Policy Perspectives from the Bottom Up: What Do Firm-Level Data Tell Us China Needs to Do?

Loren Brandt
Noranda Chair Professor of Economics and International Trade
Department of Economics
University of Toronto

This paper was originally prepared for the 2015 Asia Economic Policy Conference, Policy Challenges in a Diverging Global Economy, Federal Reserve Bank of San Francisco, November 19-20, 2015

Background

Much of the current focus on China is on the consequences for growth of deleveraging and the need for rebalancing of the economy. In the near term, China needs to work down a huge run-up in its debt-GDP ratio incurred trying to cushion the economy from the effects of the international financial crisis. Often forgotten in these discussions are equally important issues relating to productivity. Although much is often made of China's "investment-led" growth, productivity growth has been the most important source of China's rapid growth over the last three and a half decades (Zhu 2012).[1] This will be true moving forward.

The Chinese economy combines enormous amounts of dynamism with huge distortions and inefficiency. The two exist side by side and in fact are the product of the same system and set of institutions. Investment spending—often supported through access to inexpensive finance—has been used as much as a vehicle to redistribute resources from dynamic sectors enjoying rapid TFP (total factor productivity) growth to laggard firms and sectors that are politically connected and serve political and strategic objectives, as to foster growth. Redistribution of this form is also probably a major source of widening inequality.[2]

At the aggregate level, there are likely important links between macroeconomic imbalances and productivity growth through the effect of distortions in the price of capital, energy, and the exchange rate that run through both. For policymaking however, a more microeconomic perspective on productivity seems useful. Here, I would like to provide an assessment that comes from the bottom up, based on a combination of extensive firm-level analysis and several hundred firm interviews over the years. It is an assessment that is less than perfect, and carries with it some margin of error. We face huge data issues for industry that are even more severe for the service sector. One obvious policy recommendation is for better access to firm-level data.

Much of my focus will be on industry, but as I note at the end, the tertiary sector (i.e., services) cannot be ignored. This point is increasingly well recognized, but usually in the context of rebalancing of the economy (Lardy 2014; Pettis 2012). The direct contribution of services to the economy now exceeds that of industy and will only increase over time. Services such as ICT (information and communications technology), power, finance, and transportation and logistics are also critical inputs into manufacturing; thus, productivity in these sectors exerts a significant influence on the competitiveness of the rest of the economy.[3]

---

[1] Recent work by Zhang and Zhu (2013) also suggests that investment (consumption) has been overestimated (underestimated) in the Chinese national income accounts.

[2] A case could be made that the imbalances in the Chinese economy have widened with efforts to redistribute.

[3] Power and utilities are actually part of industry, but have similarities with telecom in that both are network industries and key upstream sectors for manufacturing.

In a number of respects, the current Chinese leadership recognizes the important role of productivity growth and innovation in helping China to narrow the gap with the West. China's industrial sector currently rivals that of the United States in terms of its size. It is also a major exporter of manufactured goods that span most sectors of industry (Schott 2008) and compete in increasingly more demanding market segments (Mandel 2013). However, gaps in technological capabilities remain between domestic Chinese firms and firms from advanced countries, and those gaps are also reflected in productivity differences.

The Chinese leadership firmly believes that the country's economic *and* strategic future rests on the ability of the country to be at the cutting edge of newly emerging technologies and "indigenous innovation" in both industry and services. Indigenous innovation here means innovation by Chinese-owned firms as opposed to firms operating in China. These perspectives are embodied in the 2006 Science and Technology Medium Term Plan as well as in the Five-Year Plan on Strategic and Emerging Industry announced at the end of 2010. These initiatives committed US$1.6 trillion to seven emerging technologies: energy saving and environmental protection, next-generation information technology, biotechnology, advanced equipment manufacturing, new energy, new materials, and new-energy vehicles.

Underlying current policy directions, most notably, the focus on indigenous innovation and a more limited role for MNCs (multinational companies) in key sectors is a view that China's earlier model failed to deliver, especially in terms of producing "national champions." I agree that dynamic Chinese firms have not emerged in all sectors, but the interpretation I offer for this "failure" is different from the narrative currently heard in some policy circles in China.

A key lesson from the experience of the past 15 or 20 years is that sectors that have been consistently most open to competition, in which entry and exit of firms have been far less encumbered and, more generally, in which firms have been free from the all too "visible" and often distorting hand of the Chinese state at both the local and central level, are in fact those that have been most dynamic. They are also the sectors in which Chinese firms are successfully competing today in more demanding markets, domestic as well as overseas.

By contrast, those sectors that remain the preserve of the SOEs (state-owned enterprises) either exclusively, or occasionally through ventures with other types of firms; in which NDRC (National Development Reform Commission) or MIIT (Ministry of Industry and Information Technology) continues to influence sector dynamics through licensing and entry decisions, technology choices and investment, and regulatory behavior; and in which outcomes are often badly distorted by a combination of central government objectives and local governments incentives, have usually failed to deliver dynamic local firms.

These contrasting experiences have important implications for policy. They also suggest that China's continued inward turn runs the risk of making the economy less, not more, dynamic and innovative.

Productivity Dynamics in Industry

Overall, China's current industrial sector combines enormous amounts of entrepreneurialism and dynamism with huge inefficiencies and distortions. The former is most clearly reflected in rapid productivity growth—measured here in terms of output per units of inputs—that is on par with that achieved by the manufacturing sector in other successful Asian economies, e.g., Japan, Korea, and Taiwan, at similar periods in their development (Brandt, Van Biesebroeck, and Zhang 2012; Yu 2015).[4] The dynamism is also revealed in the success of manufacturing firms in China—foreign and increasingly domestic—in moving up the value chain and capturing growing market share in more demanding export markets from firms in advanced countries (Mandel 2013). In the process, the share of domestic value-added in China's export sector has increased significantly (Kee and Tang, forthcoming).

The inefficiency is reflected in recurring problems of excess capacity and low returns on investment in some firms and sectors, and in the constraints on more dynamic firms in capturing a growing share of a burgeoning domestic market. These constraints come in multiple forms, including access to finance and human resources, state procurement policy that discriminates against non-state actors on the demand side, and so on. More generally, the lack of a level playing field works to the disadvantage of these better firms. Estimates suggest that there are huge gains to eliminating the inefficiencies *within as well as between* sectors (Gao 2014; Hsieh and Klenow 2009). The problem is that these constraints are deeply embedded in China's political economy and so far have been difficult to remove. Furthermore, top-down policies designed to help promote upgrading and innovation are often having the opposite effect.

Where Have the Productivity Gains Been Coming From?

Productivity decompositions allow us to examine the role of a number of alternative margins in raising productivity. Four are important. First, there are gains coming through TFP improvement amongst existing firms. These can be the product of efforts that lower firm costs or that improve product quality and thus allow firms to command higher prices for the products they sell. Second, a reallocation of resources to the most productive of firms will have the

[4] At the firm level, Brandt, Van Biesebroeck, and Zhang (2012) estimate productivity improvements of 8.0 and 2.8 percent per annum on a gross output and value-added basis, respectively. At the industry level, productivity growth is even higher, reflecting the role of entry/exit and reallocation of resources among firms in the sector. On average, productivity growth has been the source of a half or more of the growth in industry since the mid-1990s.

same effect. M&A (mergers and acquisitions) is a potentially important mechanism through which resources are reallocated amongst firms. Third, entry of new firms at levels of TFP higher than incumbents will also lift average TFP. Finally, the exit of poorly performing firms with TFP below average will also contribute to these gains. Generally speaking, the contribution of entry and exit will depend on the volume of these flows as well as the size and relative productivity of these firms.

A unique feature of China's productivity growth in industry compared with other countries is the important role of entry. Entry rates for new firms[5] can be calculated based on firm-level records from the Industrial Census for 1995, 2004, and 2008.[6] The 1995 Chinese Industrial Census puts the number of new firms entering industry in that year at slightly more than 40,000, or an entry rate of 8 percent. By the time of the 2004 census, the number of new entrants more than tripled in absolute terms, as the entry rate rose to 12 percent. The rate of entry fell off in 2008—likely reflecting the effect of the global financial crisis—however, an additional 150,000 firms were added.[7]

Estimates of entry as well as exit can also be extracted from the business registry of the Ministry of Industry and Commerce for the period between 1998 and 2013. Figure 1 provides entry, exit, and net entry rates (entry minus exit) for industry. Entry rates are generally higher but move in line with the estimates of new firm entry from the Census data and the NBS (National Bureau of Statistics) annual firm survey data. The behavior is also cyclical, with entry rising with the recovery from the Asian financial crisis in the late 1990s, falling in 2007 and 2008 with the onset of the global financial crisis, and then rising again.[8] Exit rates are declining over this period but net entry remains highly cyclical.[9] By 2013, there were 3.85 million industrial establishments, compared with 1.47 in 1998, implying an annual increase in the number of new firms of more than 6 percent.

Estimates made by Brandt, Van Biesebroeck, and Zhang (2012) using the annual firm-level survey data of the NBS between 1998 and 2007 show that 57 percent of the growth in industrial output is a result of productivity growth. Moreover, up to two-thirds of the productivity growth within sectors is coming from new firm entry, especially private firms. The

[5] Entry rates are calculated by dividing the number of new firms established in a year by the total number of firms operating that were established earlier.
[6] The activity of these firms covers between 75 and 80 percent of industrial activity. Those excluded are small in terms of size.
[7] These estimates are based on data from the 1995, 2004, and 2008 Industrial Census.
[8] The Census data for 2004 and 2008 suggest a decline in the gross entry rate of 4 percent over this period, compared with 3 percent in the business registry data.
[9] The reasons for the decline in exit rates are a mystery at this point and remain to be investigated. Declining exit rates may have important implications for productivity, however.

remaining one-third is from rising TFP amongst incumbents. Figure 2 provides a breakdown of the contributions to output and productivity growth.

Significantly, the role of either the reallocation of resources to more productive firms or firm exit is negligible. The latter is more likely to be the case when exit rates are either low or when larger, poorly performing firms do not exit. As for the limited contribution of efficiency-enhancing input reallocations, capital market restrictions are often cited in this context (Hsieh and Klenow 2009; Song and Wu 2013), but also likely important are product market barriers, input subsidies for inefficient firms, and finally, preferential treatment of politically connected firms.

Differences across Sectors

The high rates of productivity growth in industry conceal important differences across sectors. Figure 3 graphs the distribution for TFP growth at the four-digit level between 1998 and 2007, and reveals wide differences between sectors over this period.[10] Sectors experiencing especially high rates of TFP growth include electronics, office machinery, and furniture; laggards include electrical equipment machinery, ferrous and nonferrous metals, and chemicals.

A critical determinant of the differences between sectors is the role of state-owned firms in the sector. As has been well described (Pearson 2015), the state has retreated from major segments of the economy. Today, SOEs dominate more capital-intensive upstream sectors such as power, telecommunications, transportation, and finance, and in manufacturing are most important in "pillar" and "strategic" sectors such as aeronautics, chemicals, iron and steel, and electrical machinery. Drawing on the Industrial Census, the share of the state sector in GVIO (gross value of industrial output) fell from 53 percent in 1995 to slightly more than 36 percent in 2008. Over the same period, the percentage of firms classified as state owned fell even more sharply, reflecting the huge selloff and bankruptcy of the smaller SOEs in the late 1990s.[11] In the context of a general decline in the role of SOEs in industry, state shares at the sector level are highly correlated over time.

The top half of Figure 4 shows the relationship between the share of state-owned firms in the sector in 1998 and TFP growth between 1998 and 2007. The relationship is clearly negative, with those sectors in which the state was most important in 1998 experiencing the lowest growth in productivity over the same period. Paradoxically, the bottom half of Figure 4 reveals that these same sectors experienced the most rapid growth in profitability over this period, a

[10] These estimates are drawn from Brandt et al. (2012, revised 2015).

[11] State ownership (and control) can be identified in a number of alternative ways, none of which are perfect. The estimates reported above are based on a relatively conservative definition. Specifically, a firm is classified as an SOE if ….

likely byproduct of technological differences and preferential access enjoyed these firms to key inputs such as capital, energy, and land.[12] Naughton (2008) has argued that "rents" of this sort remain important to maintaining patronage in the system.

Decompositions of productivity of the kind described above that break down the sources of productivity change into its components are equally telling. Table 1 reports results based on a division of the two-digit sectors for industry into two groups: those in which the state had more (less) than 50 percent of GVIO in 1998.[13] Note the huge gap in TFP growth between the two types of sectors, negative in state-dominated sectors, and positive in those in which the role of the state is less important. Equally telling, in the state-dominated sectors, the contribution of both incumbents and new entrants to productivity growth is negative. The former occurs when productivity growth of established firms is negative; the latter occurs when new firms enter the productivity distribution at a level that is lower than the industry average. Disaggregating even further by ownership reveals that in state-dominated sectors, non-state actors—incumbents as well as entrants—also perform poorly, and contribute to the declining productivity we observe. Conversely, state-owned firms in non-state-dominated sectors perform better, albeit not to the levels of the non-state actors.

This behavior suggests that not only is ownership important, but so is the entire regulatory environment that governs and shapes how firms compete in a sector. The negative contribution to TFP of "new" non-state actors in state-dominated sectors—sectors in which profitability was actually rising—suggests an entry process that is highly politicized and distorted, and in which political connections rather than how good a firm is likely matter most. Table 2, which reveals huge differences in outcomes among three (two-digit) industrial sectors in which state firms have been important, helps make the point further that ownership alone is not the problem. Clearly, there are sectors in which SOEs appear to be doing reasonably well.

Unfortunately, data limitations do not allow comparable estimates of productivity for the post-2007 period. Estimates for 2013 at the two-digit level on capacity utilization rates recently reported by the State Council reveal, however, a significant overlap in sectors currently experiencing low capacity utilization rates with those we identified above having low (or negative) TFP growth between 1998 and 2007. These include chemicals, ferrous and nonferrous metals, cement, electrical machinery and equipment, shipbuilding, and autos. Coincidentally, all of these sectors were included in the government's Top 10 Industries Revitalization Plan rolled out in 2009. For these sectors, capacity utilization in 2013 was only 70 percent, compared with 85 percent or so for the rest of industry. In general, there appears to

[12]The most important technological difference is an elasticity of substitution between capital and labor greater than one. See Berkowitz, Ma, and Nishioka (2014).

[13] A third of all sectors had a state share of 50 percent or more in 1998. Using a slightly lower cutoff point or dividing sectors into two groups after ranking them does not alter the picture.

be a high correlation between problems of excess capacity and how "strategic" the sector is in the economy.

With relatively robust growth in domestic demand in all of these sectors until only the last few years, the problem would seem to rest heavily on the supply side. Central government policy—compounded by the incentives facing local government officials to promote local growth—has badly distorted firms' investment decisions and choices. The consequence is not simply too much investment in these sectors, but rather investment in new capacity by some of the most inefficient firms (in probably some of the most inefficient regions), firms that all else equal should have been going out of business or, at a minimum, downsizing.[14]

Policy measures now proposed to address these issues include the familiar: firm-level consolidation through top-down M&A; elimination of existing "backward" capacity and tighter control on new expansion; and stimulus of domestic demand. Added to the list is a new measure: relocation of some of the excess capacity overseas.[15] In the past, top-down administrative M&A tended to favor firms that were either the largest or best connected. Provincial and subprovincial governments, whose own power is often tied to these firms, know the game. Not wanting "their" firms to be among those that are acquired by others, they have clear incentives to expand—through either new investment or local M&A—measures which only add to existing inefficiency, and likely discriminate against better firms.

Leveraging the Domestic Market: The Important Role of Continuing Market Liberalization

The role of expanded access to global markets in the learning and upgrading process of firms and countries is well documented. But on the demand side, far more important for a majority of firms in China is the domestic economy, which has consistently absorbed more than 85 percent of what is produced by manufacturing firms in China. For a long list of products including autos, heavy construction equipment, wind turbines, cell phones and network equipment, glass, and iron and steel, China is the largest market in the world. Important here are several factors: China's huge population, 1.37 billion; sustained growth of the economy over more than three decades; and a rapidly growing middle class. Recent estimates put the size of China's middle class—defined to be households earning between $US9,000 and $US34,000-- at several hundred million (Barton, Chen, and Jin 2013).

The huge size of this market has been providing a unique set of upgrading opportunities for firms operating in China that their counterparts in smaller countries do not enjoy. This suggests

[14] Since the mid-2000s, similar kinds of behavior have emerged in sectors such as solar, a sector in which SOEs have been much less prominent and the market is largely overseas, but the role of the government, local and central, has been offsetting and highly distortionary.

[15] Relocation of capacity overseas in these sectors is viewed as highly complementary to the setting up of the Asian Infrastructure Investment Bank.

that government policy toward the domestic market is as important, if not more important, than it is with respect to nurturing overseas markets. In fact, the two are highly complementary. Liberalization of the domestic market and its timing has been far from uniform, however, and is reflected in wide differences in the competitive strengths of Chinese firms across sectors.

In selling locally, Chinese-owned firms do not face the same set of marketing and technical gaps that they usually face in selling overseas. In fact, in some domestic market segments—notably, the low to middle end—domestic firms may actually have advantages vis-à-vis foreign firms, whose products are often better suited for consumers in richer countries (Brandt and Thun 2010, 2016). Success in selling in the domestic market can also become an important platform for selling in other emerging markets where levels of incomes (and consumer preferences) are often more similar than they are in advanced countries.

Central to the dynamism and productivity growth we often observe at the sector and the firm level have been policies that have lowered barriers, increased competition, and helped to better leverage capabilities inherited from the planning period that often continue to reside in the state sector. These measures include falling tariff and nontariff barriers for imports that were part of China's accession to the WTO (World Trade Organization), lower entry barriers for new firms, a more open environment to foreign direct investment, the bankruptcy and reorganization of the assets and workers of the SOEs, as well as less-discriminatory procurement policy by state actors.

In the context of a growing domestic market, these market-liberalizing reforms put considerable pressure on firms operating in China to lower costs and improve product quality; more generally, they promoted investments in upgrading at both the OEM (original equipment manufacturer) and supplier level. Falling tariffs and nontariff barriers also helped to provide less expensive access to capital and intermediate goods, which facilitated product upgrading and productivity improvements.[16] A key channel through which tariff liberalization affected growth was through its effect on the productivity of firms that entered these sectors (Brandt et al. 2012, revised 2015).

At the outset, there were deep concerns in China that market liberalization of the sort mandated by WTO accession would be at the expense of domestic firms. Similar concerns get expressed today in the context of the prospect of opening up the service sector. There have been casualties, and thousands of firms folded under intensified competitive pressures, but more generally, and after an initial reduction in their market share, Chinese firms have done

[16] For intermediate goods, we observe significant pass-through of falling tariffs into lower prices of domestically manufactured intermediate goods.

well in the domestic market. This is perhaps most noticeable in more mature industries in which incremental innovation in both product and process technology are especially important to newcomers. Like firms in Korea, Japan, and Taiwan before them, Chinese firms are remarkably adept at this kind of innovation (Breznitz and Murphree 2011), strengths that policymakers should be leveraging.

Especially important in this context has been an evolving relationship between MNCs and domestic firms. In order to help lower costs in the context of falling domestic prices and profit margins, and to meet demand in the rapidly expanding "middle" segments of the market, foreign firms have invested heavily in building up the domestic supply chain, increasing their local content in the process. A leading multinational OEM in the auto sector, for example, had a five-year plan in the mid-2000s to lower their costs by 45 percent through more local sourcing for intermediate inputs and capital machinery and equipment, and a shift in some of their more "applied" R&D (research and development) to China. They succeeded.[17]

These kinds of investments have resulted in the transfer of manufacturing know-how and capabilities from the multinationals to local firms, and required complementary investment by local firms in capital equipment, human resources, and R&D. Foreign firms have also become an important source of managerial and engineering expertise for new Chinese firms. Chinese firms have leveraged these opportunities, and it is not uncommon to find them participating in both domestic and global value chains. Development of the domestic supply chain has also become key to the upgrading by Chinese firms at the OEM level who have been able to tap into rapidly improving networks of Chinese suppliers.

Case Studies: Autos, Heavy Construction Equipment, and Wind Turbines

Liberalization of the domestic market and its timing has been far from uniform. A few examples help link policies to the current competitiveness of domestic (Chinese) firms.

China's heavy construction equipment sector is a good example of where liberalizing forces over an extended period have contributed to robust growth of the sector *and* the rise of national champions. Two decades ago the domestic market was highly segmented, with a long list of Chinese firms dominating the "low-end" wheel loader market, and imports and local production of MNCs in China serving the "high-end" excavator market.[18] Since the early 1990s, the sector has been relatively open: tariffs on heavy equipment machinery and intermediate goods were low; entry by non-state actors, domestic as well as foreign, was relatively

[17] Interview with a leading global auto OEM, July 2006.

[18] These two products differ enormously in terms of their design and manufacturing requirements, much of which is related to the hydraulic system in an excavator, and the integration of hydraulics and transmission. In key respects, however, they are substitutes.

unencumbered; and there were few restrictions on the form of technology transfer allowed, e.g., licensing, joint ventures (JVs), and wholly owned subsidiaries. With one or two prominent exceptions, M&A was also generally permitted. On the demand side, small and medium-sized enterprises (SMEs) in the construction sector have been a major source of market demand.

Today, multinationals such as Caterpillar, Komatsu, and Volvo continue to be important players in a highly competitive domestic market, but Chinese firms have done remarkably well in the sector. In the wheel loader market, the top four firms—three of which are Chinese—now enjoy upwards of 70 percent of the market, while in the domestic excavator market, Chinese firms currently capture upwards of half. Only five years ago, it was less than half of this. A recent in-depth analysis of the sector attributed this success to the ability of Chinese firms, SOEs as well as private, to compete on the basis of both price and quality in medium-market segments (CLSA 2013). In a test of 13 leading excavator brands in China in the mid-size excavator market (20–25 tons), performed over 185 working hours during a two-week period in 2013, CLSA (p. 23) found that "*technology gaps are non-existent* between top-tier Chinese and international companies."

Rapid growth in a domestic car market now rivaling that of the United States in terms of size has not meant similar success of Chinese (domestic) automotive OEMs. The root of these difficulties lies in earlier policies—most notably, very high rates of protectionism prior to the WTO, restrictions on forms of entry and technology transfer, and until only more recently, a marked policy bias in favor of the state-owned, JV partners of leading international auto MNCs. Licensing of technology, which was common in heavy construction, was limited to a single, locally state-owned company, Tianjin Xiali.

The expectation of policymakers was that a combination of a high tariff umbrella and local content requirements would help to foster national champions through the development of the independent production capabilities of the same SOEs, i.e., FAW (First Auto Works), Dongfeng, and SAIC (Shanghai Automotive and Industrial Company). Despite huge investments in their operations, these spillovers have not materialized, and car production of the SOEs outside the JVs remains very modest. Nor have newer firms such as BYD or Chery, with deep local government support, developed the foundations needed to compete successfully.

A recent external assessment of the domestic OEMs is revealing, especially when read in juxtaposition to the one above for their counterparts in heavy construction: "The leading Chinese products now have bodies, safety and suspension hardware that are largely competitive. But they are behind on engine technology and are also let down by assembly standards, material choices, systems integration, refinement, and a lack of final development and testing. *They are still a long way from being genuinely 'world class.'*" (Warburton et. al 2013). With their domestic market share declining, some of these same firms—with the

encouragement and financial support of the "go out" policy of the central government—now look overseas, especially to low-income countries, for markets.

Wind turbines provide a similar and more recent example of policy-induced difficulties. In the early 2000s, a small nascent domestic industry was dominated by multinationals, largely through local JVs.[19] Within less than a decade—and almost exclusively in the context of a rapid, government-led expansion in the domestic market—Chinese firms came to dominate, and today they have all but 1 or 2 percent of the domestic market. JVs have largely disappeared and MNCs supply the local market through a small number of wholly owned subsidiaries. In 2014, foreign firms sold almost the same number of units they had a decade earlier. Over the same period, the domestic wind turbine market expanded from 250 to 13,121 units, while the average size of wind turbines (in terms of kilowatt hours) doubled.

On the surface, this looks like a huge success, and there is an extensive literature documenting the rise of Chinese domestic wind turbine companies and the role of public policy in fostering the development of the domestic sector (Lewis 2013). Upgrading of capabilities in domestic firms has certainly occurred, but there may be less than meets the eye. The sharp drop in the market share of the MNCs may have as much to do with procurement rules and localization requirements that made it harder for them to compete with local firms. The industry is increasingly dominated by a handful of firms, largely SOEs. Moreover, a majority of the rapid expansion in wind farms in China, the local customers for wind turbines, has been through subsidiaries of the five big state-owned power-generating companies, two of which have also acquired domestic wind turbine manufacturers. Vertical integration and the dominance of state firms throughout the value chain in key components—e.g., generators, gearboxes, and blades—and as end users of turbines has dampened the demand for more efficient wind turbines relative to a sector in which independent power producers facing hard budget constraints were allowed a larger role. Recently, it has been reported that less efficient wind farms with higher costs were receiving higher feed-in tariffs (citations). High levels of wind curtailment, which reflect problems in both the wind turbines and the power system, have been a recurring problem in the sector.[20]

The end result is that Chinese wind turbine companies—urged on by policy initiative to leapfrog the foreign competition and gain first-mover advantage—have been able to increase the size of the wind turbines that they manufacture, but they are not able to compete globally, even in wind turbines between 1.5 and 2 megawatts that are the "bread and butter" of the sector. In

[19] There were a relatively small number of domestic firms, of which Goldwind was the largest, that entered the sector through technology licensing agreements with some of the smaller European manufacturers and design firms.

[20] Curtailment occurs when wind is available but the grid operator does not allow the wind farm to supply power on the grid. This is a common problem for renewables in all power systems, but in China it is especially serious.

2014, the number of units exported was less than 2 percent of total production. Like their domestic counterparts in the auto sector, they remain weak in design capabilities and systems integration; they are also highly dependent on foreign firms for control systems, the "core" of the wind turbine.[21] The recent collapse of Sinovel, one of China's largest wind turbine manufacturers, following charges of Internet Protocol (IP) theft from AMSC, a leading U.S. supplier of the software that controls wind turbines, is a case in point. With problems of excess capacity in the sector and intense competition from other power sources for a share of a slowly growing market, a future shakeup among wind turbine manufactures seems likely.

The Service Sector

Our focus has been primarily on industry, but there are equally important issues relating to the service sector. Today, the service sector represents upwards of 50 percent of GDP, a percentage that will only rise over time with the growth in household incomes. These services also represent important inputs into industry, and thus affect the global competitiveness of Chinese industry through their upstream role.

Analysis of the service sector is seriously handicapped by the lack of the same kind of rich firm-level data we have for industry, but several observations can be made. In the service sector, we observe rates of entry of new firms that are even higher than those for industry. In Figure 5, we draw on the business registry data and provide estimates of the flows in and out of the sector for the period between 1998 and 2013. In general, they follow those in industry but suggest even higher rates of gross and net entry. Between 1998 and 2013, net entry (entry minus exit) averaged nearly 8.5 percent per annum, compared with 6.6 percent for industry. These high rates of entry help explain several more recent positive assessments of developments in the sector.

Analysis at the more aggregate level suggests a possibly less sanguine picture. Although the gap between services and industry in productivity growth has narrowed since the late 1990s, huge differences remain in *productivity in levels* with industry (Brandt and Zhu 2010, revised 2015). Services are also highly segmented, with the more capital- and skill-intensive sectors such as finance, telecommunications, and transportation dominated by state or state-connected firms, while the more labor-intensive sectors such as retail and wholesale trade and hospitality are often largely private. Some of these barriers are beginning to recede slightly, but a case can be made that labor-intensive, low-productivity services have been left to absorb those individuals not able to find jobs in either the more highly competitive manufacturing sector or the capital- and skill-intensive segments of services and manufacturing which tend to

[21] Goldwind is an exception and is investing heavily in design as opposed to manufacturing capabilities. In this regard, the head of R&D said they aspire to be like Apple (Interview with Goldwin, October 23, 2012).

be state dominated. One consequence of these barriers (and distortions in capital markets) is huge differences in the after-tax returns to capital in state and non-state firms in industry and services. (See Figure 6.) In both industry and services, returns to capital in the state sector are low if not negative. They are higher in the non-state sector, but note the gap between industry and services, and the rapidly falling returns in the non-state sector after 2008.

ICT (information and communication technology) is reflective of these difficulties. In the case of broadband Internet, the three state-owned telecom operators, China Mobile, China Telecom, and China Unicom, are the backbone of the system. Retail Internet service providers are largely private but depend on the state-run operators for connectivity. A recent study by the International Technology Union (2014) showed that Chinese broadband prices were high in a cross-country comparison. A principal reason these rates remain high is that interconnection rates (to the network and to international gateways) are high due to the lack of competition and the market power enjoyed by the three telecoms (Wu 2015). In part, the monopoly power enjoyed by the three carriers is tied to continuing state efforts to regulate Internet content.

Mobile services in China fare slightly better in international comparisons, but capacity utilization rates for China's 3G networks, which we expect to be tied to productivity and returns to capital, are low for all three carriers.[22] These low utilization rates are likely one of the reasons regulators recently required the three operators to open their networks to mobile virtual network operators (MVNOs) in hopes of expanding mobile services to customers. The first of the MVNOs was established in the spring of 2014, but reports for 2015 suggest that the MVNOs are having a hard time offering competitive retail rates, largely because of high interconnection terms. There is now discussion of possible mergers among the three state-owned telecom operators that would reduce the number of firms to two.

In the last few years China has laid out a new ICT policy, the core component of which is the development of indigenous technologies and industries. A recent review (Atkinson 2014) of the major initiatives of this policy recognized the steps taken to open up the market to the private sector, but raised concerns that have an uncanny similarity to those identified above. On their list were huge subsidies to Chinese-owned firms, requirements that foreign firms localize R&D and IP, the development of Chinese-only technical standards, and the establishment of discriminatory government procurement measures. If history has any lessons, perhaps the most important is that these policies will have high costs not only for foreign firms but for China as well.

What's Next?

[22] In interviews in the fall of 2013, one of the carriers reported a utilization rate of 35 percent for their 3G network. They also claimed that it was higher than that of their two other competitors.

Improvements in productivity have been the most important source of growth in the Chinese economy, and will be in the future as well. The problem has been that sources of dynamism in the economy have been accompanied by huge inefficiencies at the sector and firm level that often have high ancillary costs, e.g., nonperforming loans.

The reasons for the distortions that underlie these inefficiencies have not been our central focus. Nonetheless, a case can be made that they are deeply embedded in China's political economy and often serve multiple purposes: they are an important source of patronage and rents, they help align central and local interests, and they enable the party and the state to fulfill strategic objectives tied to domestic and international security considerations. There are also vested interests.

I do not have a crystal ball, but the lessons from the past 10–15 years—that the most dynamic sectors are those that have been most open to competition from all sources and free from the often visible and distorting hand of the state—will likely be true moving forward. This is not to say that the state should not have a role: it should, both as a regulator and as an important provider of key inputs that might otherwise be undersupplied, including coordination. Limiting itself to such a role, however, has run counter to the instincts of China's earlier leadership, and probably the current one as well.

References

Atkinson, Robert. 2014. "ICT Innovation Policy in China: A Review." Report, Information Technology and Innovation Foundation, July.

Barton, Dominic, Yougang Chen, and Amy Jin. 2013. "Mapping China's Middle Class." *Mckinsey Quarterly* (June). http://www.mckinsey.com/insights/consumer_and_retail/mapping_chinas_middle_class (Accessed Nov. 5, 2015).

Berkowitz, Daniel, Hong Ma, and Shuichiro Nishioka. 2014. "Recasting the Iron Rice Bowl: The Evolution of China's State Owned Enterprises." Working paper.

Brandt, Loren, and Eric Thun. 2010. "The Fight for the Middle: Upgrading, Competition, and Industrial Development in China." *World Development* 38(11), pp. 1555–1574.

Brandt, Loren, and Eric Thun. 2016. "Constructing a Ladder for Growth: Policy, Markets, and Industrial Upgrading in China." *World Development* 80(April), pp. 78–95.

Brandt, Loren, Johannes Van Biesebroeck, and Yifan Zhang. 2012. "Creative Accounting or Creative Destruction? Firm-Level Productivity Growth in Chinese Manufacturing." *Journal of Development Economics* 97, pp. 339–351.

Brandt, Loren, Johannes Van Biesebroek, Luhang Wang, and Yifan Zhang. 2012, revised 2015. "WTO Accession and Performance of Chinese Manufacturing Firms." CEPR Discussion Paper 9166.

Brandt, Loren, and Xiaodong Zhu. 2010, revised 2016. "Accounting for China's Growth." Institute for the Study of Labor (IZA) Discussion Paper 4764.

Breznitz, Dan, and Michael Murphree. 2011. *Run of the Red Queen: Government, Innovation, Globalization and Economic Growth in China*. New Haven, CT: Yale University Press.

Credit Lyonnais Securities Asia (CLSA). 2013. *Global Machinery.* CLSA.

Gao, Hang. 2014. “Productivity, Trade and Misallocation in China’s Economic Transformation.” PhD dissertation, Belgium: KU Leuven.

Hsieh, Chang-Tai, and Peter J. Klenow. 2009. “Misallocation and Manufacturing TFP in China and India.” *Quarterly Journal of Economics* 124(4), pp. 1403–1448.

International Technology Union. 2014. *Measuring the Information Society Report 2014*. Geneva.

Kee, Hiau Looi, and Heiwai Tang. Forthcoming. “Domestic Value Added in Exports: Theory and Firm Evidence from China.” *American Economic Review.*

Lardy, Nicholas R. 2014. *Markets over Mao: The Rise of Private Business in China*. Washington, DC: Peterson Institute for International Economics.

Lewis, Joanna I. 2013. *Green Innovation in China: China’s Wind Power Industry and the Global Transition to a Low-Carbon Economy*. New York: Columbia University Press.

Mandel, Benjamin R. 2013. “Chinese Exports and U.S. Import Prices.” Federal Reserve Bank of New York Staff Report 591.

Naughton, Barry. 2008. “The Political Economy of China’s Economic Transition.” In *China’s Great Economic Transformation,* eds. Loren Brandt and Thomas G. Rawski. New York: Cambridge University Press, pp. 91–135.

Pearson, Margaret M. 2015. “State-Owned Business and Party-State Regulation in China’s Modern Political Economy.” In *State Capitalism, Institutional Adaptation, and the Chinese Miracle,* eds. Barry Naughton and Kellee S. Tsai. New York: Cambridge University Press, pp. 27–45.

Pettis, Michael. 2013. *The Great Rebalancing: Trade, Conflict, and the Perilous Road Ahead for the World Economy*. Princeton and Oxford: Princeton University Press.

Schott, Peter K. 2008. “The Relative Sophistication of Chinese Exports.” In *Economic Policy* 23(53), pp. 5–49.

Song, Zheng, and Guiying Wu. 2013. “Identifying Capital Market Distortions.” Working paper.

Warburton, Max, Robin Zhu, et al. 2013. “Chinese Autos, Part 1: The Quest for Global Competitiveness—Technology, Competence, Ambition, and Politics.” *Bernstein Global View*. Bernstein Research.

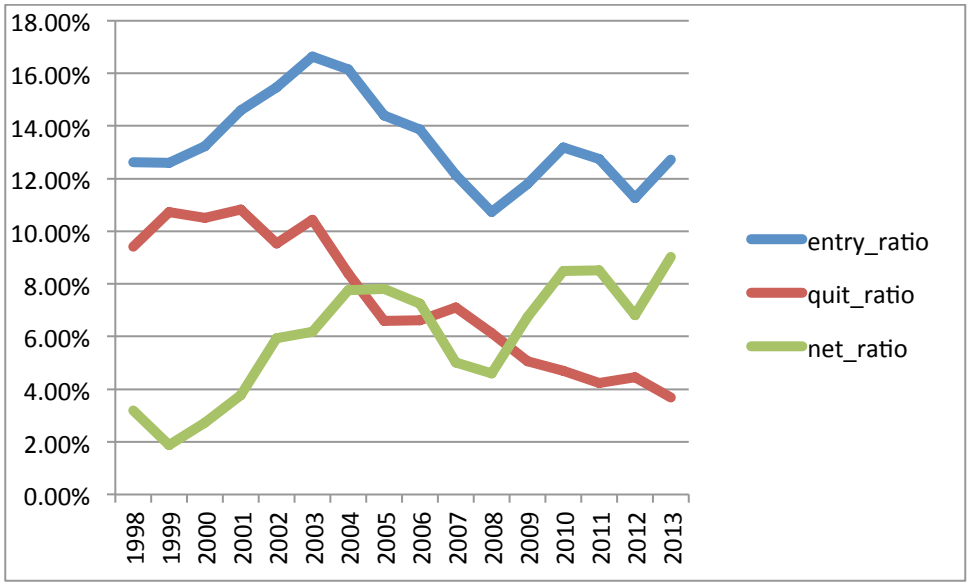
Wu, Irene S. 2015. “Electricity and Telecom Regulations: China in Context.” *Competition Policy International.* (Spring).

Yu, Miaojie. 2015. “Processing Trade, Tariff Reductions and Firm Productivity: Evidence from Chinese Firms.” *Economic Journal* 125(585), pp. 943–988.

Zhang, Jun, and Tian Zhu. 2013. “Re-Estimating China's Underestimated Consumption.” (September 7). Available at SSRN: http://ssrn.com/abstract=2330698 or http://dx.doi.org/10.2139/ssrn.2330698

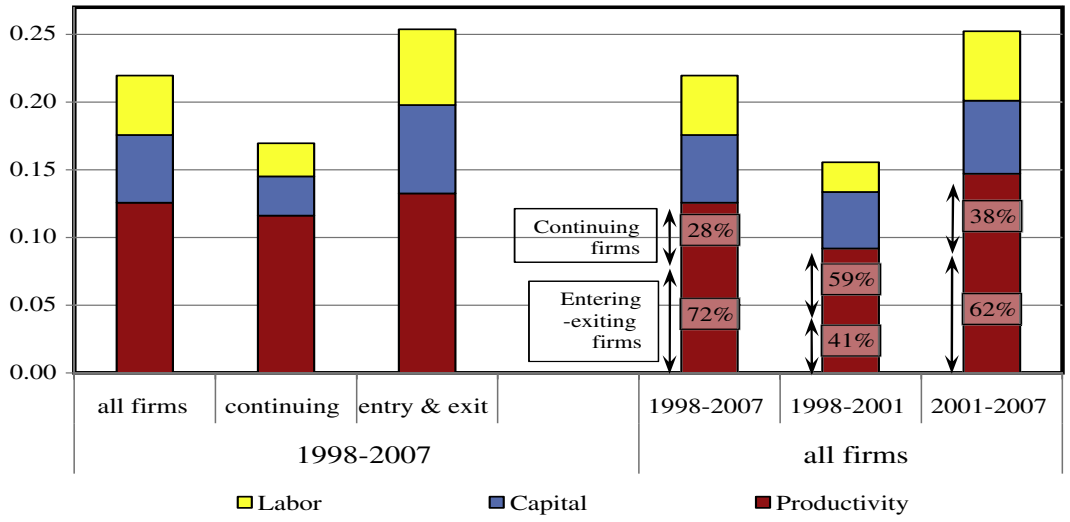
Zhu, Xiaodong. 2012. "Understanding China’s Growth: Past, Present, and Future.” *Journal of Economic Perspectives* 26(4), pp. 103–124.

Figure 1: New Firm Dynamics, Industry, 1998-2013



Source: Business Registry of Ministry of Industry and Commerce

Figure 2: Output and Productivity Decompositions



Source: Brandt, Van Biesebroeck, and Zhang (2012), Figure 7, p. 348.

Figure 3

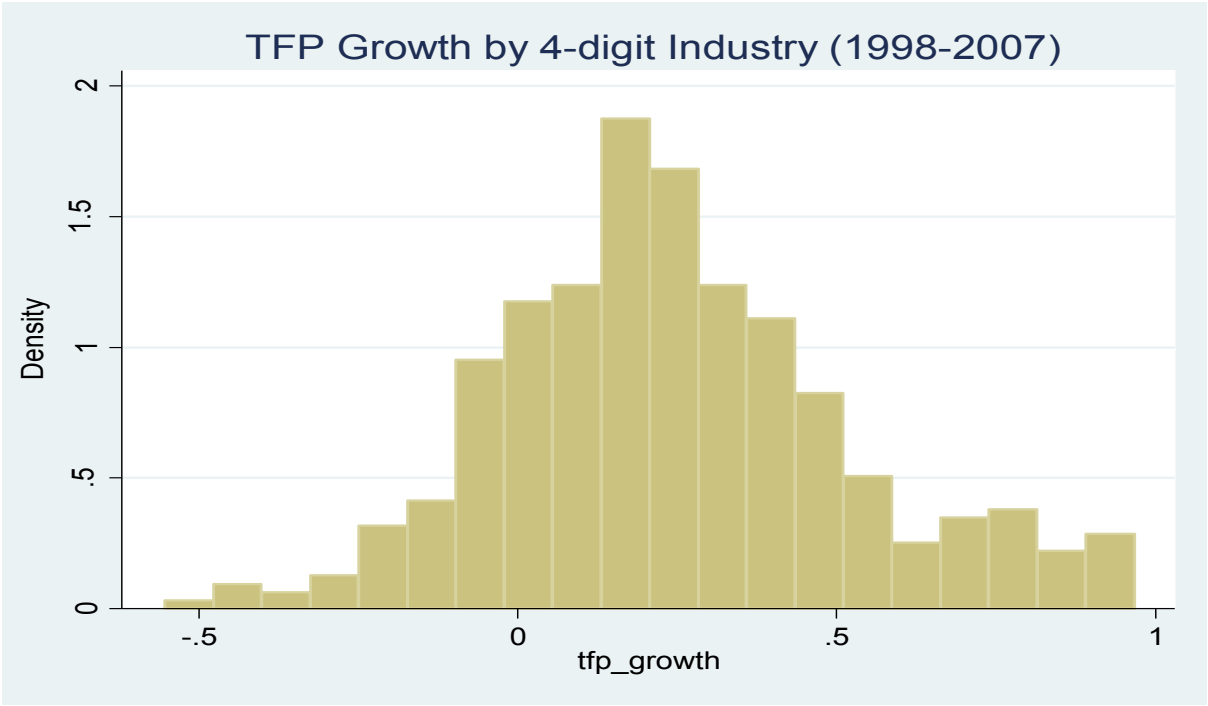
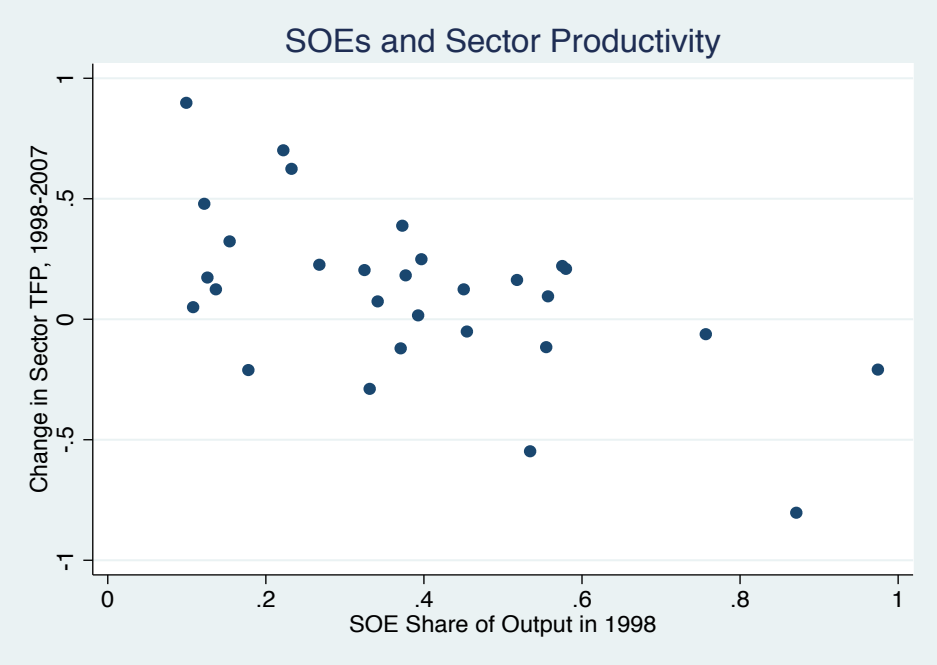


Figure 4: SOEs, Productivity and Profitability, 1998-2007



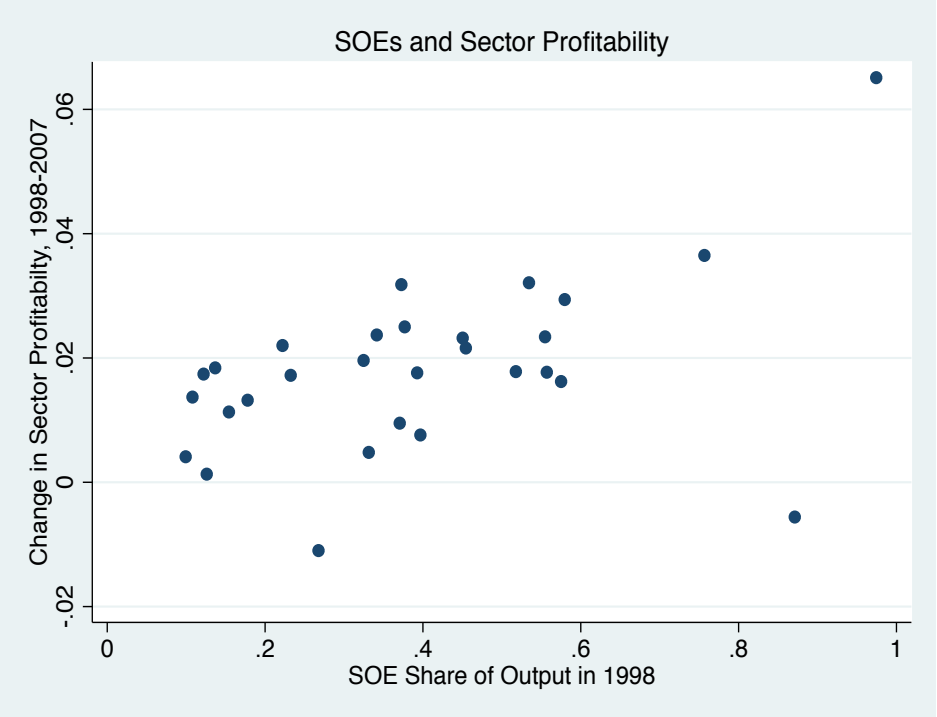


Figure 5: New Firm Dynamics, Services, 1998-2013

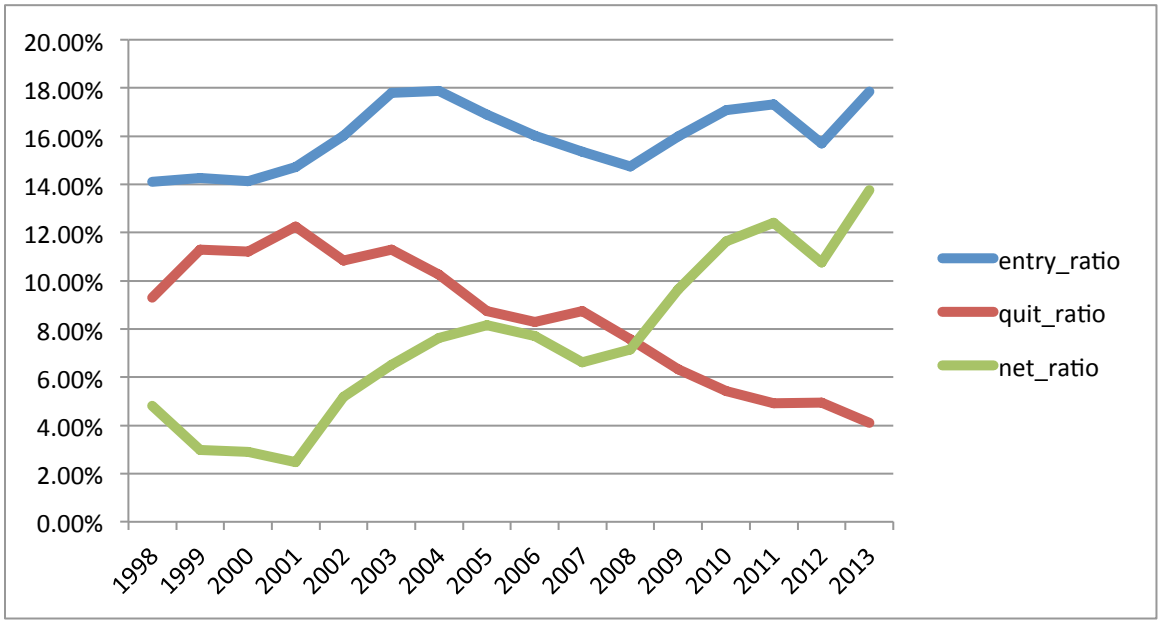
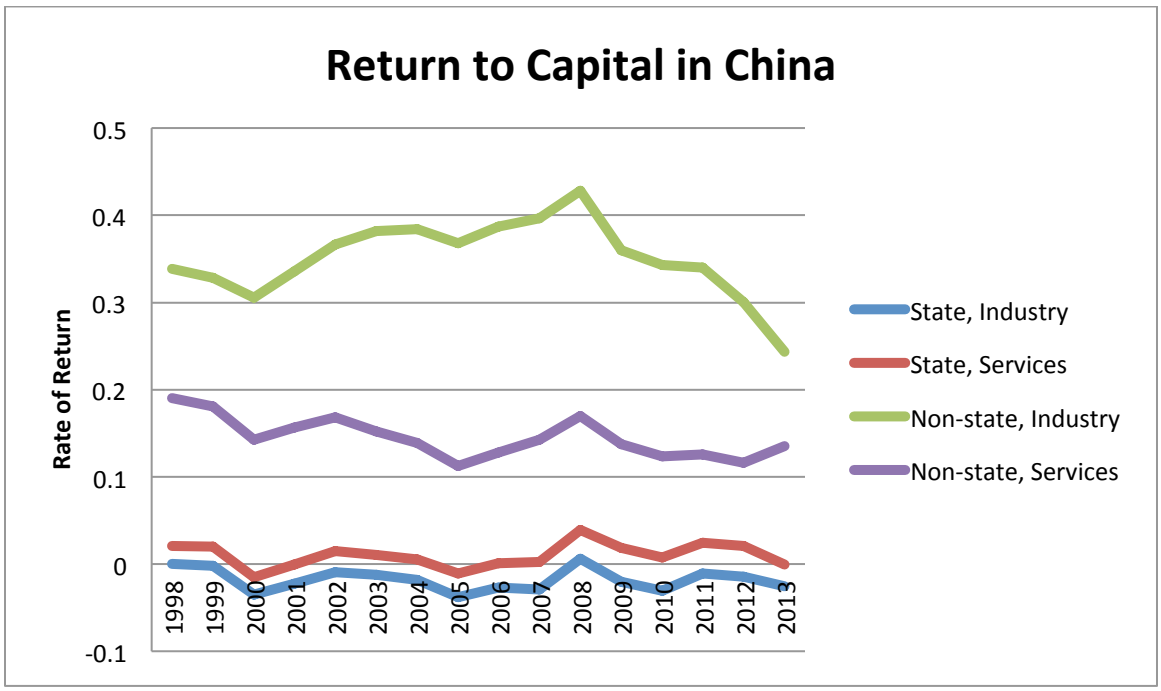


Figure 6



Source: Brandt and Zhu (2010, updated 2016).

Table 1: SOE Shares and Sector TFP Growth, 1998-2007

		Sources of Change in TFP			
Sectors	Total Change in ln TFP	Within	Between	Entry	Exit
SOE Share > 0.50	-0.117	-0.048	0.007	-0.080	0.004
Soe Share < 0.50	0.208	0.050	-0.024	0.175	0.007
All Sectors	0.107	0.019	-0.014	0.096	0.006

Based on TFP estimates from Brandt et al. (2015).

Table 2: Differences Among SOE-Dominated Sectors

	SOE Share		Change in TFP	Contribution to TFP			
Sector	1998	2007		Within	Between	Entry	Exit
			"Better Perfoming" SOE-dominated Sectors				
Special Purpose Machinery	0.58	0.43	0.21	0.07	-0.01	0.15	0.00
Transport Equipment	0.52	0.39	0.16	0.07	-0.02	0.11	0.00
			"Average" SOE-dominated Sector				
Smelting of Ferrous Metals	0.76	0.60	-0.06	-0.01	0.00	-0.04	-0.01
Chemical Products	0.55	0.41	-0.12	-0.06	0.00	-0.06	0.00
			"Poorly Performing" SOE-dominated Sectors				
Smelting of Non-ferrous Met	0.53	0.52	-0.55	-0.21	0.06	-0.39	-0.01
Processing of Petroleum	0.87	0.75	-0.80	-0.31	0.08	-0.57	0.00