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5 April 2009

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Summary

In this paper, we argue that the role of the State (to be understood as a holistic term referring to the public sector as whole), far from being withering out, is in fact massive, dominant, and crucial to China's industrial development. Actually, it has been strengthened by the successful implementation of the "keep the big dump the small" policy, which in turn is consistent with a more general strategy shift towards re-centralization in many areas of economic and social policies. This trend that not only is still going on, but is inevitably bound to be further accelerated by the massive package of fiscal and other interventions made necessary as a response to the world financial and economic crisis.

State-owned and state-holding enterprises are now less numerous, but much larger, more capital- and knowledge-intensive, more productive and more profitable than in the late 1990s. Contrary to popular belief, especially since the mid-2000s, their performance in terms of efficiency and profitability compares favourably with that of private enterprises. The state-controlled sub-sector constituted by state-holding enterprises, in particular, with at its core the 149 large conglomerates managed by SASAC, is clearly the most advanced component of China's industry and the one where the bulk of in-house R&D activities take place.

The role of the public sector, moreover, goes beyond that of those enterprises which are owned or controlled by the State. In the specific Chinese context, many of the most advanced formally private industrial enterprises are in fact related to the public domain by a web of ownership, financial, and other linkages, to an extent that is qualitatively different and deeper than that of their counterparts in capitalist countries. The role public sector is paramount in engineering an extraordinary boom in S&T and R&D activities (both inside the industrial sector and outside, in universities and research centers), and in fuelling a massive investment drive aimed at enhancing China's infrastructural and human capital environment. These processes also generate major systemic external economies, which are reaped by public and private enterprises alike, contributing to abating their operative costs and to sustain their competitiveness and profitability.

Contrary to many other analysts, we do not view the dominant role of the state in China's industry (and, more generally, in China's economy) as a possibly necessary - albeit wasteful - evil, which will be superseded once the transition from a centrally-planned to a fully capitalist modern economy will be completed. We rather see it as a primitive, embryonic, ever-evolving but permanent form of strategic planning aimed

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at fostering industrial development, and as a key distinctive, structural, and pioneering characteristic of market socialism.

1. Introduction

The unprecedented boom of China's economy has been interpreted by many orthodox analysts more or less as follows. Domestic markets have been almost fully liberalized, first in agriculture and then in industry and services. Previously-collectivized land has been given back to peasants households. Most industrial and services enterprises are privately-owned, and now produce the bulk of GDP, due mainly to their superior efficiency with respect to SOEs (see Dougherty et. al. 2008). The country also opened up to international trade, and even joined the WTO, thereby boosting labor-intensive exports and acceding foreign, advanced knowledge, thanks to FDI spillovers. In sum, there is nothing so special about China, apart from its size that ensures a virtually unlimited supply of cheap, unskilled labor to fuel export-oriented industrialization. Yes, relatively egalitarian land distribution, widespread literacy, and an innate, culture-based attitude towards thrift also help. However, the bottom line is that China is just one more developing country that is prospering since it traded its obsolete socialist model to embrace capitalism.

Other, more acute observers do acknowledge the depth of the structural differences between China and "normal" capitalist countries, but dismiss the applicability of the term "socialism" as a useful tool to analyze such a strange animal.

Lindbeck (2008), for instance, argues that "the bulk of production today takes place in private firms" and "most prices in China are today formed on market, the main exceptions being natural resources and public utilities. Moreover, the label "socialism" is not usually associated with a strong reliance on economic incentives, competition, internationalization and (as in China) an apparent neglect of the distribution…of income, education and welfare" . Therefore, both terms as "state capitalism" and "market socialism" are inappropriate, and the neutral term "mixed economy" should rather be utilized to characterize China's economic system.

Lindbeck is right when referring to the contradictions between China's present social reality and the traditional goals of socialism, which are particularly stark in the domain of income and social inequalities (see, for instance, Kanbur R., Quian Y., and Zhang X., 2008). Yet, in the present paper we are focusing on some positive (i.e. objective) features of China's economic system, rather than on the country's social problems seen in[2] a normative, teleological dimension. In this context, we show that Lindbeck's view amounts to a severe underestimation of the role of the State in China's economy, and to an overestimation of the relative autonomy and supposed commanding position of unplanned, market-based regulatory mechanisms. Thus, we consider it as appropriate to retain the term "market socialism", even if it has to be taken with a pinch of salt and to some extent as ad hoc definition[1].

The crucial differences between a "market socialist" and a capitalist system are two. The first one is that in a market socialist system the role of the State is both quantitatively larger and qualitatively superior, thereby allowing the public sector as a

whole to exert an overall strategic control over the country's development path, especially in crucial areas such as setting the economy-wide rate of the accumulation and determining the speed and direction of technical progress.

The second difference is that in a market socialist system, although capitalists endowed with private ownership rights on some means of production do exist, they are not strong enough to constitute a hegemonic and dominant social class, as it happens in "normal" capitalist countries (see Gabriele and Schettino 2008).

This paper focuses on China's industrial sector. In order to confute the myth of an industrial sector in China which would by now be fully capitalist in everything but in name, dominated by domestic and foreign private investors, the paper provides both quantitative and qualitative evidence showing that the State exerts full strategic control on China's industrial development. The Chinese state employs as an important but not unique tool its ownership and control rights on the largest and most advanced industrial enterprises. However, thanks to its unique degree of control on the country's resources, it also engages in huge and ever-increasing investments in infrastructure, institution- and human capital building, R&D, and in other areas, on a scale unequalled anywhere else in the world. This public investment drive generates a network of systemic external economies[2], which in turn decisively enhance the competitiveness, productivity and profitability of both public and privately owned/controlled industrial enterprises.

The paper is organized as follows. Section 2 reviews part of a sprawling literature on SOEs' reforms and their relative efficiency and profitability, focusing mainly on studies which covered the 1990s and the early 2000s, and showing that some more recent contributions suggest that major improvement were beginning to become apparent by the mid-2000s.

Sections3 and 4 presents some statistical evidence on China's industrial enterprises and R&D activities. We show that the role of public industry has been changing but is far from marginal. The performance of public industry in China has improved dramatically in recent years, and is likely to do so even more in relative terms in the near future, due to the collapse of large sections of small-scale, export-oriented manufacturing private firms. Moreover, it has to be taken into account that the impact of China's extraordinary R&D effort, the bulk of which is conducted either in large state-owned and state-holding industrial enterprises or in public universities and research centers, has important implications for evaluating the overall contribution of the State to industrial development.

Section 5 concludes.

2. A review of the literature

China's industrial scenario, previously dominated by traditional state-owned enterprises (SOEs), has been profoundly modified, first by the surge of township and village enterprises (TVEs) in the 1970s and 1980s, and subsequently by the boom of private and foreign-funded enterprises. The latter presently constitute the vast majority of firms and generate the bulk of industrial employment.[3]

These trends should not unwarrantedly lead to underestimate the evolving but still crucial role of the state in China's industrial development. Subsequent rounds of SOE reforms have been going on in China since the 1980s. However, the governments' political willingness to accept the social and political costs of radically reforming state enterprises strengthened progressively during the 1990s and the early 2000s, and a major turnaround in the performance of state-owned and state-holding firms has become apparent in the second half of the present decade.

Numerous studies analyzed different aspects of SOE reforms in the 1990s and early 2000s. With some significant exceptions, the majority of them tended to acknowledge that important changes were going on and steps forward were being made, but concluded that results were failing short of expectations and no decisive breakthrough in SOEs' performance was being achieved.

Zheng et al (2000) analyzed SOEs' productivity performance over the 1980-1994 period. They found that productivity did grow, thanks mainly to technical progress, but technical efficiency remained low. Dong and Putterman (2003) argued that hardening budget constraints without relieving SOEs from their social burdens caused a scarcity of non-labor inputs and thus rising redundant labor in the early 1990s. Cull and Xu (2003) found that bank finance - as an alternative to other sources of funding such as retained profits or direct state transfers - had a positive impact on firms' profitability and on managerial flexibility in the 1980s, but this association had been weakening in the early 1990s. Zhang (2004) reviewed the effects of corporatization and stock market listing on SOEs' performance, identifying a rapid trend towards firms' concentration and consolidation, but concluded that results in terms of performance were still modest on balance.

Other studies compared the performances of public and private enterprises. Most of them found that private firms performed better (see Chen(2001), Gul and Zhao (2001), Sun and Tong (2003), Wei and Varela (2003), Hovey (2005), while others were inconclusive or did not find a systemic relationship between ownership and firms' behaviour (Wang 2005).

Zhang, Y., and D Parker (2004) analyzed TFP trends in China's Electronics Industry in the 1990s', and found that corporatised SOEs did not perform significantly better than traditional ones, with TFP[4] growing but at a slower pace than in both collective and private electronic firms. Most researchers, however, found that legal person holdings have appositive impact (see Sun and Tong (2003), Wong et al.(2004). In a more recent study, Hovey and Naughton (2007) reached similar conclusions: "state ownership per se(is) negatively correlated with performance", while " legal persons … have a positive influence on firm performance or value" (p.139). On this basis, they put forward policy recommendations favouring various forms of divesture of state ownership in existing SOEs, some of which amount to a transformation of traditional SOEs into state-holding legal persons.

Other recent studies have identified serious weaknesses in reformed SOEs persisting well into the 2000s. Girma and Gong (2008), on the basis of a large micro data set investigate whether SOEs in China have benefited from the managerial, technical and organizational skills possessed by multinational firms operating in the country, and conclude that evidence in favor of positive spillovers is weak, due mainly to scarce regional linkages and low level of absorptive capacity. The latter, in

turn, was partly caused by a still-undeveloped structure of managers' incentives. Yu and Nikamp(2008) assess the comparative productivity performance of SOEs in high-tech industries from 1996 to 2006. They find that SOEs as a whole experienced an unsatisfactory trajectory of catch-up for 1996-2006, with SOEs gaining ground in 1997-2003, but falling further behind foreign-funded enterprises (FFEs)[5] in 2003-2006, due to their inadequate capability to develop indigenous technologies.[6] . These results (to be taken as indicative, due to some debatable features of the authors' methodology) might be due in part to the disruptive short-term effects of the major acceleration in SOEs' reform which started in 2003, as shown by Dong and Xu (2008). The authors analyze econometrically the short-term impact of China's major labour restructuring program, which was much more widespread among public-owned rather than private enterprises, and especially in older and SOEs with higher excess capacity. Their most interesting finding is that, far from automatically improve performance and profitability, "downsizing has serious short-term costs in terms of total factor productivity (TFP)", due largely to its "psychological" costs in terms of workers' demoralization.[7] They also found that "private firms tend to have worse allocation efficiency after downsizing but tend to cut wages to a greater extent such that profitability is unaffected, and SOEs tend to have slightly milder deterioration in allocating efficiency, and tend to cut wages to a lesser extent as well… SOEs have a more positive 'catch-up' effect from downsizing, and …tend to be more protective of labour." (p.238). Dong and Xu's results contribute to explain why improvements in the performance of state-owned and state-holding industrial enterprises (SOSHEs)[8] did not become apparent until the mid-2000s, while the bulk of labour shedding took place in late 1990s and early 2000s.

Another recent contribution reaching drastic conclusions on the superiority of private enterprises is that of Dougherty et al. (2008). The authors provide a quantitative analysis based on a large sample made up by quarter of a million industrial firm, and conclude that " … the private sector… operates much more efficiently than the public sector" (p.309). However, their argument is flawed, due to various methodological and interpretative problems which are analyzed to some length in the Appendix attached to this paper.

Since the early-to-mid 200s has been on the ascendance a discordant strand of literature, which tends to be more optimistic on the results of past SOEs reforms and to deny the intrinsic superiority of private ownership of industrial enterprises. Some of these studies focus on the interaction between SOEs reforms and China's mushrooming R&D activities, analyzing various aspects of China's national system of innovation (NSI), which has been booming at a historically unprecedented pace and is now the second largest in the world in terms of R&D expenditure (see Mandel 2006, McGregor 2007, OECD 2008a,b, Gabriele and Khan 2008).

China's NSI is characterized by specific forms of interaction involving public universities and research centres, public enterprises, privately owned and foreign-funded industrial firms (see, among others, Gabriele and Khan 2008, Mazzoleni (2008), Niosi 2008). However, even in this flexible, rapidly evolving, and ever-changing context, the role of public organizations remains paramount, especially taking into account that most university-affiliated enterprises are ultimately state-owned[9].

In-house R&D activities on the part of public enterprises are a crucial component of any NSI, as they constitute a key linkage between the creation of

knowledge and its productive application. Hu and Jefferson (2004) found high returns to R&D among Beijing's SOEs in the 1990s. However, they also found that R&D expenditures was increasing less than proportionately with firm size, suggesting a less than optimal propensity to invest in R&D on the part of SOEs. Hu, Jefferson, and Jinchang (2005) showed that in-firm R&D was crucial to "complement technology transfer—whether of domestic or foreign origin"(p.780). Hu and Jefferson (2005) argued that, without underestimating the positive impact of the surge in indigenous R&D, China's patent explosion in the early 2000s was mainly due to legal and institutional changes in the competition conditions prevailing in the domestic market, which had been favouring patent holders and strengthened intellectual property rights protection. It was particularly the competitive challenge of FFEs, along with that stemming from the industry's shift towards a high degree of export-orientation, which was "prompting domestic Chinese firms to file for more patent applications for their strategic competitive value." The case of patents is an example of a wider trend towards deepening linkages between international trade opening and technological change: "The export economy is best understood as a big technology-transfer machine…Exports contribute to technology transfer in two ways...One is to compel exporting firms to keep up with global technology trends, the other is the role played by FFEs in enhancing in-bound technology flows" (Kroeber 2008).

Another form of interaction between economic and scientific human and non-human assets, in a framework characterized jointly by China's indigenous drive towards technological development and by the profit-oriented strategies of foreign investors, is the increasing propension to establish R&D centers in Beijing on the part of many leading TNCs (Chen 2008). Fisher-Vanden, Jefferson, Ma, and Xu (2006) found that both domestic (such as increasing R&D activities and enterprise reforms) and externally-originated factors (technology imports) contribute to an energy-saving bias in China's technological development. In-house R&D activities are crucial to enable firms to develop the absorptive capacity needed for the diffusion of imported technologies. Their findings "underscore the importance of diverse channels of technical change in driving the economic growth and development of China with likely implications for other developing countries. "(pp.659-670). Fisher-Vanden and Jefferson (2008) found that in-house R&D is labour- and material-using and capital- and energy-saving, thereby capitalizing on China's comparative advantage, and is mainly aimed at slashing production costs of already-existing products. Conversely, imported technologies, which are comparatively capital-intensive, focus on new product development: "These diversified channels of technical change reveal a pattern of technical change in a developing country context that is far more diversified than that suggested by the conventional growth literature (Fisher-Vanden and Jefferson 2008, p.658) [10]

Other authors analyzed comparatively the performance of public and privately owned/controlled industrial enterprises. Holz (2002) showed that the gap between SOEs and non-SOEs was not due to the formers' intrinsic inefficiency, and could be explained simply by SOEs' higher circulation tax rates and capital intensity. Qiu, Aivazian, and Ge (2005a,b) found that restructuring according to corporate law improved firms' governance in the late 1990s, and argued that full privatization was not needed to effectively improve SOEs' performance. Chang (2008) analyzed the diversification of large SOEs in Lanzhou, and concluded that the process was subject to market conditions and firm-specific factors, yet the government played a key enabling role in the reorganisation and diversification process.

In order to interpreter these findings, it is important to evaluate them in the context of the major reform drive which has been going on in China's industrial sector at least since the mid-1990s, but accelerated dramatically during the 2000s. Since the late 1990s, private firms have boomed, rapidly overcoming public industry in terms of number, employment and - to a lesser extent - share of total industrial output. SOEs' numbers, conversely, were drastically downsized, and so did their workforce[11], consistently with the thrust of the zhuada fangxiao (keep the big dump the small) policy[12]. A key result of SOEs' reforms has been a major turnaround in profitability. By the mid-1990s, SOEs' losses were so high that net profits were less than 0.6% of GDP. By 2007, the picture had changed drastically, with profits reaching 4.2% of GDP in industrial SOSHEs[13,14] and 2% of GDP in non-industrial SOEs (Naughton 2008).[15]

A major role in this recovery has been played by the State-owned Assets Supervision and Administration Commission (SASAC). The Commission was created in 2002 to represent central-government shareholder interests in large enterprise groups, the number of which is now 149[16] after having been reduced through mainly vie merger operations. After reorganizations[17], SASAC-managed firms become joint stock corporations or wholly-owned state corporations[18]. SASAC acts mainly as the facilitator and promoter of the effective implementation of reforms which had been officially launched already in the 1990s, but had not been carried out thoroughly until the political will to get rid of loss-making SOEs became evident, and state support was drastically focused on a limited number of large and ever-growing firms. Public enterprises are now concentrated in few strategic sectors: energy and power, industrial raw materials, military industry and large-scale machinery-building, transport and telecommunications. Some of these sectors are explicitly reserved to state firms; while in others spontaneous market forces and regulatory discrimination combine to erect very high barriers to entry for private operators. In both cases, however, the government has strived to avoid the creation of monopolies, rather engineering the emergence of oligopolistic market structures in which typically two or three large public firms compete with each other.[19]

Moreover, during the present decade, two other major and only apparently contradictory policy trends have become increasingly apparent. One is a tendency towards re-centralization (pursued also in domains different from that of industrial policies, as shown by the key 1994 tax reform), which continues unabated and cannot but be further strengthened by the drastic interventions need to control the exogenous impact of the world financial and economic crisis. The other is the adoption of leverage and of a rationalized hierarchical chain[20] as an effective means to maintain state control under a diversified ownership structure.[21]

Many analysts have been caught wrong-footed by the speed and depth of the changes taking place in China's industrial landscape, where they saw only a spectacular private-led entrepreneurial unfolding, and concluded that SOEs' assets were being privatized at an accelerated pace and the State's presence in China's industry was withering away. A very different view is put forward by Kroeber 2008)[22]: "This privatization story exists in defiance of experience: in virtually all industrial sectors state firms play a significant or dominant role…. More than 70% of all China's enterprises are now private, and they have contributed to compensate both job losses in the public sector and to net job creation in urban areas. Yet, economic power remains firmly concentrated in the hands of the state"" Similarly, Wildau (2008) states that "the state's command over key economic levers is as strong as ever.

The state has retreated from highly competitive, low-margin manufacturing and service industries, but has kept tight grip over a wide range of critical industries generating large cash flows ".

Moreover, it should also be taken into account that the true scope of state intervention in China's industry goes well beyond the boundaries of SOSHEs Even the most advanced among nominally private enterprises are often connected to the public sector through a number of ownership, finance, and other linkages, to a much larger extent than their counterparts in capitalist countries. A case in point is that of Huawei, a very successful and dynamic producer of telecoms network equipment with sales of about US$15 bn in 2008. According to Cartlidge (2008), "... Huawei, nominally a private company, has received massive state support both at home and abroad… It is frequently asked whether Huawei acts purely from commercial motivations, or if it is an agent of broader state policies. ..Huawei is in fact far more Chinese than an ordinary TNCs, and its recent actions fit nicely in China's recent pendulum shift towards a revamped support for key state-owned enterprises[23]…the last few years have also seen increased support for a smaller group of some 40-50 of the country's biggest state firms. Huawei, ostensibly private, does not formally belong to this group, but seems to enjoy similar benefits". ther similar cases of leading formally private companies which are in fact largely connected to public institutions are those of the white goods company Hai'er, that is now controlled by Qingdao city SASAC, and that of the computer firm Legend, the biggest shareholder of which is the China Academy of Sciences (see Naughton 2008).

Finally, a particularly interesting contribution is that of Chen, Firth, and Xu (2009), who analyze a sample of listed companies with different types of ownership, to evaluate their relative efficiency. Their results show that the group of 157 large enterprises controlled by SASAC, which they call SOEs affiliated to the central government (SOECGs)[24,] " excel in almost every way when compared to other ownership types", while mixed enterprises controlled by private investors do not perform particularly well, contrasting "the claims that firms perform best when the state is completely absent from ownership …at least in the case of China". (p.172).

The authors interpreter their results -which are entirely consistent with our own findings presented below in section 3 - as follows: "In a transitional economy with a weak legal environment, the governance mechanisms of state and private ownership are different from those in either a planned economy or a developed market economy. We find that commercialized state ownership has its advantages in these circumstances. Thus, certain types of state ownership can be superior to private ownership when the institutional environment is relatively underdeveloped and when law enforcement is capricious and weak…. We document an alignment effect where higher ownership of the dominant shareholder is associated with better firm performance." We agree with the last point, but in our view the rest of this argument is flawed, as it unwarrantedly assumes that private ownership would be superior in a fully developed legal and institutional context. On the contrary, our view is that China's SASAC-controlled elite enterprises are pioneering a form of ownership and management structure which has a good chance to prove itself the most suitable to deal with the challenges of industrial development in the XXI century, also in the most advanced technological and institutional contexts.

3. SOEs, State-holding mixed enterprises and private enterprises:

Public industry in China, as in any other country, is constituted by industrial enterprises which are controlled by non-private legal entities (be them the State, local governments, or groups of workers[25]). The state-controlled sector of industry is constituted by two components: SOEs and state-holding enterprises (mixed enterprises in which the State holds a majority share). Besides them, there is another, smaller category of non-state public enterprises. Most of them are local cooperatives and collectives, many of which are small-scale and are located in rural areas.

Adding up all public-owned and public-controlled categories of enterprises, it is possible to gauge the relative weight of the public sector in China's industry.[26] This weight has been shrinking fast over the present decade, especially due to the relative decline of TVEs[27,] collectives, and cooperatives, and to the parallel correspondent emergence of a growing number of domestic private enterprises (see table 1).

In 1998, SOSHEs were still almost 40% of all industrial enterprises, owned 70% of the assets, produced half of the national industrial output and employed 60% of the workforce. SOSHEs' relative weight declined over all these three dimensions, but in an uneven fashion. As a result, by 2007, SOSHEs were only 6% of all industrial enterprises, while (domestic) private enterprises were more than half of the total. Yet, SOSHEs employed over 20% of the industrial workforce, produced almost 30% of the output, detained over 40% of industrial assets and generated 40% of the sector's profits. SOEs proper were less than 3% of all industrial enterprises, producing about 9% of total gross industrial output value (GVIO) and employing 8% of the sector's workforce (see Tables 1, 2).

However, such a reduced but still sizeable relative weight tells only a rather small part of the story. To evaluate thoroughly the role of the public sector in China's industry it is necessary to examine a number of economic and financial statistical indicators relative to its three components: SOEs, non-state public enterprises, and s.Mtate-holding enterprises. In turn, these figures shall be compared to the correspondent ones for the various components of privately-controlled industrial enterprises. To this purpose, data on various groupings of industrial enterprises from China's Statistical Yearbook 2008 (CSY 2008) have been aggregated and decomposed in order to offer a clearer picture of the public/private relation in China's industry. Indicators of productivity, capitalization, profit-generating capability, profitability, and efficiency, have also been calculated for each group of enterprises (see table 3). The indicators are as follows. The O/L ratio (where O is the GVIO and L is the average number of workers) is the labour productivity indicator. The K/L ratio (with A representing the assets endowment) is the capitalization indicator. The P/L ratio (with P representing profits) - i.e., the level of profit generated by each worker - is the profit-generating capability indicator. The P/K ratio is the profitability indicator. K/O, the capital/ output ratio, is a rough indicator of efficiency in terms of "capital productivity".[28]

Data in table 3 show that SOEs are on average much larger and capital-intensive than most other Chinese industrial enterprises. With respect to the national averages for the entire industrial sector[29,] SOEs' per employee asset endowment is about double, while labor productivity is only slightly higher (Table 3, row 1). Thus, SOEs' workers utilize on average twice as much capital than the industry's average, but do not translate this advantage into a correspondent productivity gain. SOEs'

profitability is also lower than the national industrial average, both in per employee and in per unit of capital terms. Therefore, SOEs do not appear to be among China's most efficient and profitable industrial enterprises.

However, this conclusion is a at best a very tentative one, due mainly to two main reasons. One is simply that the explanatory power of rough aggregate indicators such as those presented in the last five columns of Table 3 should not be overstated. The other is that this caveat is more significant in the case of SOEs than in that of all the other groupings of industrial enterprises, because many SOEs are large infrastructural firms. They operate in sectors which are intrinsically capital-intensive and whose markets are characterized by a high degree of monopoly, therefore they are subject to particularly stringent price and operational regulations. As a result, estimates of SOEs' productivity and profitability and are prone to be affected by particularly severe biases. The sign of the bias, more over, cannot be known with certainty either. In fact, it is likely that many monopolistic or quasi-monopolistic SOEs providing basic public services are mandated by regulations to charge consumers prices lower than those which would prevail if these enterprises were privately-owned. These SOEs' productivity and profitability might look poor if judged at market prices, even if they are actually very well-managed, efficient, and socially useful enterprises. But in other cases, central and local governments may choose to avoid the bankruptcy of truly inefficient SOEs, providing them ad-hoc fiscal advantages, and/or applying lax regulatory norms that allow these firms to charge very high prices. In those cases, productivity and profitability indicators might actually underestimate the gravity of SOEs' true situation.

Adding to SOEs two other minor state-controlled, fully public-owned categories of enterprises, State Sole funded Corporations and State Joint Ownership Enterprises, we obtain the category of State Enterprises (total) (Table 3, row 2). As the weight of State Sole funded Corporations and State Joint Ownership Enterprises is very small in comparison with that of SOEs, the indicators relative to State Enterprises (total) do not differ markedly from those relative to SOEs.

Conversely, the picture of another category of fully-public industrial enterprises, that of Fully Public Non-State Enterprises (FPubNSEs, essentially constituted by cooperatives and collectives), is very different from that of SOEs (Table 3, row 3). They are the smallest group of firms in terms of average labour force size, the most undercapitalized and those that generate the smaller amount of profits per employee. Yet, they have the lowest capital/output ratio and the higher profits/assets ratio. These small and very light public enterprises occupy a segment of the industry that is virtually at the opposite side from that of SOEs, and utilize their scarce assets in a quite efficient and profitable way. However, their overall weight in China's industrial scenario is very limited, not only in terms of output but also in terms of employment.

The most advanced component of public industry is constituted by state-holding mixed enterprises (SHMEs). In SHMEs, the State owns a larger share than any other share-holder, thereby effectively being able to exercise strategic control. These enterprises are not formally very different from those state-controlled mixed enterprises which are still common (even if much less than a few decades ago 2008) in many capitalist countries. Yet, in the Chinese context, their role is far more crucial, both in quantitatively and in qualitative terms.

SHMEs are few: they are only 2.7% of all industrial enterprises, a share even smaller than that of SOEs. Yet, they employ over 9% of the labour force, own over 20% of total assets, produce almost 16% of the output and generate almost a quarter of all industrial profits. SHMEs are large, capital-intensive, and very profitable, as confirmed by the very high levels of their profits/worker and profits/assets ratios. Both profitability indicators are superior to those of any other large grouping of either public or private industrial enterprises (see Table 3, row 10). SHMEs lead also in terms of labour productivity. This indicator stood at 880300 Yuan on average in 2007, almost 60% higher than that of SOEs and extra-regional FDI-funded enterprises[30], and also more than double that of domestic private enterprises and that of private-controlled mixed enterprises.

SHMEs' capital/output ratio, while lower than that of SOEs, is higher than those of all private and privately-controlled enterprises.[31] However, we have already found that the enterprise grouping exhibiting the lowest K/O ratio is that of non-state public industry. It is not surprising, after all, that poorly capitalized, small-scale enterprises exhibit a very favourable K/O ratio: it is still possible for a firm (although unlikely in the modern industrial sector) to produce some output, and to realize a profit, utilizing only labour. Such a hypothetical enterprise would exhibit a zero K/O ratio, but would hardly represent a model for industrialization and technical progress. These findings show that SHMEs are, as a group, the most advanced component of China's industry, and suggest that the drastically-implemented zhuada fangxiao strategy has been rather successful so far.

Turning the focus on China's private industrial sector, the first point to note is that it is quite heterogeneous, as it is composed by four quite uneven categories of enterprises: domestic private enterprises (DPrivEs); private-controlled mixed enterprises (PrivMEs); enterprises with funds from Hong Kong, Macao, and Taiwan (HKMTEs); foreign-funded enterprises, owned by investors from countries different from Hong Kong, Macao, and Taiwan (FFEs). The latter two categories of enterprises jointly constitute the group of FDI-funded enterprises (FDIEs) (See table 3, rows 6, and 9, and Table 4)

DPrivEs are now over half of the total, employ over ¼ of the industrial labour force, produce almost ¼ of total output. They own only about 17% of industrial assets and generate a slightly higher fraction of total profits. DPrivEs ' labour productivity is almost identical to that of their similarly small and undercapitalized public counterpart constituted by cooperatives and collectives, and much lower than that of all other categories of industrial enterprises. With respect to profitability, DPrivEs fare poorly in terms of profit/worker, but lead in terms of profit/asset ratio[32]. DPrivEs' K/O ratio is also the lowest of all groupings of industrial enterprises. Yet, it is very similar to that of cooperatives and collectives[33]. The latter finding shows that DPrivEs' apparent efficiency in utilizing physical capital to produce industrial goods is not stemming from a supposed intrinsic superiority of private property, but simply by the very low K/L ratios which is a common characteristic of both DPrivEs and FPubNSEs.[34] In sum, DPrivEs are comparatively small and undercapitalized, and their most valuable contribution to China's overall economic and social development so far is that of creating and maintaining a sizeable share of total employment, utilizing relatively few physical and financial resources (see Table 3, row 6, and table 4).

PrivMEs share a number of characteristics with the state-controlled section of mixed enterprises. As such, they are larger and more capital intensive than PrivDEs. They are about 15% of all enterprises, and contribute to about 10% of total industrial capitalization, output, and profits, and to almost 15% of the employment. However, on average, privately-controlled mixed enterprises lag behind their state-owned counterparts, as shown by size, labor productivity, capitalization, and profitability indicators. As they are less capital-intensive, however, PrivMEs perform better than SHMEs in terms of K/O ratios (see table 3, row 11, and Table 4).

The two groups of FDI-funded enterprises are quite different from each other. HKMEs are mostly constituted by small and medium-sized firms exhibiting a behavior very similar to privately-controlled domestic mixed enterprises. They are about 10% of the total and contribute a roughly similar share of assets, output, and profits. Their contribution to total employment is higher (15%). HKMEs' productivity and profitability indicators are strikingly similar to those of PrivMEs (see table 4). Conversely, as most FFEs are controlled by large TNCs originating from advanced capitalist countries, they are more capital intensive than HKMEs, and their labour productivity is higher, as well as their contribution to total industrial capitalization, output and profits. However, the two sub-groups of FDI-funded enterprise do not differ much in terms of P/K and K/O ratios (see table 4).

Table 5 complements the preceding findings, showing data and indicators on China's industrial enterprises classified by scale and comparing them with those of SOSHEs. Each size-based category - large (LEs), medium (MEs), and small (SEs) enterprises - produces about 1/3 of China's total industrial output. However, LEs are less than 3000, while MEs and SEs are about ten times and one hundred times as numerous. Of course, LEs are more capitalized and have higher labor productivity than MEs and SEs, but their superiority is even more remarkable in terms of profitability: LEs' profits/worker ratio is about double that of MEs and three times higher than that of SEs. SOSHEs' indicators are similar to those of LEs. This is probably due to the fact that most SOSHEs are medium-sized, but the largest ones are super-large. However, SOSHEs' degree of capitalization is higher than that of LEs. More importantly, the last two rows of table 5 confirm that there are significant differences in performance between SOEs and SHMEs [35]. With respect to the national average, SOEs are much more capitalized (their A/L ratio is almost double), yet their productivity and profitability are only slightly higher. This finding confirms that SOEs proper, at least to some extent, still come short of exploiting fully their preferential access to capital. Conversely, SHMEs are only marginally more capitalized than SOEs, but their productivity and profitability indicators are far superior, suggesting that their organizational, managerial, and ownership structures are indeed more advanced and effective.

4. The role of public enterprises in China's research effort

Until the mid-1990s, China's research effort was still very modest, even in purely quantitative terms. In the second part of the decade, however, all S&T and R&D indicators started to skyrocket. In 1996-2000 period, S&T expenditure more than doubled[36] and the share of GDP devoted to R&D activities (R&D/GDP ratio) increased sharply, from 0.6% to 1% (see CSY 2008, Table 20.44). Research output indicators also exhibited a sustained increase: certified patent applications, for instance, more than doubled (see CSY 2008, Table 20.38 and 20.44).[37]

The upward trend continued in the 2000s, at a pace unequalled anywhere else in the world (see Gabriele and Khan 2008). During a period of exceptionally fast economic growth, the R&D/GDP ratio kept climbing, reaching 1.13% in 2003 and almost 1.5% (a figure much higher than that of many OECD countries) in 2007. Taking into account the scale effects stemming both from China's unique size and from the speed of its GDP growth, these indicators show that the sheer expansion of China's R&D human and material resources has been historically unprecedented, and according to some quantitative indicators (such as the number of scientists, engineers, and other S&T and R%D personnel) have already reached. closely approached, or surpassed those of the US. One of the most recent estimates (OECDb 2008) puts the number of full time researchers in 2007 at 1 387 882 for the US and 1 223 756 for China.[38] As these figures are increasing much faster in China than in the US, this probably means that by now China is already the world leader in terms of this important, albeit only quantitative[39] R&D indicator.

In sum, over little more than one decade, China leapfrogged from an almost insignificant role in the global research scenario to that of one of its main protagonists. Table 6 compares some key R&D basic statistics in China, the US, Japan and the EU 27. The data presented in the table confirm the extraordinary dynamic momentum of China's R&D effort, and show that China's R&D inputs are approaching an order of magnitude similar to that of the US and EU27. Table 6.I. corroborates the above-mentioned trends on R&D personnel, showing that by 2006 their number in China was 1.5 million - higher than in Japan and equivalent to about 2/3 that of the EU27- and that it was increasing at annual rates much faster than either Japan or the EU27[40] [41].

Overall data on growth rates in total Gross Domestic Expenditures on Research and Development (GERD) show that 2006 and 2007 trends were no aberration, and that the overall resources earmarked towards the R&D sector have been growing at much higher rates in China than in the US, Japan and the EU 27 at least since the beginning of the 2000s decade. Actually, the average annual compound growth rate of GERD in 2002-2007 was over 18% in China, more than five times higher than the correspondent rate in Japan and nine times higher than in the US and EU 27 (see table 6.II.)[42].

With respect to the respective role of government and industry, Tables 6.III. and 6.IV. show that - contrary to past experience, when research was almost completely confined to universities and government research institutes - most R&D activities in China are presently financed and performed by industry, similarly to the situation prevailing in the advanced capitalist countries. Actually, the share of total R&D performed by industrial enterprises in China (71%) is about the same as in the US, and higher than that of EU27. In China, however, the role of specialized government research institutions (which perform almost 1/5 of total R&D, and actually carry out the most advanced and ambitious research programs)[43] is more relevant than in the advanced capitalist countries. Conversely, the role of universities is correspondently minor.[44]

The role of the public sector at large in propelling China's unprecedented research effort is overwhelming. It has been pointed out that over 70% of China's R&D takes place in the industrial sector (the rest being performed by fully public

research centres and universities). An absolute majority of this R&D activity is carried out by enterprises owned or controlled by the state or other public bodies.

Tables 7 and 8 show a number of indicators on R&D activities of Large and Medium-sized Industrial Enterprises(LMEs)[45], grouped according to their registration Status (2007). SOSHEs contribute almost half of the industry's total R&D personnel and over 47% of the funds. Adding the (small) R&D contribution of non-state public enterprises, both figures increase to well over 50%. The bulk of the remaining R&D activities are performed by foreign-owned enterprises, especially by those owned mostly by large TNCs and classified by CSY as foreign-funded enterprises (FFEs). FFEs fund over 20% of China's industrial research and employ 15% of the R&D personnel. The correspondent figures for the other group of FDI-funded enterprises, those owned by entrepreneurs from Macao, Hong Kong, and Taiwan, are both less than 9%. Fully-owned private domestic enterprises fund only 7% of the industry's R&D effort and employ 8% of the R&D personnel (see table 7).

Mixed enterprises (ME) as a whole fund almost 40% of China's industrial research, and employ almost 43% of the R&D personnel. State-holding mixed enterprises (SHMEs) is paramount: they contribute about 27% of China's industry R&D funds and personnel, correspondent to over 60% of the total for the ME sub-sector and to well over half for the SOSHEs sub-set of public-controlled enterprises[46]. Thus, SHMEs constitute the most research-oriented sub-component of mixed enterprises, on one hand, and of public industry, on the other hand (see Table 8).

These statistical findings allow us to draw a few stylized conclusions. We saw that research centres and universities carry out about 30% of China's total R&D activities. State-owned and state-holding industrial enterprises fund over half of the rest. Thus, the public sector as a whole funds and performs about 2/3 of China's R&D activities. Statistical and descriptive evidence shows that two sub-components of public R&D system play a paramount role. One is constituted by government-funded research centres, which perform most of the basic research and truly scientific activities[47] aimed at approaching or surpassing top world knowledge standards in a number of key areas (see Gabriele and Khan 2008). The other sub-component is that of state-holding mixed enterprises, which carry out the bulk of China's R&D activities in the industrial sector. Most of the remaining R&D activities are carried out by foreign-funded enterprises, while the role of the domestic private sector is minor.

Therefore, China's national innovation system (NSI) can be seen either as an almost fully public system (if only R&D activities performed by domestic agents are considered as really "national"), or as a symbiotic system where a dominant[48] national, mostly public component interacts with a significant, yet much smaller foreign-owned component (see Gabriele and Khan 2008).

We now turn our attention to the tentative interpretation of aggregate statistical evidence on R&D inputs and outputs. Table 9 shows synoptically, for each grouping of large and medium-sized industrial enterprises, four basic R&D indicators. Two of them are the same input indicators (R&D personnel and expenditure), which have been examined above. The other two are output indicators: patent applications accepted (PAA) and owning of inventive patients (OIP). The last four columns of table 9 present crude indicators of R&D's productivity. PAA/PERS is the average number of patent applications accepted per R&D workers, and PAA/EXP is the

average number of patent applications accepted per billion yuan spent. OIP/PERS and OIP/EXP are the correspondent productivity indicators relative to the owning of inventive patients.

SOSHEs' share of R&D outputs (both PAA and OIC) is lower than their correspondent share of R&D inputs. Consistently, all four R&D productivity indicators for SOSHEs are significantly lower than the average for the whole industrial sector. With respect to PAA, the stellar performers appear to be share-holding corporations (SHCs). Some SHC are state-held, and as such they are themselves part of the SOESH grouping. However, the data appear to suggest that most of the patenting activity of SHCs is carried out by their private-controlled subcomponent. SHCs' R&D inputs are less than half those of SOSHEs as a whole, but their PAA output is higher. Both R&D productivity indicators are three or four times higher than those of SOSHEs. The other category of MEs that of limited liability corporations (LLCs), on the contrary, fares rather poorly. It contributes over 1/3 of total R&D inputs for China's industry as a whole, but it generates only about ¼ of PAA and OIP. FFEs - the only other group of enterprises which, along with SOESHs, carries out a significant R&D effort) do only marginally better than SOESH, especially with respect to the PAA/EXP indicator. With respect to OIP, on the other hand, SHCs' performance is about average, while the best R&D productivity indicators are exhibited by domestic private enterprises and by HKMTs.

These findings are someway puzzling. Those groups of enterprises which are most R&D-intensive (mostly SOSHEs, but also FFEs) appear to extract less results in terms of patenting activity than those who do very little R&D (DPrivEs and HKMTEs), at least in relative terms. One category of mixed enterprises (SHCs) is far more effective in transforming R&D inputs into accepted patent applications than the other, that of LLCs. SOEs and state-holding mixed enterprises appear to perform modestly in both tasks.

The most straightforward interpretation of these results is as follows. China's public industry is pouring a lot of resources into R&D, but is not very effective/ efficient in translating this effort into quantifiable R&D outputs such as patents. Moreover, a law of diminishing returns appears to hold, as both public and private large and R&D-intensive enterprises fare worse than small domestic and foreign-owned private firms.

Such an interpretation is, however, not very plausible - especially the second part, which would imply to posit negative scale economies in industrial R&D. Thus, we tentatively advance an alternative one (without fully ruling out that our findings might also in fact, to some extent, indicate the existence of a productivity problem in R&D activities carried out by China's state-owned and state-holding enterprises).

The core of this alternative interpretation is that these patent indicators carry a limited informative value, and are not very suitable to evaluate the "true" research component of R&D activities. Patenting activity in China's industry is mainly aimed at obtaining protection of minor product or process improvements requiring little or no scientific research as such, and identifiable mostly only with the "development" component of R&D.[49]

Other statistical evidence on patents appears to be broadly consistent with our tentative interpretation of enterprises' patenting activities. Table 10 reports data on

three types of patents[50], quite different from each other, granted to all categories of agents (i.e., not only domestic enterprises, but also universities, research centres, and other official and unofficial domestic organizations and individuals, as well as foreign agents[51]) in the years 1990, 2000, and 2007.

Patenting activities in China have expanded manifold, growing from about 22000 in 1990 to more than 100000 in 2000 and to over 350000 in 2007. Two types of patents, utility models and designs, refer to incremental innovations belonging to the "development" component of R&D activities. Taken together, they constitute the large majority of patents, but the relative weight of designs has been increasing, while that of utility models has been declining. Consistently to their very nature, which is directly market-oriented, these innovations are generated almost exclusively by - and the correspondent intellectual property rights are granted to - domestic and foreign enterprises (official and non-official). Utility models are patented only by Chinese agents, most of them non-official (probably, small entrepreneurs-innovators). The role of larger, official enterprises, however, has being increasing. Designs are also granted mostly to Chinese enterprises, while the role of foreigners has been declining, suggesting that domestic enterprises of various dimensions are increasingly capable to carry out autonomously this kind of innovative activity.

The relative weight of inventions, after declining in the 1990s, has increased markedly afterwards, reaching almost 1/5 of the total number of patents granted in 2007. Moreover, in 1990 less than 1/3 of all invention patents were granted to Chinese agents, while now this share is close to 1/2. These trends suggest that during the present decade the "quality" of China's R&D activities has been improving, shifting progressively towards the basic research end of the continuum, generating more and more indigenous inventions and lessening the country's dependency on imported foreign technology.[52] In this context, the role of enterprises, previously marginal, has become quite relevant. Universities and colleges have also increased their relative contribution to China's inventing activities during the present decade. Data in table 10 do not allow disentangling which share of domestic enterprises' invention patents is granted to SOEs and state-holding enterprises. However, we argued above that the bulk of the patents granted to privately-owned and (to a lesser extent) privately-controlled Chinese enterprises are likely to be of the incremental, directly market-oriented type, and therefore lie towards the "development" end of the R&D range. Conversely, by the same token, most of the inventions stemming from China's industrial sector are likely to be generated by large, capital- and R&D-intensive SOEs and state-holding enterprises, with the rest coming mainly from privately-controlled mixed enterprises.

These considerations make possible to propose an indicative, back-of-the-envelope calculation, which confirms the paramount role of the public sector at large in generating new technological knowledge in China. Assuming (conservatively) that in 2007 only 10% of total inventions patents were granted to SOSHEs (out of a share of 19% for enterprises as a whole), and adding to this figure those corresponding to universities and colleges (12%) and research institutions (5%), we get 27%. As patents granted to Chinese agents are 47% of the total (the rest going to foreigners), we can tentatively conclude that the public sector directly generates almost 60% of China's indigenous inventions. It is more likely, however, that the true share is at least 2/3, with the rest being contributed by privately-controlled mixed enterprises and by more or less informal "non-official" inventors.

5. Conclusions

The statistical analysis presented in section 3 is based on official data published in CSY 2008, and depict the evolution of China's industrial and R&D activities up to the year 2007. Our findings are also consistent with less systematic, non-academic statistical and analytical sources on the structure, role, and performance of public industry and services in China in 2007 and 2008, some of which have been reviewed in Section 2 along with other studies on China's industrial sector.

In this paper, we argue that the role of the State (to be understood as a holistic term referring to the public sector as whole), far from being withering out, is in fact massive, dominant, and crucial to China's industrial development. Actually, it has been strengthened by the successful implementation of the "keep the big dump the small" policy, which in turn is consistent with a more general strategy shift towards re-centralization in many areas of economic and social policies. This trend that not only is still going on, but is inevitably bound to be further accelerated by the massive package of fiscal and other interventions made necessary as a response to the world financial and economic crisis.

State-owned and state-holding enterprises are now less numerous, but much larger, more capital- and knowledge-intensive, more productive and more profitable than in the late 1990s. Contrary to popular belief, especially since the mid-2000s, their performance in terms of efficiency and profitability compares favourably with that of private enterprises. The state-controlled sub-sector constituted by state-holding enterprises, in particular, with at its core the 149 large conglomerates managed by SASAC, is clearly the most advanced component of China's industry and the one where the bulk of in-house R&D activities take place.

The role of the public sector, moreover, goes beyond that of those enterprises which are owned or controlled by the State. In the specific Chinese context, many of the most advanced formally private industrial enterprises are in fact related to the public domain by a web of ownership, financial, and other linkages, to an extent that is qualitatively different and deeper than that of their counterparts in capitalist countries. The public sector is paramount in engineering an extraordinary boom in S&T and R&D activities (both inside the industrial sector and outside, in universities and research centers), and in fuelling a massive investment drive aimed at enhancing China's infrastructural and human capital environment. These processes also generate major systemic external economies, which are reaped by public and private enterprises alike, contributing to abating their operative costs and to sustain their competitiveness and profitability.

Contrary to many other analysts, we do not view the dominant role of the state in China's industry (and, more generally, in China's economy) as a possibly necessary - albeit wasteful - evil, which will be superseded once the transition from a centrally-planned to a fully capitalist modern economy will be completed. We rather see it as a primitive, embryonic, ever-evolving but permanent form of strategic planning aimed at fostering industrial development, and as a key distinctive, structural, and pioneering characteristic of market socialism.

Appendix. A recent econometric attempt to estimate comparatively productivity and efficiency in China's public and private industrial enterprises: a critique

Dougherty et al. (2008) analyze a large sample of enterprises covering the 1998-2003 periods. Their methodology can be summarized as follows. First, they construct a Cobb-Douglas production function using "wage-augmented variants"[53] (p.316), including two dummy variables representing scale and ownership type. Then, they transform it into log-linear form, and obtain both static and dynamic productivity and efficiency estimates, arguing that "… the exponential of the coefficients on the dummy variables can be directly interpreted as percent differences in the constant term, total factor productivity (TFP). Thus, differences in productivity (in levels or growth rates) between directly state controlled companies and various forms of non-state control are simply the exponential of the estimated coefficients" (p. 317).

Dougherty et al., on the basis of this methodology, estimate TFP levels and growth rates of enterprises belonging to different ownership types. Their main finding is that enterprises belonging to the domestic private sector (DP) are much more efficient than SOEs, and also than most state-holding enterprises. However, they also obtain other results, which portray a more nuanced picture, and show in any case a marked improvement of many profitability indicators of state-holding enterprises. An

example is the finding that in state-holding enterprises the net surplus as a percentage of output grew from 23.2 in 1998 to 34.6 in 2003. These figures are much higher and grow faster than those of privately controlled firms (22.2 and 26.2 respectively) (see Dougherty et al., 2008, Table 6 p. 323) The capital/output ratio is higher among SOSHEs, but it declined over the period (from 3.8 to 2.9) . In fact, the authors concede that "Financial indicators for state controlled industrial companies show that they have made significant improvements in performance ……the modest improvements in TFP have allowed depreciation charges to fall… As a result, net operating surplus has risen markedly, bringing about a near-doubling in the rate of return to physical assets" (p.324).

The main weaknesses of Dougherty et al.'s argument, however, lie in their methodology, which presents four main problems. The first stems from the very utilization (in a rather ad hoc fashion) of the TFP concept, which is theoretically inconsistent, as has been shown, among others, by Felipe and McCombie (see Felipe and McCombie 2005, 2007, 2009). The second is that the 1998-2003 period was just too short to allow for robust dynamic statistical inferences on differential productivity and efficiency trends. Moreover, it was also characterized by major and drastic public industry reforms implying high transitional costs, which could not be expected to produce fully satisfactory results in the short run. The third problem is constituted by the wage term.[54] Dougherty et al. realize that their results are heavily dependent on the inclusion of the wage term in the equation: "…the effects of removing the wage term on the overall equation are… substantial. In particular, without the wage term, the coefficient on labor input declines by a large amount, while it increases on net fixed assets. Moreover, the adjusted R-squared drops appreciably under the value added specification. Given the stronger explanatory power of the equations that include the wage term…our preferred specifications shown above include the wage term." (p.322).

The point is that both wage levels in 2003 and their growth rates in the 1998-2003 period were very uneven across different types of industrial enterprises. Tables A 1 and A 2 show that, over the 1998-2003 period, wages in SOEs grew much more than in collectives and in the "enterprises of other types of ownership" category. As a result, by 2003 SOEs' wages were about the same as in enterprises of other types of ownership (they were about ¼ lower in 1998), and 40% higher than in collective enterprises. The picture becomes clearer observing wage trends in the various sub-sectors of the "enterprises of other types of ownership" category (see Table A 2). Wage increases were higher in cooperative, mixed (especially so in shareholding corporations) and in domestic private enterprises, lower in foreign funded and joint ownership enterprises, and even lower in enterprises owned by capitalists from Hong Kong, Macao, and Taiwan (HKMTEs). As a result, wages in all these sub-categories of enterprises lost some ground vis a vis those in SOEs, but the deterioration of purchasing power with respect to their SOEs counterparts was particularly severe for workers employed by foreign enterprises and by joint ownership units. Among foreign-owned enterprises, moreover, such a relative deterioration was particularly pronounced in HKMTEs. The other foreign-funded enterprises (mainly large TNCs) were left as the only sub-category paying average wages higher than SOEs[55], but this wage premium was eroded by over 20%.

These findings allow us to severely qualify the results on comparative productivity and efficiency of public vs. private industrial enterprises obtained by Dougherty et al.. In a static framework, the authors' results appear to show that

(statically) the most favourable TFP differential accrues to domestic private and collectives, most of them SMEs. Actually, however, these were precisely the sectors with lowest wages in 2003[56] . It is clear that at least a good part of this supposed "efficiency " advantage is simply a reflection of a very high degree of labor exploitation. The story is partly different, however, if we consider FDI-funded enterprises.. Most HKMTEs are small-to-medium sized, very market-oriented , and in 2003 they were paying their workers about the same wages as in SOEs. FFEs, however, paid the highest wages, yet were in fact more efficient than other types of firms. This finding is, however, far from surprising, taking into account that most FFEs are capital- and knowledge-intensive firms belonging to TNCs from advanced capitalist countries, which enjoy privileged access to the best state-of-the-art technologies and managerial practices.

In a dynamic perspective, a few other observations are warranted. First, as already pointed out above, 1998-2003 is a very short period, during which China's public industry underwent the first stages of a deep transformation. The size of its workforce was dramatically reduced, while wages increased more than the industry's average. Wage trends explain at least part of the negative difference in TFP growth estimated by Dougherty et al... Yet, less-than-satisfactory TFP growth in SOSHEs during the 1998-2003 period might also in part have been a true phenomenon, attributable to a number of factors related not only to the persistence of many traditional inefficiencies typical of pre-reform SOEs, but also to the rapid pace of enterprise reforms and to the difficulties that managers and workers were encountering to adapt to the changes. An example can be constituted by workers' reaction to dramatic cuts in their enterprise employment levels: it has been demonstrated that, at least in some cases, labor shedding - at least in the short term - led to a decrease, rather than an increase in labor productivity, due to the demoralizing and disrupting effects of such abrupt organizational changes in collective working routines (see Dong and Xu (2008)). Finally, a comment is worth on a result presented by Dougherty et al.(2008) in Table 4, p.320,, which in our view was not adequately emphasized by the authors. Table 4 shows that in firms with over 1000 workers not only TFP was higher than in other types of enterprises, but was increasing at a much faster rate. The point is simply that most of these enterprises are SOSHEs, and the very fact that the state is hegemonic among this vanguard group of industrial enterprises, and obviously able to exploit to a substantial extent their huge economies of scale potential, shows that an overall interpretative thread equating public property and control with low productivity and inefficiency should be taken with a grain of salt.

The last problem is the inclusion of the scale dummy. While formally correct, this dummy has the effect of exceedingly penalizing the estimate of "TFP" among SOEs and SOSHEs, which were already relatively larger (on average) than domestic private firms[57] in 1998, and have been growing progressively larger and less numerous over the 1998-2003 period as result of the rapid and drastic implementation of the "keep the big dump the small" policy. Economies of scale are indeed huge, and they are mostly reaped by large SOSHEs and FFEs.. Thus, measuring an abstract concept of TFP which excludes the economies of scale points towards a narrow, static idea of productivity. Such a productivity concept is based on the obsession about static allocative efficiency, and ignores the crucial importance of the systemic and dynamic productivity gains that can only be reaped enlarging the average size of firms and endowing them with ever-increasing physical and human

capital and technology - which is after all the very reason why big capitalist TNCs exist and (usually) prosper.

This narrowly conceived TFP is therefore a flawed measure of true productivity, and therefore it is not surprising that it ends up glorifying the supposedly- superior performance of China's domestic private firms. The existence of the indigenous small-scale private sector, with its important industrial component, is indispensable for China in its present stage of development, as neither the state nor the large foreign TNCs would be in a position to create each year as many millions of jobs as private entrepreneurs do - or, if this were the case, could only do it at the price of paying a real, enormous price in terms of waste and inefficiency, thereby jeopardizing the whole of China's development path. Yet, private industrial firms should not be unduly idealized. Most of them are small, undercapitalized, and technologically backward. They only survive because they pay extremely low wages, and often engage in hyper-exploitative and illegal forms of absolute surplus value extraction, such as blackmailing workers and forcing them to accept extremely long working hours and/or the partial non-payment of their direct and indirect labour compensations.

References

Akerlof G. and Y. Janet Y., 1986, Efficiency wage models of the labour market, Cambridge University Press, Cambridge, UK.

Cartledge S. 2008, China's first multinational? ,China Economic Quarterly, September

Chang G. 2008, Restructuring of large industrial SOEs in transitional China: a case study in Lanzhou, Tijdschrift voor Economische en Sociale Geografie,2008, vol. 99, issue 1, pages 84-93

Ownership structure as corporate governance mechanism: evidence from Chinese listed companies, Econom. Plan. 34 (2001), pp. 53–72.

Chen Y-C., 2008, Why Do Multinational Corporations Locate Their Advanced R&D Centres in Beijing?, The Journal of Development Studies. London: May 2008. Vol. 44, Iss. 5; p. 622

Chen G., Firth M., and Xu L., 2009, Does the type of ownership control matter? Evidence from China's listed companies, Journal of Banking & Finance , Vol.33, Issue 1, 2009, Pages 171-181

National Bureau of Statistics of P.R: China, 2008,China Statistical Yearbook 2008 (CSY 2008),

Cull R. and Xu L.C., 2003, Who Gets Credit? The Behavior of Bureaucrats and State Banks in Allocating Credit to Chinese State-owned Enterprises, Journal of Development Economics, Vol.71, no.2, August 2003.

Dodson B., 2008, China SOEs Getting Lean and mean, in http://thisischinablog.com

Dong X-Y and Putterman L., 2003, Soft budget constraints, social burdens, and labor redundancy in China's state industry, Journal of Comparative Economics , Vol.3, issue 1, , March 2003, Pages 110-133

Dong X_Y. and Xu L.C., , 2008, . The impact of China's millennium labour restructuring program on firm performance and employee earnings, The Economics of Transition, The European Bank for Reconstruction and Development, vol. 16(2), pages 223-245, 04.

Felipe J. and McCombie J.S.L., 2009, Measuring Economic Growth: An Evaluation and Critique of the Aggregate Production Function, Edward Elgar (forthcoming).

Felipe J. and McCombie J.S.L., 2007, Is a Theory of Total Factor Productivity really needed?" ,Metroeconomica, Vol. 58, No.1: 195-229

Felipe J. and McCombie J.S.L., 2005, "How Sound are the Foundations of the Aggregate Production Function?" . Eastern Economic Journal, Vol.31, No.3 (Summer): 467-488

Fisher-Vanden, K., G. Jefferson, J. Ma., J. Xu., 2006. Technology development and energy productivity in China. Energy Economics, 28(5/6):690-705.
Fisher-Vanden K. and Jefferson, G. H . "Technology Diversity and Development: Evidence from China's Industrial Enterprises." Journal of Comparative Economics 36 (4) (2008) pp.658-672

Gabriele A. And Schettino F., Market Socialism As A Distinct Socioeconomic Formation Internal To The Modern Mode Of Production, 2007, MPRA paper No.7942, available in http://mpra.ub.uni-muenchen.de/7942/

Girma S. and, Gong Y., 2008, FDI, Linkages and the Efficiency of State-Owned Enterprises in China,. The Journal of Development Studies. London: May 2008. Vol. 44, Iss. 5; p. 728
Gul, F.A., Zhao, R., 2001. Corporate governance and performance in Chinese listed companies. Paper presented at the AAA International Accounting Section, Phoenix, AZ, January.

Haggard S. and Huang Y., 2008, The Political Economy of Private Sector Development in China, in Brandt L. and Rawski T.R., 2008, China's Great Economic Transformation, Published by Cambridge University Press, 2008

Holz, C. A. and Lin, Y.M., 2001, The 1997-1998 break in industrial statistics : facts and appraisal, China economic Review, Vol.12, No.4, 2001.

Holz, C. A., 2002, Long live China's state-owned enterprises : deflating the myth of poor financial performance, Journal of Asian Economics, Vol.13, No.4, 2002.

Hovey M., 2005, , Do ownership structures stimulate the performance of listed firms in China?, Proceedings of the 10th AIBF Banking and Finance Conference September 30 (2005).

Hu M.C.. and Mathews J.A., 2008, China's national innovative capacity , Research Policy , Vol.37, Issue 3, , October 2008, Pages 1465-1479

Hu G. and Jefferson G.H., 2004, Returns to research and development in Chinese industry: Evidence from state-owned enterprises in Beijing, China Economic Review, Vol.15, Issue 1, 2004.

Hu G. and Jefferson G.H., 2005, A Great Wall of Patents: What is Behind China's Recent Patent Explosion?, New Economist , in http://people.brandeis.edu

Hu A:G., Jefferson G.H., ,and Jinchang Q., 2005, R&D and Technology Transfer: Firm-Level Evidence from Chinese Industry Review of Economics and Statistics, Vol..87, No..4

Kanbur R., Quian Y., and Zhang X., 2008, Symposium on Market Development and Inequality in China, The Economics of Transition, Vol.16, No.1, 2008

Kerr, D. (2007) 'Has China abandoned self-reliance ?' , Review of international political economy., 14 (1), pp. 77-104.

Kroeber A. 2008a, Large and in charge, China Economic Quarterly, June, No.41

Kroeber A. 2008b Kroeber A., Time for a new story China Economic Quarterly, December

Lee K., 2005, Making a technological catch-up: barriers and opportunities, Asian Journal of Technological Innovation 13 (2) (2005), pp. 97–131.

Lindbeck A., 2008,Economic-Social Interaction in China, The Economics of Transition, Vol.16, No.1., 2008.

Mandel M., 2004, China moves into second place for R&D, in

http://www.businessweek.com/the_thread/economicsunbound/archives/2006/12/china_moves_int.html

Mayberry T., Wang S., and Suh B., 2008, Special Report: China III: Getting IT Right the First Time, Outlook Journal, May 2006, in http://www.accenture.com/Global/Research_and_Insights/Outlook/By_Issue/Y2006/GettingFirstTime.htm

Mazzoleni R., 2008, Catching Up and Academic Institutions: A Comparative Study of Past National Experiences, The Journal of Development studies,. Vol. 44, Iss. 5, 2008; pg. 678

Ministry of Commerce 2008, Two thirds of China's SOE giants become share-holding companies, in http://english.mofcom.gov.cn/aarticle/counselorsreport/westernasiaandafricareport/200808/20080805745646.html

McGregor 2007, China develops research sector, Financial Times, September 3 2007

Morel E, 2006, The Changing Role of State-Owned Enterprises in Chinese Industrial Research: New Goals, Ownership, and Management,University of Kansas, 2006, Motorola Foundation Young Scholar, October 2006

Naughton B., 2008a, Profiting the SASAC way, China Economic Quarterly, June.

Naughton B., 2008b, Strengthening the Center, and Premier Wen Jiabao, China Leadership Monitor, No. 21, 2081

Naughton B., 2008c, SOE policy, Profiting the SASAC way, China economic Quarterly, June 2008

Naughton, T. and Hovey, M., 2007, A Survey of Enterprise Reforms in China: The Way Forward, . Economic Systems, Vol. 31, No. 2, 2007. Available at SSRN: http://ssrn.com/abstract=998433

Niosi J., 2008, Technology, Development and Innovation Systems: An Introduction,The Journal of Development Studies. London: May 2008. Vol. 44, Issue 5,2008.

OECD 2008a, Reviews of Innovation Policy: China, September 2008

OECD 2008b Main Science and Technology Indicators

Qiu J., Aivazian V., and Ge,Y , 2005a, "Corporate Governance and Manager Turnover: An Unusual Social Experiment," 2005a, Journal of Banking and Finance, 1459-1481

Qiu J., Aivazian V., and Ge,Y , 2005b, "Can Corporatization Improve the Performance of SOEs Even Without Privatization?" Journal of Corporate Finance, 791-808. [

Sun Q. Tong, W.H., 2003, China share issue privatization: the extent of its success, J. Financ. Econom. 70 (2003), pp. 183–222.

Sunami A. , 2002, Industry-University Cooperation and University-affiliated Enterprises in China, a Country Aspiring for Growth on Science and Education - Building New System for Technological Innovation, RIETI Research & Review, May 2002

http://www.rieti.go.jp/en/papers/research-review/001.html

Wildau G., 2008, Albatross turns phoenix, China Economic Quarterly, June

Wei Z. and O. Varela O., 2003, State equity ownership and firm market performance: evidence from China's newly privatized firms, Global Finance J. 14 (2003), pp. 65–82

WangC., 2005, Ownership and operating performance of Chinese IPOs, J. Bank. Finance 29 (2005), pp. 1835–1856

Wong S.M.L., Opper S.and R. Hu R., 2004, , Shareholding structure, depoliticization and firm performance: lessons from China's listed firms, Economics of Transition No. 12 (2004), pp. 29–66

Xia L. and Li S., 2008, The Roles and Performance of State Firms and Non-State Firms in China's Economic Transition, World Development,., Vol. 36, Issue 1.

Xu B. and Li W., 2008, Trade, Technology, and China's Rising Skill Demand , The Economics of Transition, Vol.16, Issue 1, 2008.

Yu J. and NijKamp P., 2008, Ownership, R&D and productivity change: assessing the catch-up in China's high-tech industries, in J. Yu: Vrije Universiteit Amsterdam, Faculteit der Economische Wetenschappen en Econometrie (Free University Amsterdam, Faculty of Economics Sciences, Business Administration and Econometrics, in http://econpapers.repec.org

Zhang L.Y., 2004 ,The Roles of Corporatization and Stock Market Listing in Reforming China's State Industry, World Development,., Vol. 32, Issue 12, 2004.

Zhang, Y., and D Parker D, 2004, 'Labour and Total Factor Productivity in the Chinese Electronics Industry in the 1990s', International Review of Applied Economics , Vol.18(1), 1-22, 1465-3486

Zheng Jj., Liu X., and Bigsten A.., Efficiency, Technical Progress, and Best Practice in Chinese State Enterprises (1980-1994),

Working Papers in Economics no 30, September, 2000, Department of Economics Göteborg University

Notes

[1] For a thorough discussion on the conceptual and definitional complexities related to the use of terms such as "market socialism" and "socioeconomic formation", see Gabriele and Schettino 2008.
[2] Systemic external economies stem from the ability of individual firms to externalize a number of costs - such as infrastructure building and maintenance, human capital formation, access to free and quasi-free (less-than-fully-protected) knowledge, environmental protection - which otherwise they should have born directly. Some of these external economies are far from virtuous from a social welfare perspective, such as those resulting in environmental damages. However, on balance, in most countries they favour industrial development, or at least industrial growth. They are called systemic because they are predicated on a number of systemic factors which lie outside the scope of the firm's behaviour. these factors, in turn, ultimately depend on the State's willingness and capability to macro-manage strategically the development path of the national economy. Systemic external economies are particularly relevant and crucial in China, consistently with the unique role played by the public sector.
[3] The preminent role of private enterprises as industrial employment generators is being severely weakened by the impact of the international economic crisis. However, the present retrenchment of private industry is probably a temporary phenomenon.
[4] On the intrinsic weaknesses of the TFP concept see the Appendix.
[5] There are two main groups of FDI- owned/ controlled industrial enterprises (jointly referred to as FDI-funded enterprises, FDIEs) in China. One is that of enterprises owned/ controlled by capitalists from Hong Kong, Macao, and Taiwan (HKMTEs). The remaining FDIEs , mainly controlled by large TNCs from the most advanced capitalist countries, constitute the group of foreign-funded enterprises (FFEs). See below, Section 3.
[6] SOEs operating in competitive sectors appear to have performed better than others. In the ICT sector (the most competitive high-tech sector in China), in particular, SOEs' efficiency gap vis-à-vis FFEs is quite small.
[7] An additional factor is probably constituted by the transitional costs of adapting to new forms of labor allocation and organization on the part of both workers and managers.
[8] See below, Section 3..
[9] "90 percent of some 5,000 university-affiliated enterprises are wholly owned by the state, thus, ultimate responsibility should be theoretically held by the state. In reality, however, universities have substantial freedom over the management of their affiliated enterprises… the complexity concerning the ownership of university-affiliated enterprises straddling over respective universities and the state has not been fully solved university-affiliated enterprises are categorized as state-owned, thus, equities in those enterprises should fully belong to the state. However, the registration of those enterprises has a lot of ambiguity. " (Sunami 2002). Not surprisingly, such increasingly complex forms of indirect public ownership and control are not immune from problems.

[10] Fisher-Vanden, and Jefferson (2008) distinguish three types of technical change: autonomous, in-house R&D-led, and purchases of imported technologies. Autonomous technical change is associated with the passage of time and the accumulation of new vintages of plant, equipment, and workers that embody new technologies, without requiring R&D (Fisher-Vanden and Jefferson 2008, p. 659).
[11] The redundant workers were partially cushioned from the negative consequences of the loss of employment by various welfare measures.
[12] The zhuada fangxiao policy was formally adopted by the State Council in 1995.
[13] Naughton refers to the state share of total profits, both in SOEs proper and in state-holding mixed enterprises.
[14] Over 2/3 of the total is generated by just nine firms: PetroChina, Sinopec, CNOOC, China Mobile, China Telecom, Baosteel, Chinalco, Shenhua Energy, and the State Electricity Grid.
[15] SASAC walked an important step in this direction in late 2007, when itbegan collecting dividends from its firms.
[16] This figure refers to August, 2008 (source: Ministry of Commerce , 2008), and might be further reduced by the time this article is published.

[17] The pace of SOEs reforms accelerated since the late 1990s.y in place, 1998-2003 saw the most rapid phase of SOE reform.

[18] SASAC has also strengthened managerial incentives."In 2004, all central SASAC firms signed three-year performance contracts, outlining annual and three-year targets. On the basis of these contracts, SASAC evaluates each CEO's performance. The three-year evaluation criteria are based on growth of capital value and revenues as well as annual profit results.

[19] "Three national oil companies produce all of China's oil and gas; four telecom companies provide all basic telecom services; three airline companies carry 82% of the domestic air passengers. These companies enjoy enough protection that they can earn rich profits, but not so much protection than they can enjoy a "quiet life," the ultimate, stagnant reward of a pure monopolist. In a few sectors, large, centrally-run flagship firms operate in a fiercer competitive environment. Baosteel and Chinalco have the most expensive and sophisticated production technologies in their sectors, and are moving out on to the global stage" (Naughton 2008, p.2).

[20] The present Chaebol-like ownership structure allows to overcome many of the contradictions that plagued the decision-making process in traditional SOEs, which had to follow directives emanating from several state and government bodies resulting in unclear lines of authority .

[21] The 149 central SASAC-run groups control over 40% of state enterprise assets, over ½ of revenues, and almost 2/3 of profits. These figures are similar, or higher, than the correspondent ones for the 500 largest SOEs in 1995.

[22] Kroeber (2008)also presents tentative aggregate estimates for services sector, concluding that in that macro-sector as well "state firms are fewer in number than private firms , but are on average far larger and hold all the plum spots" (p.40). Domestic private firms are over 60% of the total, but generate only 27% of services' profits. Conversely, SOSHEs are about 1/3 of all services firms in number, but reap almost 2/3 of profits. SOSHEs capture almost all the revenue generated by their of the financial (insurance and banking) sectors, where they exert a virtually absolute dominance, over ½ in most other services sectors and over 40% even in quite competitive and market-driven sectors such as hotel and catering and It and software services (p.41).

[23] This policy shift was already apparent before the launching of a massive public expenditure drive in late 2008, to counteract the collapse in export demand caused by the international economic crisis. Largely out of necessity, but also due to the resilience exhibited so far by state-owned/controlled industrial firms vis a vis the parlous state of many privately-owned domestic export-oriented manufacturers, the new spending programmes will further strengthen the role of the State. This change in the public/private relative relation of forces is concentrated in the areas of infrastructure, R&D, and other services. The long overdue expansion of the role of the public sector as non-market provider of basic services is particularly consistent with the long-run goals of creating a "harmonious society" advocated by China's leadership.

[24] Of course, all SOECGs belong to the larger grouping of SOSHEs. Even if the authors consider them as de facto SOEs, notwithstanding their modern and diversified ownership structure, they are classified as "state-holding" rather than "state-owned" enterprises in CSY 2008.

[25] It might be argued that enterprises -such as cooperatives and collectives - that are owned and self-managed by workers are in fact non-private organizations, but cannot be considered "public". The reason would be that they ultimately do not behave to maximize the welfare function of local or national governments (which can be assumed to reflect, albeit imperfectly, the interests of the local or national population as a whole), but only those of the workers themselves. In practice, this objection carries little weight in China, because cooperatives and collectives are rarely fully autonomous and operate in close connection with local governments. In any case, their relative importance is modest.

[26] The task of disentangling the relative weight and characteristics of public and private industry respectively along various significant dimensions (i.e., number, production, investment, productivity, profitability, etc.) has been greatly simplified by the 1998 statistical reform (see Holz and Lin 2001), but still requires a certain amount of interpretation of available data.

[27] To a considerable extent, the speed of the relative decline of public industry is overstated by statistical data, because it is a known fact that many small public firms (most of them TVEs) were already de facto privately owned/controlled, at least by the early 1990s, and subsequently registered as private (thereby giving up their "red hat") when this became more politically acceptable (see Holz and Lin 2001). This transition, however, was basically completed by the early2000s.

[2828] Of course, the indicators including the capital term shall be seen as indicative, as they compare a stock variable (the total asset endowment owned by enterprises in a certain moment of time, as a result of an accumulation process which usually lasted for several years and was not homogeneous across different firms) with flow variables such as labour force, output, and profits, each of which refers to a specific year.

[29] Statistical data always refer to enterprises over a minimum size.

[30] Excluding Hong Kong, Macao, and Taiwan-funded enterprises, These enterprises are on average much smaller, less capitalized, and less productive than their counerparts owned by large TNCs from developed countries.
[31] A relatively high K/O ratio is not incompatible with the existence of economies of scale and is not necessarily a symptom of inefficiency in a static context. Very large enterprises can achieve a very high labour productivity, which is the very essence of industrial development. To do so, they usually require a lot of capital investment. In a dynamic framework, it is possible, in theory - but rarely feasible in practice - to pursue a fully virtuous pattern of technical progress where more production is achieved with less labour and less capital. The key issue is whether or not the continuous accumulation of capital (which might cause an ever-rising K/O ratio) is checked by a sufficiently rapid technical progress, thereby rendering sustainable the industrial development path in the long run. Such a dynamic path sustainability is not incompatible with an ever-rising endowment of capital per worker, which constitutes by itself a normal feature of economic growth.
[32] As previously noticed, SHMEs are also very profitable. It is interesting to note that the difference in the respective profit/assets ratios between two very different groupings of enterprises such as SHMEs and PrivDEs is less than 2%.
[33] The difference is less than 6%.
[34] In Marxian terms, under ceteris paribus conditions, a higher organic composition implies a lower profit rate. Neoclassical theory also predicts that the profit rate shall decrease if the K/O ratio increases, due to a decline in the marginal productivity of capital.
[35] Each of these two sub-groups of SOSHE sis constituted by about 10000 enterprises.
[36] In nominal terms.
[37] The number of S&T personnel in state-owned enterprises and institutions also kept increasing, more than doubling during the 1990s (see CSY 2008, table 20.44).
[38] According to China's own statistics (which are not fully comparable with OECD ones), the number of Scientists and Engineers engaged in R&D activities reached over 3.2 million by 2007, correspondent to about 1.7 million full-time equivalent man-years (source: CSY 2008, table 20.38).
[39] Although the gap is difficult to estimate properly, the professional quality of China's researchers is considered to be still lower than that of those of the US and of other advanced OECD countries (see Gabriele and Khan 2008).
[40] Data on the growth rates of R&D personnel in the US are not available in OECD 2008b.
[41] The caveat mentioned in Note 39 applies also to the data in table 6.
[42] Available preliminary information indicates that this expanding trend continued unabated after 2007. In his report delivered to the National People's Congress on March 3, 2009, Premier Wen Jiabao stated that central government expenditure on S&T activities grew by 16.4% in 2008, and were expected to increase by over 25% in 2009 (Chinaview 2009-03-05)
[43] See Gabriele and Khan 2008.
[44] In the US and in EU27 there is also a fourth actor, the private non-business sector, which plays a complementary role. Such a sector in non-existent in China's research scenario.
[45] In China, almost all R&D is carried out by LMEs.
[46] Other figures in Table 8 further confirm the paramount role of also shows
[47] The term basic research should be understood in a broad sense, relative to the Chinese reality. Activities classified as basic in China might be regarded as non-basic in more advanced countries.
[48] These observations are based on quantitative input indicators. It might be the case that, in some industrial sector, the effectiveness and quality of R&D activities performed by foreign-owned enterprises is superior to that carried out by public Chinese enterprises, universities, and research centres.
[49] This is particularly true for the OIP indicator. The findings on the PAA indicators can also be interpreted along these lines, but with some more difficulty. The exceptional role played by SHCs, in particular, appears to require further research.

[50] Data on patents in tables 7, 9, and 10 are not homogeneous and therefore not directly comparable.
[51] CSY 2008 does not specify clearly what the term "official" means. However, domestic unofficial agents are probably individuals and/or firms or other organization too small to be considered" official".

[52] The requirements needed for granting invention patents vary from country to country, even in the OECD. It is quite likely that in China they are less stringent than in most d advanced capitalist countries. What we are focusing on here are the trends which are unfolding over time.

[53] "Wage-augmented variants are used in the preferred specification due to concerns about the quality of the measure of employment (total headcount), and the presence of large wage gaps across different types of firms. These gaps suggest that private firms either hire much more qualified workers or they utilize higher wages to deter shirking and improve incentives using efficiency wages (see Akerlof and Yellen 1986)". (p 316). The reader might inadvertently understand that private firms in China pay higher wages than their public counterparts, but this is not the case (the authors refer simply to the classic theoretical model on efficiency wages developed by Akerlof & Yellen over 20 years ago, which obviously does not contain data on future Chinese wages). Actually, as we show in this appendix, the opposite is true.

[54] To some extent, this problem also stems from another of the theoretical flaws of the TFP concept, which assumes a priori that production factors are remunerated according to their respective marginal productivities. The derivation of TFP from this crucial assumption inevitably mixes up two very different levels of the analysis, that of production (axed on the quantitative relationship between inputs and outputs) and that of income distribution (between labor force buyers and sellers).

[55] These data clearly support the "efficiency wages" argument in the case of FFE, but not in other types of privately-owned/controlled enterprises..

[56] The differential was 40% for UCs (Table A1) and 27% for domestic private enterrises (Table A 2)

[57] The authors note that the private sector is composed mainly by small and medium enterprises, and that this well-known fact is reflected also in the firms included in their sample (p. 316).