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Political favoritism in China's capital markets and its effect on city sizes

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Abstract

This paper examines political favoritism of cites in national capital markets and the effect of that favoritism on city sizes. The paper estimates the city-by-city variation in the prices of capital across cities in China from 1998 to 2007. It relates how the prices facing the highest order political units and overall cross-city price dispersion change with changes in national policy and leadership. The effect of capital market favoritism on city growth after the national relaxation of migration restrictions in the early 2000's is investigated. The elasticity of the city growth rate with respect to the price of capital is estimated to be - 0.07 in the OLS approach and -0.12 in the IV approach.

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1 Introduction

Policy bias towards politically favored cities in developing countries is a major policy issue (e.g., Ades and Glaeser, 1995; Davis and Henderson 2003) in general as well as in specific countries such as China (World Bank 2014). Simple theoretical models suggest that cities that are favored in national capital markets, in export or import markets or with enhanced transport infrastructure, will attain larger sizes than non-favored cities, increasing inequality in size distributions (Henderson, 1988; Ades and Glaeser, 1995; Duranton, 2007). The empirical work to date has focused on special cases such as favoritism of national capitals (e.g., Ades and Glaeser, 1999; Davis and Henderson 2003) or favoritism of a national leader's birthplace (Hodler and Raschky, 2014). For national capitals, the idea is either that national leaders favor the place they live and their relatives may work, or that they garner key political support from the national capital population. Favoritism of one type or another will shift up returns to living or producing in favored cities, potentially drawing in workers and firms, with the advantages of favoritism being dissipated by increased disamenities from increased populations. This literature suggests that unrestrained migration can lead to gross over-population of favored cities and the specter of poor living conditions such as congestion and urban slums. Alternatively, countries can try to restrict in-migration to favored cities, as is China in the 1990's and even continuing today.

In these analyses, a better articulation, let alone a political economy model of different aspects of favoritism is lacking, beyond just favoritism or not of the national capital. And empirical evidence on political favoritism is limited and indirect. In the literature that focuses on national capitals in Ades and Glaeser (1995) and David and Henderson (2003), one must worry that capital cities are, for example, often located in prime geographies and have transport links which make the capital the main hub of the country (as opposed to some other city), in potentially an efficient hub and spoke system. Both factors draw in high numbers of people themselves and separately identifying the effect of political bias on size is a challenge. A second challenge is to identify degrees of bias. For example, evidence that per capita public expenditures is higher in a capital city is not evidence of bias per se; higher per capita expenditures in larger cities may be efficient if there are greater relative benefits of such expenditures. Or evidence that capital to labor ratios are higher in larger capital cities is not necessarily evidence of bias, since nominal labor costs are higher.

Keeping in mind the above challenges, we utilize the specific institutional and political setting in China to quantify political favoritism directly, and examine its causal relationship to city sizes comprehensively and carefully. While the context is particular, it will inform us about analysis of other contexts. We first articulate a basis for widespread favoritism in China where it is not just favoritism of one or two political cities versus all others, but shifting favoritism of a wide variety of cities at the expense of the rest, based on the specific and shifting national and local leadership structures, and incentives inherent in that. Second, we use data on Chinese capital markets to study political favoritism. This has two key advantages. In general, defining bias in capital markets is more clear-cut and not confounded with issues of city scale, unlike for analysis of differential per capita public expenditures or capital to labor ratios. Efficiency in capital markets requires equalized marginal returns to capital across cities, regardless of size. The second advantage in looking at capital markets in China is that they can be the key mechanism of political favoritism: banks are still de facto state owned. The state intervenes in capital markets in response to policy initiatives and political pressures, to potentially favor different types of firms and cities.

The final step is to look at the effects of bias on city sizes. There is a cross-section, or long run

equilibrium model, where cities with lower costs of capital, ceteris paribus will be larger. While we will examine such a model, estimation is challenged by all the unobservables that might drive differences in city sizes and might be related to the degree of bias, either incidentally or by design. However again, China provides a context where we can construct an empirical framework where inferring the effects of bias is better grounded. We examine the effects of bias on population growth from 2000 to 2010, or how more favored cities grow differentially faster. Looking at growth in a specific context arguably allows us to difference out other fundamentals that affect city sizes. China's internal migration policies provide variation helpful to identification of effects. Prior to 2000, migration in China was legally and sharply limited (Chan, 2010), curtailing the ability of migrants to move to locations with better wages and job opportunities (Au and Henderson, 2006a and 2006b). Around 2000, legal constraints on migration[1] disappear, although migration still faces impediments. This context allows us to argue that there is a regime shift with all cities facing more elastic supply curves of population after 2000, in terms of drawing upon the national reserve of under-employed rural populations. We develop a simple model to show that those favored cities facing a lower price of capital then are likely to respond with larger population increases over the next decade, with the change in supply elasticity.

What do we find? By analyzing firm level data in China from 1998 to 2007, we find that, depending on the year, one or two of the four highest level administrative unit cities in China (Beijing, Tianjin, Shanghai, and Chongqing) experience a 20-40% lower price of capital than others. The magnitude of differential in price is similar to the differential in favor of state over private owned firms near the end of our time period. For these four cities, we find that the degree of bias varies overtime in predictable ways as national leadership changes, consistent with our conceptual framework. We then turn to our main analysis which looks at how the price of capital differs city-by-city for the whole set of cities and how these differentials seem to be driven by changing political forces across China as they affect local areas. Finally, we turn to the effects of these differential prices on city sizes and growth rates. The effects on city sizes in a cross-section framework are large. But even in the growth framework where identification is better defended, we find an elasticity on growth of about -0.124. A one standard deviation decrease in the price of capital would increase a city's growth rate from 2000-2010 by 4% given an average growth rate of 5%.

These findings face a variety of identification issues that we try to resolve. A city's cost of capital may be driven by non-political factors and capital prices are not randomly allocated across cities. We construct relevant measures to account for varying local economic culture, differences in historical total factor productivity [TFP], national programs promoting investment in specific sectors in which a city has historical employment and built-up comparative advantage, and the like, to shore up our evidence. For city growth analysis, in uncovering causal effects, many other factors may simultaneously affect the cost of capital facing a city and its population growth, including other forms of favoritism such as local infrastructure investments funded from the outside and the assignment of politically favored leaders to faster growing cities. Another issue for this growth analysis involves separating out the positive effects on growth of lower costs of capital from the negative effects of capital market inefficiencies such as allowing inefficient firms to be propped up and to remain in business. We make serious attempts in circumventing these identification issues by the use of specific controls and with two different instrument variables. However, most candidates for an instrument for capital market favoritism are inherently likely to have direct effects on city growth, if only through affecting other

[1] For examples, these constraints include: taxes and fees on migration, job quotas, needing official permissions from both the sending and receiving places.

forms of favoritism which might also affect city growth. We interpret our instrumental variable estimations cautiously, discussing their validity and limitations.

The rest of the paper is organized as the following. Section 2 discusses a conceptual famework for local favoritism in capital markets in China and reviews the existing literature and Chinese context. In section 3, models and general econometric specifications are respectively developed for measuring political favoritism in the capital market and its link to city growth. Section 4 details data sources and examines how the descriptive patterns further motivate this paper. Results on capital market bias and its effect on city growth are separately presented and discussed in Section 5. Lastly, section 6 concludes.

2 Conceptualizing urban political bias in China

2.1 Conceptualizing favoritism

Based in part on work by Li (2001, 2002, 2005, 2013), Li (2005), and Lim, Porter, Romer and Spence (2011), how should we think about spatial favoritism in China's capital markets? As we will discuss in more detail below, the Communist Party has various well defined factions. People at the top of a faction are patrons to those below within that faction. At the city level, local leaders are evaluated on the basis of economic performance, meaning literally the local GDP growth during their tenure as a local leader. The patrons of a local leader want to make conditions conducive to economic growth in that city, so that leader will get a good evaluation. A simple lever is intervention in local capital markets to ease credit for producers in that city. Next, we will discuss mechanisms for how capital is allocated across cities, discussing, in particular, how provincial leaders influence the allocation of capital across cities, noting that provincial leaders also appoint local leaders. The expectation is that provincial leaders appoint people they prefer as local leaders, and in turn favor the cities governed by their appointees. This is simply patronage politics. Of course these provincial leaders expect a pay-back: backing within the Party by these local officials as these leaders later seek higher office within the Party.

While this is a general framework, we note also that there is an administrative hierarchy among cities in China: provincial level cities (Beijing, Tianjin, Shanghai, and Chongqing), provincial capitals and other prefectures. By place in the hierarchy, cities have different formal degrees of autonomy, different fiscal responsibilities and resources, as well as potentially differential favoritism in the state influenced capital allocation process. Leaders of provincial level cities are like provincial governors and are appointed by national leaders. These leaders are relatively high up in the political hierarchy; and as such we might expect that leaders of higher level cities are overall favored in national politics and capital market allocations. However, as we will explain later, given the specific factions within the party, national leaders can have allegiance to particular provincial level cities and can favor those over others.

How is it possible for political leaders to distort capital market allocations? To answer that, we examine the literature on the evolution of China's banking system. The online Appendix gives more detail but here we note key items. Despite China's economic reforms since 1978 that successfully freed up most output market and induced widespread growth, reforms in factor markets for labor, capital, and land have been slow and incomplete. Banks in China today remain de facto state owned.

There have been extensive reforms over the last 20 years designed to put banks more on a market basis and minimize the extent of non-performing loans. However, the Committee of the Chinese Communist Party retains the power to appoint the boards of directors and senior management of banks. The state's interest is not communicated through shareholder's meetings but via the firm-level Communist Party Committee. The Party Committee is not telling banks to act in the interest of shareholders, but in accordance with "stability", "lawfulness", and national "macroeconomic measures". Individuals appointed to bank senior management posts are personnel with standing in the Communist Party hierarchy (Howson, 2010) and move between government and state bank corporate functions. As such, it is difficult for state owned banks to operate independently while facing pressure from different levels of government. In terms of spatial bias, Liu (2007) notes that after the establishment of China's commercial banking system, bank lending concentrated not just on China's state-owned enterprises, but also major cities. One issue is that commercial banks in China have cautiously retrenched credit-extending authority from their local branches (Liu, 2007). Bank branches below provincial level are limited in their autonomy to extend credit to new clients and new investment projects. Branches in cities are allocated funds for loans with stated priorities, and such allocations may reflect the political influence and connections of local leaders to provincial and national leaders, as they attempt to garner credit for enterprises in their cities. In addition there are national industrial priorities announced once every few years, aimed at expansion of particular industries through better access to credit (State Council, 1989; 1997; 2000; 2005). To the extent such announced priorities actually affect capital allocations, cities with an initial larger base of favored industries may gain. However, interviews we conducted also suggest there is simply a lot of idiosyncratic variation in local practices both in interest rate manipulation and charges and in default provisions. Corruption in the disbursement of loans is analyzed in Nan and Meng (2009).

As the major banks in China are unable to function freely, bias measured in the capital market captures signals of political favoritism. The bias in China's capital market by firm type is well documented. For example, Dollar and Wei (2007) show much lower marginal products of capital in the state compared to private sector in China for 2002-2004, consistent with the notion that private firms have less political influence than state owned firms in capital markets. On the spatial side, early research on China noted the differential access to capital markets as reflected in higher returns to [shortage of] capital in the rural versus urban sector, or higher returns to rural town and village enterprises compared to state owned enterprises (Jefferson and Singhe, 1999; Au and Henderson, 2006a). In this paper we expand these analyses to look more in-depth at spatial biases.

2.2 Other relevant literature

Apart from the literature on favoritism of major political cities, there is a literature on estimating the cost of capital. We utilize the traditional average revenue product [ARP] methodology as in Dollar and Wei (2007), which differs from the recent work on China's overall factor market distortions. Starting with Hsieh and Klenow (2009), and extended by Gao (2013) and then by Song and Wu (2013), these papers develop methodologies appropriate to identifying welfare losses from overall factor distortions. Our objective, however, is to quantify specific differentials in the price of capital faced by firms in different locations. Furthermore, we note that some of the simplifying assumptions in the basic Hsieh and Klenow (2009) or Gao (2013) approach are unpalatable in an urban framework, particularly the assumption of a single market clearing wage. From standard work on systems of cities (Henderson, 1974; Roback, 1982; Duranton and Puga, 2004; Albouy, 2009b), while returns to capital

are equalized across space under a free capital market, there are large cross-city differences in nominal wages and corresponding values of labor marginal products under national free mobility of labor that equalizes real wages across cities. Because city sizes, industrial compositions, and costs-of-living differ across cities in a first best equilibrium, nominal wages and marginal products of labor differ as well. In developed countries such differences between a big and small city may be 60% or more (Albouy, 2009a, Combes, Duranton and Gobillon, 2012) for both nominal wages and cost of living, but in developing countries they can be much more (Henderson, 2002). To do a full analysis of distortions one would require quality adjusted wage data for a large sample of Chinese cities. Also Hsieh and Klenow (2009) assume firm constant returns to scale and a single nominal wage clearing all labor markets in a country under free mobility equilibrium. Constant returns to scale has the uncomfortable issue that, with costless trade, all production in an industry in a country should occur solely in the one most efficient firm in that country.

Additionally, this paper relates to the literature on the uneven distribution of city sizes and their differential growth rates within countries. For example, Duranton and Puga (2013) note that the population of US metropolitan areas range from 0.5 to over 18 million, and that their growth rates from 2000 to 2010 have a standard deviation as large as the mean. And in China more dramatically, the distribution of this figure has a standard deviation double its mean [2]. The relative differences have led to modeling and empirical efforts to explain why there are wide size differences, with explanations based on varying agglomeration economies and specialization, producer and consumer amenities, spatial frictions and the like (e.g., Henderson, 1974; Roback, 1982; Duranton and Puga, 2013; Behrens and Robert-Nicoud, 2015). Less is known about the role of institutional factors in affecting size distributions, such as democratization and federalism, although there is suggestive empirical work that federalism and democratization both lead to reduced dispersion, or greater "equality" in spatial allocations (Arzaghi and Henderson, 2005; Fetzer and Shanghavi, 2015). Work on political favoritism especially in less than democratic regimes suggests that politically important cities in countries under dictatorship enjoy substantially better amenities than their counterparts in the hinterlands (Ades and Glaeser, 1995), leading to increased urban primacy. Country-specific evidence on favoritism of the largest political cities is also documented for Indonesia in Henderson and Kuncoro (1996); and, in Albouy (2009a, 2012), there is an analysis of bias in national taxation structures against bigger cities in the US and Canada. This paper will look in a more comprehensive fashion at differential bais across the entire set of cities in a country. A challenge to the literature remains how to incorporate politics and bias into models looking at the differential allocation of resources across cities and the size distribution of cities.

Finally, there is a large literature on migration restrictions in China. One strand motivates the empirical approach in looking at the effect on capital cost reductions on city growth, where a key element is the easing of migration restrictions after 2000 (e.g., Chan, 2010; Cai, 2006). The second is a literature which suggests that the easing of such restrictions will lead to increased growth of what are implicitly favored cities. While the existing theory (e.g., Duranton, 2007) predicts over-population of favored cities in general under free mobility, Au and Henderson (2006a and 2006b) demonstrate how formal migration restrictions muted the growth of cities in China in the 1990's. Scholars in China then argued that the State understood that such easing would induce greater population growth of the biggest and political cities (Cai, 2006), and that localities would respond by trying to discourage such in-migration, as in Brazil in the 1980's (Feler and Henderson, 2011).

[2] Authors' calculation.

3 Models

3.1 Quantifying capital market biases

In this subsection we first specify how to estimate the degree of China's capital market favoritism city-by-city. Our objective is to quantify specific differentials in the price of capital faced by firms in different locations. Hence our specific estimates call for the average revenue product [ARP] approach, just as in Song and Wu (2013) when they look at how the costs of capital vary across certain firm attributes, or as in Dollar and Wei (2007) when they look at favoritism by firm type.

The firm produces output with inputs of labor and capital, and output (value added) is taxed by a VAT. In the framework, labor costs are assumed to vary by location and there can be non-optimization in the choice of labor. Output markets are assumed to be relatively free, but the degree of local competition will differ across industries and locations. We allow for non-constant returns to scale.

Firm i in industry j in location s has the optimization problem:

$$\max_{l,k} \; p^*_{js} A_{ijs} x_{ij}(l_i, k_i) - w^*_s l_i - r_{ijs} k_i \tag{1}$$

where p^*_{js} is output price to the firm net of taxes; and depends on industry, location, and competition. A_{ijs} is a Hicks neutral productivity shifter, representing inherent firm efficiency and local scale externalities; l_i, k_i are firm specific firm inputs of labor and capital; w^*_s is compensation cost per worker, which varies in equilibrium by location; and r_{ijs} is the price of capital specific to the firm. Optimizing with respect to capital usage yields a first order condition:

$$p^*_{js}(1 - \frac{1}{\eta_{js}}) A_{ijs} \frac{\partial x_j(l_i, k_i)}{\partial k_i} = r_{ijs} \;\; \begin{matrix} > \\ < \end{matrix} \;\; \bar{r} \tag{2}$$

where $\bar{r}$ is the true market cost of capital and η_{js} is the elasticity of demand facing a firm in industry j in location s. If $p^*_{js}(1 - \frac{1}{\eta_{js}}) A_{ijs} \frac{\partial x_j(l_i,k_i)}{\partial k_i} = r_{ijs} > \bar{r}$ that implies either the firm faces a higher than market cost of capital or the firm faces a binding quantity constraint that raises its marginal revenue product (and shadow price of capital) above the market return. If $p^*_{js}(1 - \frac{1}{\eta_{js}}) A_{ijs} \frac{\partial x_j(l_i,k_i)}{\partial k_i} = r_{ijs} < \bar{r}$, the firm is getting an effective subsidy in capital markets.

The literature typically approximates the production function as being log-linear, so $x = Ak^{\alpha} l^{\phi}$. Then the first order condition for the use of capital becomes:

$$p^*_{js}(1 - \frac{1}{\eta_{js}}) \alpha_j x_j \;\; / \;\; k_i = r_{ijs} \tag{3}$$

$p^*_{js} x_j$ is measured as value added net of taxes. Taking logs the estimating equation is:

$$\ln(\frac{p^*_{js} x_j}{k_i}) = \ln r_{ijs} - \ln(1 - \frac{1}{\eta_{js}}) - \ln \alpha_j + \varepsilon_{ijs} \tag{4}$$

While capital prices are specified to vary by each firm, in practice we have price of capital varying by the typical firm of type i, in industry j and in location s. $\ln r_{ijs}$, relative to a base (e.g., private firms in textiles on the coast in regular prefecture cities) is captured by a set of firm, industry, and location type dummies. We note that the figures discussed earlier assume $\eta_{js} \to 0$, $\alpha_j = \alpha$, $\forall j$. These industry and elasticity terms will now be present and represented by controls to be discussed in section 5.1.

Note if equations 3 and 4 hold exactly, for implementation, issues of selection on for example A's where perhaps better firms go to better locations does not matter per se. The critical assumption is that all firms adjust capital usage until the marginal revenue product which is proportional to the average revenue product equals the price (or shadow price) of capital they face. For the same price of capital, demand elasticity, and capital intensity, firms with higher A's simply expand capital usage until they have the same $p^*_{js}x_j/k_i$, as firms with lower A's, so A is not a right hand side variable. This fact depends critically on the log linear specification. If for example we have a constant elasticity of substitution production function where $x = [al^\rho + bk^\rho]^{\frac{1}{\rho}}$, $\ln(p^*_{js}x_j/k_i) = \frac{1}{1-\rho}\ln r_{ijs} + \frac{1}{1-\rho}\ln[(1-\frac{1}{\eta_{js}})^{-1}(p^*_{js}A_{ijs})^{-\rho}/\ \alpha_j]$. Then unobserved A's appear on the right hand side [RHS] and that creates problems in estimation if, say, the allocation of capital costs across firms is related (positively or negatively) to firm efficiency. Secondly, if production is constant elasticity of substitution [CES], the coefficient we estimate is $\frac{1}{1-\rho}\ln r_{ijs} = \sigma \ln r_{ijs}$.This says for a given change in the price of capital, responses rise with the elasticity of substitution, σ , in production as would be expected.

The error term in equation 4 is for a firm in a city and industry, capturing for example optimization and measurement error. As noted, if the specification is exact there are no identification problems in the estimation of capital price differentials, even if capital prices are not randomly allocated across cities. However, two sorts of problems may arise. The first is that variables may not fully capture what they are intended to represent. For example, within an industry, α_j's may vary. Older firms with more Soviet technological influence and engineering from the past may favor more capital intensive technologies and younger or foreign direct investment influenced firms may favor lower capital intensive technologies. If capital prices are slanted towards one group or another, that will bias estimates of capital prices by firm type. The second type of problem relates to whether or not technology is log-linear. If not, the unobserved A's can be a RHS variable. If lower capital price are slanted towards cities with higher A's that could result in an under-estimate of capital market bias towards these cities. This has two implications. Firstly our estimates of capital prices themselves could misrepresent the extent of bias. In the results section we will experiment with some controls based on historical TFP by city and firm type to try to control for A's. The second implication is that, when we turn to city growth, systematic biases could be related to factors that affect city growth. While we use a static model of capital allocation, in a dynamic world with durable capital, expectations and risk play a role. Cities that are favored may be viewed as lower risk or may have expectations of higher future growth, both of which would reduce the current returns demanded on investments. These identification problems will be analyzed below in the paper.

3.2 Capital market favoritism and city growth

Now, we turn to modeling the effect of capital market favoritism on city size and growth. For a simple and standard city growth framework we turn to the Roback (1982) model, modified to incorpo-

rate the standard systems of cities model from Henderson (1974), as articulated in handbook chapters (Duranton and Puga, 2004; Behrens and Robert-Nicoud, 2015; Desmet and Henderson, 2015). On the production side we utilize a log-linear production technology, consistent with the previous specification of capital market bias estimation. In that specification we assume firms use capital (k) and labor (l) to produce output x, where $x = Ak^{\alpha}l^{\phi}$. Here to simplify discussion, we assume firm constant returns to scale and perfect competition. Given these assumptions we set the corresponding unit cost function equal to output price, or $A_s^{-1} c r_s^{\alpha} w_s^{1-\alpha} = p_s$, where for city s, A_s incorporates urban scale economies and city production amenities, c is a collection of parameters, and w and r are respectively the prices of labor and capital.

If we use the usual urban scale economy formulation, L_s^{ε}, where L_s is effective labor in the city to be defined below, we can rearrange to get:

$$w_s = C_s r_s^{\frac{-\alpha}{1-\alpha}} L_s^{\frac{\varepsilon}{1-\alpha}} \tag{5}$$

where C_s contains c, the price and any amenity terms.

While this gives us urban wages it does not given us urban real income, or utility. For that we turn to the standard urban model where workers commute in mono-centric city from residences to the city center. Following Duranton and Puga (2004), workers live in a city where they must commute to work in the city center. Each worker is endowed with 1 unit of labor, and commuting reduces time spent working at a rate of $4t$ per unit distance commuted. Those living far from the city center spend less on land rents to compensate for their higher commuting costs, or lost labor earnings. City land rents are redistributed to urban workers. Per worker net income, after commuting and land rents are paid and land rent income is redistributed, is $y = w(1-tN)$ where N is city population[3]. City effective total labor supply net of time spent commuting, L, is $L = N(1-tN)$. Substituting into $y = w(1-tN)$ for w from above and for L gives:

$$y_s = C r_s^{\frac{-\alpha}{1-\alpha}} N_s^{\frac{\varepsilon}{1-\alpha}} (1-tN_s)^{1+\frac{\varepsilon}{1-\alpha}} \tag{6}$$

The economics literature has a standard empirical framework for evaluating the effect of capital price differentials on city sizes, the Roback model. In the standard Roback model there is prefect mobility of labor so everyone nationally earns $\bar{y}$ (relevant to the time period). One might then argue that cities are endowed with differential costs of capital in China in a world of perfect mobility. That then results in differential changes in N_s such that $y_s = \bar{y}$. A city with a higher cost of capital will be smaller than an otherwise similar city (same C_s), or:

$$\frac{d\log N}{d\log r} = \frac{\alpha/(1-\alpha)}{z} < 0, \quad Z \equiv (1-tN)^{-1}[\varepsilon/(1-\alpha)(1-2tN) - tN] < 0 \tag{7}$$

[3]Following Duranton and Puga (2004), in a linear city, where each worker is endowed with 1 unit of time and working time is $1-4tu$ where u is distance from the city center and $4t$ unit commuting costs, it is easy to derive expressions for city labor force L as a function of population N (by integrating over the two halves of the city each of length $N/2$), for the city rent gradient (equating rent plus commuting costs for a person at u with that of a person at the city edge where rents are 0, so they are equally well off in equilibrium) and for total rents. These have forms respectively: $L = N(1-tN)$; $R(u) = wt(2N-4u)$; total rents= wtN^2; where w is the wage rate. A person living at the city edge and paying zero rent earns in net $w(1-2tN_U$, with the diseconomy arising from increasing commuting distances reducing time available to work. After getting a share in urban rent income their net income is $y = w(1-tN)$.

which specifies a relationship between city size and price. Z is signed by imposing stability of city size. In the model just presented, ceteris paribus, y rises, peaks, and then declines as N increases. Stability in the Roback model requires the city be on the downward sloping part of the city size-real income relationship. Note even in this simple framework the implied coefficient of a regression of city size on price of capital represents complex function of parameters and size. That makes it difficult to learn about specific parameter values. Inspection would suggest effects should be increasing in capital's share in production, α, as would be expected. We will estimate such an equation. However, such estimation faces severe missing variables problem: all natural amenity and historical political infrastructure differences (here captured by differentials in A) which might influence sizes and be related to prices of capital.

A standard way to try to deal with problems of missing variables bias in estimation of levels equations is to first difference out the A's. The Chinese context presents a compelling context to help with identification in a growth context. Labor mobility in China prior to 2000 was sharply limited as explained above. A key change is relaxation of at least the formal migration restrictions right around 2000, inducing a surge in migration and facing cities with more elastic labor supplies. So our approach is to argue that differentials in capital costs appear before 2000 and persist. The change inducing differential growth is cities' ability overall to attract migrants with an increase in the elasticity of labor supply from the countryside facing all cities. We next argue that cities with lower prices of capital have a larger increase in population with the change in supply elasticity than cities with higher prices of capital.

To show this we assume the supply curve facing the city in y, N space is $\gamma_s N_s^{\delta}$ where $\delta = d\log y/d\log N$ is the inverse supply elasticity. We now look at the effect of an increase in δ, or decrease in the supply elasticity of city population. Equating $\gamma_s N_s^{\delta}$ to y_s in equation 6, taking logs:

$$\log\gamma+\delta\log N=\log C-\frac{\alpha}{1-\alpha}\log r+\frac{\varepsilon}{1-\alpha}\log N+(1+\frac{\varepsilon}{1-\alpha})\log(1-tN) \tag{8}$$

and differentiating $\log N$ with respect to δ, we have:

$$\frac{d\log N}{d\delta}=\frac{\log N}{Z-\delta}<0,\quad Z\equiv(1-tN)^{-1}[\varepsilon/(1-\alpha)(1-2tN)-tN]<0 \tag{9}$$

where stability would require that $Z-\delta<0$. So an increase in the supply elasticity or decrease in δ increases city population must be the case. The issue is to show that a city facing a lower cost of capital has a larger increase in N, or that:

$$\frac{d(d\log N/d\delta)}{d\log N}\frac{d\log N}{d\log r}<0 \tag{10}$$

This states that, if the cost of capital to a city is higher, the response in city population increase as the supply elasticity changes is reduced. From equation 8 we can show that $\frac{d\log N}{d\log r}=\frac{\alpha}{1-\alpha}(Z-\delta)^{-1}<0$, given $Z-\delta<0$. Then we need to sign $\frac{d(d\log N/d\delta)}{d\log N}$ by differentiating equation 9. This yields $\frac{d(d\log N/d\delta)}{d\log N}=\frac{Nt\log N(1+\frac{\varepsilon}{1-\alpha})+(1-tN)^2(Z-\delta)}{(Z-\delta)^2(1-tN)^2}$. This is not unambiguous since the second term in the numerator is negative, even though the first contains a city size term. One can pick accepted values in

the literature on ε (0.02-0.08 in Behrens et al), α (0.25-0.35) and values of t such that real incomes peak at city sizes from anywhere from 100,000 to 10,000,000, to make a numerical evaluation. The bottom line will be as long as the starting value of δ is not too large, the expression will be positive, with a benchmark being Roback where $\delta = 0$. Our results will be consistent with the current signing of equation 10.

In estimation, given the equilibrium size condition ($y_{st} = \gamma N_{st}^{\delta_{st}}$) for each time period is non-linear and involves functional form simplifications/approximations, we use a simple growth formulation where:

$$\log N_{st+1} - \log N_{st} = \alpha + b_0 \log r_{st} + X_{st} b_1 + e_{st+1},\ b_0 < 0 \tag{11}$$

where N_{st} is the population for city s at time t; r is our measurement of capital prices from the previous section; X is the set of other characteristics that may affect growth. The sign of b_0 is based on equation 10. Estimation of equation 11 faces obvious challenges such as unobservables correlated with the price of capital which in themselves affect city growth. Our approach to identification is detailed in Section 5 where relavant.

4 Data and descriptives

In this paper, we confine the analysis to the 283 prefectures in the provinces of the Han part of China, where the spatial unit defining local market areas is the prefecture, which we have been labeling as a city. The data we use are from the survey of medium and large size industrial firms in each year from 1998 to 2007, the last year the relevant economic data are available. The industries included are all manufacturing plus utilities. The survey is designed to cover all state owned firms plus all other firms with over 5 million RMB in annual sales. So our sample covers most of industrial output[4]. We trim the samples as is common with the China data, where with typos and mis-reporting there can be significant outliers. Our trimming is modest. We start by removing a tiny fraction of observations which are clearly flawed: output, wages, fixed assets and material inputs are less than or equal to zero; fringe benefits are negative, or current annual depreciation exceeds accumulated depreciation. We then order observations by the ratio of value added to net assets, our main dependent variable. We remove the top 2% of observations in each year and we remove at least the bottom 2%. At the bottom we remove all observations with negative value added (rounding up to the nearest integer). In 2007 this is 2%. The fraction rises over time as we go backwards, with the most being 6% in 1998. Tables will report specific numbers for each year.

For establishing capital market bias patterns across groups, we first define city-region and firm types. As noted above for city types in China there is an administrative hierarchy: provincial level cities, provincial capitals and other prefectures. We also distinguish regions (west, central, coast/east) based on policy initiatives, such as those to promote development of the West. Firm types are defined by the share of paid-in capital rather than legal status per se. The hierarchies of types we identify are

[4]Some firms have sales less than 5m RMB, but in 2007 that is only 2.2% of firms in the data. What are we missing in this data set? From the 2008 Economic Census, 75.3% of industrial firms have under 5M RMB in sales, but they account for only 5.8% of total industrial sales nationally. Nevertheless, to the extent there is even greater discrimination against smaller firms we are potentially understating effects of discrimination.

(1) wholly state owned firms; (2) majority state owned firms, where 50% or more of paid in capital is from the state; (3) wholly collective owned firms; (4) majority collective owned firms, where 50% or more of paid in capital is from the collective, (unless the state owns 50%); (5) wholly private owned firms; (6) majority private owned firms, where 50% or more of paid in capital is private (unless the state or collective owns 50%); (7) wholly foreign owned firms; and (8) majority foreign owned firms, where 50% or more of paid in capital is foreign owned (unless the state, collective, or private owns 50%)[5]. Table 1 shows the dramatic change in industrial structure for the 10 years, 1998-2007. In 1998 only 19% of firms are wholly private firms, while in 2007 that has risen to 72%. Correspondingly there is a truly dramatic drop in the relative number of firms in the state owned sector, but a more modest drop in the state owned sector's share of value added. These reflect state policy focused on limiting the state owned sector size, with the state sector focused on strategic key industries with typically large plant sizes.

In gauging bias in terms of cost of capital, people typically look at two types of data. The first is quantity data. Quantity data suggest that state-owned enterprises are favored in capital markets: in 2011, state enterprises only contributed 26.2% to national industrial output but still represented 43.9% of total debt; the corresponding numbers for private firms were 29.9% and 17.8% (China Statistical Yearbook, 2012). For cities, the City Statistical Yearbooks tell us that in fixed assets of industrial enterprises per capita from 2002-2007 in provincial level cities was almost double that in ordinary prefecture level cities despite the greater relative presence of manufacturing in the latter types of cities. However, the problem with quantity data is that quantities may differ for reasons other than favoritism: differential total factor productivity; varying efficiency by types of firms; disparate sub-industry composition of firms in different types of cities; and better economic fundamentals in some city types than others.

Thus, the more compelling raw data evidence is to look at the distributions of a simple measure that is proportional to the private marginal product of capital under certain assumptions – perfect competition, equal capital intensity across industries, and log-linear production functions. As discussed in the previous section, that measure is the ratio of after-tax value added to net assets[6] (as defined in equation 4). Before getting into the econometric details, we first present here descriptive patterns of

[5]Note we break the small number of ties (0.34% of total firms) where ownership is equally split (50/50) in a hierarchical fashion based on a modest presumption about level of political influence (highest to state, then collective, then domestic private, then foreign). We drop the tiny percent (0.56% in 2007) of firms where there is no majority control. The issues with this firm hierarchy have been well discussed in the literature and it is not our focus (specifically to capital markets there is Dollar and Wei, 2007).

[6]We need to discuss the use of measure of capital stock in the context of the literature. Papers advocate for a perpetual inventory based measure (see Brandt, van Biesebroeck, and Zhang, 2012; or Song and Wu, 2013), using accepted measures of economic depreciation and investment price indices applied to investment flows, with a base of some form of first recorded book value. The problem is that this requires linking firms across years using ID's (that may be incorrectly recorded), without interruption and missing values of investment series. These problems can generate significant losses in sample, with then various fix-ups (Brandt, Tombe, and Zhu, 2013). An alternative is to use either gross book value or net book value based on accounting depreciation and ignoring investment price increases. The tradeoff is that, the longer the series for a firm the worse is the problem between an economic measure of capital stock and an accounting one (which uses different depreciation rates and no indexing for price changes). However, our context is unusual. In the 10 years covered by our sample, the total number of firms increases by 130%. In one critical margin, private firms, the number increased by 780% over the 10 years. About 50% of firms in 2007 have been in the data set for less than 5 years (Brandt, Tombe, and Zhu, 2013). Therefore, we use net book value to avoid loss of sample which means we rely on accounting depreciation rather than an economist's estimate of depreciation and we do ignore price changes for investment although such changes in the mid-2000's are modest (Brandt, Tombe, and Zhu, 2013). We think this is a reasonable way to proceed, but do robustness checks such as controlling for firm age later on.

this key variable to establish the existence of large scale capital cost variations across firm types and cities in China. The descriptives support two central points. The first is more well known: favoritism by firm type. Figure 1 for 2007 compares the (log) marginal returns of firms which are wholly or majority state owned to those that are wholly privately owned. The distribution for private firms is distinctly shifted to the right, indicating that they face either or both higher costs of capital or restricted access to capital markets (and thus a higher shadow price of capital).

The second point is that, controlling for firm type, certain cities per se are favored in capital markets. While the approach when analyzing city growth across China will be general, in the first part of the paper, we focus on known political cities and regions, compared to more ordinary cities. Figures 2 and 3 examine an aspect of this spatial dimension. Here the differentials are a little more modest but still compelling. Figure 2 compares the returns for all wholly private firms in non-provincial level cities nationally with (1) all firms in the 3 east coast provincial level cities (Beijing, Tianjin and Shanghai) and (2) just wholly private firms in the same 3 east coast provincial level cities. The latter two distributions overlap suggesting that within provincial level cities, by 2007, all firms may be treated fairly equally, at least as suggested by the raw data. However the returns for private firms in non-provincial cities nationally are more concentrated and shifted right, compared to firms in provincial level cities, suggesting political cities are favored in capital markets. Figure 3 isolates an example and directly compares returns to privately owned firms in each of the three east coast provincial level cities, Tianjin, Beijing and Shanghai, with the supposedly freer wheeling, more (non-state) capitalistic cities in the south-east, in particular Guangzhou and Shenzhen. The ordering is very suggestive. The worst distributions in terms of favoritism are for Beijing and its twin, Tianjin, the centers of national political influence certainly in 2007. Then there is Shanghai, followed by Guangzhou. Guangzhou as a provincial capital still has a distribution distinctly more concentrated and shifted to the right of those for Beijing, Tianjin and arguably Shanghai. But Shenzhen dominates all these political cities with a distribution distinctly to the right of all the others, reflecting its distinctly higher cost of capital.

5 Results

5.1 Estimating capital market favoritism

5.1.1 Regression specifications

As established in the previous sections, we estimate differences in the returns to capital by city, accounting for differences in inherent firm and/or location productivity and in the degree of competition in different markets across locations and industries. Recall that in equation 4, $\ln(\frac{p^*_{js}x_j}{k_i}) = \ln r_{ijs} - \ln(1-\frac{1}{\eta_{js}}) - \ln\alpha_j + \varepsilon_{ijs}$, the $\ln r_{ijs}$ aspect is captured by fixed effects variously representing firm type, city or region type and individual cities, depending on the specification and issue in discussion. In equation 4, industry fixed effects control for differences in α_j. To control for differences in demand elasticities, we include the number of firms in the industry the observation is in for that prefecture (where the degree of local competition affects the local value of η_{js}). To account for other differences in demand elasticities, for each city-industry a firm is in, we control for measures of overall market scale and access, in particular distance to the coast and GDP within 150 kilometers of the prefecture city center. Furthermore, to avoid feedback effects, the base industry firm counts are from the 1995 industrial census and the income measures are for 1990 GDP. Results are robust to other dating choices for these controls (such as for 2007 estimation, 2004 Census firm counts and 2000

GDP).

In the following subsections, we present the estimation on capital market favoritism as they pertain to Chinese policies and give suggestive evidence of political influence. We will first focus on the 2007 cross-section pattern to establish the methodology. Then we turn to all ten years of results, which we relate to political events, so as to argue the link between capital market prices and political influence.

5.1.2 Illustrative results on city type and regional favoritism in 2007

Table 2 presents the cross-sectional results for 2007. The first two columns look at the effect on average returns of being a particular type of firm, in a particular type of location. We represent the hierarchy of firm types in each column and a simple characterization of spatial differences, based on city-region types, not individual cities. For these, the base case covers private firms in east coast ordinary prefecture level cities. Column 1 controls only for industry fixed effects, while all other columns reflect the inclusion of city-industry characteristics affecting local demand elasticities. Many of the results are similar but our preferred specification is in column 2.

In column 2, for firm types, relative to wholly private owned firms, wholly and majority state owned firms have about 45-50% lower marginal products and effective prices of capital. Foreign firms have about 25% lower returns; this may reflect their overall easier access to (international) capital than domestic private firms. In the smaller collective sector, wholly owned have modestly higher costs and majority owned modestly lower costs. Finally, compared to wholly owned private firms, majority owned private firms also face lower effective prices of capital. In the Appendix Table A2, we look at these majority owned categories for collectives, foreign and private. If the minority stakeholder is the state, compared to not the state, returns are typically 20 percentage points lower. That is, the role of the state ownership in having better access to capital markets extends beyond majority and wholly state owned firms to ones where the state is a minority stakeholder.

Next, turning to our main focus, spatial biases, we examine how the price of capital in the four provincial level cities, in provincial capitals as a group, and by west and east region differs relative to ordinary prefecture level cities on the coastal region. Below when we look across years we will build an evolving political story around this. For regions, we ask if the policy of developing the hinterlands, especially the West has any bite in capital markets. We see in column 2 in fact overall the price of capital in the West and Middle regions is higher than on the coast in 2007, despite the "develop the West" rhetoric. When we group together provincial capitals, perhaps surprisingly, *on average* compared to ordinary prefecture cities in the Coast, we find no significant differences. Finally we look at each of the 4 provincial level cities at the top of the hierarchy on their own. For provincial level cities, the twins, Beijing and Tianjin in 2007 have favored access with distinctly lower returns: 19% for Beijing and 30% for Tianjin in column 2. On the other hand Chongqing and Shanghai operate the same as ordinary prefecture level cities on the coast. Below, we will see that these patterns differ over time, as national leadership changes.

In columns 3-6 we conduct robustness checks. Firstly in column 3 we replace the measure of capital stock, net book value, by gross book value. While qualitatively results are the same, using gross book value tends to inflate the degree of bias for, for example, the state owned sector with its

older firms (with long series of non-depreciated gross capital numbers). In column 4 we give the Least Absolute Deviations [LAD] estimates for column 2 to check that measures based on the median as opposed to average firms are similar. The coefficients in the two columns are remarkably similar. In column 5, we add to column 2 a control for firm age. That has no effect on spatial biases but affects magnitudes for the older state owned firms.

Finally in column 6 we explore the bias issue from missing covariates in a non-log-linear specification, in particular city (and industry) specific A's. We have 1995 industrial census data (where we do not observe paid in capital by firm type). For 1995 we calculate TFP for each firm as $\ln(netVA) - 0.30\ln k + 0.70\ln l$. We then regress TFP on industry and city fixed effects, as well as elasticity controls on 1995 numbers of firms in the own industry in the city, log distance to the coast and 1990 GDP within 150 kilometers from the city. Then we insert these measures of industry and city TFP into the column 2 specification. The TFP variables themselves have large positive but at best weakly significant effects. Second, they have no effect on other the covariates in this table. This is not to say we do not have an omitted variables problem, but this specification is encouraging as it suggests that missing A's may not be a key issue.

5.1.3 Margin at which to measure bias

In Table 3 we turn to several issues that are critical to final choices on how to measure city type or city-by-city biases. Column 1 of Table 3 repeats the base result from column 2, Table 2. The first issue is that if we want to represent city bias, do we control for firm type or look just at private firms? Column 2 presents results for just private firms; results on the city-type and regions are very similar as for all firms in column 1. In column 3, we look at all firms again, but remove firm type controls. The idea is that a city faces two sources of bias that we may want to combine. Firstly, all industries are favored by some percent; and, second, a city may have a firm type composition where it has more favored types of firms, such as state owned firms. The combined effect is captured in column 3. Since cities grow both by new firm entry and expansion of existing firms of all types, it is possible this overall measure may be more relevant. However, again the city type and region results are very similar to column 1.

Finally, in columns 4-6 of Table 3 we turn to the actual measures considered for the growth analysis in Section 3. For these we remove the region and provincial capital variables, and have a fixed effect for every city with Shenzhen being the base city but we just report for the 4 provincial level cities. In column 4 we show results where we control for firm type. In column 5, we remove firm type controls and in column 6 we show for just private firms. We have three key findings. First in column 4 relative to column 1, we get almost identical firm type effects. Second and mostly critically, in columns 4-6 with a full set of individual city fixed effects, where the base city is Shenzhen, results on cities are not really comparable with those in columns 1-3. All we can say is that all provincial level cities are favored relative to Shenzhen.

The third result is that if we take the 3 sets of city fixed effects in columns 4-6 the three pairwise correlations are all over 0.9775. This suggests that variants of the basic formulation give very similar results. We are generally going to rely in what follows on the results for the full sample without firm type controls, although we will report some results when we add back in firm type controls.

5.1.4 Ten-year patterns and national politics

Are these region, provincial capital, and provincial level city patterns the same over time? We will argue that we expect them to change to some degree with national leadership. The Communist Party has factions and a hierarchy, although a precise description is elusive and there is inter-mingling. The key in the hierarchy are the Princelings, who are the descendants of senior communist officials historically in the People's Republic of China (Li, 2013). Two other factions stand out, the "Shanghai" branch (*Shanghai bang*) and the Communist Youth League, or what we call "Beijing" branch (*tuanpai*). Until early 2003, Jiang Zemin was in office and represented the Shanghai branch of the party. As such he may have favored Shanghai relative to other cities. But he was also a reformer and committed to privatization (Li, 2001). When Hu Jintao was selected for office in late 2002 (officially to take effect in early 2003) he represented more the Beijing branch of the party and in subsequent years pulled back on the full thrust of privatization reforms (Li, 2002; Li, 2005). These national changes affected policy, which might be represented in the city-type and region fixed effects, as well as firm type effects.

What are the patterns over time? In Table 4 we repeat the Table 2 column 2 formulation for all years. For firm type variables, we see the massive advantage of state owned firms erodes almost monotonically with time, starting at a 118% discount on the cost of capital and falling to 49%. Collectives experience little change and little advantage or disadvantage over time. The advantage of foreign firms also declines. That could be because capital markets in China improve, so that the overall advantage of access to international capital markets declines. Or it could be that that state promoted (subsidized) foreign firms more in the early years, but less or not at all later on.

Of central interest to this paper are the regional effects. There are some particular patterns in the data that coincide with changes in national leadership. We do not want to make too much of this, but they nonetheless motivate the idea that politics play a significant role in the capital market. In Table 4 and coefficients graphed in Figure 4, relative to ordinary prefecture cities in the east, cities in the West have lower costs of capital under the Jiang Zemin regime but under Hu Jintao that reverses with the West facing higher costs of capital, whatever the rhetoric may have been.

More telling, under the Jiang Zemin regime, Shanghai faced lower costs and Beijing higher costs of capital. That differential disappears by 2003/04 as the Party regime switches more to a Beijing orientation with Hu Jintao coming to office. By 2006/07 under Hu Jintao, the pattern has reversed with Beijing facing lower costs of capital and its twin, Tianjin, being very heavily favored from 2004 on. Under neither regime do provincial capitals as a group experience advantages or disadvantages. The graph in Figure 4 suggests some degree of convergence in these differentials by spatial units towards zero in 2003 then strong divergence after that. Is that a more general pattern in the data: narrowing of spatial differences and then divergence?

To see if the data suggests a more general pattern of convergence and divergence, we turn to the analysis of individual city fixed effects presented in column 4 of Table 3. We re-estimate the Table 4 specification, for each year with firm type variables and region and provincial capital indicators removed, but having a complete set of city fixed effects, where Shenzhen is the base case in each year. Changes in the mean are not relevant since that is about Shenzhen versus other cities in China. To look at changes in dispersion we examine the time pattern of the coefficients of variation for these year-by-year city fixed effect coefficients. Figure 5 plots these. The coefficient of variation is lowest at the end of the Jiang Zemin era in 2002. After 2004 and especially as we move into 2006 and 2007

the coefficient escalates, consistent with overall increase in dispersion of capital prices across cities, and retrenchment from aspects of reform in capital markets.

Correspondingly in Table 5 we examine the year-by-year pairwise correlations in these annual vectors of city fixed effects. Two items emerge. On the relevant diagonal, the sequential year correlation is lowest in 03-04 and 04-05, in the early years of Hu Jintao's leadership. Secondly fixed effects in say 1998 (but any year up to 2002) remain highly correlated with those for subsequent years up until about 2004 when that correlation drops noticeably in years subsequent to 2004. That suggests a change in patterns of city capital market favoritism, timed with the change in national leadership. Again, these are suggestive results, indicating that capital markets in China are politicized and certainly different cities face evolving prices of capital as individual city fortunes evolve over time.

5.2 How does capital market favoritism affect growth?

5.2.1 Regression specifications

In this section, we turn to a central theme of the city-urban bias literature: cities which experience favoritism will have larger populations. To examine it here, we look at the effect of the change in population supply elasticities to cities after 2000, to show that cities with lower prices of capital experience larger population increases. Recall from section 3, we propose to estimate a standard city growth equation 11:

$$\log N_{st+1} - \log N_{st} = \alpha + b_0 \log r_{st} + X_{st} b_1 + e_{st+1}$$

with expected $b_0 < 0$. Similarly, we also do the parallel analysis for the 2010 (log) level of city sizes to shed light on the long-run equilibrium effect:

$$\log N_{s,2010} = \alpha\prime + b\prime_0 \log r_{st} + X_{st} b\prime_1 + e\prime_{st+1} \tag{12}$$

with expected $b\prime_0 < 0$.

First, we need to deal with the issue of how to characterize capital market favoritism as it affects city population growth from 2000 to 2010. One idea that relates to identification is to go with pre-period measures of favoritism (i.e., 1998-1999), as occurring before shocks to city growth during the 2000 - 2010 time period (such as later changes in political leadership and contemporaneous favoritism). Note unlike Table 4 where each year is treated separately, to reduce noise we pool two adjacent years to try to capture pre-growth period favoritism. We use a 98-99 measure of city fixed effects, which will be uncorrelated with later shocks affecting growth from 2000 to 2010. However rather than a pre-period measure, we might want to try instead to capture the effects after 2002 of the changes in capital market favoritism that followed changes in national leadership. For this we would want to know the later, say 06-07, level of favoritism. We show a variety of OLS specifications, experimenting with different measures of favoritism, before turning to the instrumental variable estimates.

The challenges to arguing that we identify the causal effects of capital market favoritism on city growth are twofold. The first issue is the possibility of selection bias – it could be that favored cities

are ones with more growth potential to begin with – that is favoritism is not randomly sprinkled across cities. In examining prefecture population growth from 2000 to 2010, to try to mitigate the issue of non-random favoritism we control for pre-period growth trends (in an era of strong migration restrictions, 1982-1990). Secondly, even if favoritism was spatially randomized, favoritism of cities may be favored in dimensions other than capital markets. In order to separate out capital market favoritism from what other aspects the estimated fixed effects might represent, we add relevant controls for which we have measures. There are two main concerns: other types of favoritism and aspects of capital market efficiencies that may be correlated with our measures of capital market favoritism. Other forms of favoritism would be public sector allocations and amongst all infrastructure investment is the key. We might expect that if a city if favored in "private" capital markets it might be favored with subsidized public infrastructure investments. For that, we control for the key item: allocations of major highways to cities in 1999. From Baum-Snow, Brandt, Henderson, Turner and Zhang (2014) we extract a count of major highway rays going out from the city center.

For aspects of capital market (in)efficiencies hindering growth we have two concerns. The first one is that a lower local price of capital for all firms overall in a city could also be correlated with a local culture of enhanced market reforms and privatization, building on a long standing notion that cities dominated by SOE's suffered from slower reforms, inhibiting growth (Naughton, 2007; see also Au and Henderson, 2006a,b). Secondly and in contrast, a lower price of capital could be associated with the propping up of local firms who are inefficient, detracting from city growth potential. To deal with these two concerns we utilize two measures from the 1995 Census of Industry. In 1995 we do not have data on types of firms other than by title; from that we extract the share in employment of LTD firms that are supposed to be limited liability private firms in 1995, as a measure of the local culture of reform and enthusiasm for privatization in a city. To deal with aspects of capital market bias which may be correlated with gross inefficiencies in the operation of local markets, for 1995 we control for the share of industrial employment by firms with revenues which do not cover operating costs, or specifically value added is less than labor costs.

After all of these considerations and adjustment to the specification, identification is still a concern. For example, even pre-period measures of capital prices may be correlated with unobserved persistent conditions that affect city growth directly, like aspects of local business culture which persist over time and we do not capture fully with our controls. The use of 06-07 measures of favoritism is even more challenging. Increased favoritism after 2002 may be correlated with other shocks that stimulate city growth. And there may be other dimensions to city favoritism correlated with capital prices for which we do not fully capture with our controls. Ideally, in this non-experimental context there would be an instrument, which was correlated with capital market favoritism per se but not with city growth potential or other forms of favoritism. We return to this issue after presenting the OLS results.

5.2.2 OLS Results

Table 6 presents OLS results for city population growth from 2000 to 2010. Recall that cities with higher costs of capital are expected to have smaller population increases after the relaxation of many migration restrictions. For prices of capital we use the individual city fixed effect coefficients from specifications where we pool 2 years of data and generally do not control for firm type. Standard errors are bootstrapped. We start with pre-period estimates of city fixed effects as the key covariate.

The first 3 columns show 2000-2010 growth regressed on a set of pre-period covariates. In column 1 the only covariate is the city fixed effects from 98-99 representing the city-by-city cost of capital (in logs). The effect is insignificant and has a sign that is positive, as opposed to the expected negative sign. Column 2 adds in controls which may be directly correlated with the cost of capital, but have their own effects. In particular, the share of employment by firms whose revenues are not covering basic operating costs would detract from growth and be negatively correlated with the cost of capital. Thus adding these controls turns the positive coefficient to the expected negative sign but it is still insignificant. In column 3, we add in other basic controls for growth that could be incidentally (or otherwise) correlated with the cost of capital. These include 1982 population and 82-90 growth of prefecture population as controls both for size and for early growth trends, distance to the coast which represents poorer access to export markets and 1999 road rays which represents greater infrastructure investments in the city. Controlling for these factors makes the cost of capital coefficient more negative and significant at the 1% level. In column 3, a 1% decrease in the cost of capital is associated with an increase in city size of 0.07%. Column 4 repeats column 3 with a measure of 98-99 city fixed effects from a specification with firm type controls; the coefficient is then modestly enhanced relative to column 3.

Column 5 presents results for city capital prices measured in 06-07 with strong negative effects of similar magnitude as column 3. This could be the most relevant column. For growth from 2000-2010, it would be the price of capital after the national political regime switch in 2002/03, which should mostly drive growth and a mid-period (for 2003-2010) estimate should capture the average price differential across cities as these start to widen after 2003 (Figure 5). The elasticity in column 5 is a little larger than column 3, at 0.08%. Column 6 controls for both 98-99 and 06-07 capital prices. Both significantly deter growth, with marginal effects being somewhat higher for the later price measure. These OLS results are suggestive of the effects of capital market favoritism on growth, but there are clearly many sources of bias, in addition to the downward bias of measurement error.

5.2.3 Identification: challenges and solutions

In addressing the endogeneity concerns in the OLS specification discussed above, our hope was to find a suitable instrument for individual city level bias in capital prices. We thought of two potential solutions. Firstly, we turned to national policies supposedly governing differential capital allocations across types of industries and then deriving a city specific version of those based on cities' historical industrial composition, a Bartik (2002) - Card (2001) type instrument. For the second candidate, we turned to political variables, measuring changes in local leadership and their relationship to national factions of the party following the national leadership change in early 2003.

For constructing the Bartik-Card type instrument, we compile the lists of favored industries announced by China's State Council once every few years. Amongst the specific industrial favoritism policies, one key is allowing greater access to capital markets. For 2000 and 2005 we coded the favored industries at the 4 digit level, with a "1" for favored and "0" for not listed. We calculated for both the 1995 census and the 1998 survey of industries the share of each 4-digit industry in 1990 prefecture manufacturing employment (from the 1990 Population Census). We multiplied the share by the indicator of favored or not and summed across the 4-digit industries, to create an index of city-like capital market favoritism from national industrial policies for 2000 and 2005.

In Table 7 we present what might have been a first stage of an IV regression with this index of national favoritism. The 06-07 fixed effects are regressed on the index in 2005 for each city for the two sets of Bartik weights. With regression controls from Table 6 or without controls, this index is unrelated to our measures of capital market prices. Recognizing that many favored industries have been on the books for many years, we looked at just 35 newly favored ones added between 2000 and 2005; again there was no relationship to capital market prices. We also worried that our controls for 2-digit industry effects in the basic city fixed effects regression was limiting variation in the data, and we re-estimated city fixed effects without these controls. But these new fixed effects again are uncorrelated with national industry favoritism indices relevant to each city. All this suggests that whatever national industrial policies are on the books, this has no effect on individual city capital market prices in the later 2000's. While disappointing to an identification strategy, the non-result hints that political forces drive price differentials, not policies announced by national planners.

We then looked at observable political events at the local level. A newly appointed local leader with good patronage ties may bring in favorable capital market conditions. We know when local prefecture leaders (party secretary) change office and thought that newly appointed ones in the late 2002 to end of 2004 time frame might be more favored leaders under certain conditions. There were also an unusual number of changes in early 2003: 57 in the first 4 months where usually that would be about 20. We do not know the affiliation of these party secretaries but we know the affiliation of the provincial governors who appointed them. We know if those governors are Princelings, Communist Youth League ("Beijing" branch), "Shanghai affiliated", no known affiliation, or ambiguous affiliation, from records and a data set assembled by Qinghua Zhang of Peking University. Being a new party secretary appointed by one of these types of provincial leaders actually gives us a first stage for predicting capital market prices for 06-07, as reported in column 1 of Table 8. Relative to no new appointment (about 50% of the cases), a new appointment that is the most politically connected in the party hierarchy, a "Princeling", brings a low price, while "fence-sitting" (ambiguous affiliation) brings the highest. This first stage then gives a second stage reported in column 2 of Table 8. The capital market price is significant and now even more negative than the OLS results with an elasticity of -0.12. If this is the true elasticity, it implies that a one standard deviation decrease in the price of capital (see Table 10) would increase city growth by 4% relative to an average growth overall from 2000-2010 of 5%.

The first stage results are consistent with our idea that politics play a big role in capital market distortions. The problem is that politics may not only drive capital market prices but other forms of local favoritism. New dynamic local leaders appointed from late 2002 to 2004 with better connections to the national new leadership may have brought in other dimensions of favoritism. All this suggests that the use of political instruments (in the literature for all kinds of local conditions) are suspect and must be viewed with caution. At best the -0.12 estimate relative to -0.08 in Table 6 is correcting for measurement error; at worst it is biased estimate picking up other favoritism factors besides capital market favoritism. Then what we have is a reduced form estimate of the overall effect of bais, not just capital market bias.

5.2.4 How levels results differ

We now turn to more typical types of estimates in the favoritism literature, which uses a cross-section approach. In Table 9 we show results of estimating a levels equation as in equation 12, where the LHS variable is the log of prefecture population in 2010. Such a cross-section estimation may

be worrisome for potentially larger bias than the growth estimation, because fixed city characteristics which affect size are differenced out in the latter. Nonetheless, this estimation sheds light on the long-term outcome of capital market favoritism on city sizes with implied full adjustment, while the growth estimation is only for 2000-2010. Column 1 of Table 9 shows the results for the formulation corresponding to Table 6 column 3, and column 2 shows the second-stage IV result corresponding to Table 8 column 2. The set of control variables is kept identical. Essentially, we are looking at 2010 population conditioning on 1982 population, 82-90 population growth and other city characteristics as a way of controlling for unobserved city amenity differentials (Duranton and Turner, 2012). Now we see larger impacts of differences in capital costs on city size as might be expected. From the IV results, a 1% reduction in the price of capital reduces city size in 2010 by 0.19%, whereas the growth results suggest a 0.12% reduction in growth.

5.2.5 Spillovers and heterogeneity

What about potential spillovers and heterogeneity? For spillovers, neighbors' prices of capital may affect an own city in two ways. Firstly, lower neighbor prices that spur their development may result in increased demand for own city products, in a market access context. On the other hand, lower neighbor prices of capital may make them better able to compete for local resources (e.g., regional labor) and hurt the own city. To the Table 6 column 3 base case, if we add in the average of all contiguous neighbors' prices controlling for own and neighbor characteristics (other dimensions on which neighbors compete), we get a small (absolute value less than 0.01) negative coefficient for this spatially weighted neighbors' price of capital. In a column 5 or 6 formulation, the coefficient on contemporaneous (i.e., pooled 2006/07) prices is negative and significant[7]. All in all, the signing of the coefficient on contiguous neighbor's average capital price suggest that higher neighbor prices hurt the own city, presumably via the aforementioned channel of reducing their demand for own city products.

We examine heterogeneity in two dimensions. We first asked if capital intensity as measured by capital share in value added or as the capital to labor ratio either increased from 2000 to 2007, or was higher in 2007 (as a level "long run" effect) for lower priced cities. The use of capital relative to labor is based on a clear price effect, and is thus the simplest measure[8]. In all of our tested formulations, an increase in the price of capital reduces capital intensity. Focusing on IV results (with Kleibergen-Paap F-statistic of 8.8), which correspond to the formulations in Tables 8 and 9, we find the following. In a growth formulation, the elasticities of capital intensity with respect to price are -0.27 and -0.72 respectively for intensity measured by the capital to labor ratio and by the capital share in value added. For 2007 levels of capital intensity, the elasticities are -0.55 and -0.90 respectively. All but the first of the four listed are statistically significant. We conclude that indeed higher prices of capital reduce capital intensity, passing a basic test of what one might expect.

Additionally, we asked if cities with higher capital intensities have stronger price effects on size as might be expected from the model. We measure capital intensity variously as total industrial survey capital in 1998, 1999, or the average of both per industrial worker for corresponding years, per total employment in 2000, and as a share of value added. In the OLS versions corresponding to Table 6, capital intensity itself generally has a positive and sometimes significant effect on growth, but the

[7] We have no way to do an IV version of this with any strength as in Table 8.

[8] Share measure responses depend on the specific functional form of production

interaction with the price of capital generates a tiny positive and mostly insignificant effect, where a negative effect is expected. We also tried an IV version as in Table 8 where we use 2007 capital intensity measures instrumented with historical intensity measures (with the price variable also instrumented for as in Table 8). There the interaction terms are negative as expected but insignificant; and the first stage regressions are very weak. Trying to capture an interaction term with shifting capital intensities over time seems to be more than we can do with our data.

5.2.6 Thinking about welfare cost implications

In this paper, what we have estimated is a micro econometric relationship that describes, from the equilibrium in China, how the growth or size of a single city would change as response to a change in the price of capital. Evaluating welfare impacts requires two considerations. For the single city, an increase in size in principle moves it further down its average real income curve as graphed against city size so the city is more over-sized and operating at a less efficient scale. If the real income curve is relatively flat this loss in efficiency might be quite small; but there is the factor of giant over-sized political cities with teeming slums and the work in Henderson (2003) showing considerable growth losses induced by excess primacy, with a more nuanced approach now available in Castells-Quintana (2015). Secondly, however, the welfare inference issue is much bigger. In a deeper analysis moving beyond a partial equilibrium look at one city, in a general equilibrium context such as in Hsieh and Klenow (2009), we would be trying to quantify the effects on real national income of misallocation of capital across cities on a national scale. But that involves a general equilibrium model where there are cities and efficient nominal wage differentials between bigger and smaller cities in equilibrium. And for China this would be in the context of limited labor mobility. While our ability to carry out such analysis has improved (Desmet, Nagy, and Rossi-Hansberg, 2015), we are still some distance from combined micro-econometric and structural estimation that would allow a proper evaluation in such complex contexts. But it would be fundamental to evaluating welfare costs.

6 Conclusion

This paper provides evidence on political favoritism in China's capital market and quantifies the differentials by firm, city, and region types. We also document the shifting climate in city and regional favoritism over time in light of national and local leadership changes. Lastly, we make a serious attempt to identify the causal relationship between capital market favoritism and city population growth in China. Our basic findings are as follows.

Firm type affects the cost of capital. Compared to private firms, wholly or majority state owned firms earn a much lower return on capital consistently across space. The inferred value of marginal product of capital is over 50% lower for state owned firms in 2007. This is an improvement over the 117% lower returns for state owned firms in 1998. By city and region type, the provincial level political cities and regions experience changing costs of capital related to changing national policies and leadership. In the early years under Jiang Zemin, Shanghai and the West were favored relative to Beijing and Tianjin. By 2006-2007 under Hu Jintao, this has reversed. Dispersion in capital market prices across cities drops to a low in 2002 and then escalates under Hu Jintao, representing a reintroduction of willingness to intervene in capital markets.

We then test the effects of a lower price of capital on the growth of cities after the national relaxation in migration restrictions in the period around 2000. Controlling for other factors likely to be correlated with the costs of capital which also affect city growth, we find strong and suggestive evidence that lower costs of capital result in larger increases in city size. This finding is further supported and its magnitude strengthened in the better defended causal context with local political faction affiliation as the instrumental variable. Additionally, we also examined the spatial dimension of this relationship between capital prices and city sizes by considering neighboring cities, following by brief discussions on potential heterogeneous treatment effects by capital intensity and welfare implications.

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Figure 1. 2007 Differential Returns. Ownership Comparison at National Level
State owned or majority controlled firms versus wholly private firms
Distribution of after tax value added divided by net asset value

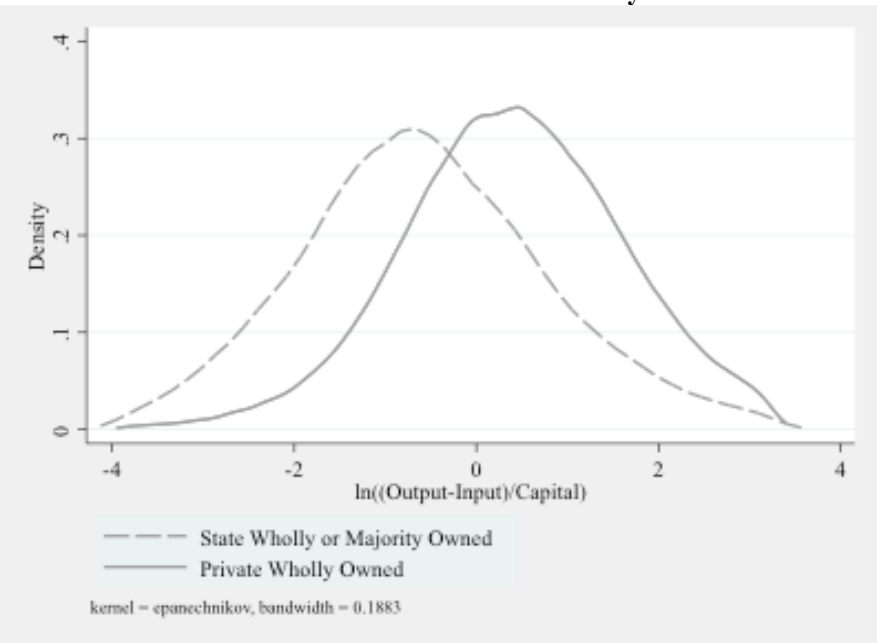

Figure 2. 2007 Differential Returns. All Private Firms Nationally in Non-Provincial Level Cities versus Private and also All Firms in East Coast Provincial Level Cities
Distribution of after tax value added divided by net asset value

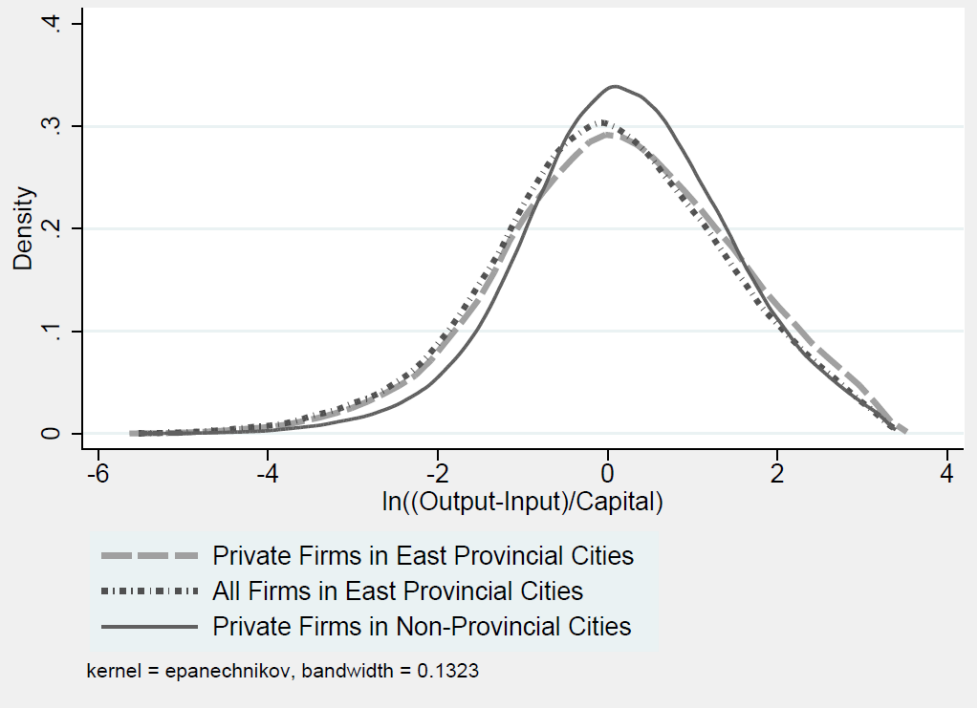

Figure 3. Differential Return. Wholly Private Firms by Major City.
Prefecture Level East Coast Cities versus South Coast Free Wheeling Cities
Distribution of after tax value added divided by net asset value

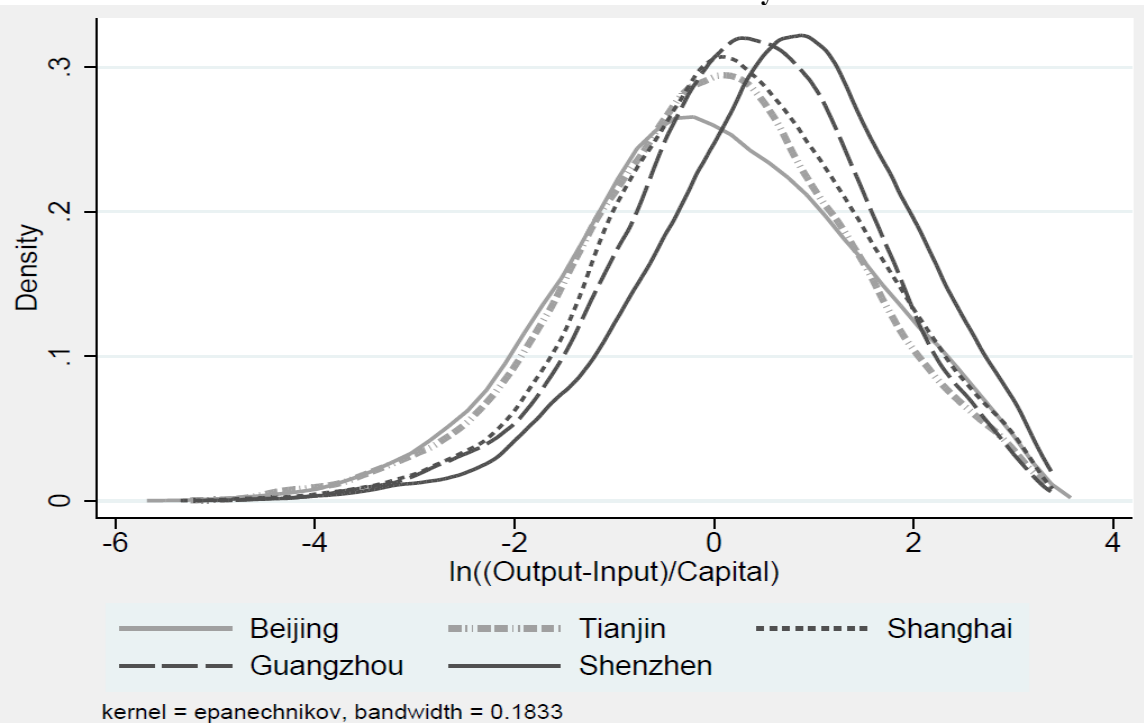

Figure 4. Overtime changes in place based bias coefficients

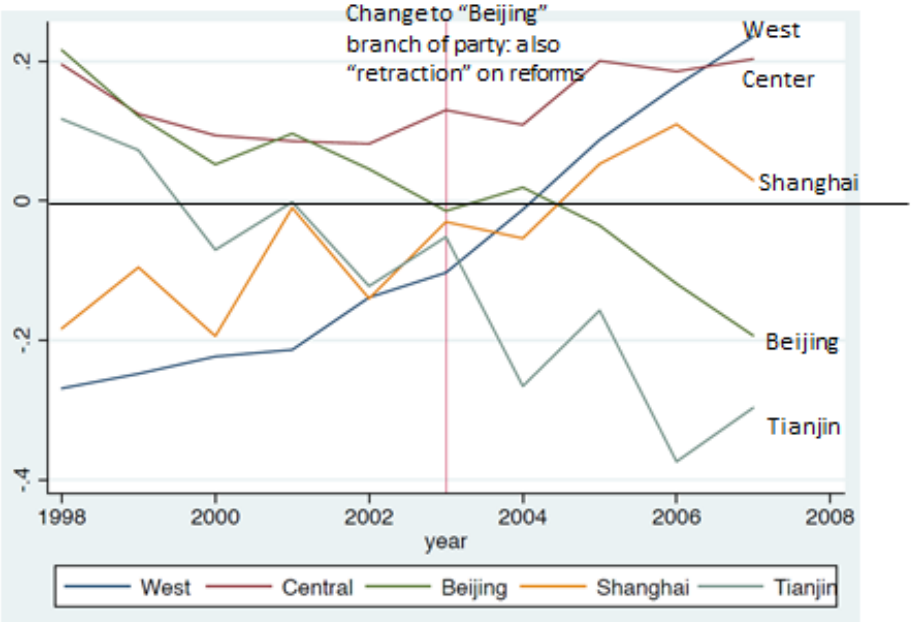

Figure 5. Dispersion of city fixed effects over time (no firm type controls)

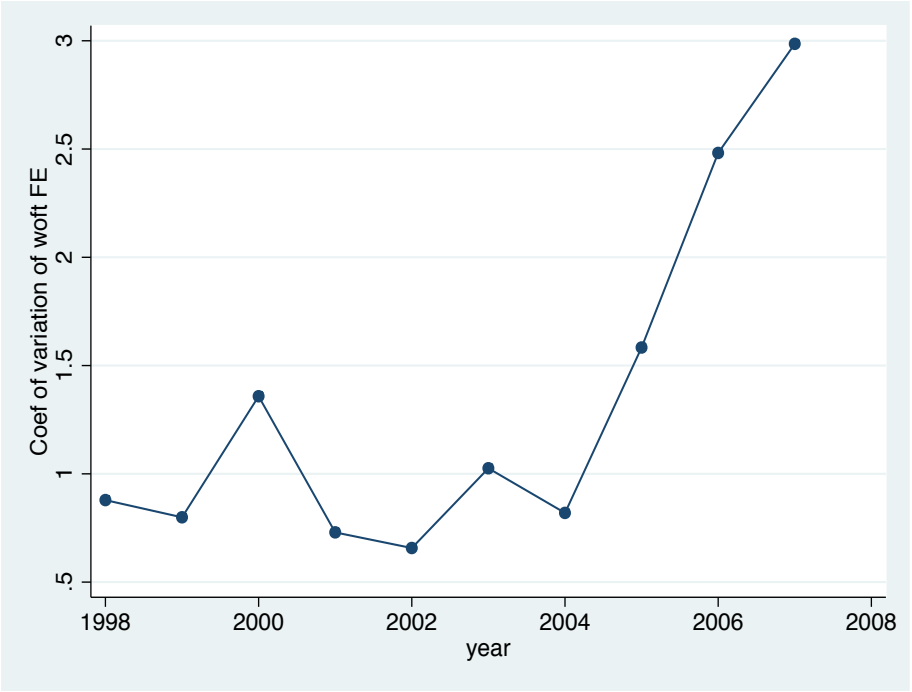

Table 1. Composition of ownership (by paid-in-capital) 2007 versus 1998

	Estimating sample			
	Share of firm count		Share of value added	
	1998	2007	1998	2007
Majority collective	9.14%	0.94%	6.74%	1.22%
Wholly collective	21.30%	3.51%	11.00%	2.77%
Majority foreign	4.30%	2.45%	6.95%	4.81%
Wholly foreign	6.29%	12.42%	7.26%	16.12%
Majority private	9.13%	5.36%	11.09%	10.78%
Wholly private	18.98%	72.06%	16.45%	48.46%
Majority state	5.43%	0.71%	11.15%	4.23%
Wholly state	25.44%	2.55%	29.35%	11.62%
Any state ownership	34.46%	4.15%	47.33%	19.90%

Table 2. Base results for 2007

	base	Full covariates	gross book capital	LAD	add firm age	add TFP controls
	(1)	(2)	(3)	(4)	(5)	(6)
West	0.0377	0.2361***	0.1803**	0.2630***	0.2413***	0.2463***
	(0.0583)	(0.0707)	(0.0781)	(0.0131)	(0.0703)	(0.0695)
Central	0.0672	0.2034***	0.2501***	0.2361***	0.2039***	0.1978***
	(0.0506)	(0.0573)	(0.0606)	(0.0096)	(0.0573)	(0.0576)
Provincial capital	-0.0074	0.0216	-0.0455	0.0272***	0.024	0.0168
	(0.0812)	(0.0883)	(0.0886)	(0.0085)	(0.0886)	(0.0852)
Beijing	-0.2405***	-0.1935***	-0.2961***	-0.1850***	-0.1910***	-0.1691**
	(0.0390)	(0.0711)	(0.0707)	(0.0222)	(0.0712)	(0.0748)
Shanghai	0.0432	0.0293	-0.0579	0.0766***	0.0301	0.0469
	(0.0396)	(0.1310)	(0.1322)	(0.0211)	(0.1311)	(0.1355)
Chongqing	0.0119	0.0067	-0.0249	0.0189	0.0074	0.0623
	(0.0506)	(0.0942)	(0.0989)	(0.0316)	(0.0939)	(0.1002)
Tianjin	-0.3015***	-0.2966***	-0.3309***	-0.2854***	-0.2961***	-0.2765***
	(0.0379)	(0.0784)	(0.0772)	(0.0229)	(0.0786)	(0.0820)
Wholly state	-0.4614***	-0.4491***	-0.6271***	-0.4253***	-0.3793***	-0.4486***
	(0.0305)	(0.0293)	(0.0302)	(0.0182)	(0.0332)	(0.0292)
Majority state	-0.4978***	-0.5004***	-0.6839***	-0.5094***	-0.4672***	-0.4988***
	(0.0491)	(0.0470)	(0.0441)	(0.0313)	(0.0486)	(0.0469)
Wholly collective	0.1160***	0.1161***	-0.0733**	0.1487***	0.1459***	0.1183***
	(0.0270)	(0.0252)	(0.0294)	(0.0145)	(0.0247)	(0.0251)
Majority collective	-0.1145***	-0.1302***	-0.3167***	-0.1291***	-0.1044***	-0.1269***
	(0.0390)	(0.0331)	(0.0356)	(0.0272)	(0.0323)	(0.0336)
Wholly foreign	-0.2385***	-0.2777***	-0.3833***	-0.2963***	-0.2785***	-0.2762***
	(0.0334)	(0.0374)	(0.0418)	(0.0086)	(0.0372)	(0.0375)
Majority foreign	-0.2014***	-0.2307***	-0.3917***	-0.2514***	-0.2272***	-0.2297***
	(0.0263)	(0.0262)	(0.0335)	(0.0171)	(0.0263)	(0.0265)
Majority private	-0.2138***	-0.2268***	-0.3144***	-0.2268***	-0.2182***	-0.2276***
	(0.0209)	(0.0203)	(0.0203)	(0.0118)	(0.0203)	(0.0203)
Firm age					-0.0041***	
					(0.0009)	
1995 industrial TFP Fixed effects						0.7069
						(0.8064)
1995 city TFP fixed effects						0.1408*
						(0.0823)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Elasticity controls	No	Yes	Yes	Yes	Yes	Yes
N	312351	312351	312142	312351	312351	312351
R-squared	0.0767	0.0836	0.1028		0.0844	0.0843

* p<0.10, ** p<0.05, *** p<0.01. This table shows various specifications to look at the cross-sectional average return differentials by firm type and locational hierarchy in 2007. Column 1 accounts for industry fixed effects, while columns 2-6 include city-industry fixed effects reflecting local demand elasticities. Column 2 is our preferred specification.

Table 3. Variants of the basic specification and individual city fixed effects

	Main specification	Private firms	Without firm types	Individual city FE	Without firm types	Private firms
	(1)	(2)	(3)	(4)	(5)	(6)
West	0.2361***	0.2778***	0.2117***			
	(0.0707)	(0.0769)	(0.0722)			
Central	0.2034***	0.2169***	0.1947***			
	(0.0573)	(0.0623)	(0.0584)			
Provincial capital	0.0216	0.0209	0.0053			
	(0.0883)	(0.1013)	(0.0847)			
Beijing	-0.1935***	-0.2567***	-0.2183***	-0.6341***	-0.5185***	-0.7796***
	(0.0711)	(0.0758)	(0.0748)	(0.0399)	(0.0410)	(0.0447)
Shanghai	0.0293	0.0289	-0.0135	-0.4698***	-0.4305***	-0.5872***
	(0.1310)	(0.1425)	(0.1350)	(0.0492)	(0.0507)	(0.0553)
Chongqing	0.0067	-0.0155	0.0044	-0.2701***	-0.1177*	-0.3201***
	(0.0942)	(0.0985)	(0.0974)	(0.0682)	(0.0677)	(0.0744)
Tianjin	-0.2966***	-0.3490***	-0.3457***	-0.7185***	-0.6543***	-0.8629***
	(0.0784)	(0.0848)	(0.0820)	(0.0382)	(0.0397)	(0.0421)
Wholly state	-0.4491***			-0.4222***		
	(0.0293)			(0.0261)		
Majority state	-0.5004***			-0.4735***		
	(0.0470)			(0.0452)		
Wholly collective	0.1161***			0.1069***		
	(0.0252)			(0.0173)		
Majority collective	-0.1302***			-0.1113***		
	(0.0331)			(0.0286)		
Wholly foreign	-0.2777***			-0.2973***		
	(0.0374)			(0.0300)		
Majority foreign	-0.2307***			-0.2196***		
	(0.0262)			(0.0225)		
Majority private	-0.2268***			-0.1795***		
	(0.0203)			(0.0182)		
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Elasticity controls	Yes	Yes	Yes	Yes	Yes	Yes
City fixed effects	No	No	No	Yes	Yes	Yes
N	312351	225086	312351	312351	312351	225086
R-squared	0.0836	0.062	0.0738	0.1308	0.122	0.1202

* p<0.10, ** p<0.05, *** p<0.01. This table presents a variant of specifications to establish how we measure bias in the capital market. Column 1 is a repetition of our preferred specification (column 2 of Table 2) for comparison. Column 2 constrains this specification to just private firms. Column 3 repeats column 1 without firm type controls. Column 4 uses individual city instead of political hierarchy fixed effects. Columns 5 and 6 are parallels of columns 3 and 2 for column 4.

Table 4. All firm sample for all years

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
West	-0.2690***	-0.2480***	-0.2233***	-0.2136***	-0.1386**	-0.1030*	-0.0125	0.0876	0.1652**	0.2361***
	(0.0541)	(0.0520)	(0.0511)	(0.0528)	(0.0629)	(0.0557)	(0.0576)	(0.0656)	(0.0686)	(0.0707)
Central	0.1957***	0.1246**	0.0938	0.0856	0.0818	0.1301**	0.1091**	0.2007***	0.1856***	0.2034***
	(0.0604)	(0.0581)	(0.0578)	(0.0580)	(0.0548)	(0.0556)	(0.0453)	(0.0502)	(0.0537)	(0.0573)
Provincial capital	0.0131	0.0512	0.0244	0.051	0.06	0.0633	0.0426	0.033	0.0334	0.0216
	(0.0741)	(0.0629)	(0.0586)	(0.0646)	(0.0636)	(0.0670)	(0.0677)	(0.0717)	(0.0843)	(0.0883)
Beijing	0.2164***	0.1213***	0.0522	0.0965**	0.0455	-0.0145	0.0192	-0.0354	-0.1189*	-0.1935***
	(0.0399)	(0.0397)	(0.0417)	(0.0457)	(0.0518)	(0.0483)	(0.0509)	(0.0662)	(0.0653)	(0.0711)
Shanghai	-0.1833***	-0.0953	-0.1940***	-0.01	-0.1401*	-0.0302	-0.0537	0.053	0.1098	0.0293
	(0.0539)	(0.0582)	(0.0627)	(0.0670)	(0.0812)	(0.0827)	(0.0908)	(0.1210)	(0.1211)	(0.1310)
Chongqing	0.0391	0.0607	-0.0914*	0.0954	-0.0053	0.1324**	0.0622	0.0014	-0.024	0.0067
	(0.0610)	(0.0519)	(0.0552)	(0.0599)	(0.0702)	(0.0673)	(0.0732)	(0.0907)	(0.0946)	(0.0942)
Tianjin	0.1174***	0.0727*	-0.0703*	-0.0018	-0.1223**	-0.0517	-0.2658***	-0.1571**	-0.3740***	-0.2966***
	(0.0384)	(0.0392)	(0.0408)	(0.0441)	(0.0506)	(0.0489)	(0.0557)	(0.0710)	(0.0714)	(0.0784)
Wholly state	-1.0980***	-1.0703***	-1.0617***	-1.0326***	-0.9285***	-0.8263***	-0.7430***	-0.6177***	-0.5993***	-0.4491***
	(0.0547)	(0.0492)	(0.0416)	(0.0410)	(0.0366)	(0.0334)	(0.0338)	(0.0356)	(0.0362)	(0.0293)
Majority state	-0.8786***	-0.8548***	-0.8357***	-0.8494***	-0.7936***	-0.7245***	-0.5960***	-0.5665***	-0.5568***	-0.5004***
	(0.0486)	(0.0439)	(0.0426)	(0.0430)	(0.0431)	(0.0364)	(0.0373)	(0.0380)	(0.0576)	(0.0470)
Wholly collective	0.1371***	0.1153***	0.1026***	0.0894***	0.0768***	0.0838***	0.1205***	0.1280***	0.1028***	0.1161***
	(0.0362)	(0.0315)	(0.0303)	(0.0296)	(0.0265)	(0.0275)	(0.0262)	(0.0249)	(0.0277)	(0.0252)
Majority collecitve	-0.0585*	-0.0668**	-0.0754**	-0.1009***	-0.0720**	-0.0729**	-0.1032***	-0.0604*	-0.0768**	-0.1302***
	(0.0333)	(0.0321)	(0.0318)	(0.0306)	(0.0298)	(0.0316)	(0.0298)	(0.0316)	(0.0316)	(0.0331)
Wholly foreign	-0.3475***	-0.3300***	-0.3171***	-0.3736***	-0.2936***	-0.3183***	-0.3321***	-0.2927***	-0.2739***	-0.2777***
	(0.0535)	(0.0479)	(0.0497)	(0.0448)	(0.0470)	(0.0459)	(0.0510)	(0.0380)	(0.0433)	(0.0374)
Majority foreign	-0.5005***	-0.4344***	-0.4036***	-0.4270***	-0.3573***	-0.3138***	-0.2849***	-0.2718***	-0.2367***	-0.2307***
	(0.0416)	(0.0393)	(0.0346)	(0.0329)	(0.0306)	(0.0325)	(0.0262)	(0.0267)	(0.0281)	(0.0262)
Majority private	-0.1426***	-0.1635***	-0.1864***	-0.2004***	-0.1760***	-0.1816***	-0.1831***	-0.1850***	-0.2048***	-0.2268***
	(0.0253)	(0.0253)	(0.0182)	(0.0195)	(0.0190)	(0.0184)	(0.0172)	(0.0178)	(0.0186)	(0.0203)
N	134717	134443	137569	146658	156751	175404	247443	246302	276888	312351
Percentage bottm trim	6%	5%	4%	3%	4%	3%	3%	3%	2%	2%
R-squared	0.1967	0.1933	0.1875	0.1809	0.1621	0.148	0.1168	0.1054	0.1017	0.0836

* p<0.10, ** p<0.05, *** p<0.01. This table repeats our preferred specification (column 2 of Table 2) for the full time span of our data, i.e., 1998-2007. This table shows us how bias in the capital markets varies over the 10-year span, to which we relate the changes in national leadership.

Table 5. Year pairwise correlations in annual city fixed effects (Table 4 specification)

	1998	1999	0	2001	2002	2003	2004	2005	2006	2007
1998	1									
1999	**0.927**	1								
2000	0.884	**0.947**	1							
2001	0.859	0.911	**0.946**	1						
2002	0.814	0.862	0.902	**0.921**	1					
2003	**0.779**	0.804	0.851	0.895	**0.896**	1				
2004	**0.648**	0.665	0.699	0.746	0.795	**0.854**	1			
2005	**0.462**	0.475	0.498	0.539	0.614	0.714	**0.843**	1		
2006	**0.336**	0.352	0.393	0.442	0.507	0.635	0.747	**0.901**	1	
2007	**0.23**	0.223	0.253	0.314	0.378	0.522	0.652	0.83	**0.924**	1

Table 6: How does varying city-level capital market favoritism relate to city growth, OLS

	(1)	(2)	(3)	(4)	(5)	(6)
City fixed effects without firm type controls, 1998-1999	0.0263	-0.0289	-0.0688***			-0.0468**
	(0.0202)	(0.0218)	(0.0248)			(0.0219)
City fixed effects with firm type controls, 1998-1999				-0.0823***		
				(0.0259)		
City fixed effects without firm type controls, 2006-2007					-0.0801***	-0.0657***
					(0.0172)	(0.0174)
1995 share of emp by firms whose Y-M-labor costs <0		-0.1231**	-0.1639***	-0.1454***	-0.0818*	-0.1386**
		(0.0555)	(0.0582)	(0.0485)	(0.0441)	(0.0577)
1995 share of emp by LTD firms		0.4575***	0.3223***	0.3132***	0.3283***	0.3339***
		(0.0770)	(0.0896)	(0.0874)	(0.0776)	(0.0767)
ln(prefecture population in 1982)			-0.0262**	-0.0270**	-0.0238**	-0.0213*
			(0.0117)	(0.0114)	(0.0115)	(0.0119)
Population change from 1982 to 1990			-0.049	-0.0415	-0.0493	-0.0375
			(0.2074)	(0.2045)	(0.2274)	(0.3048)
ln(Distance to coast)			-0.0248***	-0.0241***	-0.0149***	-0.0215***
			(0.0056)	(0.0055)	(0.0039)	(0.0054)
1999 all road rays			0.0107***	0.0114***	0.0101***	0.0097**
			(0.0041)	(0.0042)	(0.0038)	(0.0041)
Constant	0.0652***	0.0123	0.5124***	0.5088***	0.4325**	0.4195**
	(0.0149)	(0.0188)	(0.1876)	(0.1888)	(0.1840)	(0.2057)
N	284	283	283	283	283	283
R-squared	0.0109	0.1912	0.2824	0.286	0.2999	0.3151

* p<0.10, ** p<0.05, *** p<0.01. Bootstrapped standard errors in parentheses.

This table presents the OLS regression results on relating capital market favoritism to city population growth. Various city-level measures of capital market bias are tested with or without variables measuring other city characteristics that may simultaneously affect growth.

Table 7. Capital market favoritism (06-07 city fixed effects) on city growth, Historical employment composition of favored industries as IV, first-stage

	(1)	(2)
Index of favored manufacturing industries in 2005 with 1995 weights	0.0051	
	(0.015)	
Index of favored manufacturing industries in 2005 with 1998 weights		0.0098
		(0.012)
Other controls: Column 3 Table 6	Yes	Yes
N	283	283
R-squared	0.022	0.022

* p<0.10, ** p<0.05, *** p<0.01

Table 8: Capital market favoritism (06-07 city fixed effects) on city growth, Political faction as IV

	First stage (1)	Second stage (2)
Political faction: Chinese Youth League	0.1198	
	(0.0793)	
Political faction: ambiguous	0.3230***	
	(0.0948)	
Political faction: none	0.0232	
	(0.0544)	
Political faction: prince	-0.2315***	
	(0.0566)	
Political faction: Shanghai	0.0855	
	(0.0566)	
1995 share of emp by firms whose Y-M-labor costs <0	-0.1093	-0.0830*
	(0.1806)	(0.0445)
1995 share of emp by LTD firms	0.1382	0.3388***
	(0.2211)	(0.0821)
ln(prefecture population in 1990)	0.2689	-0.0367
	(0.1664)	(0.1619)
ln(prefecture population in 1982)	-0.18	0.0174
	(0.1567)	(0.1561)
ln(Distance to coast)	-0.0098	-0.0148***
	(0.0145)	(0.0038)
1999 all road rays	-0.0219*	0.0092**
	(0.0118)	(0.0042)
City fixed effects 06/07, no firm type controls		**-0.1237****
		(0.0535)
Constant	-1.3730***	0.3593
	(0.5101)	(0.2242)
N	283	283
R-squared	0.1363	0.2838
KP F stat		8.8139

* p<0.10, ** p<0.05, *** p<0.01

Table 9: How levels results differ

	(1) OLS	(2) IV 2nd Stage
City fixed effects without firm type controls, 1998-1999	-0.0768*	
	(0.0431)	
City fixed effects without firm type controls, 2006-2007		-0.1949**
		(0.0797)
1995 share of emp by firms whose Y-M-labor costs <0	-0.108	-0.0193
	(0.1459)	(0.1226)
1995 share of emp by LTD firms	0.8402***	0.8724***
	(0.1816)	(0.1733)
ln(prefecture population in 1982)	0.9517***	1.5734***
	(0.0193)	(0.3143)
Population change from 1982 to 1990	1.5431***	-0.6081**
	(0.418)	(0.3039)
ln(Distance to coast)	-0.0260***	-0.0146***
	(0.01)	(0.0056)
1999 all road rays	0.0155**	0.0126*
	(0.0063)	(0.0067)
Constant	0.7719***	0.5054
	(0.3201)	(0.3610)
N	283	283
R-squared	0.9405	0.9426
KP F stat		8.8139

* p<0.10, ** p<0.05, *** p<0.01. Bootstrapped standard errors in parentheses for column 1. This table replicates Table 6 column 3 and Table 8 column 2, but with ln(prefecture population in 2010) as the dependent variable to test the "long run outcome" effect of capital market favoritism on city size.

Table 10: summary statistics of variables used in the city growth exercises

	Mean	Standard deviation	Median
Population growth 2000 - 2010	0.0506	0.1143	0.0439
Ln(city population in 2010)	15.0812	0.6735	15.101
City fixed effects without firm type controls, 1998-1999	-0.5498	0.4523	-0.6114
City fixed effects with firm type controls, 1998-1999	-0.5197	0.3652	-0.5572
City fixed effects without firm type controls, 2006-2007	-0.1315	0.3401	-0.1196
1995 share of emp by firms whose Y-M-labor costs <0	0.2341	0.1189	0.2181
1995 share of emp by LTD firms	0.1119	0.114	0.0778
Ln(city population in 1982)	14.808	0.6972	14.8991
Population change from 1982 to 1990	0.1298	0.1155	0.1168
ln(Distance to coast)	5.3753	1.7275	5.9669
1999 all road rays	2.8622	1.6986	3

Online Appendix: The evolution of domestic capital markets and the banking sector in China

The banking sector in China controls 70% of assets in the entire financial system, and the four large state-owned banks are the central pillars of the banking sector. Together they hold 45-55% of banking sector assets in China (Wang, 2010; China Bank Regulatory Commission, 2012). In order to understand capital market issues, we discuss the banking sector's evolution and current practices that lead to differential treatment toward firms of different ownership types and firms in different cities. We will also briefly review the limited alternatives for private enterprises in seeking credit outside the state controlled banking sector.

1.1 Banking sector reform

In 1978 as China embarked on its economic transformation, the People's Bank of China (PBC) and rural credit cooperatives were the only financial institutions in China (Chen, 2010). In urban areas, enterprises were owned by government or collective bodies and investment decisions were made by the state. The PBC had no independent lending policies and primarily functioned to collect deposits (Chen, 2010). The first banking reform was to remove deposit-taking functions from the PBC and establish four state-owned banks[2] to take over specific lines of business, and then later to designate the PBC as the central bank, supervising all other state-owned banks. The four state-owned banks were established as policy banks, so the lion's share of lending went to finance projects that were sanctioned by planning committees and regional governments (Green, 2010). In the mid-1990s, three policy banks[3] were established to take over policy loans from the big four banks and to free them for more market-oriented businesses. However in this time period, the four state-owned banks did not progress to develop independent risk assessment mechanisms, since they were merely generally underwriters of projects that had been pre-determined by the state. By 1999, the four state-owned banks had inherited and accumulated large proportions non-performing loans (NPL), which crippled their ability to develop market-oriented commercial business. At this point in preparation for later public listing and strategic investment and minority shareholding by foreign banks to add technical know-how and modern corporate governance (Green, 2010), the state removed RMB1.3939 trillion worth of NPLs from the balance sheets of the four banks, handing the NPLs over to specially established Asset Management Companies[4] (AMCs). Since then, the risk situation of the four banks has improved significantly (Wang, 2010), but political influence remains strong with two forms of discrimination of interest here.

1.2 Sources of discrimination by firm ownership type

Despite the on-going reform effort, private enterprises still face strongly discriminatory access to the formal financial system. According to an All China Federation of Industry and Commerce report (2010), it is very hard for private enterprises to get mid-term or long-term loans. Wei (2012) estimates that only 20% of private firms in Wenzhou (one of the centers of informal financing) can get loans from the formal system, with the rest relying solely on underground financing. And earlier we noted the disproportionate share of industrial enterprise debt held by state enterprises even in 2011. Why is there discrimination by firm type?

Howson (2010) notes that, despite years of reform of state-owned banks, the Committee of the Chinese Communist Party retains the power to appoint the boards of directors and senior management of banks. The state's interest is not communicated through shareholder's meetings

[2] The Agriculture Bank of China took over lending business for the agricultural sector; the China Construction Bank for infrastructure finance; the Bank of China for foreign exchange management and the Industrial and Commercial Bank of China for commercial banking

[3] These were the China Development Bank (CDB), the Agricultural Development Bank (ADB) and the Export-Import Bank of China (China Exim Bank))

[4] The Asset Management Companies are Huarong, Changcheng, Dongfang and Xinda. They were set up specifically to attend to the task of disposing of the NPLs of the state-owned banks (Wang, 2010).

but via the firm-level Communist Party Committee. The Party Committee is not asking banks to act in the interest of shareholders, but in accordance with "stability", "lawfulness", and national "macroeconomic measures". Individuals appointed to bank senior management posts are personnel who have standing in the Communist Party hierarchy (Howson, 2010) and move between government and state bank corporate functions. As such, it is difficult for state owned banks to operate independently while facing pressure from different levels of government. Private enterprises have little leverage in this power politics. It creates an environment where private sector financial needs will be sidelined when state-owned enterprises and local governments are looking for money.

Feyzioglu, Porter and Takats (2009) further argue that China's existing interest rate control structure with a large gap between the ceiling on the deposit rate and the floor on the bank lending rate[5] reduces the incentive for China's state-owned banks to improve efficiency and risk assessment. In exercising credit control and in deciding which firms get how much credit, since politically and well-connected enterprises have better access and connections to bank officers and the bottom line is not profit maximization, credit control creates an environment where loan officers are more likely to channel funds to politically favored undertakings (Feyzioglu, Porter and Takáts, 2009). Moreover the whole structure tends to breed corruption in the banking sector (Nan and Meng, 2009).[6]

Finally, the standard for evaluating credit ratings is determined by the headquarters in Beijing of the banks in China; each bank imposes a unified standard on all branches across the country. Enterprises that do not reach a certain credit rating standard do not qualify for loans (Chen, 2010). However, many standards were set up according to the circumstances of the largest firms in major cities. Smaller enterprises often lack the resources to meet the formal standards for preparation of accounting and auditing documents, even though they may provide higher growth potential than large state-owned firms.

1.3 Discrimination over space

The first aspect of discrimination across space concerns the urban versus rural sector. Chen (2010) argues that the commercialization of state-owned banks led to the fall of rural financing for rural, town and village enterprises (TVE's). The "Law on Commercial banks of the People's Republic of China" passed in 1995 set up stringent requirements on collaterals and guarantees. State-owned commercial banks can extend banking credit only on the basis of clearly defined assets (Chen, 2010), usually land and buildings (Cousin 2006)[7]. The Collateral Law forbids rural land from being mortgaged, so rural enterprises and households cannot collateralize their most important asset to get credit from the banking sector (Chen, 2010). Beyond the evolving TVE sector, more generally, county-level branches of state-owned commercial banks do not have the power to issue loans (Chen, 2010). Since state enterprises disproportionally concentrate in big cities, private enterprises in smaller cities and rural enterprises suffer relative credit shortage.

In the paper we focus initially on discrimination across cities of different political significance, but then generalize to all cities. We already observed the imbalance in bank loans going to entities in provincial capitals and provincial level cities, relative to their contribution to GDP. Liu (2007) notes that after the establishment of China's commercial banking system, bank

[5] As for June 2012, the Yearly Current Deposit Baseline Rate was 0.35%, while the Yearly 6-month Loan Baseline Rate was 5.6% (the People's Bank of China, 2012).

[6] All this is over and above the incentive to focus on bigger loans to spread the fixed costs in making a loan. The costs include information costs and supervision costs. Information costs include resources invested on researching a firm's creditability and the costs of Non-Performing Loans due to insufficient information before lending. Supervision costs include the costs of supervising both lending enterprises and bank loan officers (Yin, Weng and Liang, 2008).

[7] Moveable assets back only 4% of commercial loans; inventory and receivables cannot be collateralized under Chinese Security Law (WB-PBOC Report, 2006).

lending concentrated not just on China's state-owned enterprises, but also major cities. One issue is that commercial banks in China have cautiously retrenched credit-extending authority from their local branches (Liu, 2007). Bank branches below provincial level are limited in their ability to extend credit to new clients and new investment projects. In general one would expect that firms in provincial level cities and provincial capitals have a closer relationship to provincial level branches where most of the credit extending power rests, than their counterparts in cities lower in the political hierarchy. Later we will argue that issues of favoritism are more widespread and may for example be related to the political influence and connections of local party secretaries and provincial leader attempting to garner credit for enterprises in their cities, or to national programs aimed at expansion of particular industries (through better access to credit), in which some cities are more specialized.

1.4 Alternatives for private firms

The private sector in China depends on informal financing on different degrees in different places to meet their investment needs (Tsai 2002, Allen, Qian and Qian 2005, Linton 2006). Farrell et al. (2006) notes that alternative financial sources could represent up to a quarter of total bank deposits in China; and Tsai (2002) claims that at least one quarter of all financial transactions are done through the informal system. Unlike formal financial intermediaries, informal lenders require no or very lenient collateral, charge very high interest rate, and reply on alternative enforcement measures that usually involve reputation or coercion (Allen, Qian and Qian, 2008). Ayyagari, Demirguc-Kunt & Maksimovic (2010) argue that Chinese private enterprises which have access to bank loans grow faster than similar firms without bank financing. They argue that the monitoring and enforcement mechanisms from the informal sector are ill equipped to scale up and serve the higher end of the market. Hence informal financing is not a sufficient substitute for formal financing, and it is increasingly the case as the size of Chinese economy grows. Firms, especially private firms, face sub-optimal growth potential when they are denied access to the formal financial system. To the extent this lack of credit varies across cities that affects city growth potential.

In principle, private firms could turn to equity markets. However in China, the banking sector dwarfs its equity market and bond market, in terms of both market capitalization and total value traded (Ayyagari, Demirguc-Kunt & Maksimovic, 2010; Naughton, 2007). The equity market is a vehicle for state-owned enterprise semi-privatization rather than a level playing field for all firms to raise capital. Furthermore, the process of capital market listing is largely controlled by the government (Wang, Xu and Zhu, 2004). Durnev et al. (2004) argues that China has one of the worst performing equity markets in the world. Highly synchronous returns in the market are the consequences of weak property rights, corporate opacity and rent seeking. China's corporate bond market is undeveloped too, crippled by excessive government regulation, the lack of institutional investors and credit rating agencies to set the price accurately (Ayyagari, Demirguc-Kunt & Maksimovic, 2010).

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