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Labor Allocation in China: Implicit Taxation of the Heterogeneous Non-State Sector

Fariha Kamal*,† and Mary E. Lovely**

*Center for Economic Studies, U.S. Census Bureau, Washington, DC 20233, USA. e-mail: fariha.kamal@census.gov
**Department of Economics, Maxwell School of Citizenship and Public Affairs, Syracuse University, Syracuse, NY 13244, USA. e-mail: melovely@maxwell.syr.edu

Abstract

Using China's Annual Survey of Industrial Production, we estimate the marginal revenue product of labor (MRPL) for all state-owned and above-scale non-state manufacturing firms for 2001–2004 and 2004–2007. We find that labor productivity varies systematically within industries by ownership type and that non-state firms face implicit labor taxation relative to state-owned enterprises (SOEs). We also find that, in keeping with ongoing reforms of the state sector, ownership differentials fall over time, with gaps between non-state enterprises and SOEs falling by about half over time. Within the non-state sector, enterprises registered as legal persons have higher MRPL, on average, than do firms registered as collective or private enterprises. Disaggregating this group using information on equity shares reveals that firms registered as legal persons and majority owned by legal persons have the highest MRPL relative to SOEs. Indeed, these enterprises show significantly higher MRPL than those firms directly controlled by the state. Legal-person firms with majority state ownership have MRPL differentials similar to those for legal-person firms with majority private or majority collective ownership. This evidence is consistent with continuing, albeit diminishing, implicit labor subsidies for directly SOEs but not for firms whose shares are owned by the state, even if those shares are registered to legal persons. (JEL codes: L16, O53, P23, P31)

Keywords: labor allocation, privatization, labor subsidies

1 Introduction

Low aggregate productivity in the developing world is, in part, the result of micro-level resource misallocation. Structural accounting exercises indicate that barriers to sectoral reallocation, particularly out of agriculture, are a quantitatively important explanation for income differences across countries (Restuccia et al. 2008; Gancia and Zilibotti 2009; Duarte and Restuccia 2010). An emerging and growing body of research focuses on misallocation of resources within, rather than between, sectors and

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calibrations by Restuccia and Rogerson (2008), Bartelsman et al. (2008) and Alfaro et al. (2009) suggest that misallocation of resources across heterogeneous firms can explain much of the total factor productivity (TFP) gap across countries. For China, Hsieh and Klenow (2009) estimate that if capital and labor were reallocated across firms to equalize marginal products to the extent observed in the United States, manufacturing productivity could rise by 30–50%. Looking at a longer time period, 1985–2007, and across provinces and sectors, Brandt and Zhu (2010) estimate that factor misallocations have reduced aggregate Chinese TFP by ~30%.

Banerjee and Moll (2009) argue that a natural explanation for so much misallocation is asset market inefficiencies, which make it difficult for successful firms to expand and simultaneously allow failed firms to survive.[1] In China, the prominence of state-controlled financial institutions has focused attention on differential access to capital by state-owned enterprises (SOEs) relative to non-state firms. Using data from China's Annual Survey of Industrial Production (ASIP), Brandt and Zhu (2010) provide evidence that outside of agriculture, non-state firms have higher TFP and higher returns to capital, yet lower capital–labor ratios, than do state firms.[2] Poncet et al. (2010) also use data from the ASIP and conclude that private Chinese firms are credit constrained while state-owned firms and foreign-owned firms are not.

In addition to substantial capital market distortions, however, China remains plagued by labor market distortions arising from a wide variety of policies that favor the state sector. The reward for state-sector employment includes differential access to social services, preferential treatment for urban 'hukou', even proximity to opportunities for corruption and side payments. Among college graduates, state employment remains a desired goal. Despite these non-wage factors, which suggest that state firms should be able to pay lower money wages, numerous studies find a state-sector money-wage premium. Brandt and Zhu (2010) report that non-state-sector wages in 2007 were only 66% of those inside the state sector. Mincerian wage regressions based on urban household surveys also consistently find a state-sector premium (Knight and Song 2008).[3]

[1] Given the high rates of return to investment in firms that are capital starved, the question arises as to why such misallocations are not corrected. Banerjee and Moll (2009) build a simple model with credit constraints to explain how such inefficiencies could persist.

[2] The Annual Surveys of Industrial Production includes all non-state-owned firms whose annual sales exceed five million yuan (referred to as 'above-scale' industrial firms) and all SOEs.

[3] Existing data make it difficult to control for unobservable individual characteristics of workers, and positive selection by state employers may explain some of the wage premium.

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High non-wage compensation and a money wage premium, coupled with high capital–labor ratios relative to the non-state sector, should be matched by high labor productivity in the state sector. It is puzzling, therefore, that state firms have lower labor productivity than do non-state firms. Jefferson and Su (2006) find that the largest Chinese state-owned industrial enterprises have the lowest labor and capital productivity compared to other ownership types, controlling for industry and year.[4] Fleisher et al. (2011) estimate production functions by sector and find that the marginal product of labor in state-owned manufacturing enterprises is about half that of private enterprises for both highly educated and less educated workers. These systematic gaps between labor productivity and labor costs suggest implicit subsidies to the state sector to maintain employment, perhaps to promote social stability.

This article contributes to our understanding of factor misallocation in China by estimating labor productivity by ownership status and then using these estimates to characterize implicit taxation of labor in the non-state sector. Like Fleisher et al. (2011) we use production function estimation to calculate labor's marginal product for China's state-owned and above-scale domestic enterprises, but unlike previous studies we allow production functions to vary by ownership status. We also control for variation across ownership classes in industry composition and geographic location before measuring the gap between the state and non-state sectors. We calculate relative labor productivities for two recent periods, 2001–2004 and 2004–2007. We also provide estimates of implicit tax rates on non-state labor by industry.

Our second contribution is to decompose the non-state sector into its member components. The non-state domestic sector encompasses a wide variety of organizational types, including private enterprises, collectives, and firms registered as legal persons. Although Naughton (2007: p. 325) notes, '...we do not have a very detailed understanding of Chinese privatization', the non-state sector is often termed the 'private sector' and thus implicitly associated with private ownership, profit maximization, market input and output prices, and a hard budget constraint.[5] Strong growth in TFP in the non-sector sector supports a maintained

[4] Jefferson and Su (2006) measure labor productivity as value added per worker and capital productivity as value added divided by the net value of fixed assets.

[5] For example, Song et al. (2011) include a wide range of organizational forms under the category 'domestic private enterprises' to show rapid growth in China's private sector. In their modeling, they equate growth of the private sector with a reallocation of resources from low productivity firms to high productivity firms in their model of the Chinese economy.

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assumption of productive efficiency, but the sector encompasses many different organizational forms, about which we know relatively little.

The spectacular growth in China's non-state GDP has been widely noted, but a large share of non-state value added is produced by enterprises whose ownership and control structures are only vaguely understood. One group of enterprises, those registered as legal persons, is particularly shrouded. These enterprises are mostly shareholding firms, an organization form integral to reform of China's SOEs (Jefferson et al. 2005). Shareholding firms are primarily not publicly traded companies, and they may operate under state control, may be privately controlled, or may simply be an unknown 'hybrid ownership'. Particular concern about the classification of these firms is raised by Huang (2008), who argues that these firms, especially the largest ones, remain state-controlled and that they should be considered part of the state sector, not part of the non-state sector. As we show below: (i) the extent to which many of these firms are state owned cannot be determined from available information and (ii) these firms account for a large share of value added in the manufacturing sector. Their size and veiled ownership structure require us to consider their performance in isolation from either SOEs or privately owned enterprises. Therefore, we estimate differences in labor productivity between SOEs and private enterprises, collective-owned enterprise (COE), and legal-person enterprises and we then further disaggregate our results using information on equity ownership. To our knowledge, we are the first to examine the comparative performance of legal person enterprises.

We begin by reviewing briefly the unique role of shareholding firms in the restructuring of Chinese enterprises. We show that whether these firms, many of which are registered as legal person firms, are considered private or state enterprises affects how one views the extent to which Chinese manufacturing is 'privatized'. Next, we explain how labor misallocation can be inferred from residuals in first-order conditions for profit maximization. We describe how we use the ASIP to estimate the marginal revenue product of labor (MRPL) for each enterprise and then employ regression analysis to measure the difference between the marginal product of SOEs and other firm types. We present these results as the MRPL of each non-state enterprise relative to state-owned firms, showing this ratio for two time periods, for the full sample and for incumbents, and for groups of legal-person enterprises reclassified using equity shares. This method also allows us to estimate the implied tax on labor, relative to its use in the state sector, for each industry and non-state-owned ownership type. We provide summary measures of the dispersion of MRPL across firms. We conclude by discussing the implications of our findings for Chinese restructuring and reform.

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2 Ownership restructuring, enterprise classification, and the size of the private sector

The largest group of firms registered as legal persons are those organized as shareholding enterprises. According to Jefferson et al. (2005), the emergence of Chinese shareholding enterprises stems from policy changes of the 1980s and early 1990s, which allowed new firm entry, strengthened managerial incentives, and permitted accumulation of non-state assets in the state sector. Formal conversion of SOEs to joint stock companies was introduced in 1993, but shareholding conversion became a broad-based initiative involving large numbers of SOEs and COEs only after 1997 when the Chinese Communist Party's 15th Party Congress elevated the shareholding system as a vehicle for enterprise restructuring. From 1997 to 2001, Jefferson et al. find that the number of large and medium-size SOEs declined by over 40%, and the number of large and medium-size COEs declined by 35%, while the number of shareholding firms soared.

Since 2001, the evolution of the Chinese industrial sector has continued, but tracking the extent to which shareholding firms are state controlled is difficult. China's National Bureau of Statistics assigns each firm an ownership classification, known as its 'registration status'. Table A1 provides a disaggregation of the ownership forms included under each registration code. SOEs include those that are majority owned by the central government or a local government, those registered to the state but jointly operated with a non-state entity, and those wholly state owned. Private-owned firms, by registration status, include those registered to natural persons, whether solely, in partnership, as limited liability enterprises, or shareholding firms. Distinctions between ownership types become blurred in the fourth type of domestic registration status, legal person. Firms registered as legal persons include limited liability and shareholding limited liability firms. Their relationship to the state is not indicated by their registration status, unlike other classes.[6]

Some progress in relating firms classified as legal persons to either state, collective or private ownership status can be made by reference to information on equity shares. The ASIP includes information on the origin of the various sources of capital in the firm—state-owned, collective-owned, legal person, private-owned, and foreign-owned.[7] This information on equity shares can be used to reclassify legal person firms based on majority ownership. If 50% or more of equity originates from

[6] The number of firm registered in a final category, 'other', accounts for $<1\%$ of firms in the ASIP.

[7] Foreign-owned includes capital from Hong Kong, Macao, Taiwan, and all other foreign sources.

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state, collective, private, or foreign sources, the enterprise can be reclassified accordingly. However, for many firms, legal person is a significant source of capital, making it impossible to reclassify these firms without arbitrarily treating this share as state or private. Indeed, of the 54 320 firms officially registered as legal person, 21 910 enterprises cannot be reclassified using equity information because the majority of their capital originates from a legal person. In other words, equity shares do not allow us to completely peer around the veil of legal-person status.

Other researchers have faced this problem. Dollar and Wei (2007) add legal-person capital to private capital before calculating majority ownership. While subsequent researchers have followed the same procedure, this method ignores Huang's (2008) observation that categorizing legal person firms as private can be misleading because '(e)ven a casual glance at the data reveals that many of these legal-person shareholding firms are among the best-known and quintessential SOEs in China' (p. 16). He concludes that '(t)he majority of the shareholding firms, especially the large ones, are still state-controlled' (p. 46). Huang's observation suggests that an alternative grouping of firms, in which legal person capital is treated as state-owned capital before calculating majority ownership, is also reasonable.[8]

When ownership is defined using NBS registration status, Table 1 shows that the number of SOEs fell by 93% between 1998 and 2007 (Panel A), accounting for only 2.22% of all above-scale firms by 2007 (Panel B). COEs also declined sharply in number, falling 86% over the period and accounting for only 5.14% of firms by 2007. In contrast, firms registered as private enterprises rose sharply, with the number of private firms growing by a 670%, and constituting 53.6% of all above-scale firms by 2007. The number of firms registered as legal persons, the majority of which are shareholding enterprises, rose 160% and accounting for 17.4% of firms by 2007.

Using information in the ASIP on equity shares to define ownership allows us to reclassify 59% of legal-person firms to other ownership categories, with only 3.9% reclassified as state and another 4.9% reclassified as collective. The remainder, 51% of enterprises registered as legal-persons, is privately owned. However, that leaves 41% of legal-person enterprises with an unknown relationship to the state.

As seen in Table 1, adding legal-person capital to private capital before reclassifying enterprises reduces the calculated growth in the number of private enterprises, but increases the share of firms classified as private

[8] Other methods for classifying firms have also been used. For example, Brandt et al. (2011) look at registered capital and use equity shares to classify firms as state, private, or 'hybrid'.

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Table 1 Distribution of firms by various ownership classification schemes, selected years

	Panel A. Number of firms in sample				Panel B. Percent share in sample			
	1998	2001	2004	2007	1998	2001	2004	2007
Registration status								
State owned	46 916	27 664	17 994	6962	31.55	17.76	7.00	2.22
Collective owned	53 705	38 861	23 328	16 079	36.12	24.95	9.08	5.14
Foreign owned	26 047	30 903	56 412	66 490	17.52	19.84	21.95	21.24
Private owned	10 348	35 182	114 838	167 716	6.96	22.59	44.68	53.58
Legal person	9923	21 673	43 357	54 320	6.67	13.92	16.87	17.35
Others	1746	1448	1070	1479	1.17	0.93	0.42	0.47
Classifying legal person equity as state								
State owned	68 776	60 150	78 920	93 655	46.26	38.62	30.71	29.92
Collective owned	42 951	29 101	19 231	12 857	28.89	18.69	7.48	4.11
Foreign owned	17 172	21 484	41 322	49 611	11.55	13.80	16.08	15.85
Private owned	19 786	44 996	117 526	156 923	13.31	28.89	45.73	50.13
Classifying legal person equity as private								
State owned	48 923	30 565	20 048	8526	32.90	19.63	7.80	2.72
Collective owned	42 416	28 709	19 100	12 756	28.53	18.43	7.43	4.07
Foreign owned	17 186	21 455	41 240	49 503	11.56	13.78	16.05	15.81
Private owned	40 160	75 002	176 611	242 261	27.01	48.16	68.72	77.39
Total	148 685	155 731	256 999	313 046				

Note: The table displays the number of manufacturing firms only from the raw data prior to performing data cleaning. Definitions of ownership: 'Registration Status' refers to the codes provided by China's National Bureau of Statistics (see Table A1 for the list); 'classifying legal person equity as state equity' categorizes ownership based on equity shares of the firm and legal person equity in treated as state owned; 'classifying legal person equity as private equity' categorizes ownership based on equity shares and legal person equity in treated as private owned. See text for details.

Source: Authors' calculations from Annual Surveys of Industrial Production, selected years.

from 27% in 1998 to 77.4% in 2007. Using this classification system, then, one would characterize the Chinese economy as largely 'privatized'. When one chooses an alternative attribution method instead, and includes legal-person capital with state capital before reclassifying enterprises, the private sector share of enterprises in 2007 is lower—50% of all firms rather than 77.4% of all firms.

While these differences due to reclassification may seem trivial, it is important to recognize that firms officially registered as legal-person

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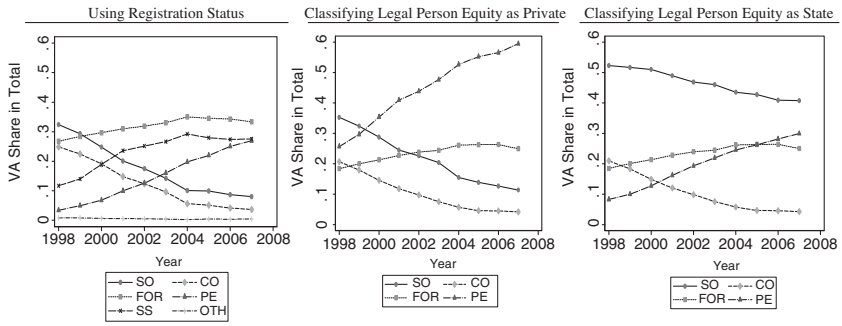

Figure 1 Value-added shares by various ownership classification schemes, 1998–2007. *Notes*: The values are expressed as shares in the industrial total. Definitions of ownership: 'Registration Status' refers to the codes provided by China's National Bureau of Statistics; 'classifying legal person equity as state' categorizes ownership based on equity shares of the firm and legal person equity in treated as state owned; 'classifying legal person as private equity' categorizes ownership based on equity shares and legal person equity in treated as private owned. See text for details. SO refers to state-owned enterprises, CO refers to collective-owned enterprises, FOR refers to foreign-owned enterprises, PE refers to private enterprises, SS refers to legal person (shareholding) enterprises.
Source: Authors' calculations from Annual Surveys of Industrial Production, selected years.

enterprises are larger than average when measured by value added. Figure 1 shows that reclassification can lead to quite different conclusions about the extent of 'privatization' when we consider contributions to industrial value added. The first panel shows trends in value-added shares when firms are classified by registration status. We see a dramatic decline over the 10-year period in the value-added shares of SOEs and COEs, and increases in both the private enterprise share and the legal person share, both of which contribute about one-fourth of value added by 2007. Because of their large value-added share, when legal-person enterprises are grouped with private enterprises, as shown in the middle panel, the private share of industrial value-added skyrockets, with 60% contributed by domestic private enterprises and another 22% contributed by foreign-invested enterprises in 2007. Alternatively, if we group legal-person enterprises with SOEs, as in the rightmost panel of Figure 1, growth in the private share of value-added stalls after 2004 as the state share flattens out at 40%. When measured in this way, privatization appears to have stopped with less than half of value added from domestic enterprises privately produced. These trends clearly indicate the need to better understand the performance of the Chinese 'private' sector, particularly those firms registered as legal persons.

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3 Using first-order conditions to infer implicit labor subsidies

Our empirical method infers labor misallocation from the residuals in first-order conditions for profit maximization.[9] Deviations between factor cost and marginal product inform the business cycle accounting of Chari et al. (2007) as well as the measurement of potential Chinese manufacturing TFP gains by Hsieh and Klenow (2009). Unlike these two contributions, which seek to measure aggregate losses from factor misallocation, our objective is to characterize deviations across the state and non-state sector, and estimate implicit non-state labor tax-cum-subsidy rates by industry. We measure these distortions as the extent to which labor's marginal revenue product differs by ownership.

Our approach recognizes the distinction, emphasized by Hsieh and Klenow (2009) and Foster et al. (2008), between a firm's physical productivity and its revenue productivity. It is common in the productivity literature to have industry deflators, but not plant-specific or firm-specific deflators, making accurate calculation of physical product difficult at the plant or firm level. Calculation of revenue product, however, does not require the missing deflators and, thus, matches well the data available to us through China's ASIP.

We maintain the hypothesis that all firms profit maximize and face market input and output prices. The allocation of resources across firms depends on the output and factor distortions they face. Let τ_{Lot} be the labor tax and τ_{Yit} the output tax facing a firm in industry I with ownership type o at time t. Regardless of the implicit capital tax or subsidy a firm faces, profit maximization requires that the firm choose its labor optimally; this implies that firms will equate the MRPL with the after-tax cost of labor. For firm j at time t, operating in industry i with ownership class o, the first-order condition for labor input is:

$$\mathrm{MRPL}_{jt}(o, i) = w(1 + \tau_{Lot})/(1 - \tau_{Yit}). \tag{1}$$

If firms face the same market wage, w, after-tax marginal revenue products will be equalized and before-tax MRPL must be higher in firms that face disincentives relative to those that do not.

Our objective is to estimate the implicit labor distortion, τ_{Lot}, facing non-state firms operating in each Chinese industry. To do this, we first estimate the marginal revenue product for each firm, allowing for differences in productivity by industry and ownership type. Next, we use

[9] We follow the literature and use the term 'misallocation' to refer to residuals in first-order conditions for profit maximization. However, welfare maximization may require deviations between labor cost and marginal revenue product across industry, space, or time. Our method controls for these factors and estimates deviations by ownership status.

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regression analysis to estimate the relative labor productivity for each ownership type, controlling for the enterprise's geographic location and industry. Such controls are needed given previous evidence of robust differences in wages for similar workers across Chinese cities (e.g. Hering and Poncet 2010; Kamal et al. 2012), and of compensating differentials across Chinese industries (e.g. Knight and Song 2008).

We estimate labor productivity differentials for each non-state ownership class (defined using registration type) and SOEs. We do so for two periods, 2001–2004 and 2004–2007, in an attempt to see if continuing economic restructuring of the state sector has reduced the misallocation of labor. Data needs limit us to these two periods, as our production function estimation makes use of firm fixed effects.

Previous research has found that entry and exit accounts for a large share of Chinese TFP growth (Brandt et al. 2010). Therefore, we recognize that changes over time in labor productivity differences may be driven by exit from the state sector and entry in the non-state sector. To avoid confounding entry and exit effects with reductions in distortions over time, we also analyze a panel of incumbent firms, defined as enterprises that operate for the entire length of the time period.

As discussed above, firms owned by a legal person have an unknown relation to the state and so we disaggregate our data to focus on these firms. Specifically, we isolate those firms with official registration status as legal persons and we re-classify them on the basis of equity shares. About 60% of legal-person firms can be assigned to the state, collective, or private sector based on majority equity ownership. The remainder, however, remain behind a veil and we compare their labor productivity to that of reclassified legal-person firms. We ask whether firms that cannot be reclassified using equity shares perform differently than legal-person firms that have majority non-state ownership.

We also use regressions to estimate the implicit labor tax-cum-subsidy for each non-state ownership type by industry. Finally, we decompose the overall dispersion of MRPL in each time period, assessing the extent to which observed heterogeneity within industries can be explained by ownership patterns, geographic clustering, and firm size, and seeing if dispersion decreases over time.

4 Estimating the MRPL

4.1 Data

To estimate marginal revenue products, we use the Annual Surveys of Industrial Production conducted by the Chinese government's National Bureau of Statistics (NBS) between 2001 and 2007. We divide the data into

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two time periods—the first period spanning 2001–2004 and the second spanning 2004–2007. The data set contains detailed information on about 100 variables, including firm identification code, four-digit industry code, six-digit geographic code, ownership classification, gross industrial output value, value added, export value, total employment, capital stock, and intermediate inputs.

We impose several restrictions on the raw data to generate our analysis data set. We filter the raw data to exclude observations with missing information and improbable values for certain variables. Since we utilize the equity share information to classify ownership of a firm, we are forced to exclude firms from our analysis that do not have information on total capital. To correct for improbable values we exclude those firms that employ eight or fewer workers since most improbable values are associated with smaller firms.[10] We further restrict the sample to include firms that have non-negative values for value added and capital.

4.2 Production function estimation

Each firm in the data set belongs to a two-digit Chinese Industrial Classification (CIC) code.[11] We estimate production functions for every two-digit industry and ownership type combination. There are 28 two-digit industries and 5 ownership types based on the registration status codes.[12] In total, we compute 140 sets of factor coefficients. The input coefficients, β_L and β_K are first determined by estimating a Cobb–Douglas production function,

$$\ln(\text{value added}_{it}) = \beta_L \ln(\text{labor}_{it}) + \beta_K \ln(\text{capital}_{it}) + \omega_{it} + \varepsilon_{it} \qquad (2)$$

[10] Individual businesses, known as *getihu*, are owned by private individuals or households and not legally considered enterprises. These businesses are officially limited to member of a family and up to seven non-family employees. See Song (2004) for a history of the development of small private enterprises in China.

[11] Prior to 2003, NBS followed GB/T 4754—1994 industry classification system and while from 2003 onwards used GB/T 4754—2002. Two changes were made in the two-digit divisions: (i) the 1994 division 39 ('Arms and Ammunition Manufacturing') was added to 2002 division 36 ('Special Equipment Manufacturing'). Then the remaining 2002 division codes were renumbered accordingly, i.e. 1994 division 40 corresponds to 2002 division 39, 1994 division 41 corresponds to 2002 division 40, 1994 division 42 corresponds to 2002 division 41, and 1994 division 43 corresponds to 2002 division 42. (ii) 2002 division 43 ('Waste Resources and Old Material Recycling and Processing') was added which was not part of manufacturing in the previous period. Consequently, we recoded firms in years prior to 2003 ensuring that all codes are comparable across the sample period.

[12] There are a total of 30 2-digit manufacturing industries under CIC. However, Industry 16 ('Tobacco Products Processing') and Industry 43 ('Waste Resources and Old Material Recycling and Processing') were excluded. Almost 100% of firms in the former are state-owned and data is not available for the latter prior to 2003. We also exclude about 1500 firms with the industry code 'other' from our estimations.

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where ω_{it} represents the part of productivity shock that is observed by firm i at time t, but unobserved by the econometrician and ε_{it} represents an error term uncorrelated with the other inputs. Since the firm observes the unobserved component of productivity, ω_{it}, it will be correlated with input choices, implying that OLS yields inconsistent estimates of β_L and β_K (Marschak and Andrews 1944).

To address this potential simultaneity bias, we employ the semi-parametric method proposed by Levinsohn and Petrin (2003) (hereafter LP). This procedure uses intermediate inputs to proxy for the unobservable productivity shock, ω_{it}.[13] Production function estimation using the LP method requires information on firm value-added, labor, capital, and intermediate inputs. The data set provides information on nominal values of firm value-added, capital, and intermediate inputs. These are converted to real terms using the output, investment, and input deflators, respectively, in Brandt et al. (2011).[14]

All regressions control for firm, year, and city fixed effects. Comparing the parameter estimates from OLS and LP, we see that on an average, the OLS labor coefficient estimates exceed the LP estimates.[15] This is in keeping with both the theoretical and empirical results discussed in Levinsohn and Petrin (2003). We tested the Cobb–Douglas estimates against the more general translog specification and we were able to reject translog for about half of our samples.

4.3 Calculating MRPL estimates

Once we obtain production function coefficients for labor, we use these to construct the MRPL for every firm in every sample year.[16] The marginal revenue product (MRPL) for each firm i is constructed as follows:

$$\mathrm{MRPL}_i = \beta_L(\mathrm{VA}_i/L_i), \tag{3}$$

[13] The production function coefficients are estimated in two stages. First, the labor coefficient is consistently identified from a regression of value added on an intercept term, labor, and unobserved productivity modeled as a function of capital and intermediate inputs. The second stage identifies the capital coefficient assuming productivity innovation is orthogonal to current capital input and lagged intermediate inputs.

[14] The deflators are available at http://www.econ.kuleuven.be/public/N07057/CHINA/appendix/. The output and input deflators are at the four-digit CIC level of disaggregation, while we use a national investment deflator.

[15] Labor coefficients based on OLS, LP, and a translog production function can be obtained from the authors on request. We obtain two (five) negative labor coefficients in period 1 (2) for state-owned firms using the LP method. These are in industries 18 and 28 in period 1 and industries 15, 27, 28, 29, and 42 in period 2. We code these coefficients to be zero for the marginal revenue product calculations.

[16] See Fleisher et al. (2011) for a derivation of the marginal revenue products assuming production functions are Cobb–Douglas and firms are price takers in output and input markets.

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where β_L is an estimate of the labor coefficient in (2) for the relevant industry and ownership class, L_i indicates total employment at firm i and VA_i is the value added of the firm.

5 Estimates of labor productivity differentials

5.1 Using regression analysis to estimate MRPL differentials

We use residuals from first-order conditions to characterize the implicit tax-cum-subsidy embedded in our marginal revenue product estimates. Recalling equation (1), τ_{Lot}, gives the relevant wedge for ownership type o at time t. Taking the log of (1) yields a linear expression,

$$\ln \text{MRPL}_{jt} = \ln w_{ict} - \ln(1 - \tau_{Yit}) + \ln(1 + \tau_{Lot}), \tag{4}$$

where MRPL_{jt} is the MRPL for firm j, and where i and c denote industry and city, respectively. Our goal is to understand how the MRPL varies by firm ownership type. We employ a regression framework to control for possible differences in the MRPL because firms must pay different wages in different industries, years, or cities.[17] In some regressions, we also allow for a wage premium by firm size. These regressions take the form:

$$\ln \text{MRPL}_{jt} = \alpha + \chi_c + \beta_i + \eta_o + \gamma_t + \mu \ln(S_{jt}) + \varepsilon_{jt}, \tag{5}$$

where α is a constant, χ_c is a city fixed effect, β_i is an industry fixed effect, η_o is an ownership fixed effect, γ_t is a year fixed effect, S_{jt} is employment of firm j at time t, and μ is an estimated coefficient, and ε_{jt} is an iid error term.

Ownership is defined by registration status—state, collective, private, and legal person—unless otherwise specified, and we estimate (5) treating state ownership as the left-out ownership category. The coefficient for ownership type, η_o, can be used to measure the wage distortion for ownership type o relative to state ownership, holding two-digit industry, year, and firm size constant. In our tables, we report average MRPL by ownership type relative to the average MRPL for SOEs.[18]

[17] China is divided into 27 provinces plus four province-status municipalities of Beijing, Chongqing, Shanghai, and Tianjin. The provinces are further divided into prefectures and prefecture level cities which can be further subdivided into counties and districts. The term 'city' in this article is used to refer to prefectures, prefecture level cities and the four municipalities.

[18] This is computed as exp η_o.

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Table 2 Marginal revenue product of labor relative to state-owned enterprises, by registration status, controlling for industry and year

	2001–2004	2004–2007
(a) All firms		
Ownership categories		
Collective owned	3.216 (0.005)	1.747.007)
Private owned	3.528 (0.005)	1.665.006)
Legal person	4.055 (0.005)	1.893 (0.006)
Total number of firms	712 823	1 054 340
Adjusted R^2	0.20	0.12
(b) Balanced panel		
Ownership categories		
Collective owned	2.843 (0.007)	1.306 (0.009)
Private owned	3.068 (0.007)	1.251 (0.008)
Legal person	3.604 (0.008)	1.433 (0.008)
Total number of firms	285 593	651 745
Adjusted R^2	0.23	0.13

Notes: Ownership defined as 'Registration Status'. This table reports the ratio of average marginal revenue product of labor by firm type relative to state-owned enterprises, controlling for year and two-digit industry fixed effects. All estimated MRPL differentials are statistically significant at the 1% level.

5.2 Labor productivity differences using registration status

Table 2 provides estimates of the MRPL for various non-state ownership categories, relative to the MRPL for state-owned firms, controlling for industry and year. Here, enterprises are classified using their official registration status. Looking first at the estimates for the period 2001–2004, we find very large gaps between non-state enterprises and state enterprises. Collective-owned firms have marginal revenue products of labor that are estimated to be 3.22 times that of state-owned firms. Private enterprises have marginal labor productivity that is 3.53 times that of state-owned firms. Firms registered as legal-person enterprises have the highest estimated MRPL of all ownership types and thus the largest gap: legal-person enterprises on an average have marginal labor productivity that is 4.06 times that of SOEs.

When we estimate MRPL for the second time period, 2004–2007, we find that the gaps have decreased for all ownership types relative to SOEs. As shown in the rightmost columns of panel (a), collective firms are estimated to have average marginal labor productivity 1.7 times that of SOEs, while the differential falls to 1.67 for private firms and 1.89 for

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legal-person enterprises. Thus, our estimates suggest a dramatic narrowing of the implicit labor subsidy for state enterprises over time.[19]

As shown in panel (b) of Table 2, we estimate (5) again with industry and year controls, using a sample that includes only firms present in every year of each period. There is active churning of firms, in and out of the ASIP and across ownership categories, and we estimate the differential for incumbent firms only to avoid confounding ownership changes with allocative reforms.[20] Restricting our sample to incumbent firms reduces the size of estimated productivity gaps, but not the ordering across ownership types. In the first time period, 2001–2004, incumbent legal-person enterprises have the highest marginal labor productivity, with an estimated MRPL 3.60 times that of SOEs. Interestingly, the gaps we estimate for the later period, 2004–2007, are substantially smaller. Incumbent collective enterprises have an estimated marginal labor productivity 1.31 times that of the state sector, labor in incumbent private enterprises is 1.25 times as productive at the margin, and labor in incumbent legal-person firms is 1.43 times as productive. Differences between the full sample and the incumbent sample are consistent with the finding of Brandt et al. (2011), who show that exit and entry has substantial impacts on productivity growth during this period. Our results suggest that new entrants face implicitly higher labor costs.

Table 3 uses additional controls to isolate differences in factor productivity across similar firms with different organizational forms. As seen by a comparison of the estimates from regression (1) to those in Table 2, controlling for the city in which an enterprise is located tends to reduce the differentials we find between the non-state sector and the state sector. The marginal labor productivity of collectives falls from 3.22 times that of SOEs to 2.87, the differential for private firms falls from 3.53 to 3.15 and the differential for legal-person firms falls from 4.06 to 3.76. Therefore, the slight tendency of SOEs to be located in higher wage cities explains a bit of the observed productivity differentials, but very large productivity differentials remain. When we also control for firm size, as measured by firm employment, we find no significant differences from those productivity gaps estimated without accounting for size, as seen by regression (2) in Table 3.

[19] Estimates for MRPL differences using labor coefficients estimated from a translog function or by OLS show the same qualitative patterns across ownership but magnitudes that are smaller by ~25%. The decline in productivity gaps is also smaller, with estimated differentials falling ~10% between the two periods. Because non-state firms are free to adjust labor input in response to shocks, we prefer the LP estimates.

[20] This churning is well documented in Brandt et al. (2011).

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Table 3 Marginal revenue product of labor relative to state-owned enterprises, by registration status, with additional controls

	2001–2004		2004–2007	
	(1)	(2)	(3)	(4)
Ownership categories				
Collective owned	2.872 (0.005)	2.875 (0.005)	1.608 (0.007)	1.597 (0.007)
Private owned	3.149 (0.005)	3.152 (0.005)	1.570 (0.006)	1.560 (0.006)
Legal person	3.762 (0.005)	3.766 (0.005)	1.820 (0.006)	1.813 (0.006)
Firm employment?	N	Y	N	Y
Year dummies?	Y	Y	Y	Y
City dummies?	Y	Y	Y	Y
Industry dummies?	Y	Y	Y	Y
Total number of firms	712 823		1 054 340	
Adjusted R^2	0.25		0.18	

Notes: Ownership defined as 'Registration Status'. This table reports the ratio of the average marginal revenue product of labor by firm type relative to state-owned enterprises, controlling for the indicated effects. All estimated MRPL differentials are statistically significant at the 1% level.

Looking at estimates for the later period, 2004–2007 regressions (3) and (4) in Table 3, we find similar results: controlling for the city in which the enterprise is located reduces the estimated productivity differentials only slightly and controlling for firm size has virtually no effect. Additional controls also do not change our finding that productivity differentials between non-state enterprises and state enterprises clearly fall over time.

5.3 Labor productivity differences for reclassified legal-person enterprises

Table 4 provides greater detail on the performance of firms that are registered as legal persons. We use equity share information to reclassify these domestic firms as majority-owned state, collective, or private, to the extent possible. When the majority of equity is contributed by legal persons, reclassification is not possible and we continue to classify them as legal person enterprises and we compare their performance to other reclassified groups.

Looking first at the top panel, which provides results for the full sample, we see that there are significant differences by ownership within the group of firms registered as legal persons.[21] For the period 2001–2004, among

[21] While we do not indicate the significance of differences among members of the non-state sector in Table 4, separate significance tests show that all differences are significant, with the exceptions noted in the text.

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Table 4 Marginal revenue product of labor relative to state-owned enterprises, firms registered as legal persons disaggregated and reclassified, controlling for industry and year

	All firms		Balanced panel	
	2001–2004	2004–2007	2001–2004	2004–2007
Ownership categories				
Collective owned	3.216 (0.017)	1.747 (0.012)	2.841 (0.021)	1.305 (0.012)
Private owned	3.534 (0.017)	1.665 (0.010)	3.066 (0.022)	1.250 (0.010)
Legal person reclassified as:				
State owned	2.999 (0.034)	1.750 (0.022)	2.863 (0.045)	1.320 (0.020)
Collective owned	4.006 (0.046)	1.758 (0.021)	3.581 (0.056)	1.343 (0.019)
Private owned	3.967 (0.026)	1.801 (0.012)	3.469 (0.031)	1.349 (0.012)
Legal person	4.497 (0.031)	2.041 (0.014)	4.026 (0.039)	1.565 (0.014)
Total number of firms	712 823	1 054 340	285 475	651 608
Adjusted R^2	0.21	0.12	0.23	0.13

Notes: This table reports the ratio of the average marginal revenue product of labor by firm type relative to state-owned enterprises, controlling for year, and two-digit industry fixed effects. All estimated MRPL differentials are statistically significant at the 1% level. Firms registered as legal persons have been reclassified as state, private, collective, foreign, or legal person using equity shares.

legal person enterprises reclassified by equity ownership, all groups show labor productivity that, on average, exceeds that of collective or private enterprises that are not registered as legal persons, with the exception of those with majority state ownership. However, it is interesting and important that the majority state-owned shareholding firms have labor productivity that is three times larger than state-owned firms that are directly controlled by the state. This category of firms is the category that best matches those firms identified by Huang (2008) and we find that they perform more like private firms than state-owned firms. Firms that we cannot further classify, those shareholding firms with majority equity held by legal persons (and which therefore may also be owned by the state) also have labor productivities that far exceed state-owned non-shareholding firms: the estimated MRPL for these legal-person majority owned firms is 4.5 times higher than traditional state-owned firms. These results suggest a connection between how state firms were restructured and their subsequent treatment. To the extent that we can identify majority state-owned legal person firms as formerly directly state-owned firms, our findings suggest that those firms 'let go' by the state now face labor costs similar to non-state firms.

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When we consider the second period, 2004–2007, in the second column in the top panel of Table 4, we see that the labor productivity differential between state-owned firms and all firms registered as legal persons fell over time. For example, the differential between enterprises registered as legal person with majority legal-person ownership falls from 4.5 to 2.04.

Gaps across ownership types are also reduced in the second period. Indeed, we find there is no significant difference between the relative MRPL of collective firms and those firms registered as legal persons but majority collective owned. There is also no statistically significant difference between collective firms and those firms registered as legal persons but majority state owned. Firms registered as private are now estimated to have a lower MRPL differential than any reclassified group of legal person firms and these differences are statistically significant. Legal person firms with majority ownership by legal persons remain the category of enterprises with the larger relative MRPL.

The bottom panel of Table 4 provides the same analysis using only incumbent firms. As before, we see that accounting for entry and exit reduces somewhat the estimated MRPL differences for all firm types compared to state-owned firms. However, as before, the ranking of firms is unchanged within each time period and differentials are smaller later in the decade.

Table 5 re-estimates the regressions with additional controls. Accounting for spatial differences in labor costs reduces our estimated differentials by ~10%, while controlling for firm size, as measured by employment, makes virtually no difference.

5.4 Implicit labor taxes by industry

We calculate the implicit labor tax-cum-subsidy for collective, private, and legal person ownership types in each two-digit industry and time period. The ownership fixed effect, η_o, can be used to obtain an estimate of the implicit labor tax. We recover these tax rates using (4) and (5) and assuming that wages and output taxes do not vary by ownership type:

$$\begin{aligned} \eta_o &= \ln(1 + \tau_{\text{Lot}}) \\ \tau_{\text{Lot}} &= \exp(\eta_o) - 1. \end{aligned} \tag{6}$$

In our estimations, the state-owned group and food processing industry are the left out categories. Our estimates of implied labor taxes by industry are displayed in Table 6. The left panel shows the results for 2001–2004 and the right panel for 2004–2007.

Looking at the first time period, several features of the table emerge. First, with the exception of food manufacturing, in every industry labor employed by the non-state sector is implicitly taxed relative to the state

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Table 5 Marginal revenue product of labor relative to state-owned enterprises, firms registered as legal persons disaggregated and reclassified, additional controls

	2001–2004		2004–2007	
	(1)	(2)	(3)	(4)
Ownership categories				
Collective owned	2.873 (0.015)	2.877 (0.015)	1.606 (0.011)	1.596 (0.011)
Private owned	3.157 (0.016)	3.161 (0.016)	1.570 (0.009)	1.558 (0.009)
Legal person reclassified as				
State owned	3.005 (0.033)	3.003 (0.033)	1.697 (0.020)	1.701 (0.020)
Collective owned	3.609 (0.041)	3.612 (0.041)	1.663 (0.019)	1.656 (0.019)
Private owned	3.667 (0.024)	3.672 (0.024)	1.740 (0.012)	1.731 (0.012)
Legal person	4.149 (0.028)	4.152 (0.028)	1.950 (0.013)	1.942 (0.013)
Firm employment?	N	Y	N	Y
Year dummies?	Y	Y	Y	Y
City dummies?	Y	Y	Y	Y
Industry dummies?	Y	Y	Y	Y
Total number of firms	712 823		1 054 340	
Adjusted R^2	0.25		0.18	

Notes: This table reports the ratio of the average marginal revenue product of labor by firm type relative to state-owned enterprises, controlling for the indicated effects, using the full sample. All estimated MRPL differentials are statistically significant at the 1% level. Firms registered as legal persons were reclassified as state, private, collective, foreign, or legal person using equity shares.

sector. Secondly, implicit tax rates on labor employed by private firms or legal-person firms typically exceed those for collective enterprises. Lastly, private enterprises face the highest labor tax rates overall.

The estimated implicit tax rates on non-state employment in the second period, 2004–2007, indicate that the non-state sector continued to face adverse factor market conditions. However, the implied tax rates are substantially and generally lower than in the earlier period. Indeed, for six industries we estimate that state-owned firms are taxed relative to the non-state sector: textiles, wood production, rubber, plastics, special machinery, and communication equipment. These industries are quite diverse in terms of skill intensity, but many contribute a significant share of China's overall exports.[22] While textiles form a declining share

[22] Matching CIC industries to trade flows requires the use of several concordances, but Dean and Lovely (2010) provide trade shares using ISIC Rev.3 that suggest these patterns.

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Table 6 Implicit subsidy/tax rates relative to state-owned enterprises in food processing, by industry and time period

Industry	2001–2004			2004–2007		
	Collective owned	Private owned	Legal person	Collective owned	Private owned	Legal person
Food manufacturing	−0.38	−0.20	−0.34	0.51	0.22	0.32
Beverages	0.17	0.50	0.23	1.33	0.88	1.04
Textiles	0.76	1.25	0.85	−0.28	−0.42	−0.37
Apparel	0.35	0.73	0.42	0.36	0.10	0.19
Leather	0.48	0.89	0.55	0.44	0.17	0.26
Wood production	1.43	2.10	1.54	0.28	0.03	0.11
Furniture	0.88	1.40	0.97	−0.02	−0.21	−0.14
Paper	0.59	1.03	0.66	1.32	0.87	1.03
Printing	1.21	1.83	1.32	1.15	0.73	0.88
Culture art	0.89	1.42	0.98	0.69	0.36	0.48
Petroleum Processing	1.71	2.47	1.84	1.53	1.04	1.21
Chemicals	2.57	3.56	2.74	0.47	0.19	0.29
Medicine	0.84	1.35	0.93	2.82	2.08	2.34
Chemical fibers	4.59	6.15	4.87	6.35	4.93	5.42
Rubber	0.27	0.62	0.33	−0.07	−0.25	−0.19
Plastics	1.34	1.99	1.45	−0.09	−0.26	−0.20
Mineral	0.38	0.77	0.45	0.43	0.16	0.25
Smelting ferrous	1.72	2.48	1.85	0.71	0.38	0.49
Smelting non-ferrous	2.77	3.82	2.95	2.44	1.78	2.01
Metal prod.	0.94	1.49	1.04	0.71	0.38	0.50
General machinery	1.66	2.41	1.80	1.12	0.71	0.85
Special machinery	1.26	1.89	1.37	0.11	−0.10	−0.03
Transport	1.79	2.57	1.93	0.29	0.04	0.13
Electrical machinery	1.68	2.43	1.81	0.57	0.27	0.37
Communication equipment	1.25	1.88	1.36	−0.83	−0.87	−0.85
Instruments	0.95	1.50	1.05	3.70	2.80	3.11
Artwork	0.44	0.84	0.51	0.57	0.27	0.38

Notes: Ownership defined as 'Registration Status'. A positive value is an implicit labor tax.

of total exports, the industry still provides a large share of export-based employment. Furniture, communication equipment, and special machinery are sectors that had growing shares in the manufacturing export bundle during the decade. Non-state employment in three industries that use relatively high shares of skilled labor—chemical fibers, medicines, and instruments—face higher taxes relative to state employment in the second period.

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The implied tax rates in Table 6 suggest that legal-person firms face labor costs that are broadly similar to those faced by other non-state firms. Interesting, the big change over time seems to be in the treatment of private enterprises. On an industry-by-industry basis, private enterprises face higher tax rates than other non-state types in 2001–2004, but they tend to face lower rates than do collectives or legal person firms in the 2004–2007 period.

Overall, these implicit tax rates suggest that, like credit policies, labor policies are a tool for state restructuring and overall industrial policy. Our results are consistent with continuing structural forces in labor markets, such as better access to non-wage benefits or services, which reduce the relative cost of labor for SOEs. These factors lead to relatively smaller non-state enterprises in a given industry, perhaps diminishing the competition faced by the state sector. The evidence suggests that these policies affect individual industries and ownership types in different ways, even as overall implied labor tax rates have fallen.

5.5 Labor productivity dispersion across the manufacturing sector

Our last exercises examine the dispersion of labor productivity across manufacturing, recognizing that there will be differences across industries due to differences in average skill attainment and compensating wage differentials. We follow Hsieh and Klenow (2009) and measure the dispersion of MRPL across firms using deviations from industry means. Table 7 provides several measures of this dispersion in each time period. While we find a small decline in the SD across firms in the industry-adjusted labor productivities, we actually find a slight increase in the 90–10 difference.[23]

Table 7 Dispersion of MRPL

	2001–2004	2004–2007
Standard deviation	1.09	1.07
75–25	1.29	1.32
90–10	2.56	2.58
Number of firms	712 823	1 054 340

Notes: Statistics are for deviations of log(MRPL) from industry and year means. S.D. = standard deviation, 75−25 is the difference between the 75th and 25th percentiles, and 90−10 the 90th versus 10th percentiles.

[23] Hsieh and Klenow (2009) find only small reductions in the dispersion of TFP in China between 2001 and 2005. See their Tables I and II (p. 1418).

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Table 8 Sources of MRPL variation within industries

	Ownership	City	Employment
2001–2004	13.68	18.22	18.22
2004–2007	4.05	10.76	10.77

Notes: Ownership defined as 'Registration Status'. This table displays the cumulative percent of within industry-year MRPL variance explained by dummies for ownership, city, and firm employment. The results are cumulative in that 'City' includes dummies for both ownership and city, and so on.

Table 8 provides additional detail about the forces that drive this dispersion across enterprises. In the first time period, we find that variation across ownership type accounts for 13.68% of the variation within industries. When we also consider variation in location (city), we are able to account for 18.22% of overall variation. Differences in firm size, as measured by employment, explain none of the cross-firm variation in labor productivity. Overall, in 2001–2004, ownership type was the most important source of productivity dispersion, among those factors considered.

In the later period, 2004–2007, in keeping with our previously shown finding that implicit tax rates fell, the share of variation within industries that is explained by ownership falls to only 4.05%. The share explained by location (city) rises, with 10.76% of variation explained by both ownership and city. Firm size again explains virtually none of the variation in labor productivity.

Figure 2 displays the kernel density of the dispersion of MRPL for all firms and two time periods. We include only domestic firms and we exclude firms with MRPL below the 10th and above the 90th percentile. We consider deviations from industry and year means. The graph shows that the density has shifted to the left between the two periods. There are more firms with relatively low labor productivity, suggesting that firms with low labor productivity, mainly in the state sector, did not exit. This shift occurred even as overall labor productivity has increased and as gaps between state and non-state firms generally have narrowed.

6 Conclusion

By estimating the MRPL for all state-owned and all above-scale non-state sector manufacturing firms over two periods, we find that labor productivity varies systematically within industries by ownership type. Despite previous studies that show that non-state firms have lower capital–labor

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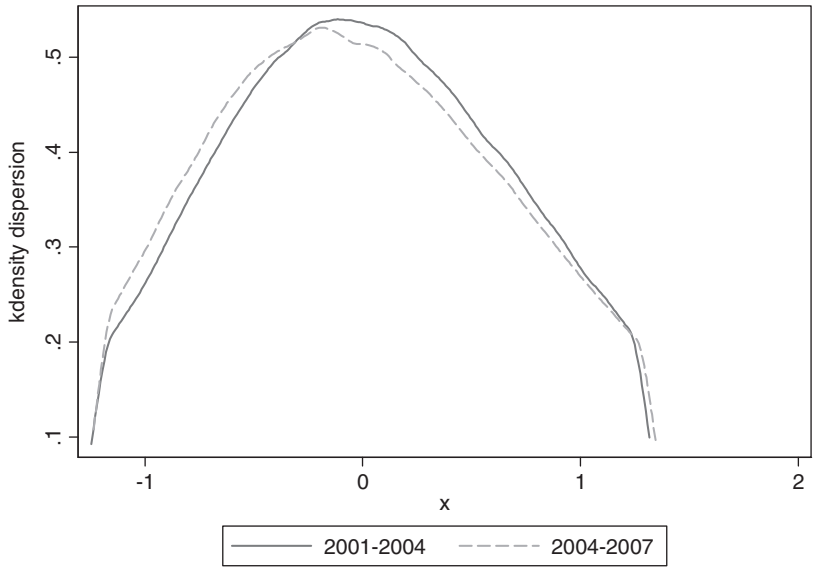

Figure 2 Dispersion of MRPL, 2001–2004 and 2004–2007. *Notes*: This table displays the kernel density of the dispersion of MRPL by time period. Measures below the 10th and above the 90th percentiles have been excluded. All foreign firms have been excluded. Graphs are for derivatives of ln(MRPL) from industry and year means.

ratios than state-owned firms, we find that non-state firms, on average, have higher marginal revenue products of labor than do SOEs. Analysis of incumbent enterprises suggests that exit and entry explain only a small part of the observed differences across ownership types. We also find that, in keeping with ongoing reforms of the state sector, labor productivity differentials associated with ownership fall over time, with the gap in MRPL between each segment of the non-state sector and SOEs falling by about half between the two periods analyzed.

While the non-state sector as a whole has a higher average MRPL than state-owned firms, we do find significant differences across the ownership types that comprise the non-state sector. Enterprises registered as legal persons have higher MRPL, on average, than do either those firms registered as collective enterprises or those registered as private enterprises. This ranking appears in both time periods and for the balanced and unbalanced panels. When we estimate the labor tax implied by these observed productivity differentials separately for each industry, we find that differences in the distribution across industries by ownership type hide underlying patterns in the treatment of private

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enterprise. On an industry-by-industry basis, private enterprises face higher tax rates than other non-state types in 2001–2004, but they tend to face lower rates than do collectives or legal person firms in the second period.

Disaggregating the group of firms registered as legal persons on the basis of equity ownership reveals interesting patterns in labor productivity. In 2001–2004, all segments of the legal-person-registered group exhibit relatively high MRPLs, with the differential ranging from 200% to 350% larger than that estimated for the registered state-owned sector. A particular surprise is that legal person firms with majority state ownership also show much higher MRPL than those firms directly controlled by the state. For 2004–2007, MRPL differentials for all firm types are substantially smaller, ranging from 25% to 57% above the registered state-owned sector. In this period, legal-person firms with majority state ownership have MRPL differentials that are very similar to those for legal-person firms with majority private or majority collective ownership. In both time periods, legal-person firms with majority ownership by legal persons have the highest MRPL relative to state-owned firms.

This evidence is consistent with continuing but reduced implicit labor subsidies for directly SOEs but not for firms whose shares are owned by the state, even if those shares are registered to legal persons. In this sense, the shareholding conversions of the late 1990s, which Li et al. (2000) claim were covert forms of privatization, appear to have created a class of enterprises that function more like private enterprises than like SOEs, even when their shares are majority state owned.

Our findings also suggest that continued development of labor markets, as well as capital markets, will produce improvements in allocative efficiency. Labor market reform is inherently far-reaching as it is interwoven with social security, health care, housing policy, and the household registration system. As China tackles these issues, successful reform will produce direct dividends in enhanced and more accessible public services. Our findings suggest it will also produce an efficiency dividend as it reduces the dispersion across firms in the value of labor.

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Appendix

Table A1 Registration status codes

Registration code	Description
State owned	
110	State-owned enterprises
141	State-owned jointly operated enterprises
151	Wholly state-owned companies
Collective owned	
120	Collective-owned enterprises
130	Shareholding cooperatives
142	Collective jointly operated enterprises
Foreign owned	
210	Overseas joint ventures
220	Overseas cooperatives
230	Overseas wholly owned enterprises
240	Overseas shareholding limited companies
310	Foreign joint ventures
320	Foreign cooperatives
330	Foreign wholly owned enterprises
340	Foreign shareholding limited companies
Private owned	
170	Private
172	Private Partners
173	Private Limited
174	Private Share Holding
Legal person	
159	Other limited liability companies
160	Shareholding limited companies
Other	
143	State-collective jointly operated enterprises
149	Other jointly operated enterprises
190	Other enterprises

Note: Overseas refers to Hong Kong, Macao, and Taiwan; Foreign refers to all other countries.

Source: National Bureau of Statistics.

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