V_s^E(a, b)]. \quad (4)$$

The asset-value equation for a worker who is employed in the non-state sector is

$$rV_n^E(a, b) = U(be_n) - V(e_n) + p_n [V_n^S(a, b) - V_n^E(a, b)]. \quad (5)$$

The asset-value equation for an unemployed worker is

$$rV_s^S(a, b) = U(\underline{w}) + q [V_n^E(a, b) - V_s^S(a, b)] \quad (6)$$

if originally employed in the state sector, and is

$$rV_n^S(a, b) = q [V_n^E(a, b) - V_n^S(a, b)] \quad (7)$$

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<sup>6</sup>As with fringe benefits,  $\underline{w}$  can be interpreted as the extra unemployment benefits offered in the state sector than in the non-state sector if some firms in the non-state sector also offer unemployment benefits.

<sup>7</sup>Because  $V_s^S(a, b)$  does not depend on when a worker enters the unemployment pool in a Poisson process, equation (4) is derived from  $V_s^E(a, b) = \int_0^\infty p_s e^{-p_s T} \left[ \int_0^T e^{-rt} (U(m_s) + (a+t)B - V(e_s)) dt + e^{-rT} V_s^S(a, b) \right] dT$  by integration by parts.  $tB$  is the only term that differs from those in Shapiro and Stiglitz (1984) and is the extra fringe benefit that a worker receives if she stays employed in the state sector for another  $t$  periods/years. Details are in the technical note to be provided by request. All remaining asset-value equations are derived similarly.

if originally employed in the non-state sector or just entering the labour force.

The intuition of Equation (4) is made clear by regarding the discounted expected lifetime utility generated by employment as an asset.  $rV_s^E(a, b)$  is then the flow income that is generated by this asset. This is equal to the instantaneous utility adjusted by the capital loss that would be realized if employment were terminated. The capital loss is represented by the expression in brackets, which is then multiplied by  $p_s$ , the rate at which losses are realized.

Given a worker's age and level of ability, Equations (5) through (7) give the asset-values for workers who are currently unemployed,

$$V_s^S(a, b) = \frac{U(\underline{w})}{q+r} + \frac{q}{r(p_n + q+r)} (U(be_n) - V(e_n)), \quad (8)$$

$$V_n^S(a, b) = \frac{q}{r(p_n + q+r)} (U(be_n) - V(e_n)). \quad (9)$$

Substituting these two asset-value equations into Equations (4) and (5) gives the asset-values for workers who are currently employed.

$$V_s^E(a, b) = \frac{1}{p_s + r} \left\{ U(\alpha be_s) - V(e_s) + \frac{p_s q}{r(p_n + q+r)} (U(be_n) - V(e_n)) + \left( a + \frac{1}{p_s + r} \right) B + \frac{p_s U(\underline{w})}{q+r} \right\} \quad (10)$$

$$V_n^E(a, b) = \frac{q+r}{r(p_n + q+r)} (U(be_n) - V(e_n)) \quad (11)$$

### 2.3 Steady state equilibrium

In the second stage, a worker chooses the current effort levels  $e_s(a, b)$  to maximize  $V_s^E(a, b)$  in Equation (4) if employed in the state sector and  $e_n(a, b)$  to maximize  $V_n^E(a, b)$  in Equation (5) if employed in the non-state sector, taking  $\alpha$ ,  $B$ , and the future values of  $V_s^E(a, b)$  and  $V_n^E(a, b)$  as given. Since a worker enters and leaves the unemployment pool following a Poisson process, the following first order conditions give the implicit solutions for  $e_s^*$  and  $e_n^*$ .

$$\alpha b U'( \alpha b e_s^* ) = V'(e_s^*) \quad (12)$$

$$b U'( b e_n^* ) = V'(e_n^*) \quad (13)$$

As  $\alpha \leq 1$ ,  $e_n^* \geq e_s^*$  for all workers if  $U'(\alpha be_s^*) \geq -\alpha be_s^* U''(\alpha be_s^*)$ , which is more likely to hold for low levels of  $\alpha$ ,  $b$ , or  $e_s^*$ . Like in Gordon and Li (1999), the following analysis assumes that this condition holds.<sup>8</sup>

$e_n^*$  increases only with a worker's ability, and is independent of age, the discount rate, the probability of being laid off in either sector, and the probability of getting a new job. The same is true for  $e_s^*$ , except that  $e_s^*$  increases with  $\alpha$ . Thus, we can rewrite the solutions to Equations (12) and (13) as  $e_s^*(b, \alpha)$  and  $e_n^*(b)$ , respectively.

Given each worker's optimal choice of effort,  $e_s^*(b, \alpha)$  and  $e_n^*(b)$ , a worker employed in the state sector determines whether she wants to search for a job in the non-state sector. There is no loss of generality to assume that the search cost is zero. The probability of successfully migrating to the non-state sector in the same period is  $q$ . The unsuccessful workers will stay in the state-sector. Therefore, a worker wants to leave the non-state sector if

$$q(V_n^E(a, b) - V_s^E(a, b)) > 0. \quad (14)$$

Substituting in Equations (10) and (11) and evaluating the above condition at the optimal effort levels determined by Equations (12) and (13) give

$$\frac{p_s + q + r}{p_n + q + r} [U(be_n^*) - V(e_n^*)] > \left[ U(\alpha be_s^*) + \left( a + \frac{1}{p_s + r} \right) B - V(e_s^*) + \frac{p_s U(w)}{q + r} \right]. \quad (15)$$

Since  $e_s^*$  and  $e_n^*$  do not depend on  $r$ ,  $p_s$ ,  $p_n$ , and  $q$ , for workers with the same ability ( $b$ ), there is a cut-off age  $\underline{a}(b)$ . All workers younger than  $\underline{a}(b)$  search for a job in the non-state sector and successfully migrate to the non-state sector with probability  $q$  in each period, and all those older than  $\underline{a}(b)$  or younger but fail to find a job in the non-state sector stay in the state sector. Since the relative impact of  $p_s$  and  $p_n$  is quite intuitive, the following analysis assumes  $p_n = p_s$  to focus on the effect of  $q$  on the compensation scheme in the state sector ( $\alpha$  and  $B$ ), the effort levels ( $e_s^*$  and  $e_n^*$ ), and the migration between the state and the non-state sector.<sup>9</sup> Thus,

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<sup>8</sup>The next section will show that this condition together with the other assumptions mentioned later in this section is likely to hold for China's case.

<sup>9</sup>The major results in this paper will stay the same as long as  $p_n \geq p_s$ .

$$\underline{a}(b) = \frac{1}{B} \left\{ \left[ U(be_n^*) - V(e_n^*) \right] - \left[ U(\alpha be_s^*) - V(e_s^*) + \frac{p_s U(w)}{q+r} \right] \right\} - \frac{1}{p_s + r}. \quad (16)$$

If the age of the youngest worker who is willing to stay in the state sector is non-positive, i.e.,  $\underline{a}(b) \leq 0$ , then all workers want to stay in the state sector. Let  $\underline{a}(b) = 0$  in the following analysis. If the age of the youngest worker who is willing to stay is greater than one, i.e.,  $\underline{a}(b) \geq 1$ , then all workers want to seek a job in the non-state sector. Let  $\underline{a}(b) = 1$  in the following analysis.

Finally, substituting each worker's choice of effort,  $e_s^*(b, \alpha)$  and  $e_n^*(b)$ , and the minimum age  $\underline{a}$  for each group of workers with ability  $b$  into Equation (10), the government officials'

objective function,  $\iint_A V_s^E(a, b) da db = \int_0^1 \left( (1-q) \int_0^{\underline{a}} V_s^E(a, b) da + \int_{\underline{a}}^1 V_s^E(a, b) da \right) db$ , becomes

$$\frac{1}{p_s + r} \int_0^1 \left[ (1-q\underline{a}(b)) (U(\alpha be_s^*) - V(e_s^*) + p_s V_s^S) + B \left( \frac{1-q\underline{a}(b)}{p_s + r} + \frac{1-q\underline{a}(b)^2}{2} \right) \right] db, \quad (17)$$

where  $V_s^S$  is given by Equation (8) in which  $e_n = e_n^*(b)$ . Similarly, budget constraint (3) becomes

$$\int_0^1 \left[ \alpha be_s^*(b, \alpha) (1-q\underline{a}(b)) + \frac{\beta B}{2} (1-q\underline{a}(b)^2) \right] db = \int_0^1 (1-q\underline{a}(b)) be_s^*(b, \alpha) db. \quad (18)$$

From the above constraint,

$$B = \frac{2(1-\alpha) \int_0^1 (1-q\underline{a}(b; \alpha)) be_s^*(b, \alpha) db}{\beta \int_0^1 (1-q\underline{a}(b; \alpha))^2 db}. \quad (19)$$

In the first stage, the government officials' maximization problem (17) becomes a function of a single variable  $\alpha$  by substituting (16) and (19) into (17). Evaluating the first order condition of this maximization problem at Equations (12) and (13) gives that  $\alpha$  satisfies

$$\left\{ 1 - q\underline{a}(b) + q \left( U(\alpha be_s^*) - V(e_s^*) + p_s V_s^S + \frac{B}{p_s + r} + \underline{a}(b) B \right) \right\} be_s^* U'(\alpha be_s^*) + \left( \frac{1-q\underline{a}(b)}{p_s + r} + \frac{1-q\underline{a}(b)^2}{2} \right) \frac{dB}{d\alpha} = 0, \quad (20)$$

where  $\underline{a}(b)$  is given by Equation (16) and  $dB/d\alpha$  is derived from Equation (19). From budget constraint (3),  $dB/d\alpha$  is negative at any given effort  $e^*$  and set of employees  $A$ . However,  $\alpha$

increases the incentive of each worker in the state sector to spend more effort and also to stay in the state sector, i.e.  $e_s^*$  increases and  $\underline{a}(b)$  decreases, both increase the total budget to spend on wage and fringe benefit. The following analysis assumes that these secondary effects will not dominate the initial trade-off between  $\alpha$  and  $B$  so that  $dB/d\alpha < 0$ . Following the analysis in Gordon and Li (1999), we assume that parameters fall in the range so that the first and second order conditions for an interior maximum  $\alpha^*$  are satisfied. Finally,  $B^*$  is given by substituting the solution of  $\alpha^*$  into Equation (19).

### 3. The Impact of FDI

#### 3.1 FDI and labour migration

This section will first illustrate solution (20) from the maximization problem (17) subject to (18) in Figure 1. Since more FDI inflow leads to more job opportunities in the non-state sector and hence increases  $q$ , this section will analyse how a higher  $q$  changes the slope of the curves in Figure 1, and then derive propositions on how inward FDI can influence the compensation schemes and productivities in both sectors as well as the labour migration between the state and the non-state sectors.

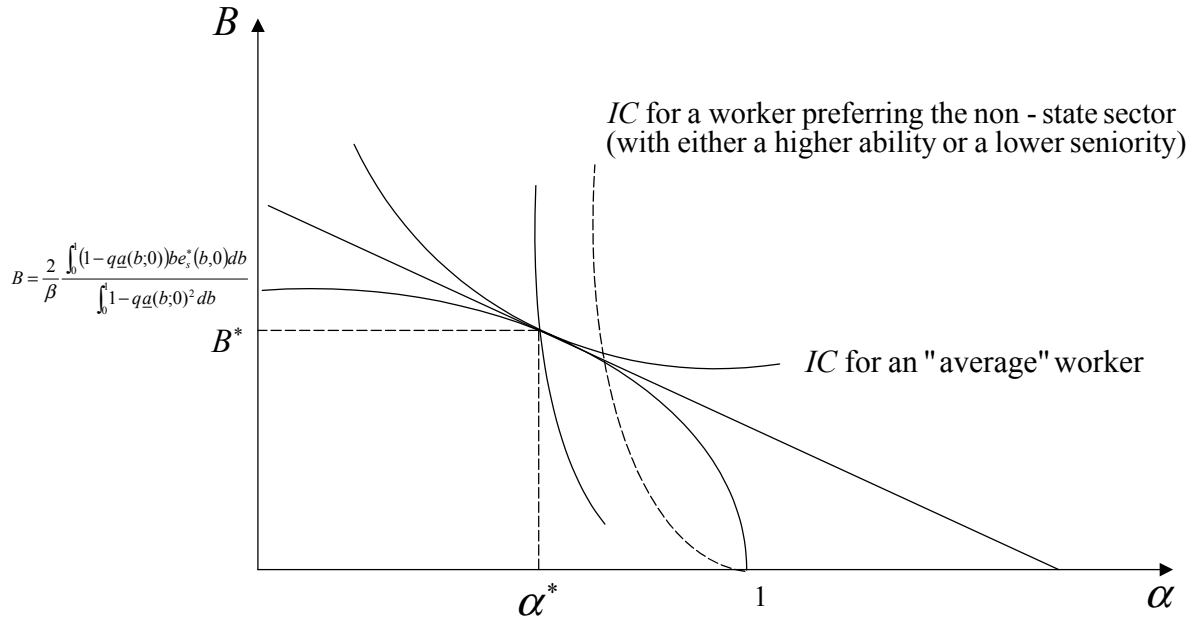
The indifference curves (IC curves) in Figure 1 are derived from the expected lifetime utility function (10). Each presents the trade-off between productivity reward  $\alpha$  on the x-axis and fringe benefit  $B$  on the y-axis for a worker with a given non-productive factor  $a$  and ability  $b$ . As usual, it is assumed that a worker's indifference curve is convex so that its slope is flatter as  $\alpha$  increases, i.e.

$$dB/d\alpha = -be_s^*U'(\alpha be_s^*)/(a+1/(p_s+r)) \quad (21)$$

decreases in absolute value in  $\alpha$ . For a worker with a lower  $a$  or a higher  $b$ , the indifference curve becomes steeper at each given  $\alpha$  and  $B$ , as shown in the above expression (21). The optimal choice of  $\alpha^*$  and  $B^*$  is where the indifference curve for an “average” worker in the state sector given by (17) (integrated from (10)) is tangent to the budget constraint (18), which is

assumed to be concave (linear if  $\alpha$  has no effect on  $\underline{a}$  and  $e_s^*$ ).<sup>10</sup> The vertical intersection of  $B$  is given by Equation (19) at  $\alpha = 0$ .

FIGURE 1. EQUILIBRIUM COMPENSATION SCHEME IN THE STATE SECTOR



Given their steeper indifference curves, workers with higher ability receive a higher utility in the non-state sector, where they receive a full payment of the value of their marginal product. This is shown by the dotted IC curve representing a payoff  $be$  in the non-state sector, which yields a higher utility level than the parallel solid IC curve representing these workers' alternative payoff  $\alpha^*be_s^* + aB^*$  in the state sector. Moreover, the derivations in section 2.3 shows that workers in the non-state sector also spend more effort than those in the state sector. Thus, Proposition 1 holds if the assumptions on the shapes of the indifference curves and budget

<sup>10</sup>Here, more restrictions are put on the functional forms of  $U$  and  $V$  to ensure that the indifference curve and the budget constraint have the properties to yield a stable interior equilibrium. These additional assumptions are supported by empirical data discussed later in this section.

constraint are valid. Hence, the results in Gordon and Li (1999) are extended to this case where there are unemployment and discounting for future monetary rewards.

**Proposition 1** Workers with higher productivity, due to higher education or better health or other factors, are better off in the non-state sector than in the state sector. Thus, the non-state sector has a more productive labour force on average and hence pays a higher average wage.

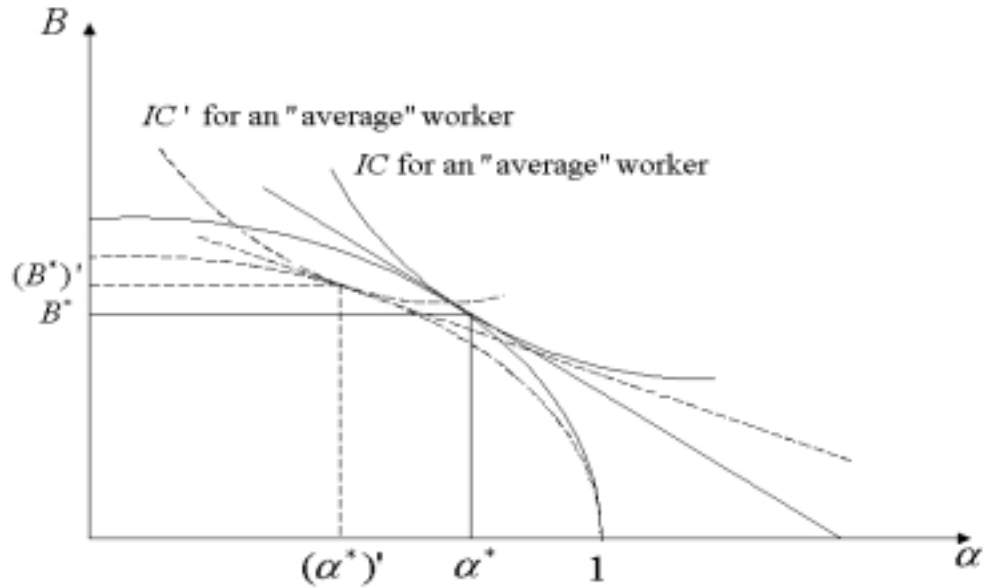
We now examine the impact of more FDI inflow, i.e., an increase in  $q$  as more jobs are available in the non-state sector, on the state compensation scheme and hence workers' decision to migrate voluntarily from the state sector to the non-state sector. A rise in  $q$  increases a worker's incentive to migrate to the non-state sector and also her likelihood of success. This is because more multinational firms make it easier to find a job outside the state sector and hence reduces the relative value of job security in the state sector.

As more productive workers leave the state sector, the average productivity falls and hence the indifference curve for an average worker in the state sector becomes flatter from Equation (21). The intuition is that a larger proportion of workers now benefits more from the fringe benefits and hence, for a given reduction in  $B$ , an average worker now wants to have a larger increase in effort compensation to be indifferent. Meanwhile, as more productive workers leave the state sector, the state sector's budget also shrinks and hence the vertical intersection of the budget constraint shifts down as shown in Figure 2.

In sum, a rise in  $q$  increases the reward to seniority  $B^*$  and hence the proportional payment to fringe benefits and reduces the percentage return to productivity in the state sector  $\alpha^*$ . This reduces each worker's effort input and productivity, which in turn, further reduces the total budget on wage payments and fringe benefits in the state sector.

**Proposition 2** With more FDI influx, the average ability/productivity of workers staying in the state sector decreases while that in the non-state sector increases if everything else stays the same. The state sector gives less reward to productivity and more to seniority in forms of fringe benefits.

FIGURE 2. IMPACT OF FOREIGN DIRECT INVESTMENT ON THE STATE COMPENSATION SCHEME



Finally,  $q$  may differ for workers of different ages and abilities. If workers with higher ability (productivity) are relatively in shortage and hence have a better chance to find a job in the non-state sector (Gordon and Li, 1999), then this can intensify the above trend. Thus, as FDI creates more job opportunities, both foreign and local firms in the non-state sector become more competitive than the SOEs in attracting the more productive workers. This rising competition can be partially responsible for the profit loss in many SOEs during a country's economic reform.

**Corollary** If workers with higher education or in better health status are in shortage in a country's job market with increasing foreign competition, then it is almost impossible for firms in the state sector to keep these workers without increasing the relative reward to productivity in the compensation scheme.

### 3.2 China's experience

Before we discuss the policy implications from the above analysis on labour migration between the state sector and the non-state sector due to an increase in FDI, we need to address

two crucial empirical questions. One is whether the non-state sector is large enough to have any impact on the labour market in a transitional economy.<sup>11</sup> The other is whether the assumptions made in the above analysis are valid in practice. In this section, we will use China as an example to demonstrate that the hypotheses from the previous theoretical analysis can find some empirical support. Thus, the theoretical analysis in this paper can provide some guidance to SOE reform in a transitional economy as discussed in the next section.

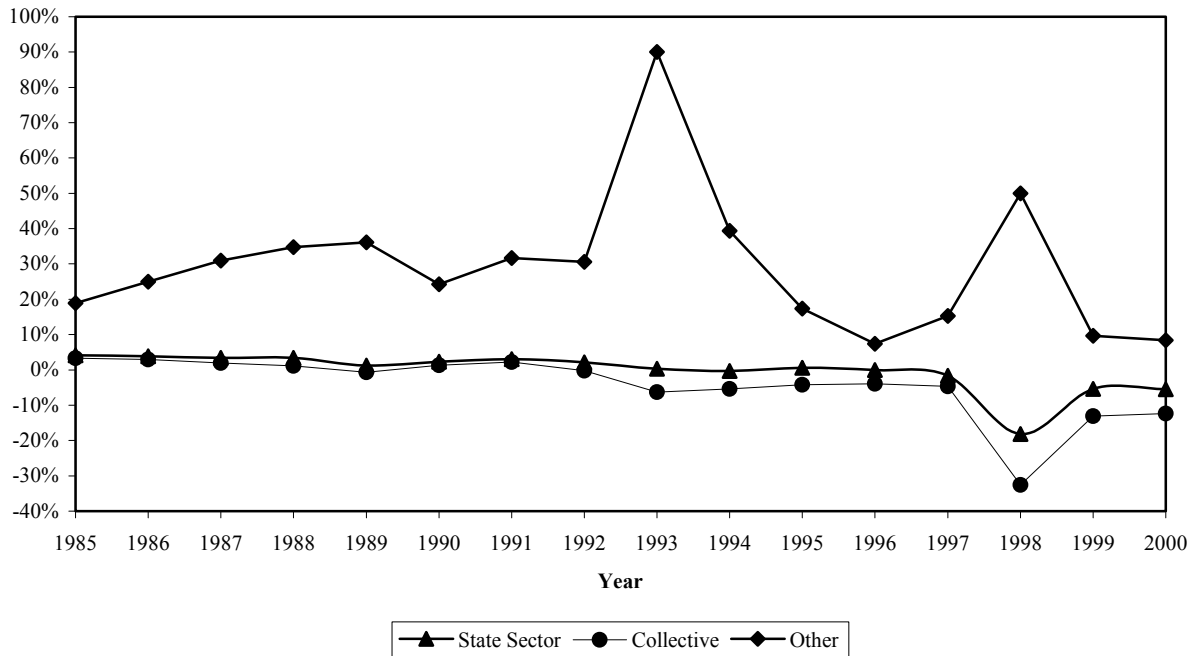
First, the contribution of other ownership enterprises to China's total employment has been growing rapidly. The employment in these other ownership enterprises, including both domestic and foreign-owned or share holding corporations, increased from accounting for only 0.36 percent of total long-term employees in 1985 to 17.18 percent in 2000 (*China Statistical Yearbook*, 1985, 2001). In 1978, over 72 percent of newly employed persons in urban areas were in the SOEs, and this rate fell to below 32 percent in 1997 (*China Statistical Yearbook 1998*, p.156).

Second, Figure 3 reveals two significant turning points. One was in 1993 when China first became the second largest FDI recipient country after the United States (United Nations Conference on Trade and Development (UNCTAD, 1999). The annual growth rate of employees in the state sector dropped to only 0.28 percent in 1993 from a relatively steady 2 percent growth rate from 1985 till 1992, while the annual employment growth rate in the other ownership enterprises jumped from an average 25 percent between 1985 and 1992 to 90.07 percent in 1993. The annual growth rate of employees in all sectors was only 39% in that year and hence there was a labour movement from the state sector to the non-state sector. By 1994, the percentage of long-term employees in the other ownership enterprises first exceeded 5 percent of the total urban employment (*China Statistical Yearbook*, 1995). This coincides with the rapid FDI growth from 1992 to 1993 and the corresponding large increase in total value of foreign capital invested in China as shown in Figure 4.

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<sup>11</sup>Wu (2001) demonstrates that the rapid growth of multinational firms in China has a significant impact on its labour market, especially on the relative wage of skilled versus unskilled labour.

**FIGURE 3: ANNUAL GROWTH RATE OF LONG-TERM EMPLOYEES BY OWNERSHIP**



Notes: 1. From 1998, the number of employees includes on-post workers only, excluding laid-off workers.  
 2. Other ownership enterprises include all domestic funded enterprises, cooperative units, joint-owned units, collective joint-owned units, limited liability corporations, state-funded corporations, and share holding corporations Ltd., but excluding private enterprises and township and village enterprises. This classification applies throughout the paper. A detailed description of various classifications of the Chinese economy by ownership is in Qian and Xu (1993).

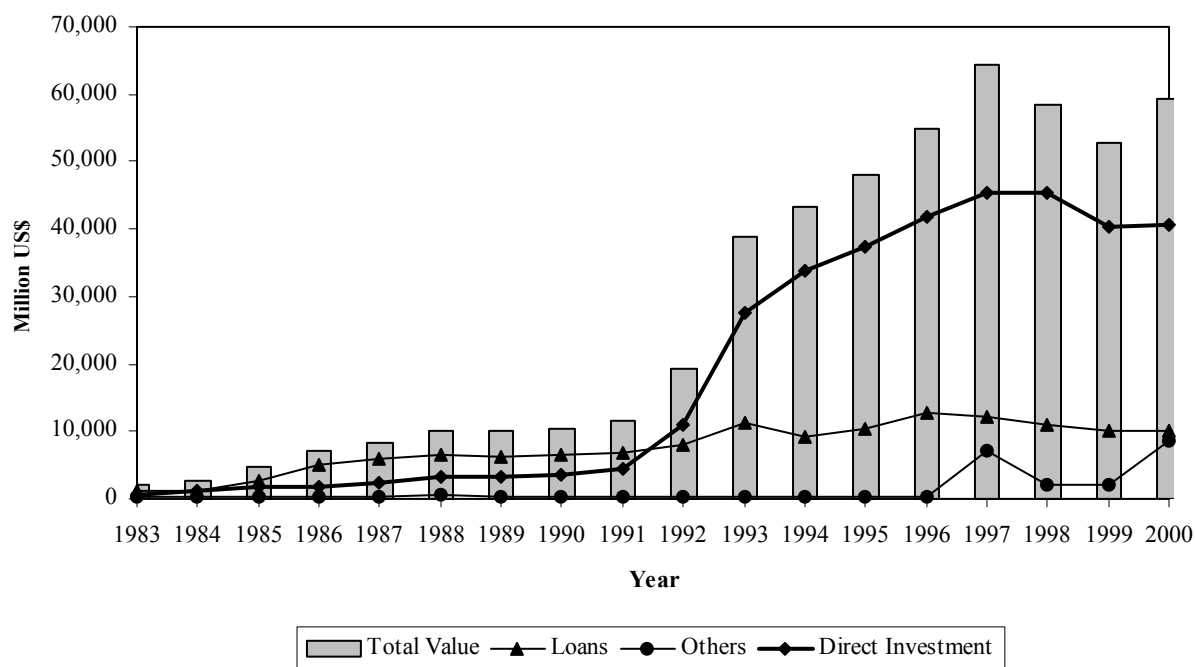
Sources: *China Labour Statistical Yearbook*, 2000; *China Statistical Yearbook*, 2001.

The other turning point was from 1997 to 1998 when SOE reform was launched. Figure 4 shows that foreign capital inflow also reached its historic high during this period. In Figure 3, employment in the state sector fell dramatically and continued to fall till year 2000, which clearly indicated the disguised unemployment problem resulting from the command-and-control system. On the other hand, the employment in the other ownership enterprises grew almost 50 percent in that year and showed a clear sign of expansion in spite of the obvious contraction in the state sector.

Although cross-sectional data are needed to determine the exact causality to avoid structural breaks due to frequent policy changes during the 1990s, these time series data support FDI as one of the factors that can contribute to labour migration between the state sector and the

non-state sector, especially between the SOEs and the other ownership enterprises. We now turn to examine the second concern: whether the major assumptions in the theoretical model are true in practice and hence whether Proposition 1 holds so that this model can provide some explanation and prediction of the real world phenomena.

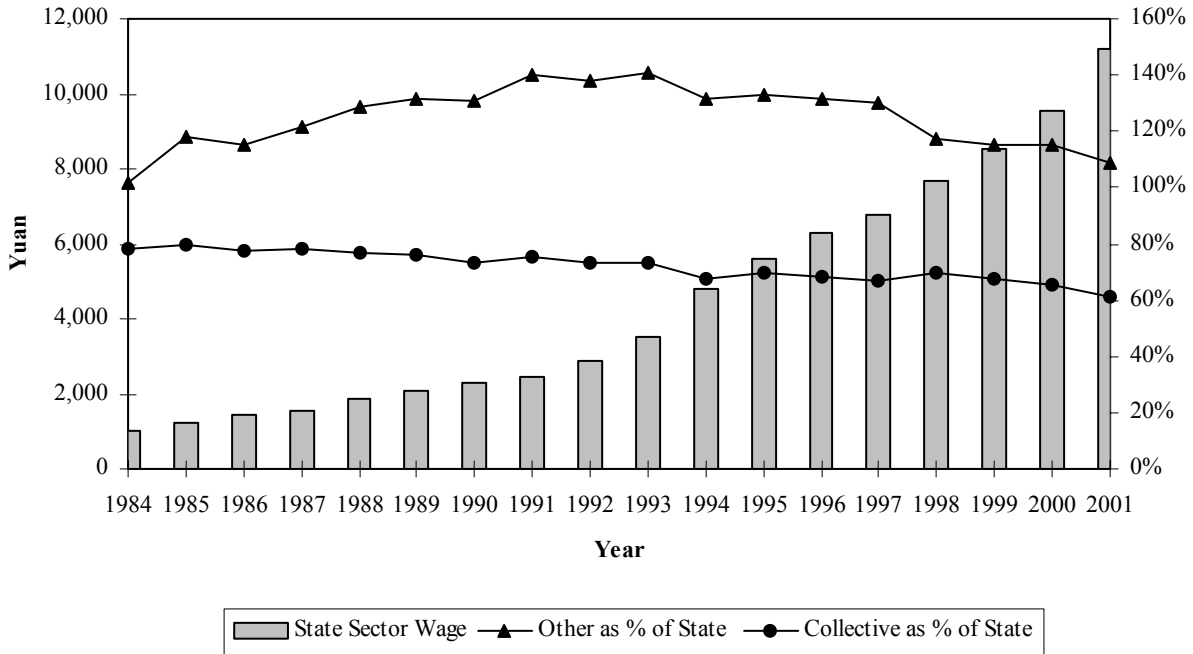
**FIGURE 4: FOREIGN CAPITAL INVESTED IN CHINA**



Sources: *China Foreign Economic Statistical Yearbook*, 2000; *China Statistical Abstract*, 2001.

First, Figure 5 shows that, since 1984, the average wage of permanent staff and workers in the state sector was always higher than that in the collective owned enterprises, but lower than that in the other ownership enterprises. This average wage gap between the state sector and the other ownership enterprises was the highest in 1993 when FDI more than doubled, and then dropped almost by a half from 1997 to 1998 when SOE reform started. By 2001, this gap further dropped to only 8.61 percent above the wage paid in the state sector. This was after the deepening of enterprise wage reform, which allowed employees to negotiate more favourable wages with over 100 million state-owned enterprises in 88 cities in that year (First Quarterly Report 2002, Ministry of Labour and Social Security).

**FIGURE 5: AVERAGE WAGE COMPARISON FOR FORMAL EMPLOYEES**



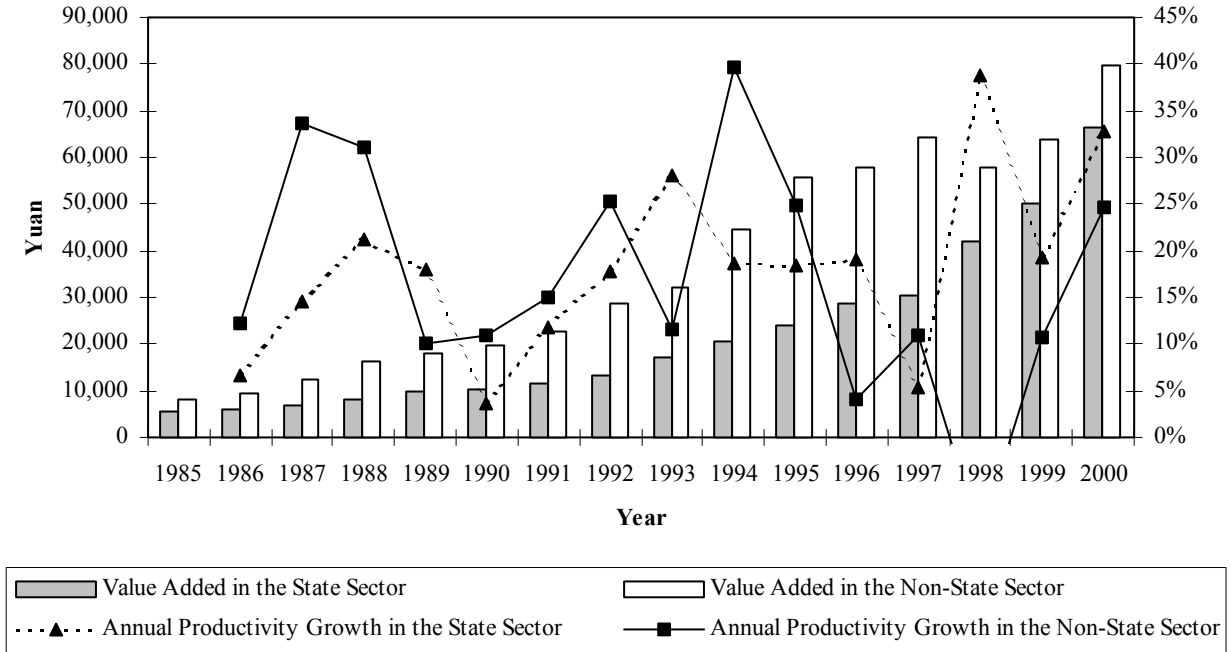
Note: 1. The average wage is higher for foreign funded enterprises and those funded by entrepreneurs from Hong Kong, Macao, and Taiwan than the other enterprises in this category.  
 2. Wages in the state sector are the average wage of the on-post staff and workers only from 1998.  
 Sources: *China Statistical Yearbook*, 2001; *China Statistical Abstract*, 2001; First Quarterly Report 2002, Ministry of Labour and Social Security.

Second, Figure 6 uses per-capita industrial output value added as an indicator to illustrate that productivity was indeed higher in other ownership enterprises than in the state sector in all years from 1985 to 2000.<sup>12</sup> Figure 6 does not include collective enterprises in the non-state sector and concentrates only on the productivity comparison between the state sector and other ownership enterprises, as Figures 3 and 5 both indicate that other ownership enterprises rather than collective owned enterprises are the main competitor of the state sector in China’s labour

<sup>12</sup>Longitude productivity data by ownership from 1985 to 2000 are unavailable even if we only focus on industry productivity. Industry, including mining and quarrying, manufacturing, electricity, gas and water production and supply, attracts a majority share of total FDI, which was over 60 percent in 1998 (Wu, 2001). The productivity estimates in this paper are biased upward for all sectors because the calculation is based on the number of long-term employees at the end of each year. However, only the absolute not the relative size of productivity in the state sector and the non-state sector will change if we include the contract staff and workers at the end of the year.

market. Also, to be compatible with the nominal wages in Figure 5, the average productivities are in current prices and hence are higher than the real productivities calculated in Gordon and Li (1999) due to inflation for most of the years in their data set from 1985 to 1994.

**FIGURE 6: PRODUCTIVITY AND ITS ANNUAL GROWTH RATE BY OWNERSHIP**



- Note:
1. The state sector includes all state-owned and state holding majority shares enterprises.
  2. The same average prices are used to calculate the value added in both sectors.
  3. Double counting does occur among different enterprises although there is no double counting in gross industrial output value within each enterprise. Thus, we use the value added rate in 2000 to calculate the per-capita (average) value added. This rate is 34 percent in the state sector and 26 percent in the other ownership enterprises.
  4. The 2000 data include only industries with sales revenue above 5 million yuan and hence may not be compatible with previous years' data.

Sources: *China Statistical Yearbook*, 2000 to 2001; *China Statistical Abstract*, 2000 to 2001; *China Labour Statistical Yearbook*, 2000.

The columns in Figure 6 shows that productivity was higher in other ownership enterprises from 1985 to 2000. Together with Figure 5, these empirical results support the statements in Proposition 1 that workers in the non-state sector, on average, are more productive and earn a higher wage than those in the state sector. Moreover, the last column of Table 1

shows that the percentage of engineers and technicians in the other ownership enterprises exceeded the national average percentage and the percentages in both the state and collective owned enterprises from 1994 to 1997. Also, each year's share of engineers/technicians out of the national total (numbers in the rows) was the highest among the other ownership enterprises' national shares, while the percentage of other employees was the highest for the SOEs, and that of workers/apprentices was the highest for the collective owned enterprises. This evidence further supports Proposition 1 by indicating a higher percentage of skilled workers in the other ownership enterprises than in the SOEs.

Besides supporting Proposition 1, the lines in Figure 6 also shows that the increase of FDI inflow in the early 1990s initially coincided with a greater increase in productivity in the state sector from an annual productivity growth rate of 17.89 percent in 1992 to 28.15 percent in 1993. However, the annual growth rate of productivity in other ownership enterprises was much higher for two consecutive years from 1994 to 1995. On the contrary, the annual growth rate of productivity in the state sector fell to 5.27 percent, and the productivity gap increased to 34,115 yuan in 1997. This is consistent with the implications of Proposition 2 that, if productivity grows in both sectors due to common economic growth, then the growth should be slower in the state sector than in the non-state sector.

Finally, the last column of Table 1 shows that, although the percentage of engineers and technicians in the other ownership enterprises exceeded that in the state enterprises from 1994 to 1997, this percentage was the highest in the SOEs back in 1993. This supports the argument in the Corollary that the huge influx of FDI can draw away more productive workers and hinder the productivity growth in the state sector.

**TABLE 1. NUMBER OF STAFF AND WORKERS IN INDUSTRY AND CONSTRUCTION ENTERPRISES BY OCCUPATION**  
(1,000 persons, end of year)

	Workers & Apprentices		Engineers & Technicians		Administrative Personnel		Others		Enterprise Total	Eng & Tech in Enterprise Total (%)
	Number	% of Nat'l Total (%)	Number	% of Nat'l Total (%)	Number	% of Nat'l Total (%)	Number	% of Nat'l Total (%)		
1997										
Nat'l Total	4,813.8	100.00	474.8	100.00	730.8	100.00	708.4	100.00	6,727.8	7.06
State Owned	2,931.8	60.90	313.5	66.03	477.6	65.35	499.8	<b>70.55</b>	4,222.7	7.42
Collective Owned	1,241.8	<b>25.80</b>	97.0	20.43	158.6	21.70	165.3	23.33	1,662.7	5.83
Other Ownership	640.0	13.30	64.3	<b>13.54</b>	94.5	12.93	43.3	6.11	842.1	<b>7.64</b>
1996										
Nat'l Total	5,100.6	100.00	480.9	100.00	772.3	100.00	590.9	100.00	6,944.7	6.92
State Owned	3,177.1	62.29	325.7	67.73	515.8	66.79	414.8	<b>70.20</b>	4,433.4	7.35
Collective Owned	1,358.5	<b>26.63</b>	99.1	20.61	173.6	22.48	144.4	24.44	1,775.6	5.58
Other Ownership	565.1	11.08	56.2	<b>11.69</b>	83.0	10.75	31.7	5.36	736.0	<b>7.64</b>
1995										
Nat'l Total	5,275.7	100.00	484.4	100.00	816.5	100.00	1,086.1	100.00	7,662.7	6.32
State Owned	3,295.3	62.46	328.7	67.86	541.1	66.27	837.1	<b>77.07</b>	5,002.2	6.57
Collective Owned	1,450.4	<b>27.49</b>	103.3	21.33	192.6	23.59	183.3	16.88	1,929.6	5.35
Other Ownership	530.1	10.05	52.5	<b>10.84</b>	82.8	10.14	65.9	6.07	731.3	<b>7.18</b>
1994										
Nat'l Total	5,384.7	100.00	456.7	100.00	781.1	100.00	1,029.4	100.00	7,651.9	5.97
State Owned	3,350.9	62.23	319.2	69.89	528.2	67.62	799.3	<b>77.65</b>	4,997.6	6.39
Collective Owned	1,570.0	<b>29.16</b>	95.8	20.98	188.5	24.13	176.2	17.12	2,030.5	4.72
Other Ownership	463.8	8.61	41.6	<b>9.11</b>	64.5	8.26	53.7	5.22	623.6	<b>6.67</b>
1993										
Nat'l Total	5,284.3	100.00	422.3	100.00	747.9	100.00	401.6	100.00	6,856.1	6.16
State Owned	3,319.0	62.81	300.9	71.25	509.5	68.12	291.6	<b>72.61</b>	4,421.0	<b>6.81</b>
Collective Owned	1,637.4	<b>30.99</b>	94.0	22.26	194.1	25.95	93.0	23.16	2,018.5	4.66
Other Ownership	328.0	6.21	27.5	<b>6.51</b>	44.2	5.91	17.0	4.23	416.7	6.60

Source: *China Statistical Yearbook*, 1994 to 1998.

In terms of the impact of a labour market reform, the lines in Figure 6 shows that productivity growth rates in the state sector follow a similar trend as those in the non-state sector, but lag behind about a year or two up until 1998. After SOE reform started in 1998, the productivity growth rates in both sectors have been increasing at a similar speed. Before 1998, productivity grew faster in the state sector every year, except 1990, 1993 and 1997, which can be simply due to a general trend and the slower reaction of the state sector to this general trend. After 1998, productivity has been growing consistently faster in the state sector than in the non-state sector, indicating an early but prominent positive effect of the SOE reform.

More specifically, during the first year of SOE reform in 1998, productivity increased by almost 39 percent in the state sector and decreased for the first time by 10.42 percent in the other ownership enterprises, as shown in Figure 6. The productivity gap was more than halved from 1997 to 1998 and kept falling to just above 13,000 yuan in 2000. Although this close-up of the productivity gap stimulates the overall productivity growth in all enterprises, the growth rate in the state sector remained about 7 percent higher than that in the other ownership enterprises. This shows that the attempt to leave rooms for the SOEs to lay off workers and to release them from their social welfare obligations was very effective in increasing the productivity in the state sector, although this reform has created some social tension and even hostile demonstrations of laid-off workers against the government.

## **4. Concluding Remarks**

### *4.1 Policy implications*

This section will explore the policy implications of how an increase in inward FDI can affect the growth of the non-state sector and the SOE reform. The above theoretical analysis shows that the compensation scheme under a command-and-control system in a central planning economy cross subsidizes the less productive but more needy (“older”) workers by paying the more productive workers a wage less than the competitive market wage offered in the non-state sector. With the influx of FDI, the more productive workers are exposed to more opportunities outside the state sector so that they are more willing to reallocate to the other ownership enterprises, including not only the foreign owned enterprises but also other domestic enterprises in the non-state sector. These theoretical results are supported by the fact that both the wage gap

and the productivity gap between the non-state sector and the state sector in China had widened with the increase in FDI inflow since 1993 before SOE reform took place in 1998.

The theoretical analysis (Proposition 2) further demonstrates that this relocation of skilled and experienced workers from the SOEs to the other ownership enterprises can have a spiralling effect. As the average productivity (ability) of workers who stayed in the state sector decreases, government officials representing the collective interest of all existing state employees are pressured to set the compensation scheme in the state sector more favourable to the more needy but less productive workers as the average worker's indifference curve becomes flatter. This induced more high calibre workers to migrate to the non-state sector and further tilts the compensation scheme against rewarding productivity.

This scenario is consistent with China's increasing number of troubled state enterprises since 1995 after the surge of FDI inflow. The command-and-control nature of central planning historically diverted the best resources away from the domestic non-state sector. Since vestiges of this phenomenon described in the introduction still exist today, most collectively owned town and village enterprises and self-employed enterprises in the non-state sector could only afford to pay an average wage even lower than that in the state sector after fulfilling their other financial obligations. However, most of these constraints did not apply to most other ownership enterprises, which have been growing rapidly since China adopted an open-door policy to foreign trade and investment. As average productivity dropped and demand for government subsidy increased with the increasing competition from multinational firms, it became inevitable that more SOEs went into deficit or at the brink of financial crisis, given the government's limited resources to bail them out.

Thus, the analysis shows that FDI can provide more employment opportunities, increase the overall labour productivity, and stimulate economic growth in a transitional economy even without bring in any technology transfer. On the other hand, FDI can also cause more competition not only in the product market but also in the labour market, which can create even greater challenges to the already troublesome SOEs due to various other reasons discussed in Gordon and Li (1991). To reduce this downside of FDI inflow, the solution is not to discourage inward FDI or job information flow outside the state sector, but to revamp the SOEs to be profit-seeking enterprises in the current economic reform so that they will survive the challenge from

the other ownership enterprises and the cost of labour redeployment will be minimized. This approach has shown some early success in China as studied in the previous section.

Besides making the SOEs accountable for their profitability while releasing them from social obligations, the above theoretical analysis also suggests several other alternative policies that can also help the SOEs to compete for the more productive workers. For example, the state sector can implement a subsidy policy as follows. First is to increase the amount and duration of subsidy to the laid-off workers ( $w$ ) from former SOEs, such as the services provided by the reemployment centres in China.<sup>13</sup> This partially offsets the impact of a higher  $q$  on each worker's incentive to migrate to the non-state sector. Second is to increase the subsidy for the SOEs to provide fringe benefits (decrease  $\beta$ ) and hence increase  $B$  without sacrificing  $\alpha$ , i.e. adopting a "softer" budget. However, both of these subsidy policies drain the government's limited resources and cannot be a long-term solution. Some more radical policies aimed to provide a long-term solution are discussed in the next section.

#### 4.2 *Policy recommendations*

This section summarizes the findings in the above analysis to provide more specific policy recommendations in the labour market to accommodate the increasing influx of FDI. These policies can benefit the transitional economies to move smoothly from a planned economy to an open-market economy. In general, governments should not blame more FDI inflow for the poor performance of the SOEs. Rather, the existing command-and-control system has to change to keep up with the ongoing economic reform in the state sector and the increasing FDI inflow.

As SOE reform deepens, the legal barriers inherited from the command-and-control system in allocating labour to potential employers have become a big obstacle to labour mobility in many transitional economies. Yet, these barriers, such as China's urban residency permit requirement for obtaining jobs in the state sector and accessing to health care and education in the cities, have protected the well being of urban residents, most of whom are current employees in the state sector. To continue SOE reform and to catch up with and facilitate the rural economic reform, it becomes inevitable to eventually abolish these legal barriers of rural to

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<sup>13</sup>Wu (2003) states in more details about the special functions of these reemployment centres and the difference between workers in these centres and those classified as unemployed.

urban migration and privileges of state employees. However, to achieve a smooth transition toward an open-market economy, it is crucial to develop an effective urban labour market for the redeployment of surplus labour during this transition. The analysis suggests the following policy recommendations to achieve this goal.

First is to replace the existing social welfare system within the operation of the SOEs by an alternative independent nationwide system supported by the society broadly, and not tied directly to employment in the state sector. This system, including both government welfare agents and private insurance companies, should provide a social safety net for the employed as well as the unemployed in both the state sector and the non-state sector.

Second is to change the fundamental compensation scheme in the state sector and revive the SOEs by eventually abolishing all their social obligations and allow the “non-survivors” to go bankrupt or to be privatised. This is also a way to stop the negative spiralling effect discussed in the previous section and reduce the number of SOEs that no longer make any profits. Since the state sector still employs a majority of urban labour in most transitional economies, it is crucial to provide economic stability by revamping potentially profitable SOEs, especially at the beginning of economic reform. As a new social safety or welfare system emerges, the distortion to the economic and political stability in the transition from a planned economy to a free market economy can be minimized if many SOEs are set free from their social welfare obligations and turn from deficits into profits.

This approach has had some success in China. Since 1998, the Chinese government has started to implement a series of policies to provide a broader market-based social welfare system, including health insurance, social security, and unemployment insurance and benefits. The empirical evidence in section 3.2 has already shown some promising signs of this gradual movement toward completely freeing the SOEs from their social welfare obligations and allowing them to compete equally with other firms in the non-state sector, not just in the product market but also in the labour market. The full benefit of this reform to productivity growth and eventually the well being of the majority of the population may not be fully appreciated, as the process may turn out to be quite radical and painful in the short term.

Third is to increase government’s participation in job information dissemination. In particular, governments in the transitional economies, where a demand and supply driven job market is merging from a command-and-control system, should further encourage and facilitate

private involvement in the job information exchange, for example, by facilitating the operation of private job search centres, job search agents, and Internet job boards. The government should also make an effort to integrate the government job search agencies and job information exchange centres with those in the private network. There should be no artificial barriers or discrimination between job candidacies and vacancies in the state sector versus those in the non-state sector. An integrated job market will, first, increase the success rate in matching workers with their potential employers and reduce the pain of the laid-off workers during the SOE reform. Second, an integrated job market will also increase workers' effort and willingness to participate in training and the overall productivity across sectors in the long term.

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### Technical Note: Derivation of Equation (4)

A worker employed in the state sector has an expected lifetime utility  $V_s^E(a, b)$ , which is the sum of the expected utility from staying employed in the state sector and the utility once being laid off and starting searching for a job. Let  $U = u(\alpha be_s) + aB - V(e_s)$ . Then,

$$\begin{aligned} V_s^E(a, b) &= \int_0^\infty p_s e^{-p_s T} \left[ \int_0^T e^{-rt} (U + tB) dt + e^{-rT} V_s^S(a, b) \right] dT \\ &= \int_0^\infty p_s e^{-p_s T} \left[ \int_0^T e^{-rt} (U + tB) dt \right] d + \int_0^\infty p_s e^{-(p_s+r)T} V_s^S(a, b) dT. \quad (1) \end{aligned}$$

Since a worker enters the unemployment pool following a Poisson process, a state employee’s expected lifetime utility once laid off,  $V_s^S(a, b)$ , does not depend on time  $T$ . Therefore, the second term in equation (1) becomes

$$\begin{aligned} \int_0^\infty p_s e^{-(p_s+r)T} V_s^S(a, b) dT &= V_s^S(a, b) \int_0^\infty p_s e^{-(p_s+r)T} dT \\ &= V_s^S(a, b) \left( -\frac{p_s}{p_s+r} e^{-(p_s+r)T} \right) \Big|_0^\infty \\ &= \frac{p_s}{p_s+r} V_s^S(a, b). \end{aligned}$$

Similarly,  $U$  is also time independent so that the first term in equation (1) can be written as  $C + D$ , where

$$\begin{aligned} C &\triangleq \int_0^\infty p_s e^{-p_s T} \left[ \int_0^T e^{-rt} U dt \right] dT, \\ D &\triangleq \int_0^\infty p_s e^{-p_s T} \left[ \int_0^T e^{-rt} (tB) dt \right] dT. \end{aligned}$$

The terms in  $C$  are exactly equivalent to those in Shapiro and Stiglitz (1984) and only  $D$  is the addition term due to the extra fringe benefit that a worker receives by staying in the

state sector for another  $t$  periods/years.

Let

$$x = 1 - e^{-p_s T}, \quad (2)$$

$$y = \int_0^T e^{-rt} U dt. \quad (3)$$

Hence,

$$dx = p_s e^{-p_s T} dT$$

$$dy = e^{-rT} U dT$$

so that

$$\begin{aligned} C &= \int_0^\infty y dx = xy \Big|_0^\infty - \int_0^\infty x dy \\ &= \int_0^\infty e^{-rt} U dt - 0 - \left[ \int_0^\infty (1 - e^{-p_s T}) e^{-rT} U dT \right] \\ &= \int_0^\infty e^{-rt} U dt - \int_0^\infty e^{-rT} U dT + U \int_0^\infty e^{-(p_s+r)T} dT \\ &= U \left( -\frac{1}{(p_s+r)} e^{-(p_s+r)T} \right) \Big|_0^\infty \\ &= \frac{u(\alpha b e_s) + aB - V(e_s)}{p_s + r}. \end{aligned}$$

Let

$$z = \int_0^T e^{-rt} t dt, \quad (4)$$

$$dz = e^{-rT} T dT. \quad (5)$$

Hence,

$$\begin{aligned}
 D &= B \int_0^\infty z dx = B \left\{ xz \Big|_0^\infty - \int_0^\infty x dz \right\} \\
 &= B \left\{ \int_0^\infty e^{-rt} t dt - 0 - \int_0^\infty (1 - e^{-p_s T}) e^{-rT} T dT \right\} \\
 &= B \left\{ \int_0^\infty e^{-rt} t dt - \int_0^\infty e^{-rT} T dT + \int_0^\infty e^{-(p_s+r)T} T dT \right\} \\
 &= B \int_0^\infty \left( -\frac{1}{p_s+r} \right) T d(e^{-(p_s+r)T}) \\
 &= -\frac{B}{p_s+r} \left( T e^{-(p_s+r)T} \Big|_0^\infty - \int_0^\infty e^{-(p_s+r)T} dT \right)
 \end{aligned}$$

Since  $\lim_{T \rightarrow \infty} T e^{-(p_s+r)T} = \lim_{T \rightarrow \infty} \frac{1}{p_s+r} e^{-(p_s+r)T} = 0$ ,

$$\begin{aligned}
 D &= -\frac{B}{p_s+r} \left( 0 - \left( -\frac{1}{p_s+r} e^{-(p_s+r)T} \right) \Big|_0^\infty \right) \\
 &= \frac{B}{(p_s+r)^2}.
 \end{aligned}$$

In sum,

$$V_s^E(a, b) = \frac{u(\alpha b e_s) + aB - V(e_s)}{p_s+r} + \frac{B}{(p_s+r)^2} + \frac{p_s}{p_s+r} V_s^S(a, b). \quad (6)$$

Rearranging the above equation gives

$$(p_s+r) V_s^E(a, b) = u(\alpha b e_s) + aB - V(e_s) + \frac{B}{p_s+r} + p_s V_s^S(a, b)$$

so that

$$r V_s^E(a, b) = u(\alpha b e_s) + \left( a + \frac{1}{p_s+r} \right) B - V(e_s) + p_s (V_s^S(a, b) - V_s^E(a, b)). \quad \square$$