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GOVERNMENT AS A DISCRIMINATING MONOPOLIST IN THE FINANCIAL MARKET: THE CASE OF CHINA

Roger H. Gordon
Wei Li

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ABSTRACT

To date, China has maintained a variety of restrictions on its financial markets. In addition to imposing capital controls and regulating interest rates, the government controls both the set of firms that can sell equity on the domestic or foreign stock markets, and the amount they can sell. China is unique in that foreigners pay much less than domestic investors for intrinsically identical shares.

In this paper, we show that these characteristics of the Chinese financial market are consistent with a government choosing regulations to maximize a standard type of social welfare function. The observed policy of charging much higher prices for equity sold to domestic than to foreign investors can simply reflect the more inelastic demand for equity by domestic investors.

Under certain conditions, these regulations are equivalent to income taxes on business and interest income. The pattern of tax rates is not qualitatively different from those commonly observed elsewhere, particularly in other countries with capital controls. Given the ease with which firms and individuals can evade income taxes, however, indirect taxation through restrictions on the financial market may serve as an effective alternative.

Roger Gordon
Department of Economics
University of Michigan
Ann Arbor, MI 48109
and NBER
rgordon@umich.edu

Wei Li
Fuqua School of Business
Duke University
Durham, NC 27708
wei.li@duke.edu

1 Introduction

The emerging Chinese financial market exhibits many puzzling features. China, like a number of other countries, imposes ownership restrictions on foreigners seeking to acquire shares in domestic firms. Much more unusual, however, is the fact that China also restricts the amount of shares that can be purchased by domestic investors. Uniquely, foreign investors in China pay much less than domestic investors for intrinsically identical shares.[1] Not only are domestic–owned shares more expensive than foreign–owned shares but their price is much more volatile than the price of equivalent shares owned by foreigners (World Bank, 1995).

In addition to restricting share purchases, the Chinese government has also imposed capital controls, in principle preventing domestic investors from investing abroad. Given these controls and the high Chinese savings rate, the interest rate available in China has been much lower than that available abroad. The government also prevents nonstate firms from having their shares listed in the public exchanges. In addition, the government puts pressure on the banking system to lend primarily to state enterprises, with little regard for financial considerations.

In this paper, we argue that all of these observations can be consistent with a government choosing regulations that maximize a standard type of social welfare function. The observed regulations all aid the government in collecting revenue from both foreign and domestic investors. Due to risk aversion, domestic and foreign demand for domestic securities should be downward sloping — investors need more attractive terms to induce them to concentrate their portfolios further on any one security. The government as a result certainly has an incentive to restrict the supply of domestic shares available to foreign investors, in order to extract monopoly rents from these investors.[2] The government can use equivalent regulatory restrictions to collect revenue from domestic investors, though it may be less aggressive in exploiting its monopoly power here to the extent that it cares about individual welfare as well as government revenue.

Within our paper, the only assumed untaxed outlet for domestic savings is investments

[1]Examples of countries where ownership restrictions also exist, but where foreigners pay a premium for owning domestic shares, include Finland (Hietala, 1989), Thailand (Bailey and Jagtiani, 1994), Switzerland (Stulz and Wasserfallen, 1995), and Mexico (Domowitz, Glen and Madhavan, 1997). On the effects of foreign ownership restrictions, see also Stulz (1981), Errunza and Losq (1985), Eun and Janakiramanan (1986), and Errunza and Losq (1989) among others. On the Chinese domestic price premium, see Bailey (1994), World Bank (1995), Su (1997) and Fernald and Rogers (1998).

[2]This point is not new. See, for example, Gordon and Varian (1989). Stulz and Wasserfallen (1995) argue that value-maximizing firms would do the same if, due to market imperfections, they face downward-sloping demand curves for their ownership shares.

in nonstate firms.[3] The government may try to limit the resulting revenue loss by trying to make this untaxed alternative less attractive, e.g. by preventing nonstate shares from being traded on the exchanges.

Since foreign investors can much more easily find "greener pastures" elsewhere, their demand for domestic assets will be price elastic relative to that of domestic investors. The optimal policy is therefore to price discriminate by segmenting domestic and foreign markets. Since domestic investors' demands are less elastic, the government will charge them a higher price for domestic shares as long as the government does not put too much weight on their welfare. These implications are consistent with the stylized facts from China.

This paper is related to Stulz and Wasserfallen (1995), which shows that domestic entrepreneurs should price discriminate between domestic and foreign investors when the demand function for domestic shares differs between domestic and foreign investors. Their model explains why Swiss firms want to impose foreign ownership restrictions and why foreign investors pay higher prices. Using a similar framework, Domowitz et al. (1997) offer an explanation for why Mexican firms impose foreign ownership restrictions and why foreign investors pay higher prices. In our paper, the government, not each individual firm, has market power in the financial markets. By imposing investment barriers, the government can raise share prices and lower the interest rate in order to reduce the cost of capital for financing government-owned firms and its own budget deficit. In order to capture the government's influence on share prices and interest rates, this paper develops a general equilibrium model to analyze the government's intervention in the financial economy.

This paper is also related to other works on the Chinese financial market. Bailey (1994) and World Bank (1995) argue that differential liquidity in the two markets helps explain the foreign discount observed in China. Since fewer firms are offered to foreign investors, these markets have a lower capitalization and hence require a higher liquidity premium. However, this argument does not explain why the government chooses to list fewer firms on foreign markets than on domestic markets. Fernald and Rogers (1998) is perhaps closest to our paper. Its explanation of the domestic price premium rests on the observation that Chinese investors have far fewer investment alternatives and in particular face a lower deposit interest rate, which they use as their discount rate. However, Fernald and Rogers (1998) do not explain why the government wants to restrict domestic individuals' investment opportunities in order to keep the domestic interest rate lower than that prevailing in the international financial market.

[3]Unlike in state firms, when the government restricts equity investments in the nonstate sector, the nonstate firms rather than the government keeps the revenue.

Why are the regulations so much different in China than elsewhere? An important part of our answer is that the Chinese government may find it more difficult than other countries do to collect revenue through taxes rather than through restrictions on the financial market.[4] Restrictions on nonstate firms and investments abroad make sense because these alternative investments are more difficult to tax, even implicitly. Another part of our answer is that the Chinese government, in setting policy, may put more weight on government revenue relative to the welfare of investors than do other governments.

The rest of the paper is organized as follows. Section 2 gives a brief description of the Chinese financial economy and the puzzles that this paper attempts to explain. Section 3 describes the basic assumptions of our model, derives the characteristics of the market equilibrium, and examines the equilibrium government policy. In Section 4, we provide a discussion of our results.

2 The Institution

Before the reforms that started in 1978, capital markets did not exist in China. Private ownership of capital was prohibited. Monetary savings from individuals were deposited in the People's Bank and they accounted for less than six percent of GDP in 1978 (State Statistical Bureau, 1997).

The reforms since 1978 have greatly transformed China's economy. The lifting of the ban on private businesses has brought about an explosive growth of China's nonstate sector. Most of the private or quasi-private firms were self-financed. Private business investment has become a viable alternative savings vehicle for individuals.

Domestic individuals' access to foreign capital markets continues to be limited by currency non-convertibility and by administrative barriers. Since the reforms, however, China has opened up to both foreign direct investment[5] and foreign portfolio investment.[6] While foreigners are not yet allowed to participate in China's fixed income securities market, the Chinese government has successfully floated foreign currency denominated bonds in overseas markets.

Interest rates on domestic bank deposits have remained low by international standards.

[4]We show below that the restrictions on domestic ownership of equity shares are closely equivalent to a corporate tax on the profits of these firms.

[5]In 1996, foreign owned subsidiaries in China accounted for 25 percent of domestic investment, produced 13 percent of output, 32 percent of exports and 11 percent of tax revenues (World Bank, 1997).

[6]Foreign shares were first listed as B-shares on Shanghai and Shenzhen Stock Exchanges in February 1993, and as H-shares on the Hong Kong Stock Exchange (HKSE) in July 1993.

As Figure 1 shows, the real interest rates for one-year savings deposits were often negative. The domestic interest rate is also considerably lower on average than the foreign borrowing cost that the government faces.[7] The difference between the foreign borrowing cost and the domestic interest rate, which averages 2.8% over the period between January 1987 and October 1998, represents an implicit tax on domestic savings.

Despite low domestic interest rates, there has been a rapid increase in individual savings, which may be attributed to the rapid increase in income, the expected rapid aging of the population, and the anticipated increase in future uncertainty as the economy becomes more market-oriented. By 1996, individual bank deposits alone accounted for 56 percent of GDP (State Statistical Bureau, 1997). The large bank deposits coupled with a sizable implicit tax on bank deposits implies that the implicit taxes from domestic bank depositors alone would be worth over 1% of GDP per year between 1987 and 1998.

The implicit tax revenue was badly needed, as the reform made it much more difficult for the government to collect tax revenue. Between 1978 and 1995, budgetary revenue fell precipitously from 35 percent of GDP to 11 percent. State owned enterprises contributed 71 percent of government revenue (net of subsidies) during this period, even as their share of industrial output dropped below 50 percent (State Statistical Bureau, 1997). However, tax evasion even by state enterprises has become a major problem.

To tap the rapid rise in individual savings to finance the budget deficit, the Chinese government resumed the issuance of domestic debt in 1981. Initially, individuals were required to invest in these bonds. The government shifted to placing bonds through the market in 1988.

Given the drop in funding from the government, state enterprises experimented with selling stocks directly to the public in 1984, in order to raise financing. Unofficial secondary trading of stocks began shortly thereafter. Share trade was legalized with the formal recognition of the Shanghai Stock Exchange (SHSE) and the Shenzhen Stock Exchange (SZSE) in 1990 and 1991. By January 1999, the number of listings reached 862 with a market capitalization of US$232 billion (International Finance Corporation, 1999).

The Chinese stock market exhibits some unusual features when compared to mature financial markets.

1. The government through its regulatory bodies controls both the listing of new enterprises and the value of new stock issued.

[7]Following Giovannini and de Melo (1993) and Li (1998), the foreign borrowing cost is constructed as the sum of the Euro-currency US$ one-year interest rate (ECUSD1Y in Datastream) and the ex post 12-month ahead depreciation rate of the official RMB relative to the U.S. dollar.

2. There is a high degree of market segmentation. In addition to non-transferable government shares, corporate legal person shares (subscribed by state-owned units), and employee shares, tradeable shares can be issued in two ownership categories:

   - *A Shares* or domestic individual shares can be subscribed by and traded only among domestic investors. A-shares dominate China's equity market in both size and level of activity.
   - *B and H Shares* or foreign shares can only be subscribed by and traded among foreign investors. B-shares are listed on domestic exchanges and H-shares are listed on overseas exchanges (Hong Kong, New York, London and Singapore). Foreign shares bear the same ownership rights as A-shares.

3. A-shares are traded at a substantial *premium* over the corresponding foreign shares: see Figure 2. Among all firms that listed both domestic and foreign shares between January 1993 and November 1998, the average ratio of A-share prices to foreign share prices was 3.16.[8]

4. Share prices in A-shares market are much more volatile than in foreign-shares markets.[9] This can be seen from Figure 3 which plots A-share and B-share price indices in SHSE and SZSE. Although not shown here, A-shares are also more volatile than their corresponding H-shares.

5. Fewer firms are listed in foreign markets. In Feburary 1999, of all 862 firms listed on China's stock exchanges, 835 issued A-shares, while only 107 issued B-shares. An additional 43 firms issued H-shares. A total of 98 firms were cross-listed on both A-shares and B/H-shares markets.

6. However, given that a firm is dual-listed on both domestic and foreign markets, the government often permits more tradeable shares to be floated on the foreign than on the domestic markets. For the 98 dual-listed firms on November 30, 1998, A-shares accounted for an average of 15.6% of total outstanding shares while foreign shares accounted for 29.4%. The rest of the outstanding shares, which were non-tradeable, were held by the government, state-owned institutions and employees.

[8]It is interesting to note that this price ratio started to decline in late 1993 when some high-ranking Chinese officials called for capital account liberalization and for merging A- and B-shares (South China Morning Post, March 2, 1994). After July, 1994, the decline was quickly reversed when the government announced that separate markets would remain, and that new share issues would be restricted.

[9]The sample standard deviation of daily percentage changes in price is 3.7% for Shanghai A-shares index, 2.1% for Shanghai B-shares index, 2.9% for Shenzhen A-shares index and 2.1% for Shenzhen B-shares index.

7. All listed enterprises have been state-owned.

Each year, the new share issue quota is determined jointly by the State Council Securities Policy Committee, the State Planning Commission and the Central Bank as part of the annual investment and credit plan. In 1993, for example, the A-share quota was set at 5.5 billion yuan and the B-share quota was US$100 million.[10] The quota is then divided among provinces. Each regional securities authority then invites enterprises to request a listing, and makes a selection based on firm performance and regional development objectives. Enterprises requesting a foreign share listing are also required to obtain approval from the Ministry of Foreign Trade and Economic Cooperation (MOFTEC). Once an enterprise is approved for listing by its regional government (and MOFTEC), final approval is virtually automatic.

3 The Model

In an attempt to make sense of the above observations, we develop a simple model of a one-period economy which consists of a home country (domestic) and the rest of the world (foreign). The economy produces a single tradeable good.[11] The home country is open asymmetrically: it welcomes foreign investments, but prevents domestic individuals from owning foreign assets.[12]

The home country has two real sectors: a state-owned sector consisting of S enterprises initially owned by the government, and a nonstate sector. Each firm is represented by an investment project. Let K_s denote the investment in state enterprise s and K_N the investment in nonstate enterprises. The random ex post sizes of these firms are then $\tilde{\theta}_s K_s$ and $\tilde{\theta}_N K_N$, where $\tilde{\theta}_s$ and $\tilde{\theta}_N$ are normally distributed.

The government controls a variety of policies. To begin with, the government sets the interest rate r on bank deposits and government bonds. The government also controls the number of shares in each state firm that can be purchased by either domestic investors (A-shares) or foreign investors (B-shares).

We assume that the foreign market offers a riskless asset with a return r^*. It also offers a diversified portfolio of risky assets, including investments in all countries other than China. Let $\tilde{\theta}^*$ denote the random returns on this diversified portfolio. Foreign individuals have free

[10] Yuan is the basic monetary unit of China's currency, *renminbi*. In December 1993, the swap market exchange rate was US$1 = 8.70 yuan.

[11] To begin with, we assume a fixed exchange rate between the domestic and the foreign currency. We will discuss the implications of exchange rate risk below.

[12] See below for a discussion of when this restriction would be chosen.

access to the foreign market. Domestic individuals are barred from owning foreign assets. The government itself, however, has access to the riskless asset in the foreign market.

Both the government and the individuals are rational and risk averse. Each individual maximizes his own expected utility of wealth, taking as given the various policies chosen by the government. The government's objective is to maximize a standard type of social welfare function equal to the sum of the expected utilities of domestic residents plus the expected welfare from government revenue. In choosing policies, the government uses individuals' optimal portfolio choices to forecast how savings and asset prices will be influenced by its policies. Below we use backward induction to characterize the equilibrium. We start with individuals' portfolio choices and derive domestic and foreign demands for the equity of Chinese state enterprises, for any given set of policy choices for the government. We then solve for the optimal policies of the government.

3.1 Domestic Individuals

At the beginning of the period, each individual decides how to divide his initial wealth W_i between the domestic riskless asset, D_i, risky investment in the nonstate sector, K_{Ni}, and risky investment in equity (A-shares) of each state enterprise s, K_{Asi}. The individual's budget constraint is

$$K_{Ni} + D_i + \mathbf{P}'_A \mathbf{K}_{Ai} = W_i \tag{1}$$

where $\mathbf{P}_A = (P_{A1}, \ldots, P_{AS})$ is the vector of prices per share of state enterprises in the A-shares market, and $\mathbf{K}_{Ai} = (K_{A1i}, \ldots, K_{ASi})$ is the vector of corresponding shares owned by individual i. His uncertain end-of-period wealth is

$$\tilde{W}_i = (1+r)D_i + \tilde{\theta}_N K_{Ni} + \tilde{\boldsymbol{\theta}}'_S \mathbf{K}_{Ai} \tag{2}$$

where $\tilde{\boldsymbol{\theta}}_S$ is a vector of random returns. The domestic individual chooses K_{Ni} and $\mathbf{K}_{Ai}$, allowing D_i to adjust according to the budget constraint, so as to maximize the following expected utility function:

$$\mathrm{E}U_i(\tilde{W}_i) = -\mathrm{E}e^{-h_i \tilde{W}_i} = -e^{-h_i[\mathrm{E}\tilde{W}_i - .5h_i \mathrm{Var}(\tilde{W}_i)]} \tag{3}$$

Here h_i is individual i's constant-absolute-risk-aversion parameter, and E is an expectation operator. The resulting first order conditions can be expressed as:

$$\mathrm{E}\tilde{\theta}_N - (1+r) = h_i \mathrm{Cov}(\tilde{\theta}_N, \tilde{W}_i) \tag{4}$$

$$\mathrm{E}\tilde{\boldsymbol{\theta}}_S - (1+r)\mathbf{P}_A = h_i \mathrm{Cov}(\tilde{\boldsymbol{\theta}}_S, \tilde{W}_i) \tag{5}$$

The individual invests up to the point where the expected excess return on each risky asset equals the risk premium.

Dividing both sides of (4) by h_i, substituting in (2), and summing over i, we can derive the aggregate investment in the nonstate sector as

$$K_N = h^{-1}\sigma_N^{-2}\left[\mathrm{E}\tilde{\theta}_N - (1+r) - h\mathrm{Cov}(\tilde{\theta}_N, \tilde{\boldsymbol{\theta}}_S)\mathbf{K}_A\right] \tag{6}$$

where $\mathbf{K}_A = \sum_i \mathbf{K}_{Ai}$ is the aggregate demand for A-shares, $h^{-1} = \sum_i h_i^{-1}$, and $\sigma_N^2 = \mathrm{Var}(\tilde{\theta}_N)$. Here h can be interpreted as the individuals' aggregate absolute risk aversion. The optimal investment is proportional to the risk-adjusted excess return from the investment.

Dividing both sides of (5) by h_i, summing over i, and then substituting in (2) and (6), we can solve for the market clearing prices for A-shares:

$$\mathbf{P}_A = \frac{\mathrm{E}\tilde{\boldsymbol{\theta}}_S}{1+r} - \boldsymbol{\beta}_{SN}\left(\frac{\mathrm{E}\tilde{\theta}_N}{1+r} - 1\right) - \frac{h}{1+r}\left(\Sigma_{SS} - \Sigma_{SN}\sigma_N^{-2}\Sigma_{NS}\right)\mathbf{K}_A \tag{7}$$

where $\boldsymbol{\beta}_{SN} = \mathrm{Cov}(\tilde{\boldsymbol{\theta}}_S, \tilde{\theta}_N)/\sigma_N^2$ is the vector of A-shares' betas relative to the available nonstate asset, $\Sigma_{SS} = \mathrm{Var}(\tilde{\boldsymbol{\theta}}_S)$ and $\Sigma_{SN} = \mathrm{Cov}(\tilde{\boldsymbol{\theta}}_S, \tilde{\theta}_N) = \Sigma_{NS}'$. It can easily be verified that $\Sigma_{SS} - \Sigma_{SN}\sigma_N^{-2}\Sigma_{NS} = \mathrm{Var}(\tilde{\boldsymbol{\theta}}_S - \boldsymbol{\beta}_{SN}\tilde{\theta}_N) = \mathrm{Var}(\tilde{\boldsymbol{\theta}}_S|\tilde{\theta}_N)$ is a positive definite square matrix. This implies that the demand curve for each A-share stock is downward sloping: investors must be offered a lower price to induce them to invest further in a particular A-share stock.

In (7), the risk discount on the price of each A-share can be decomposed into two parts. The first part is represented by the second term. Here, $\boldsymbol{\beta}_{SN}$ is a measure of the risk from owning A-shares arising from their covariance with the return on the available nonstate share. The first two terms in (7) thus measure the maximum price that a domestic individual is willing to pay for the *first* share of each state enterprise. The third term in (7) measures the additional risk discounts on A-share prices for that component of the risk from A-shares that is uncorrelated with the return on the nonstate shares.

3.2 Foreign Individuals

Each foreign individual j starts with wealth W_j^*. He must decide how to allocate his wealth between the foreign riskless asset, D_j^*, a diversified portfolio of foreign equity, K_j^*, and ownership shares of each state enterprise s listed on the domestic B-shares market, K_{Bsj}. His budget constraint equals

$$D_j^* + K_j^* + \mathbf{P}_B' \mathbf{K}_{Bj} = W_j^* \tag{8}$$

where $\mathbf{P}_B = (P_{B1}, \ldots, P_{BS})$ is the vector of share prices of state enterprises in the B-shares market. The individual's end of period random wealth is thus

$$\tilde{W}_j^* = (1 + r^*) D_j^* + \tilde{\theta}^* K_j^* + \tilde{\boldsymbol{\theta}}_S' \mathbf{K}_{Bj} \tag{9}$$

Foreign investors thus face a problem similar to that of the domestic investors. Under the analogous assumptions about the utility function as above, it easily follows that the market-clearing price for B shares equals

$$\mathbf{P}_B = \frac{\mathrm{E}\tilde{\boldsymbol{\theta}}_S}{1 + r^*} - \boldsymbol{\beta}_{SF} \left(\frac{\mathrm{E}\tilde{\theta}^*}{1 + r^*} - 1 \right) - \frac{f}{1 + r^*} \left(\Sigma_{SS} - \Sigma_{SF} \sigma_F^{-2} \Sigma_{FS} \right) \mathbf{K}_B \tag{10}$$

where $\boldsymbol{\beta}_{SF} = \mathrm{Cov}(\tilde{\boldsymbol{\theta}}_S, \tilde{\theta}^*)/\mathrm{Var}(\tilde{\theta}^*)$ is the vector of B-shares' betas relative to the international market portfolio, f is a measure of the aggregate absolute risk aversion of foreign investors, and $\Sigma_{SF} = \mathrm{Cov}(\tilde{\boldsymbol{\theta}}_S, \tilde{\theta}^*) = \Sigma_{FS}'$. As before, the first two terms represent the maximum price that a foreign individual is willing to pay for the first B-share, while the last term measures the costs of bearing the added risks from further investments in B-shares.

While the equations determining the two sets of market clearing prices, $\mathbf{P}_A$ and $\mathbf{P}_B$, have the same functional forms, the parameters are very different. Because of these differences in the demand functions between foreign and domestic investors for shares in state enterprises, the government will have an incentive to segment the market in order to price discriminate.

3.3 Government

At the beginning of the period, the government is endowed with liquid assets L and 100% ownership of the state sector with an initial capitalization $\mathbf{K}_0$. To finance the expansion of state enterprises, the government can invest its liquid assets, issue domestic debt D at the riskless rate r, issue foreign debt D^* at the riskless rate r^*, and issue new equity shares

of each of the state enterprises, $\mathbf{K}_A$ and $\mathbf{K}_B$. Let $\mathbf{K}$ denote the aggregate new investment in each of the firms in the state sector. Then the amount of foreign borrowing required to balance the government's budget is

$$D^* = \iota_S'\mathbf{K} - L - D - \mathbf{P}_A'\mathbf{K}_A - \mathbf{P}_B'\mathbf{K}_B, \tag{11}$$

where ι_S is a vector of ones of length S.

Equilibrium in the domestic riskless asset market implies that the supply of domestic debt must equal the demand:

$$D = \sum_i W_i - K_N - \mathbf{P}_A'\mathbf{K}_A \tag{12}$$

Equilibrium in the stock market implies that the supply of shares must equal demand, so $\mathbf{K}_A = \sum_i \mathbf{K}_{Ai}$ and $\mathbf{K}_B = \sum_j \mathbf{K}_{Bj}$.

The government's wealth at the end of the period is

$$\begin{aligned}\tilde{W}_G \equiv & -(1+r^*)D^* - (1+r)D + \tilde{\boldsymbol{\theta}}_S'(\mathbf{K} - \mathbf{K}_A - \mathbf{K}_B + \mathbf{K}_0) \\ = & (\tilde{\boldsymbol{\theta}}_S' - (1+r^*)\iota_S')\mathbf{K}_G + (1+r^*)L + \tilde{\boldsymbol{\theta}}_S'\mathbf{K}_0 \\ & + (r^* - r)D + (1+r^*)[(\mathbf{P}_A' - \iota_S')\mathbf{K}_A + (\mathbf{P}_B' - \iota_S')\mathbf{K}_B]\end{aligned} \tag{13}$$

where (13) is obtained by substituting in (11), and where $\mathbf{K}_G \equiv \mathbf{K} - \mathbf{K}_A - \mathbf{K}_B$ measures the new investment whose return accrues to the government. The first term in (13) measures the government's investment income net of its opportunity cost of funds, $(1 + r^*)$, in the international financial market. The second and third terms in (13) measure the value of the government's endowments at the end of the period. The last two terms can be interpreted as the implicit taxes that the government collects from domestic and foreign investors. The implicit taxes collected from the domestic bond market are simply, $(r^* - r)D$. The government also collects implicit taxes from the equity market. Since a share is defined as a financial claim to income generated by one yuan of capital investment in Chinese enterprises, the implicit tax on any share equals $P_s - 1$.

We assume that the government maximizes the following social welfare function:

$$\lambda \sum_i \mathrm{E}U_i(\tilde{W}_i) + \mathrm{E}U_G(\tilde{W}_G) \tag{14}$$

where $\mathrm{E}U_G(\tilde{W}_G) = -\mathrm{E}e^{-h_G\tilde{W}_G}$. Here, λ measures the relative weight the government puts

on the utility residents receive from private consumption, relative to that received from government expenditures.

In what follows, we first consider an interior Nash equilibrium in which both A-shares and B-shares have positive net supply, and the government is a net borrower in the domestic bond market, so that $D > 0$. We will then consider "corner solutions," and describe the conditions under which the net supplies of enterprises' shares and government bonds are positive.

The government chooses its own new investment, $\mathbf{K}_G$, the riskless interest rate, r, and the supply of shares, $\mathbf{K}_A$ and $\mathbf{K}_B$, in order to maximize its expected utility, while allowing the riskless borrowing in the international bond market, D^*, to be determined by its budget. The resulting first-order conditions are:

$$\mathrm{E}\tilde{\boldsymbol{\theta}}_S - (1 + r^*) = h_G \mathrm{Cov}(\tilde{\boldsymbol{\theta}}_S, \tilde{W}_G) \tag{15}$$

$$-\sum_i (1 - \lambda\alpha_i)\left(D_i - (1 + r)\frac{\partial \mathbf{P}'_A}{\partial r}\mathbf{K}_{Ai}\right) = (r^* - r)\frac{\partial K_N}{\partial r} \tag{16}$$

$$\mathbf{P}_A + \sum_i (1 - \lambda\alpha_i)\frac{\partial \mathbf{P}'_A}{\partial \mathbf{K}_A}\mathbf{K}_{Ai} - \left(\iota_S + \frac{\partial K_N}{\partial \mathbf{K}_A}\right)\frac{r^* - r}{1 + r} = \iota_S \tag{17}$$

$$\mathbf{P}_B + \frac{\partial \mathbf{P}'_B}{\partial \mathbf{K}_B}\mathbf{K}_B = \iota_S, \tag{18}$$

where $\alpha_i \equiv (h_i \mathrm{E}U_i(\tilde{W}_i))/(h_G \mathrm{E}U_G(\tilde{W}_G))$ measures the ratio of the marginal utility of income to individual i relative to the marginal utility of income to the government.

Equation (15), describing the optimal value of K_G, takes a standard form. The expected return on government investments in the state sector simply has to exceed the risk-free rate of return available abroad by enough to compensate for the added risk.

In equation (16), describing the first-order condition for r, an increase in r implies an implicit payment from the government to each individual in proportion to their existing bond holdings, D_i. In addition, the resulting drop in market clearing prices for equity lowers the payments from each individual to the government in proportion to their equity holdings $\mathbf{K}_{Ai}$. The welfare cost of the combined transfer is proportional to the difference in welfare weights $(1 - \lambda\alpha_i)$ between the government and individual i. Offsetting these welfare costs, individuals will reduce their investments in nonstate assets when r rises, providing an efficiency gain proportional to the implicit tax rate $(r^* - r)$ on other assets.

This first-order condition can be rewritten as follows, using previous results:

$$r = \frac{r^* + (1 - \lambda\alpha_h)(\mathrm{E}\tilde{\theta}_N - 1 - h\sigma_N^2\omega W)}{2 - \lambda\alpha_h}, \tag{19}$$

where $\alpha_h = h\sum_i(\alpha_i/h_i)$ is the weighted average marginal utility of income weighting by the inverse of each individual's risk aversion, $\omega = (1-\lambda\alpha_h)/(1-\lambda\alpha_W)$, and $\alpha_W = \sum_i \alpha_i W_i/W$ equals the weighted average marginal utility of income weighting by each individual's wealth. Note that the expression $(1-\lambda\alpha_W)$ measures the net welfare gain from taking W_i/W from each individual i and transferring it to the government. For simplicity in interpreting the results, we will assume from now on that $\omega = 1$, which holds as long as individuals invest equal fractions of their portfolios in each asset.[13] Under this assumption, the optimal value of r is a weighted average of r^* and $\mathrm{E}\tilde{\theta}_N - 1 - h\sigma_N^2 W$, with a higher weight on r^* the more the government cares about individual welfare. The expression $\mathrm{E}\tilde{\theta}_N - 1 - h\sigma_N^2 W$ measures the risk adjusted rate of return in the nonstate sector if domestic individuals invest *all* of their endowments in the nonstate sector. It therefore represents domestic individuals' minimum required rate of return for buying any bonds from the government. The government issues bonds to domestic residents ($D > 0$) as long as this value is less than r^*.

Equations (17) and (18) equate the marginal revenues collected from selling an extra share of the state sector in the A-shares and B-shares markets to the opportunity cost of funds invested in the underlying capital. The extra term in equation (17) captures any changes in D that occur as a result of selling more $\mathbf{K}_A$. If K_N and each K_{As} are perfect substitutes, so that $\partial K_N/\partial K_{As} = -1$, then this added term disappears. If K_N falls by less, however, then purchases of D fall when $\mathbf{K}_A$ increases, causing a loss in government revenue.

Using equations (7) and (10) to determine the response of prices to new share issues, equation (6) to determine the change in K_N, and equation (19) to characterize the optimal r, we can write the government's optimal share prices as

$$\mathbf{P}_A = \frac{1}{2-\lambda\alpha_h}\left(\frac{\mathrm{E}\tilde{\boldsymbol{\theta}}_S - hW\mathrm{Cov}(\tilde{\boldsymbol{\theta}}_S, \tilde{\theta}_N)}{1+r}(1-\lambda\alpha_h) + \frac{1+r^*}{1+r}\iota_S\right) \tag{20}$$

$$\mathbf{P}_B = .5\left(\frac{\mathrm{E}\tilde{\boldsymbol{\theta}}_S - \boldsymbol{\beta}_{SF}(\mathrm{E}\tilde{\theta}^* - (1+r^*))}{1+r^*} + \iota_S\right) \tag{21}$$

The first term inside the large parentheses in each equation equals the maximum price that domestic/foreign residents will pay for the first share in any firm, for domestic investors when their portfolio is entirely invested in nonstate firms while for foreign investors when their portfolio simply contains no equity in Chinese firms.[14] The second term inside the

[13] Note that $\omega = 1$ if $\alpha_W = \alpha_h$. This equality holds if $h_i W_i = hW$. Given this assumption, the government cannot redistribute among individuals through changing relative asset prices.

[14] The maximum price for domestic residents can easily be confirmed by solving the investors' first-order conditions for D_i and $\mathbf{K}_{Ai}$, evaluated at $D_i = 0$ and $\mathbf{K}_{Ai} = 0$.

parentheses equals the revenue the government can earn instead by selling these investors a riskless bond and investing the proceeds abroad.

Clearly, the expressions for $\mathbf{P}_A$ and $\mathbf{P}_B$ are very different, so that the government in general has an incentive to segment the two markets, as it has done. What can be said, though, about the relative sizes of $\mathbf{P}_A$ and $\mathbf{P}_B$?

One key expression affecting the optimal policies is $(1 - \lambda\alpha_h)$, which measures the social gain from transferring a dollar from individuals (divided among individuals in proportion to their wealth) to the government. When this expression is zero, so that the government has no incentive to raise revenue from individuals, then it can quickly be shown that $r = r^*$ and $\mathbf{P}_A = \iota_S$ are the optimal policies, so that there would be no distortions in the *domestic* financial market. However, equation (21) remains unaffected, so that the government would still take advantage of its market power when selling shares to foreign investors. Therefore, when $\lambda\alpha_h = 1$, we conclude that $\mathbf{P}_B > \mathbf{P}_A$, as long as there is any market abroad for Chinese shares.

In contrast, when $\lambda = 0$, so that the government cares only about maximizing tax revenue, then the equations provide a strong presumption that $\mathbf{P}_A > \mathbf{P}_B$. To begin with, now $r < r^*$, so that the second terms in equations (20) and (21) support this forecast. In addition, foreign investors have much more attractive outside options than do domestic investors. Even without access to Chinese government bonds and stocks, foreign investors can still invest in bonds and stocks anywhere else in the world, whereas Chinese investors can only invest in Chinese nonstate firms. Therefore, there would be a strong presumption that the first terms in the two equations, measuring the maximum price that each set of investors would pay for the first share in state firms, also reenforce the forecast that $\mathbf{P}_A > \mathbf{P}_B$.

More formally, sufficient conditions can be derived as follows. Using the first-order condition for the investment by foreigners in foreign shares, the first term in equation (21) can be shown to equal

$$\frac{\mathrm{E}\tilde{\boldsymbol{\theta}}_S - fW^*\mathrm{Cov}(\tilde{\boldsymbol{\theta}}_S, \tilde{\theta}_F)[(K^*/W^*) + \boldsymbol{\beta}'_{SF}(\mathbf{K}_B/W^*)]}{1 + r^*} \tag{22}$$

Compare this expression with the first term in equation (20). To begin with, the denominator is larger since $r^* > r$. Plausibly, state firms have a higher covariance with the returns on foreign firms than with the return on nonstate firms,[15] in itself reducing $\mathbf{P}_B$ relative to $\mathbf{P}_A$. In addition, it is standard to assume increasing relative risk aversion, so that $fW^* > hW$.

[15]Nonstate firms are typically small new entrants in the service or transportation sectors while both state firms and foreign firms are typically large manufacturing enterprises.

further reducing $\mathbf{P}_B$. However, the final difference between the two equations, the term in brackets in equation (22), should be less than one, pushing in the opposite direction. Since only a trivial fraction of foreign assets are invested in China and since the net supply of foreign bonds is zero, this expression should be very close to one, so not be sufficient to outweigh the other differences between $\mathbf{P}_A$ and $\mathbf{P}_B$. We then conclude that $\mathbf{P}_A > \mathbf{P}_B$ when $\lambda = 0$.

Equations (20) and (21) also imply that $\mathbf{P}_A$ will be more volatile than $\mathbf{P}_B$ when $\lambda = 0$. In particular, new information affecting $\mathrm{E}\tilde{\boldsymbol{\theta}}_S$ will change $\mathbf{P}_A$ by more than $\mathbf{P}_B$ as long as $r < r^*$.

Under what conditions will the government choose to sell shares of formerly state-owned enterprises? Combining equations (10) and (21), we solve for the optimal share issuance to foreign investors,

$$\mathbf{K}_B = \max\left\{\mathbf{0}_S, \frac{[\mathrm{Var}(\tilde{\boldsymbol{\theta}}_S|\tilde{\theta}^*)]^{-1}[\mathrm{E}\tilde{\boldsymbol{\theta}}_S - \boldsymbol{\beta}_{SF}(\mathrm{E}\tilde{\theta}^* - (1+r^*)) - (1+r^*)\boldsymbol{\iota}_S]}{2f}\right\} \tag{23}$$

where $\mathbf{0}_S$ is a vector of 0's of length S. We see that shares will be sold to foreigners if the maximum price that foreigners are willing to pay for the first share in a firm, is greater than the cost of the underlying capital, or

$$\frac{\mathrm{E}\tilde{\boldsymbol{\theta}}_S - \boldsymbol{\beta}_{SF}(\mathrm{E}\tilde{\theta}^* - (1+r^*))}{1+r^*} > \boldsymbol{\iota}_S \tag{24}$$

The difference between the maximum price and the underlying cost represents the gain from trade between the government and foreign investors. Since the gain from trade is shared equally between the two parties (see (21)), the government would choose to sell some shares to foreign investors as long as the gain is positive. However, that the Chinese government wants to invest in the firm does not necessarily imply that foreign investors are willing to pay enough to cover investment costs, given the differences in the other risks that each faces. In equilibrium, some state-owned enterprises may not be listed on the foreign exchange.

Similarly, we derive the optimal share issuance to domestic investors from (7) and (20) as

$$\mathbf{K}_A = \max\left\{\mathbf{0}_S, \frac{[\mathrm{Var}(\tilde{\boldsymbol{\theta}}_S|\tilde{\theta}_N)]^{-1}[\mathrm{E}\tilde{\boldsymbol{\theta}}_S - \boldsymbol{\beta}_{SN}(\mathrm{E}\tilde{\theta}_N - (1+r^*)) - (1+r^*)\boldsymbol{\iota}_S]}{(2-\lambda\alpha_h)h}\right\} \tag{25}$$

In doing so, we find that $\mathbf{P}_A$ are low enough to induce some purchases by domestic investors

as long as

$$\frac{\mathrm{E}\tilde{\boldsymbol{\theta}}_S - \boldsymbol{\beta}_{SN}(\mathrm{E}\tilde{\theta}_N - (1+r^*))}{1+r^*} > \boldsymbol{\iota}_S \tag{26}$$

Comparing the left-hand expression here with that in (24), we find that shares are more likely to be issued to domestic investors than to foreign investors if $\boldsymbol{\beta}_{SN} < \boldsymbol{\beta}_{SF}$ and $\mathrm{E}\tilde{\theta}_N < \mathrm{E}\tilde{\theta}^*$.

There is a strong presumption that

$$\boldsymbol{\beta}_{SN} \equiv \frac{\mathrm{Cov}(\tilde{\boldsymbol{\theta}}_S, \tilde{\theta}_N)}{\sigma_N^2} < \frac{\mathrm{Cov}(\tilde{\boldsymbol{\theta}}_S, \tilde{\theta}^*)}{\sigma_F^2} \equiv \boldsymbol{\beta}_{SF} \tag{27}$$

As argued above, the return on state firms are likely to be more correlated with the returns on foreign firms than with those on nonstate firms. In addition, the variability of an investment in nonstate firms is likely to be higher than that of an investment in a portfolio of foreign firms.[16] Together, these imply that $\boldsymbol{\beta}_{SN} < \boldsymbol{\beta}_{SF}$.

We also expect that $\mathrm{E}\tilde{\theta}_N < \mathrm{E}\tilde{\theta}^*$. Domestic investors face a lower opportunity cost of funds than foreign investors, r vs. r^*, so would be willing to invest in lower return projects. That domestic residents invest a much smaller fraction of their assets in nonstate firms than foreign investors do in foreign firms also suggests that the expected return is less attractive.

In equilibrium, some firms will be listed on both domestic and foreign exchanges. For these firms, a comparison of (23) and (25) reveals that we cannot ascertain theoretically whether more shares would be floated on foreign or domestic market. On the one hand, we expect that $f < h$ and $\mathrm{Var}(\tilde{\boldsymbol{\theta}}_S|\tilde{\theta}^*) < \mathrm{Var}(\tilde{\boldsymbol{\theta}}_S|\tilde{\theta}_N)$, which would raise $\mathbf{K}_B$ relative to $\mathbf{K}_A$. On the other hand, we expect that $\boldsymbol{\beta}_{SF} > \boldsymbol{\beta}_{SN}$ and $\mathrm{E}\tilde{\theta}^* > \mathrm{E}\tilde{\theta}_N$, which would lower $\mathbf{K}_B$ relative to $\mathbf{K}_A$.

A graphical interpretation of the analysis is presented in Figure 4, where a single firm is dual-listed on both domestic (A-share) and foreign (B-share) exchanges. The domestic investors' demand curve, depicted in the left panel, starts from at a higher level and drops more quickly as the supply of shares increases, than does the demand curve of foreign investors.[17] The underlying cost of capital, which equals 1, is represented by the horizontal line $v = 1$. In this example, both domestic and foreign markets for the firm's shares exist. By segment-

[16] Nonstate firms are mostly recent start-ups, and start-ups face much higher risks than ongoing firms. In addition, holdings of nonstate firms will not be well diversified, if only due to government restrictions preventing their being listed on the exchanges. The diversification available abroad can substantially lower the variability of investments in a *portfolio* of foreign shares.

[17] The relative levels of the intercepts are implied by our assumptions about the maximum prices that domestic vs. foreign investors are willing to pay for a share, while the relative slopes are implied by our assumption that $\mathrm{Var}(\tilde{\boldsymbol{\theta}}_S|\tilde{\theta}^*) < \mathrm{Var}(\tilde{\boldsymbol{\theta}}_S|\tilde{\theta}_N)$.

ing the two markets, the government sets the optimal price for each market by equating its marginal revenue for selling shares in that market to the underlying cost of capital. Since their demand curve is steeper and starts at a higher level, domestic investors pay a higher share price than foreign investors. However, because the domestic demand curve is steeper than the foreign demand curve, the government may well choose to issue *fewer* shares to domestic than to foreign investors.

So far, the government has been assumed to have no control over the nature of the investments available to domestic residents in the nonstate sector. The government may have many indirect means of affecting these investments, however. For example, it can raise σ_N^2 by making trade in nonstate shares more difficult. It can also reduce $\mathrm{E}\tilde{\theta}_N$ by making it difficult for nonstate firms to gain access to bank loans, land, electricity, and other inputs controlled by the government. It may also be able to restrict explicitly the amount of nonstate investment that occurs, in the limit banning nonstate activity entirely as it did prior to the reforms.

If $\lambda = 0$, the model does imply that the government would want to ban all nonstate investments — it can then simply seize the wealth of domestic residents. As λ increases, the extent of restrictions should ease. The most efficient restrictions would limit the amount of investment, without affecting the efficiency of the investment that does occur. Remaining wealth is then entirely "capitive." However, if the government can only affect nonstate investments indirectly, by reducing the expected return or raising the risk of nonstate investments, these interventions would still be used unless λ is large enough.

To see this, note from (19) that these policy changes reduce the optimal domestic interest rate, so raise the implicit tax rate on domestic individuals. From (26) we also see that these policies increase the optimal number of state firms sold to domestic investors as long as $\beta_{SN} > 0$ and $\mathrm{E}\tilde{\theta}_N > (1 + r^*)$. In addition, if $\partial \mathrm{Var}(\tilde{\theta}_s|\tilde{\theta}_N)/\partial\sigma_N = 0$, these policies raise the optimal share issuance for all listed firms in the domestic market, further enlarging the tax base. These policies thus unambiguously raise implicit tax rates and enlarge the tax base by making the non-taxed investment alternatives less attractive to domestic investors. Due to market segmentation, these policies have no impact on foreign investors. Individuals obviously lose both directly from the restrictions on nonstate activity and indirectly from the resulting changes in implicit tax rates. To the extent that the government cares about domestic individuals' welfare ($\lambda > 0$), it would set these policies optimally to balance the marginal gains in tax revenue against the marginal excess burden borne by domestic individuals. If $\lambda\alpha_W = 1$, however, the government simply wants to maximize efficiency, so would impose no restrictions on nonstate activity.

So far, we have also assumed that the real exchange rate between domestic and foreign currencies is fixed and that the Chinese government pays no risk premium for international borrowing. How do our results change when exchange and sovereign risks are taken into account?

Because of capital controls and market segmentation, domestic individuals' portfolio choice decisions will not be affected by these risks. The demand functions for domestic equity and government bonds derived in Section 3.1 remain valid.

Foreign investors, however, now face exchange rate risk from owning Chinese shares. Consequently, foreign investors in firm s in China earn a random real return per-share of $\tilde{\theta}_s^e$, denominated in foreign currency, where the difference between $\tilde{\theta}_s^e$ and $\tilde{\theta}_s$ is the random appreciation of the yuan relative to the dollar during the period. Exchange rate risk increases the variance of Chinese stocks for foreign investors, given the presumption that poor firm performance is associated with a depreciation of the currency. From (10), we find that exchange rate risk lowers the maximum price that foreigners are willing to pay for Chinese equity to the extent that $\mathrm{Cov}(\tilde{\theta}_s^e - \tilde{\theta}_s, \tilde{\theta}^*) > 0$, and makes foreign demand more inelastic since $\mathrm{Var}(\tilde{\theta}_s^e - \tilde{\theta}_s | \tilde{\theta}^*) > 0$. As a result, both the optimal price and the optimal foreign holdings of Chinese equity fall due to exchange rate risk.

Exchange rate risk also affects the cost to the Chinese government of borrowing abroad. Given that its debt has been denominated in the foreign currency, the size of the repayment in RMB the government needs to make is now random. If this random repayment is denoted by $\tilde{r}^*$, then the net cost of foreign debt now equals $\mathrm{E}\tilde{r}^* - h_G \mathrm{Cov}(\tilde{r}^*, \tilde{W}_G)$. If the exchange rate tends to depreciate when the Chinese economy is doing badly, then the covariance is negative, raising the cost of foreign funds.

Sovereign risk, however, has an offsetting effect. To the extent that China defaults on its foreign debt when conditions are bad enough, then the covariance of the actual repayment with $\tilde{W}_G$ becomes less negative, and may even change sign. Effects of exchange rate risk and sovereign risk together on the cost of foreign borrowing are therefore ambiguous.

So far, we have also assumed that Chinese residents are not allowed to invest abroad in either foreign bonds or foreign equity. Consider the impact on the government's objective function if domestic residents were allowed to invest a unit of wealth in foreign bonds. This investment would replace a unit of investment in domestic bonds, and leave unaffected the amount invested in equity in either nonstate or state firms, given constant absolute risk aversion. The resulting gain in social welfare arising from the increase in individual utility would equal $\lambda \alpha_W (r^* - r)$, while the loss in government revenue would equal $(r^* - r)$. As long as $1 > \lambda \alpha_W$, so that the government prefers to transfer revenue from individuals to itself, it

will try to prevent domestic residents from purchasing foreign bonds.

The case for banning purchases of foreign equity is less clear. While individuals gain from the expanded investment opportunities, government revenue falls due to the "capital flight." If $\lambda = 0$, so that the government is only concerned about maximizing government revenue, then it would clearly choose to ban such investments abroad. In contrast, if $\lambda\alpha_W = 1$, so that the government cares only about efficiency, then it would want to give domestic residents the opportunity to diversify their portfolios by investing abroad. As λ increases, restrictions on investments in foreign shares should gradually ease.

4 Discussion

If the types of restrictions on the financial market observed in China are consistent with the government maximizing some measure of social welfare, why are many of these restrictions so unusual? One explanation implicitly given above is that the Chinese government may put an unusually small weight on the welfare of domestic residents, so be willing to impose larger efficiency costs at the margin in order to raise an additional unit of government revenue than other governments are. Probably a more important explanation, however, is that these restrictions take a different form in other countries.

In particular, many of the restrictions within the model would be perfect substitutes for standard types of tax policies. Consider, for example, the impact of imposing a tax on interest income from bonds at rate t, so that $r^*(1-t) = r$. With this tax in place, the government can issue domestic bonds with an interest rate equal to the international rate, r^*, and still maintain the same allocation described above. If the tax can be imposed on purchases of foreign bonds as well, then there would be no need to prevent domestic residents from buying foreign bonds.

Similarly, consider the implications of imposing a corporate income tax at rate τ_s on the earnings of state firm s. If $1 - \tau_s = 1/P_{As}$, then the government can maintain the desired allocation while eliminating all restrictions on new share issues, so that the market clearing price of new shares simply equals the opportunity cost of the underlying capital. To see this, note first that equation (5) remains satisfied at the previous allocation, except that each individual will now need to purchase $K_{Asi}/(1-\tau_s)$ shares in order to replicate the amount of risk borne in the optimal allocation found above. The government, however, now bears the added risk from the random tax revenue $\tau_s\tilde{\theta}_S K_{As}$. If K_G falls by $\tau_s K_{As}/(1-\tau_s)$ to compensate, so that the government bears the same risk as before, then it is straight-forward to check that government revenue, as described in equation (15), is entirely unchanged by

this shift from regulations to taxes. The previously optimal allocation remains feasible, and is still optimal.

Note that when the optimal P_{As} varies by firm, so does the optimal tax rate τ_s. In particular, as seen in equation (20), the government should charge a lower price for shares (or impose a lower tax rate) on firms whose returns have a higher covariance with the return from the nonstate sector. For these firms, given that nonstate firms are a closer substitute, taxes create a larger behavioral response and so a larger excess burden at the margin.[18] For example, in most countries the main untaxed sector analogous to the nonstate sector is owner-occupied housing. In this context, our results imply that the effective tax rate on firms providing rental housing should be lower than that on other types of firms.

Similarly, charging a price P_{Bs} for shares in firm s sold to foreign investors is equivalent to imposing a tax rate τ_{fs} on the profits of these firms. Our results on the relative sizes of $\mathbf{P}_A$ and $\mathbf{P}_B$ can then be reinterpreted to describe the differences in the optimal tax rates on firms owned by domestic vs. foreign investors.

The government's inability within the model to gain revenue from investments in the nonstate sector is equivalent to the assumption that this sector cannot be taxed. Small firms are difficult to tax in all countries, given that there is no effective outside monitoring of their cash flows. While we have made the extreme assumption that these firms are entirely untaxed, the qualitative story would remain the same even if they could be taxed, but at a lower effective rate than applies to state firms.

Within our model, the Chinese policy of charging domestic residents a higher price than foreign residents for equity shares is equivalent to imposing a higher tax rate on profits received by domestic residents than foreign residents. This pattern of relative tax rates is in fact quite common, though it is by no means universal. In the U.S., for example, corporate profits are subject to the same corporate tax rate regardless of who owns the profits. Both domestic and foreign residents also face further U.S. taxes on the dividends and capital gains that are derived from these profits. However, foreign owners of U.S. equity normally face much lower U.S. tax rates on dividends and capital gains than do U.S. owners.[19]

In contrast, a number of countries have dividend imputation schemes that provide for a rebate to domestic residents for some or all of the corporate taxes paid on income distributed as dividends. These rebates are rarely available to foreign investors. With the rebate, the

[18] See Piggott and Whalley (1996) for a similar argument, dealing with the taxation of substitutes for home production.

[19] Tax rates on foreign residents vary by the nationality of the investor, due to the wide variety of provisions in bilateral tax treaties. Commonly the tax rate on dividends and capital gains is set at 15%, which is the lowest statutory personal tax rate. See Hines and Willard (1992) for further information.

combined personal and corporate taxes faced by domestic residents can easily be less than those faced by foreign residents, implying a pattern of rates quite different from that observed in China.

One natural explanation for the differing relative tax rates on domestic vs. foreign investors is differences in the ease with which domestic investors can evade domestic taxes on their capital income by investing abroad. China bans such investments abroad. A number of developed countries have also imposed analogous restrictions on domestic residents, hindering if not banning their investments abroad. Gordon and Jun (1993), provide evidence that taxes on the dividend income received by domestic residents tend to be very high in countries where such controls are in place, and that they drop dramatically when these controls are removed. For example, Australia, France, Italy, Japan, and Sweden all had some form of capital controls during the 1980's, all these countries have since eliminated these controls, and in each case tax rates fell shortly thereafter.

Even if the Chinese use of a higher tax rate on domestic than on foreign investors is not uncommon, their use of restrictions on the financial market rather than tax policy to raise revenue is very unusual. Why? The administrative costs in China of raising revenue from shareholders is almost surely much lower when regulations rather than taxes are used — monitoring the amount of new share issues is much easier than monitoring financial profits period by period. However, rationing of new share issues is equivalent to corporate income taxes only under very restrictive assumptions. In particular, the government receives the revenue in both cases only if it owns the new shares that are issued, so can treat the increased price as government revenue. If the government did not own *all* the firm's shares when the policy is decided on, then existing owners receive a capital gain when restrictions on new share issues are employed, yet they would suffer a capital loss if new taxes were instead imposed.[20] As a result, the more shares that are owned privately, the more attractive taxes will appear relative to regulations.[21] Corporate income taxes also have administrative advantages when the government taxes the labor income of residents, since the corporate tax discourages individuals from reclassifying their labor income as corporate income in order to avoid labor income taxes.[22]

In summary, the model in this paper suggests that the types of restrictions that China

[20]The capital gain with regulations comes at the expense of investors who hope to be buying shares in the future, while the capital loss with taxes reflects the added tax revenue received from taxing existing as well as new investments.

[21]This reflects, however, a time inconsistency in optimal policies, since taxes and regulations are equivalent if fully anticipated.

[22]See, for example, Gordon and Slemrod (forthcoming) for evidence.

has imposed on its financial market, leading to segmented markets with much higher prices for shares owned by domestic than by foreign investors, are consistent with its maximizing a standard type of social welfare function. These restrictions are equivalent to imposing taxes on firm income, and imply a pattern of relative tax rates that is broadly consistent with those observed in many other countries. However, the use of implicit taxation through regulatory restrictions, rather than use of explicit taxes, is much more unusual and likely to be a temporary phenomenon.

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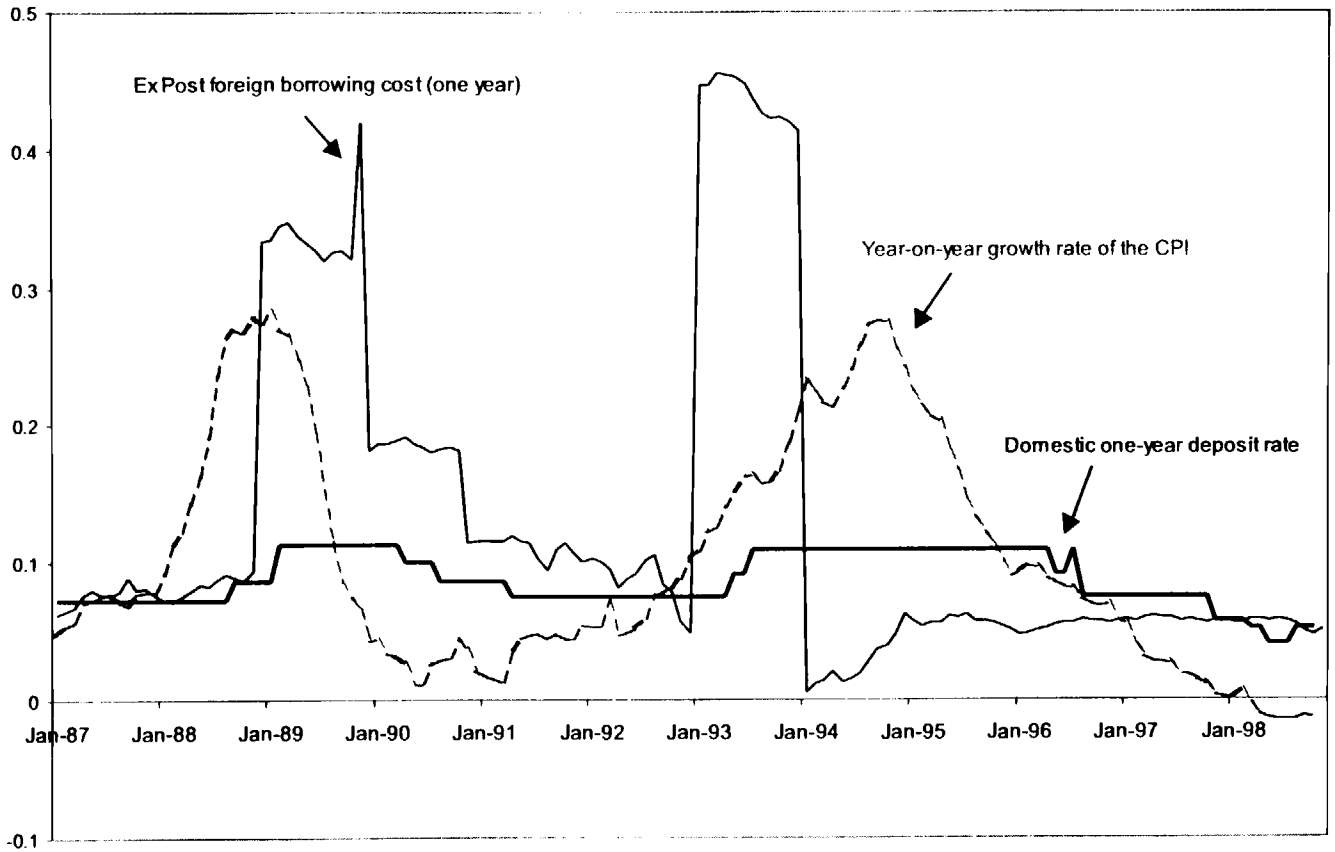

Figure 1: Comparing one-year domestic deposit rate and the government's ex post foreign borrowing cost with domestic inflation rate, 1987-98. The government's ex post foreign borrowing cost is constructed as the sum of the Euro-currency US$ one-year interest rate (ECUSD1Y in Datastream) and the ex post 12-month ahead depreciation rate of the yuan relative to the U.S. dollar. Data source: Datastream.

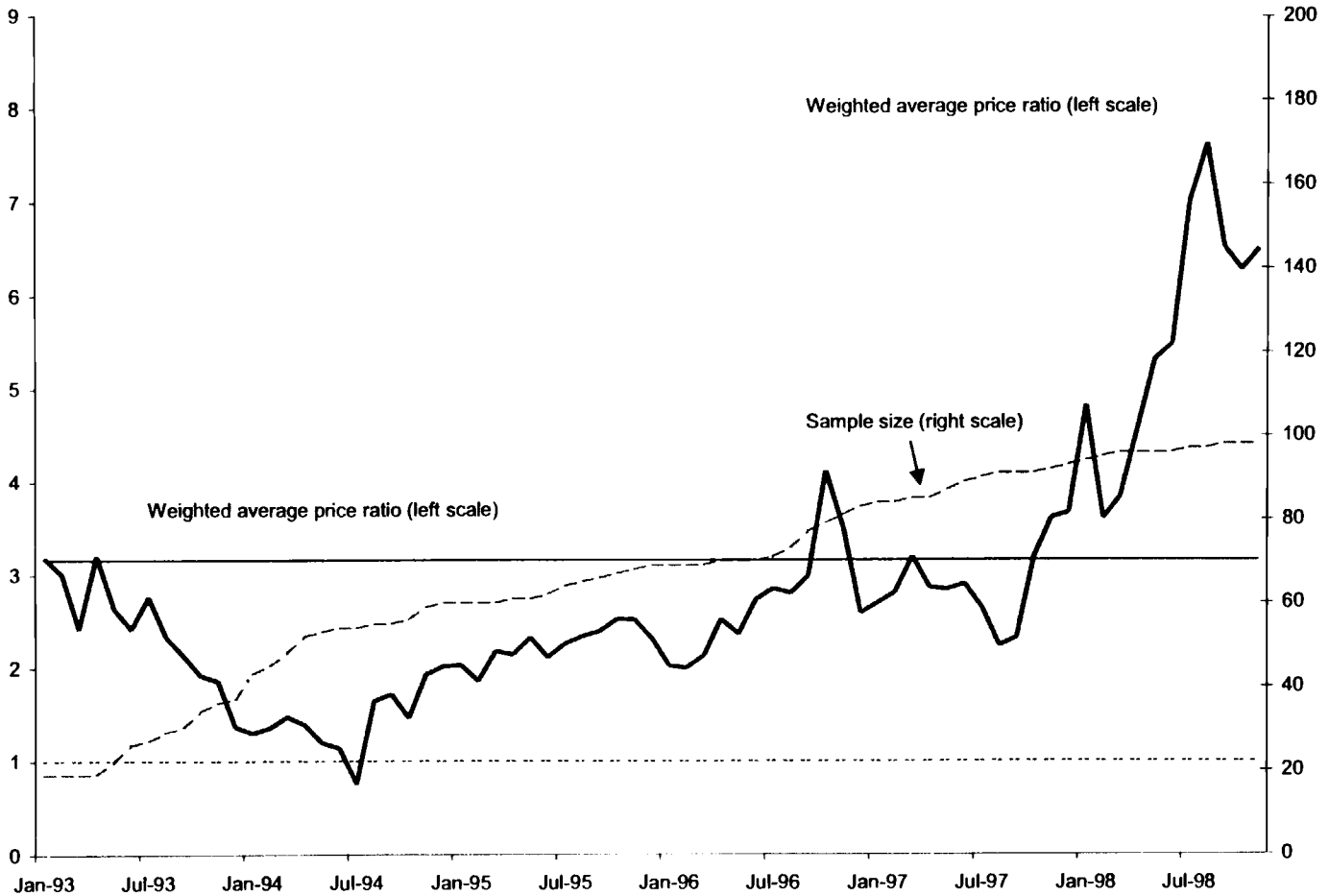

Figure 2: Weighted average premium of A-shares prices over the corresponding B-shares prices. Market value of tradeable shares in each firm was used as the weighting variable. The maximum sample contains 98 dual-listed firms. The number of dual-listed firms grew from 19 in January 1993 to 98 in November 1998. Data source: Datastream and China Securities Regulatory Commission.

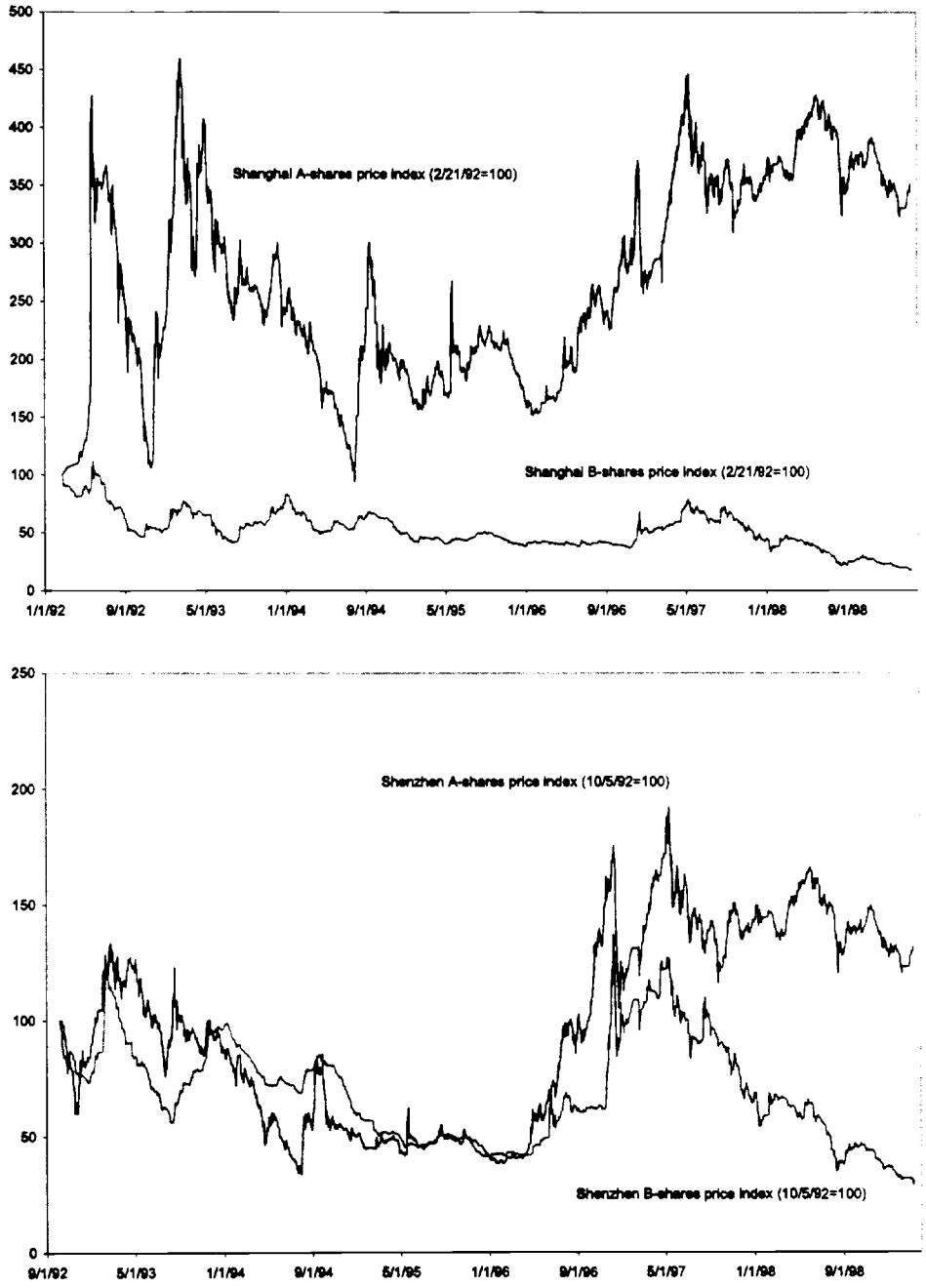

Figure 3: A-shares and B-shares price indices (daily) in SHSE and SZSE. Source: Datastream.

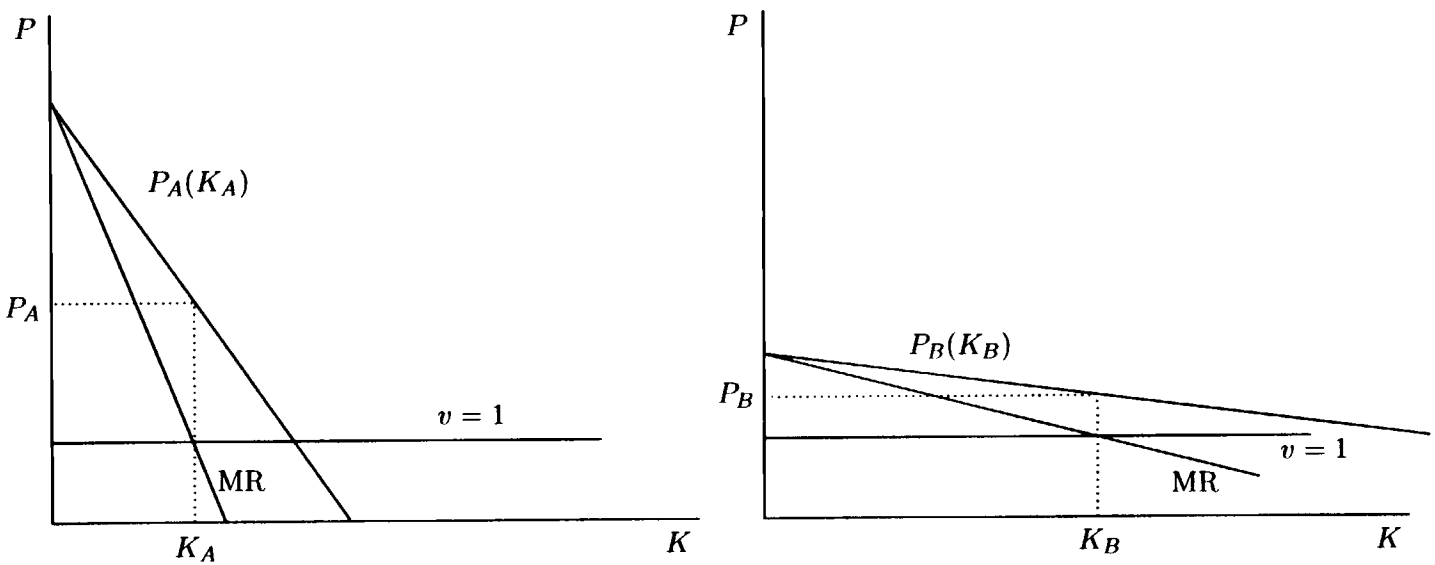

Figure 4: Stock market equilibrium under price discrimination. The underlying cost of capital, which equals 1, is represented by the horizontal line $v = 1$. Domestic investors' demand curve, depicted in the left panel, starts from at a higher level and drops more quickly as the supply of shares increase. By segmenting the two markets, the government sets the optimal price for each market by equating its marginal revenue from selling shares in that market to the underlying cost of capital.