Efficiency-Enhancing Effects of Private and Collective Enterprises in Transitional China

von

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CONTENTS

LIST OF TABLES

1 Introduction

Since China entered the process of gradual transition in 1978, it has witnessed a period of fast economic growth. This impressive growth record is often taken as a proof for the success of its transformation strategy, especially in the field of enterprise reform (Bohnet 1997; Lo 1999). The so-called commercialisation of its state-owned enterprises (hereafter SOEs) marked the first pillar of China's gradual enterprise reform strategy. The government reduced the level of direct governmental control over managerial decisions within the SOEs and confronted them with a harder budget constraint without privatising them (Naughton 1994; Raiser 1995; Lin et al. 1998). At the same time, the Chinese government kept the entry to many markets served by SOEs restricted. As a second pillar of its enterprise reform strategy, the Chinese government accepted the development of non-state enterprises (Young 1995: 14-19). As a result of this so-called grass-root privatisation (Brockmeier 1997: 364), numerous private enterprises were founded all over the country. In addition, local authorities installed an increasing number of collective enterprises. In 1998, they employed 12.6 % respectively 23.3 % of the total working population in China.

Together, the commercialisation of SOEs and the grass-root-privatisation have prevented a breakdown in production and GDP in the first years of transition. By gradually transferring labor force from SOEs to the non-state sector, China also managed to avoid high unemployment rates. Other than the people in Central and Eastern Europe, the China's population was thus not burdened with excessive costs of adjustment to market structures in the early years of transition (Bai et al. 1997; Bohnet 1997). Though these achievements have to be recognised, the ultimate criterion for a successful transition in the long-run perspective is that of efficiency. The essential question to be answered thus is whether the Chinese privatisation strategy has promoted overall efficiency. So far, most studies on this topic have concentrated on the commercialisation of SOEs. The empirical evidence is not conclusive. In sum, however, it suggests that the commercialisation merely caused a minor increase in efficiency of resource allocation within the SOEs (Raiser 1995; Wu 1995; Liu and Liu 1996; Raiser 1996: 142-146; Lin et al. 1998). The impact of the grass-root privatisation on efficiency has not been analysed with the same intensity. The theoretical literature names a number of different ways in which non-state enterprises affect overall efficiency in transition economies in general and in China in particular. This literature is reviewed in section 2 of this paper. It gives support to the hypothesis that these enterprises, especially private enterprises, enhance efficiency in transitional China. Section 3 analyses the development of labor

productivity in 28 Chinese provinces between 1993 and 1998 in order to test the empirical tenability of this hypothesis. A discussion of the results is given in section 4.

2 The role of collective and private enterprises in transitional China

Starting from the work of Pareto put forth on the turn to the 20th century, the concept of efficiency has witnessed several extensions (Leibenstein 1966; Lindbeck 1971). While the narrow concepts concentrate on a single production unit, the broader concepts refer to the efficiency of economic processes of a region or a country as a whole. As an economy can only be efficient if all its production units operate efficiently, the broader concepts include all conditions that a single production unit has to fulfil to be efficient. The following passage briefly reviews the different dimensions of a broad definition of efficiency.

The most commonly discussed concept of efficiency is that of technical efficiency.[1] It demands that a given factor endowment is allocated among different producers and applications in a way that maximizes possible output. Technical efficiency implies that all factors are employed in the production process (Kohler 1989: 16-25; Bai et al. 2000). Leibenstein (1966) furthermore demands that the process or production is organised in a way that minimizes shirking. Otherwise X-inefficiencies occur. A solution which is technically and x-efficient is located on the production surface and will hereafter be called efficient in production. If the chosen location is the one which maximizes consumers' utility because it suits their preferences best of all feasible locations, the solution is structurally efficient (Kohler 1989: 21-25). Any situation which is efficient in production and at the same time structurally efficient is called statically efficient. The concept of static efficiency refers to the performance of a certain region or country at a given point in time and therefore takes consumers' preferences, factor endowment and the state of technology as exogenous and constant (Mishan 1981; Bohnet 1984).

In a medium-term perspective, these factors are likely to change. In order to be able to characterize the ability of an economy to deal with these changes, the concept of ad-

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1 Sometimes, authors further differentiate between technical efficiency and allocative efficiency to describe the behavior of a single production unit. If both conditions are met, the unit is called profit efficient (Lovell and Schmidt 1988).

justment efficiency in introduced (Lindbeck 1971; Bohnet 1984). Adjustment efficiency is given if an economy adjusts to changes in production technique, factor endowment and consumers' preferences at the lowest possible cost (Bohnet 1984). In addition, a number of authors have suggested concepts of efficiency which refer to the ability of the economy to actively move the production surface outward over time. This can be achieved by enlarging the factor endowment through investment (Lindbeck 1971; Sengupta 1999). An economy which generates the optimal rate of factor accumulation is called growth-efficient. The degree to which an economy can move the production surface by generating new technologies and products determines its efficiency in innovation (Bohnet 1984; Funk 1996). If an economy meets the requirements of adjustment and growth efficiency as well as efficiency in innovation it is called dynamically efficient (Bohnet 1984).

In reality, none of the existing economies live up to the high standards of static and dynamic efficiency developed in the theoretical literature[2] They merely constitute a theoretical benchmark, measured by which all existing economies are inefficient. At the same time, economies differ substantially in the degree of inefficiency. In particular, centrally planned economies are regularly less efficient than market economies (Kornai 1992; Blum and Dudley 1999).

The following section addresses the question whether the acceptance of non-state enterprises in China has increased overall efficiency. It differentiates between primary and secondary efficiency-enhancing effects. First, these enterprises can increase efficiency if they are on average more efficient than SOEs. The secondary effects result from the positive externalities that these enterprises produce for the SOEs as well as for the economy as a whole. The theoretical as well as empirical literature on the non-state sector in transitional China points at a number of fundamental differences in the role of private enterprises on the one and collective enterprises on the other hand (e.g. Opper 1999: 110-135; Tian 2000; Rohde 2001). Therefore, the effects of these two types of enterprises have to be discussed separately.

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2 An economy which sets optimal incentives for innovation and thereby promotes efficiency in innovation has to accept supernormal profits for the innovator. This automatically violates the conditions of efficiency in production and adjustment.

2.1 Primary efficiency-enhancing effects

2.1.1 Primary efficiency-enhancing effects of private enterprises

Following the property-rights logic, private enterprises can be expected to be more efficient than SOEs because the property rights concerning their economic activities are more clearly assigned than for the SOEs. This gives the management the necessary executive power to decide and at the same time creates clear responsibilities for success and failure (Kornai 1992: 62-74, 110-130, 140-145). As a result, the incentives to work efficiently are stronger (Pratt and Zeckhauser 1985; Villalonga 2000). In addition, private enterprises suffer less from principal-agent problems. In SOEs, the principals, i.e. the equity owners, do not make the managerial decisions personally but delegate these to the agents, represented especially by the management. Due to the size of the SOEs and the complexity of their economic relations, the principals can only acquire very limited information about the quality of management. At the same time, monitoring is very costly (Villalonga 2000; Kessler and Luelfemann 2001). Thus the agents can use the delegated discretionary power to make decisions which maximize their own utility rather than the return for the principals. As a result, the delegation of power in SOEs leads to losses in efficiency, especially in form of x-inefficiencies (Moore 1981; Koop 1994: 293-297; Kessler and Luelfemann 2001). In the vast majority of private enterprises, management and equity owner are identical and thus pursue the same goals (Rohde 2001). Consequently, principal-agent problems do not occur and resource allocation in private enterprises can be expected to be more efficient than in SOEs.

Private enterprises compete with each other as well as with collective enterprises. This competition forces them to produce their goods and services technically and x-efficiently in order to remain profitable. SOEs are confronted with the disciplinary effects of competition only in those markets in which they are not protected by the government. In many markets, however, SOEs are still monopolists (Raiser 1995; Lin et al. 1998). Due to the possibility to cross subsidize from monopoly to competitive markets, the competition from non-state enterprises exerts only limited pressure on them. Therefore, SOEs can be expected to be less efficient in production than private enterprises (Koop 1994: 297-298.)

In transitional China, government authorities still directly influence the managerial decisions within SOEs. The governmental directives concern price policy, employment level

and in many cases the investment policy, too. The decisions are in many cases not primarily guided by the pursuit of efficiency but follow other political aims (Raiser 1995; Keister and Lu 2001). In particular, SOEs are burdened with the task or social welfare provision (Wong et al. 1996; Bai et al. 2000). In sum, the interventions reduce structural and productive efficiency in SOEs compared to private enterprises who are not subject to similar interventions (Opper 1999: 122-136; Rohde 2001).

On the other hand, the Chinese legal institutions bear a number of obstacles for private enterprises. First of all, the institutional guarantee of their property rights is still not satisfactory (Li 1996). Consequently, private enterprises face incentives to abstain from activities which require large specific investments. Second, the banking system discriminates against private enterprises. While they accounted for 4 % of the officially registered equity in 1994, private enterprises only received 0.2 % of all banking loans. Instead, they have to rely on family members, friends and sometimes illegal sources for their financial means (Dong and Putterman 1997: 183-184; Schmitt 1999: 104-117). These institutional obstacles handicap private enterprises and prevent them from reaching the degree of efficiency they could reach in a more suitable institutional framework. Nevertheless, the considerations above suggest that private enterprises are on average more efficient than SOEs. Thus their emergence can be expected to enhance overall efficiency in transitional China.

2.1.2 Primary efficiency-enhancing effects of collective enterprises

Judging by the total number of employees, collective enterprises play a much more important role than private enterprises. Yet from a theoretical point of view, their handling is less straight-forward. Formally, all collective enterprises are owned by the urban or rural community in whose sphere they are active. The community members do, however, not have the right to control the economic activities within the collective enterprises. Instead, the local authorities appoint and control the management (Opper 1999: 106-107, 119-122; Tian 2000). Thus, these enterprises appear to be very similar to the SOEs and suffer from the same indistinct assignment of property rights, similar principal-agent problems as well as similar efficiency-reducing governmental interventions. The literature on collective enterprises, especially on the so-called town and village enterprises (TVEs) in the rural areas, points out that this conclusion is misleading (Bowles and Dong 1999; Tian 2000). There is a broad consensus among experts that a large percentage of collective enterprises, especially of TVEs, are only formally under government control. De facto, however, they face only moderate governmental restric-

tions. Apart from being forced to employ too much staff, the collective enterprises are not subject to any severe interventions (Hu et al. 1997; Opper 1999: 104-121; Tian 2000). Thus, Chinese collective enterprises can be expected to operate almost as independently as their private counterparts. At the same time, they benefit from the close relationship to the local authorities by having much better access to bank loans, land and restricted inputs, such as water and electricity than private enterprises (Dong and Putterman 1997; Bowles and Dong 1999; Rohde 2001). In addition, they can count on the local authorities to support them in possible legal conflicts (Tian 2000). As a result, their legal status and economic situation is much more secure.

Many entrepreneurs, especially in the rural areas, purposefully choose the status of a collective enterprise respectively TVE to benefit from these advantages of this status (Hu et al. 1997; Opper 1999: 104-121; Tian 2000). This secure status allows collective enterprises to make specific investments that private enterprises will abstain from due to their uncertain status. The resulting increase in productive efficiency can compensate for the losses caused by moderate government interventions. Due to the fact that collective enterprises are on average smaller than SOEs, the local authorities can very easily and thoroughly monitor the management decisions within their enterprises. Consequently, principal-agent problems which lead to inefficiencies in the SOEs apply to collective enterprises only to a limited extent. The efficiency of collective enterprises is furthermore enhanced by the fact that they face competition from their private counterparts as well as from SOEs. In sum, China's collective enterprises can be expected to be more efficient than SOEs. Therefore, their emergence increases overall efficiency in China.

2.2 Secondary efficiency-enhancing effects

Next to these primary effects, non-state enterprises also exert secondary efficiency-enhancing effects. Theses secondary effects result form the fact that non-state enterprises produce positive externalities for the SOEs and the economy as a whole. Again, the effects will be discussed separately for private and collective enterprises.

2.2.1 Secondary efficiency-enhancing effects of private enterprises

Private enterprises create a competitive environment for SOEs. This competition can help to reduce X-inefficiencies within the competing enterprises, especially within the SOEs (Leibenstein 1966; Moore 1981) and force them to introduce new techniques in management and production, thereby increasing overall adjustment efficiency. Till now, these positive effects of competition on product markets are limited by the fact that the economic activities of private enterprises are restricted to certain sectors. Private enterprises do, however, also compete with SOEs on factor markets. Jefferson and Rawski (1994) point out that competition for inputs reduced the dispersion of profit rates within the economy and especially among SOEs. In order to preserve the SOEs' surplus income as a source of state revenues, the state government is forced to increase SOEs' efficiency. Without private competition, the government would have exerted less pressure on SOEs (Jefferson and Rawski 1994; Bohnet and Hong 1996). Thus, the existence of private enterprises enhances efficiency in China's SOEs.

Apart from the positive externalities they exert on SOEs, private enterprises positively affect structural efficiency. As a substantial part of the private enterprises in transition countries engage in retail trade (Lageman 1995; Schmitt 1999: 191-202), they deliver industrial goods to the countryside and improve the supply of agricultural goods in urban areas (Young 1995: 13-24). On those product markets where private enterprises compete with SOEs, this competition reduced the social costs of monopoly by reducing commodity prices (Raiser 1997). Additionally, improvement in technical and adjustment efficiency can result if the retail trade activity of non-state enterprises increases the circulation of inputs and accelerates the diffusion of new technologies.

In addition to improving availability and distribution of existing goods and services, private enterprises produce new goods and services (Young 1995: 22-23). Especially the demand for light industry products, handicrafts and services is very difficult to satisfy by large organisational units like SOEs and the central planning agency (Rohde 2001). In socialist times, these markets were largely neglected and thus characterized by severe shortages and poor quality (Kraus 1989: 67-69; Young 1995: 22-23). The newly emerging private enterprises are mostly small and medium enterprises whose explicit strength it is to be able to observe and meet the differentiated demand in these fields (Kraus 1989: 67-69; Murakami et al. 1996). Therefore, their emergence lead to a sub-

stantial increase in quantity and quality of supply in the field of light industry products, handicrafts and services.[3] This further increases structural efficiency. In addition, it may improve the productive efficiency of those enterprises for whom the new products serve as inputs.[4]

Private enterprises furthermore increase technical efficiency in transitional China by employing existing factors that have formerly not found a productive application in SOEs. Due to their lacking access to bank loans, especially private enterprises revitalize private capital, which have previously not served the productive process to the same extent because many private households were reluctant to give their savings to banks which are still under governmental control (Schmitt 1999: 104-113). The newly emerging private enterprises also absorbed parts of the superfluous labor force set free by the SOEs in the course of commercialisation.[5] In the private enterprises, the labor force continued to contribute to overall output. In sum, private enterprises activated both labor and capital that would otherwise not have been integrated into the production process and thereby improved technical efficiency in the course of transition.

Numerous authors point out the important role of small and medium enterprises in promoting technical progress (Acs and Audretsch 1988; Hornschild 1997). In contemporary China, the contribution of private enterprises is still largely restricted to small product variations or improvements in production technology rather than fundamental new achievements (Schmitt 1999: 161-166). At the same time, the competition between them enforces a fast imitation and distribution of new technical knowledge and thereby increases adjustment efficiency. In addition, the mere number of private enterprises guarantees that a large variety of production as well as management techniques is tested at the same time. Following the evolutionary approach to technical progress in

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3 The same development was observed in the Visegrad countries (Poland, Hungary, Czech Republic, Slovak Republic) in the beginning of the 1990s (Lageman 1995).

4 Like in all socialist countries, the shortcomings of the socialist planning system left plenty of room for economic activities in the informal sector. Thus, the corresponding “enterprises“ existed even before they were officially accepted by the Chinese authorities. Due to heavy restrictions for their activities as well as the often inadequate incentives, their contribution to overall efficiency in pre-reform China was limited (Lu 1994).

5 This employment function was recognized by the Chinese officials and represents their major motivation to accept the development of the non-state sector including private enterprises (Young 1995: 21; Opper 1999: 122).

the tradition of F.A. von Hayek, this large real-life experiment raises the expected rate of innovation (Grupp 1997: 70-82). In sum, private enterprises can be expected to strengthen the dynamic efficiency of the Chinese economy.[6]

2.2.2 Secondary efficiency-enhancing effects of collective enterprises

The degree to which collective enterprises can produce similar efficiency-enhancing effects as private enterprises is discussed controversially (Bowles and Dong 1999; Rohde 2001). In many characteristics, both types of enterprises are similar and thus should be able to produce similar effects. Just like their private counterparts, collective enterprises compete with SOEs in different product and factor markets and thus induce efficiency gains in the latter. Especially the rural collective enterprises have developed substantial activities in the secondary sector where the SOEs are not so heavily challenged by private enterprises (Opper 1999: 104-121). Consequently, they can be expected to exert more direct pressure on SOEs than private enterprises do. Just like private enterprises, the collective enterprises absorbed large parts of the labor force set free by the SOEs. Due to their large numbers, they also contribute to the real-life experiment on production and management techniques and thus increase the expected innovation rate.

On the other hand, their effect on the efficiency of the capital market can be expected to be smaller than that of private enterprises, because they have better access to bank loans and thus do not have to rely on formerly inactivated sources for capital. More importantly, however, Rohde (2001) argues that the remaining level of governmental control hinders collective enterprises from developing the creativity in discovering new products and markets typical for small and medium enterprises. He thus concludes that collective enterprises cannot contribute to the development of efficiency to the same extent that private enterprises do.

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6 Private enterprises have formed numerous interest groups. These interest groups inform politicians and bureaucrats about their specific situation and needs and exert pressure on the authorities to improve their position (Kraus 1989: 95-98; Lu 1994: 107-127). As the Chinese government knew about the vital contribution of these enterprises to China's impressive growth record (Young 1995), a number of important changes were introduced to foster the development of private enterprises.

3 Empirical evidence

Wu (1993) differentiates between modern and classical methods to measure efficiency. Modern methods use information on the available technology as well as quantities and prices of all relevant inputs and outputs to estimate the location of an efficient frontier of production. The degree of inefficiency of a certain production unit, e.g. an enterprise or branch, is then estimated by the distance between its own location and the efficient frontier (Lovell and Schmidt 1988; Kalirajan and Shand 1999). Applied to cross-sectional data, the methods can be used to compare the efficiency of different types of enterprises, e.g. SOEs and non-state enterprises, at a given point in time. In addition, the adjustment efficiency or the effect of a certain reform on technical efficiency within the production units concerned can be observed by tracing the degree of efficiency over time (Raiser 1997: 144-146; Villalonga 2000).

Different from the modern methods, the classical methods do not estimate an efficient frontier and measure the efficiency of production units or countries by their distance to this frontier. Instead, these methods draw conclusions concerning the efficiency of different production units or countries by directly comparing their productivity (Wu 1993). This method can only measure the relative difference in efficiency but does not give any information about absolute efficiency. The major advantage of this indirect method is that the data requirements for its application are lower. Especially when trying to analyse the long-term dynamic efficiency of different enterprises or branches, the data to estimate the efficient frontier is often not available. Therefore, many studies in this field analyse the development of productivity over time (Atkinson and Primont 2002). Similar data problems usually occur in the analysis of transition countries when trying to study the development of efficiency in the course of reforms. Consequently, classical methods of efficiency measurement are frequently used in this field of transition economics.

A number of authors have used modern methods to study the efficiency of SOEs and non-state enterprises, especially of TVEs, in transitional China (Wu 1993). They concentrate on static efficiency, and therein particularly technical efficiency.[7] TVEs were

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7 The methods proposed for this purpose cannot differentiate between technical and x-inefficiencies. Their measure for technical inefficiency covers not only technical inefficiencies but also the degree of x-inefficiency by which the analysed unit exceeds the best one within the sample with respect to the latter type of inefficiency.

found to be more efficient than other publicly owned enterprises (Murikami et al. 1994; Liu and Liu 1996; Murakami et al. 1996; Bai et al. 1997; Hu et. al. 1997; Zheng et al. 1998). Next to these studies, numerous authors have applied the classical method of comparing productivity to analyse efficiency in different types of enterprises in transitional China. Jefferson (1989) reached the conclusion that SOEs were on average more productive than urban collective enterprises, the data analysed by Zheng et al. (1998) suggested the exact opposite. The empirical evidence on the performance of private enterprises is comparatively sparse. Sverjnar (1990) found no significant difference between the productivity of TVEs and private enterprises, while Dong and Putterman (1997) reach the conclusion that TVEs to be more productive than private firms. In sum, non-state enterprises can be expected to be more productive and efficient than SOEs.

These studies are, however, inadequate for measuring the full efficiency-enhancing effect of private and collective enterprises. In order to illustrate this, consider a region where non-state enterprises are active. Following the course of argumentation in section 2, these enterprises first increase the efficiency of the overall region because they are on average more efficient than SOEs (primary effect). Second, they produce positive externalities which increase the efficiency of SOEs and thereby further raise efficiency within the region (secondary effect). If the primary effects prove empirically relevant, efficiency and productivity of non-state enterprises will exceed that of SOEs. This effect has been captured in the empirical studies mentioned above. If, however, secondary effects are relevant as well, then they will increase the efficiency and productivity of SOEs and thus reduce the difference to the non-state enterprises. Instead of assigning this impact to its true cause, i.e. the private and collective enterprises, the studies above wrongly assigned it to the SOEs. Thus, a mere comparison of efficiency or productivity of SOES and non-state enterprises is inadequate to capture the full importance of non-state enterprises with primary and secondary effects in an empirical analysis. A different approach has to be taken.

This paper compares the average productivity of provinces with different activity levels of non-state enterprises. The analysis is based on the assumption that the primary as well as secondary effects of non-state enterprises are concentrated in the region where these enterprises are active. Consequently, it can be expected that the stronger the efficiency-enhancing effects are, the higher the average productivity within the affected province. This in turn leads to the hypothesis that the average productivity within a region should be higher, the more active non-state enterprises are within this region.

This hypothesis will be tested by analysing labor productivity in 28 out of 30 Chinese provinces between 1993 and 1998. Tibet and Qinghai are omitted because the relevant data for these provinces is incomplete. The average labor productivity in province i in period t is measured by the real net value added per employee (NVA_{it}/L_{it})[8]. In order to capture differences in the capital intensity of production, depreciations per employee (D_{it}) serves as the first explanatory variable. As the Chinese Statistical Bureau calculates depreciations assuming a constant depreciation rate, D_{it} is an ideal proxy for this purpose. A positive relationship between average labor productivity and depreciations per employee can be expected. The share of employees who work in private enterprises (LPE_{it}) and in TVEs ($LTVE_{it}$) are used as proxies for the activity level of the corresponding type of enterprises within one region. As the capital-intensive production in China is concentrated in urban areas, the share of employees in urban collective enterprises is highly correlated with the depreciations per employee. In order to avoid the danger of false conclusions due to multicollinearity, the employment share of urban collective enterprises is not included in the data-set.[9] Instead, the share of labor force employed in all collective enterprises (LCE_{it}) serves as an explanatory variables. Just like LPE_{it} and $LTVE_{it}$, it is expected to have a positive influence on average labor productivity. The opposite effect can be expected for the share of employees in SOEs ($LSOE_{it}$).

In a first step, OLS methods are applied to estimate the parameters of a homogenous production function in a certain period t:

$$\ln\frac{NVA_{it}}{L_{it}} \quad ? \quad ? \; ? \; ? \quad \ln D_{it} \; ? \; ?_1 \ln LPE_{it} \; ? \; ?_2 \ln LTVE_{it} \; ? \; ?_3 \ln LCE_{it} \; ? \; ?_4 \ln LSOE_{it} \; ? \quad e_{it} \qquad (1)$$

8 The real values are calculated using the overall retail price index.

9 Both direct coefficients of correlation and variance inflation factors exceeded the critical values stated by Judge et al. (1988: 868-869). For the same reason, he share of employees in joint ventures (LJV_{it}) is excluded from the data set. In transition countries, joint ventures produce substantial spillovers in production and management techniques (Zukowska-Gagelmann 2001). Therefore their employment share is expected to exert a positive influence on labor productivity.

The results are presented in table 1. The overall explanatory value is high in all years. While D_{it} turns out to exert a highly significant and positive influence on labor productivity in all regression approaches and years, the different labor shares perform much less impressively. LPE_{it} produces positive estimators in virtually all set-ups and years. For 1994 and 1995, these are significant for the majority of set-ups. $LTVE_{it}$ and LCE_{it} produce significantly positive coefficients only for 1997. On the other hand, negative and partly significant estimators are observed for 1994. The coefficient estimators for $LSOE_{it}$ are negative in the vast majority of cases though scarcely significant. Finally, the intercept term decreases over time in the majority of set-ups.

The extremely high values of the Lagrange multiplier statistic used to test the suitability of the isolated yearly estimations (Judge et al. 1988: 456) indicate that a high degree of contemporaneous correlation exists in this data set. Therefore better results can be obtained by estimating the set of six yearly equations simultaneously instead of separately year by year. The pooling of time-series and cross-sectional data helps to reveal the relationship between the explanatory variables and the dependent variable more clearly because it substantially increases the degrees of freedom. At the same time, it makes it possible to answer the question whether the frequently observed decline in the intercept term is significant (Srivastava and Giles 1997). The following seemingly-unrelated-regression-equations (SURE) approach is chosen (Judge et al. 1988: 468-479):

$$\ln \frac{NVA_{it}}{L_{it}} \quad ? \quad ?^{s} \; ? \; ?^{s} \ln D_{it} \; ? \; ?^{s}_{1} \ln LPE_{it} \; ? \; ?^{s}_{2} \ln LTVE_{it} \; ? \; ?^{s}_{3} \ln LCE_{it} \; ? \; ?^{s}_{4} \ln LSOE_{it} \; ? \sum_{j?1}^{6} ?_{t} \, ?_{jt} \; ? \; e_{it} \tag{2}$$

where:

$$?_{jt} ? 1 \quad if \quad j ? 1 ? \quad j ? i$$
$$?_{jt} ? 0 \quad if \quad j ? 1 ? \quad j ? i$$

The results of OLS estimations of this approach are presented in table 2. The overall explanatory value remains very high. Again, the depreciations per employee performs impressively in all set-ups. In addition, the significantly positive influence of LPE_{it} indi-

cated in table 1 is confirmed for all set-ups. The estimates for $LSOE_{it}$ are significantly negative in three of four cases. LCE_{it} and $LTVE_{it}$ produce significantly positive estimators in two of three cases but fail to do so in the set-up where both LPE_{it} and $LSOE_{it}$ are included in the set of explanatory variables. The F-statistics for the $?_t$ coefficients turn out to be highly significant. In all set-ups, $?_{1998}$ is significantly negative and $?_{1996}$ and $?_{1997}$ produce significantly negative estimators in some cases.

4 Discussion

The results of the above regression approach can be interpreted in a cross-sectional as well as a longitudinal perspective. In the cross-sectional perspective, it gives evidence on the influence of a province's share of employees in private as well as collective enterprises on its average labor productivity. Having controlled for differences in capital intensity of production, the degree to which the economy is agriculturally dominated and the share of SOEs and joint ventures, the results presented in the previous section show quite clearly that the larger the share of employees in private enterprises is within a province the higher is its average labor productivity. This result supports the hypothesis put forward in section 2 according to which private enterprises increase overall efficiency. A similar conclusion can be drawn for TVEs, even though the empirical support is less clear. Due to the fact that TVEs account for largest share of LCE_{it}, the performance of the latter allows no conclusion concerning the efficiency-enhancing effects of urban collective enterprises.

In an longitudinal perspective, the regression approach above points at three major determinants of the development in labor productivity in China between 1993 and 1998. First of all, the capital stock per employee has doubled in the same period (see table 3). A second determinant is the shift in employment structure away from SOEs and in particular towards private enterprises. The third determinant is the decrease in the intercept term ($?^s + ?_t$). Contrary to the first two determinants, the latter has a negative effect on labor productivity over time.

In combination, all three determinants have led to an increase in labor productivity of 56.3 % between 1993 and 1998. In order to isolate the effects of each determinant on the average labor productivity in transitional China, a number of hypothetical scenarios have to be simulated. In these simulations, one or two of the above named determinants are kept constant at the values of 1993 while the others take on the real values

for each year. The simulations use the functional form of equation (1) and calculate the simulated labor productivity by using the average values of the explanatory variables for overall China together with the coefficient estimators in the first row of table 2. Table 4 contains the real and simulated development of labor productivity for China as a whole between 1993 and 1998.

According to the simulation results, the increase in capital intensity of production would have raised average labor productivity by 77.9 %. Without capital accumulation, the estimated labor productivity is reduced by 10.8 %. The isolated productivity gains from the shift in employment structure would have increased the labor productivity by an estimated 10.4 % in the observed period of time. The strong discrepancy between the latter two figures is largely caused by the decline in the intercept term ($?^s + ?_t$), which by itself would have reduced labor productivity by –19.3 % according to the above simulations. Together with the increase in capital intensity but disregarding the declining intersect term, the shift in employment structure would have increased labor productivity by 96.4 %.

The simulations clearly indicate that capital accumulation is the predominant driving force behind labor productivity increase in China in 1993 to 1998. This result stands in one line with previous empirical studies (Yusuf 1994; Hu and Khan 1997). At the same time, it is difficult to determine to what extent the increase in productivity results from a mere increase in inputs and to what extent capital-augmented technical progress contributes to the increase in productivity. Though smaller in magnitude, the estimated impact of the shift in employment structure on labor productivity is clearly positive. As the increasing economic importance of private enterprises is the predominant feature of this shift, the results suggest that the reorganisation of economic processes which reduces governmental influence and increases private autonomy is an important source of gains in productivity and efficiency.

When interpreting the results presented above, it is important to keep in mind that the official Chinese statistical data can for a number of reasons not be compared with official statistics from Western industrialized countries. The published figures sometimes show fluctuations from one year to another which are very unlikely to reflect real-life changes. The extreme changes in $LTVE_{it}$ and $LSOE_{it}$ between 1996 and 1998 can be taken as an example for this note of caution. The author does, however, argue that these shortcomings cannot serve as a reason to doubt the basic results presented

here. Merely the magnitude of the effects, especially in the simulations carried out in this section, should be interpreted carefully.

Apart from this precaution on data quality, the results are limited by the fact that the empirical analyses in section 3 cannot depict all efficiency-enhancing effects presented in section 2. In particular, the improvements in availability and distribution of goods and services as well as the reduction in social costs of monopoly do not raise the average productivity within a province. Thus the resulting increase in structural efficiency caused by the activity of non-state enterprises is not captured in the above regression approach. In addition, the proposed increase in innovation efficiency does in most cases not raise the productivity in the current or subsequent period but affects productivity in the medium range perspective. Though the SURE-approach taken above is generally capable of measuring these effects, the period of time observed in the study is too short to allow conclusions concerning the degree of dynamic efficiency in transitional China.

5 Conclusion

China has experienced an exceptional growth in GDP since the reforms of its economic system began in 1978. In the course of this reform process, the Chinese economy massively increased the capital intensity of production. At the same time, the commercialisation of the SOEs and especially the grass-root-privatisation strategy have led to a gradual but fundamental shift in the ownership structure. The growing share of urban and rural collective enterprises contributed to this shift. In addition, the emergence of a growing number of private enterprises marks an exceptionally important feature of this process.

This paper analyses the contribution of both types of non-state enterprises to the observed increase in labor productivity during the reform process. In section 2, it is argued that these enterprises are expected to be more efficient than SOEs. This fact constitutes their primary efficiency-enhancing effect. Further and more importantly, this paper points at the secondary efficiency-enhancing effects which result from the positive externalities that non-state enterprises produce in transition economies.

Section 3 presents a simple empirical approach which tries to measure the full efficiency-enhancing effect of collective and private enterprises in transitional China. De-

spite the limited quality of the official data used, the analysis of average labor productivity in 28 Chinese provinces between 1993 and 1998 produced interesting results. It shows quite clearly that the fast capital accumulation represents the predominant driving force behind the increase in labor productivity in China. In addition, the growing importance of private enterprises was found to accelerate this development. The empirical results in this paper furthermore give strong support to the hypotheses that private enterprises as well as TVEs exert a strong positive influence on overall efficiency in transitional China.

Abstract

Private and collective enterprises are expected to increase overall efficiency in transitional China, partly because they are more efficient than state owned enterprises. More importantly, this paper argues, they induce efficiency gains in state owned enterprises and the economy as a whole. Empirical evidence from 28 Chinese provinces between 1993 and 1998 gives support to this hypothesis by showing that the activity levels of private enterprises and rural collective enterprises have a positive effect on regional labor productivity.

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Table 1: Yearly OLS estimates for 1993 to 1998

year	?	?	$?_1$	$?_2$	$?_3$	$?_4$	$\overline{R^2}$	Lagrange multiplier statistic
1993	3.9729***	0.7863***	0.1946		0.0308	0.0679	0.838	
	(2.9192)	(5.3630)	(1.2919)		(0.2054)	(0.5601)		
1994	3.2532***	0.8688***	0.3426**		-0.1817	-0.0667	0.893	
	(3.6766)	(8.7125)	(2.6406)		(1.5888)	(0.6921)		
1995	2.7637***	0.8820***	0.2269**		-0.0429	-0.2068**	0.931	
	(4.2443)	(12.1778)	(2.3650)		(0.5067)	(2.5832)		
1996	3.0357***	0.8303***	0.0977		0.0980	-0.1623*	0.902	210.0***
	(3.9060)	(9.7394)	(0.8394)		(0.7648)	(1.7459)		
1997	3.9954***	0.7224***	-0.0291		0.2769**	-0.0382	0.927	
	(4.6294)	(8.1120)	(0.3393)		(3.0089)	(0.4380)		
1998	2.5229***	0.8679***	0.0084		0.1045	-0.1292	0.918	
	(3.0014)	(10.4440)	(0.0842)		(0.9932)	(1.3307)		
1993	3.9938***	0.7859***	0.1922	0.0317		0.0770	0.838	
	(2.8210)	(5.3199)	(1.2515)	(0.2050)		(0.5436)		
1994	3.1796***	0.8689***	0.3719**	-0.1919*		-0.1163	0.896	
	(3.6320)	(9.0574)	(2.7890)	(1.7916)		(1.1040)		
1995	2.7706***	0.8788***	0.2285**	-0.0389		-0.2151**	0.931	
	(4.3012)	(12.6216)	(2.3583)	(0.5201)		(2.4929)		
1996	2.9186***	0.8476***	0.1214	0.0508		-0.1634	0.901	205.5***
	(3.7968)	(10.4032)	(1.0445)	(0.4457)		(1.6333)		
1997	4.0914***	0.7313***	-0.0028	0.2294**		0.0239	0.926	
	(4.5043)	(8.1907)	(0.0330)	(2.8845)		(0.2368)		
1998	2.4458***	0.8783***	0.0141	0.0806		-0.1252	0.918	
	(2.9534)	(10.8973)	(0.1407)	(0.8738)		(1.2412)		
1993	3.3793***	0.8512***	0.1979	-0.0174			0.843	
	(4.0242)	(10.0623)	(1.3111)	(0.1402)				
1994	3.9042***	0.7876***	0.3340**	-0.1316			0.895	
	(6.7087)	(12.7522)	(2.5804)	(1.4219)				
1995	3.9630***	0.7506***	0.1615	0.0512			0.917	
	(8.3253)	(14.4963)	(1.5723)	(0.7084)				
1996	3.8251***	0.7537***	0.0661	0.1340			0.894	217.0***
	(6.9543)	(12.6200)	(0.5747)	(1.2717)				
1997	3.9161***	0.7480***	-0.0002	0.2174***			0.928	
	(7.5853)	(13.9564)	(0.0028)	(3.6204)				
1998	3.2314***	0.8065***	-0.0010	0.1280			0.916	
	(5.9846)	(14.2097)	(0.0010)	(1.5073)				

* significant with ? = 0.1.
** significant with ? = 0.05.
*** significant with ? = 0.01.

Table 1: Yearly OLS estimates for 1993 to 1998 (cont.)

year	$?_?$	$?_?$	$?_1$	$?_2$	$?_3$	$?_4$	$\overline{R^2}$	Lagrange multiplier statistic
1993	3.3495**	0.8166***		0.0884		0.0892	0.834	
	(2.5103)	(5.5408)		(0.5905)		(0.6232)		
1994	2.7019**	0.8588***		-0.0080		-0.0406	0.866	
	(2.7790)	(7.9107)		(0.0841)		(0.3520)		
1995	2.4648***	0.8818***		0.0695		-0.1587*	0.918	
	(3.5809)	(11.6102)		(1.0783)		(1.7542)		213.4***
1996	2.7832***	0.8498***		0.1244		-0.1330	0.900	
	(3.6663)	(10.4136)		(1.3869)		(1.3866)		
1997	4.0984***	0.7310***		0.2288***		0.0235	0.929	
	(4.7400)	(8.4286)		(3.0241)		(0.2395)		
1998	2.4128***	0.8804***		0.0861		-0.1235	0.921	
	(3.1017)	(11.3553)		(1.0518)		(1.2593)		
1993	3.1869**	0.8272***			0.0737	0.0596	0.834	
	(2.5821)	(5.6993)			(0.4974)	(0.4859)		
1994	2.7005**	0.8595***			-0.0093	-0.0389	0.866	
	(2.8108)	(7.7176)			(0.0884)	(0.3633)		
1995	2.4730***	0.8761***			0.0779	-0.1730*	0.918	
	(3.5433)	(11.0888)			(1.0589)	(2.0122)		219.7***
1996	2.9522***	0.8259***			0.1655	-0.1465	0.904	
	(3.8539)	(9.7664)			(1.6687)	(1.6196)		
1997	4.0500***	0.7208***			0.2668***	-0.0420	0.930	
	(4.8670)	(8.2592)			(3.1232)	(0.4944)		
1998	2.5048***	0.8689***			0.1083	-0.1285	0.922	
	(3.1473)	(10.7877)			(1.1644)	(1.3569)		
1993	3.4136***	0.8480***	0.1901		0.0045		0.843	
	(3.7452)	(8.9030)	(1.2826)		(0.0321)			
1994	3.6969***	0.8188***	0.3327**		-0.1576		0.895	
	(6.1282)	(12.0469)	(2.6089)		(1.4627)			
1995	4.0050***	0.7452***	0.1827*		0.0293		0.915	
	(8.1963)	(13.5657)	(1.7399)		(0.3303)			219.6***
1996	3.9938***	0.7273***	0.0567		0.1645		0.894	
	(6.9662)	(11.3482)	(0.4773)		(1.2898)			
1997	4.2805***	0.6937***	-0.0338		0.2959***		0.930	
	(7.6841)	(11.7011)	(0.4052)		(3.7086)			
1998	3.3629***	0.7892***	-0.0035		0.1517		0.916	
	(5.9644)	(13.3041)	(0.0342)		(1.5073)			

* significant with $?$ = 0.1.
** significant with $?$ = 0.05.
*** significant with $?$ = 0.01.

Table 2: OLS estimates for pooled time-series and cross-sectional data

$?^s$	3.2383***	3.2156***	3.6982***	2.9626***	2.9896***	3.7933***
	(9.3546)	(9.2331)	(15.4314)	(8.7888)	(8.9547)	(15.2511)
$?_{1994}$	-0.0198	-0.0221	-0.0118	0.0075	0.0093	-0.0107
	(0.4329)	(0.4850)	(0.2594)	(0.1682)	(0.2078)	(0.2313)
$?_{1995}$	-0.0717	-0.0762	-0.0567	-0.0278	-0.0237	-0.0523
	(1.4606)	(1.5620)	(1.1785)	(0.6162)	(0.5242)	(1.0676)
$?_{1996}$	-0.1012**	-0.1078**	-0.0834*	-0.0556	-0.0479	-0.0741
	(1.9919)	(2.1530)	(1.7096)	(1.2134)	(1.0412)	(1.4810)
$?_{1997}$	-0.1331**	-0.1405**	-0.0864	-0.0585	-0.0539	-0.0810
	(2.1203)	(2.2381)	(1.5329)	(1.0917)	(1.0074)	(1.3686)
$?_{1998}$	-0.2139***	-0.2266***	-0.1637***	-0.1439***	-0.1289**	-0.1433**
	(3.2490)	(3.5712)	(3.0021)	(2.6553)	(2.3198)	(2.4365)
$?^s$	0.8280***	0.8344***	0.7821***	0.8413***	0.8323***	0.7663***
	(21.8627)	(22.6311)	(31.6716)	(22.5517)	(21.7032)	(28.6447)
$?^s_1$	0.1047**	0.1086**	0.0919**			0.0933**
	(2.3298)	(2.4118)	(2.0630)			(2.0613)
$?^s_2$		0.0491	0.0866**	0.0943***		
		(1.2408)	(2.5018)	(2.6629)		
$?^s_3$	0.0633				0.1118***	0.0962**
	(1.4329)				(2.8323)	(2.2778)
$?^s_4$	-0.0886**	-0.0807*		-0.0605	-0.0785**	
	(2.2741)	(1.8960)		(1.4288)	(1.9982)	
$\overline{R^2}$	0.907	0.906	0.905	0.904	0.904	0.904
F-stat. for $?_t$	30.51***	30.85***	28.85***	31.13***	30.82***	28.26***

* significant with $?$ = 0.1.
** significant with $?$ = 0.05.
*** significant with $?$ = 0.01.

Table 3: Depreciations per capita and employment structure 1993–1998 (average values for all 28 provinces)

Year t	D_t (YUAN/ capita)	LPE_t [%]	$LTVE_t$ [%]	LCE_t [%]	$LSOE_t$ [%]
1993	663	5.48	20.59	26.15	18.11
1994	727	7.20	19.64	25.00	18.22
1995	824	8.91	20.71	25.72	18.03
1996	953	9.86	21.60	26.41	17.87
1997	1112	10.68	14.45	18.98	17.87
1998	1328	12.56	20.18	23.33	14.50

Table 4: Simulated scenarios of China's labor productivity development 1993 - 1998

	Real values	(1)	(2)	(3)	(4)	(5)	(6)	(7)
intercept term		V*	V	V	C	V	C	C
Employment structure		V	V	C	V	C	V	C
Depreciation per capita		V	C†	V	V	C	C	V
1993	4239	4361	4361	4361	4361	4361	4361	4361
1994	4534	4733	4384	4616	4827	4276	4472	4708
1995	4980	5112	4268	4861	5492	4059	4586	5223
1996	5532	5671	4198	5324	6275	3941	4645	5891
1997	5969	6183	4027	5862	7064	3818	4601	6696
1998	6623	6917	3889	6264	8566	3521	4816	7758
				1993 = 100				
1993	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1994	107.0	108.5	100.5	105.8	110.7	98.04	102.5	107.9
1995	117.5	117.2	97.87	111.5	125.9	93.08	105.1	119.8
1996	130.5	130.0	96.26	122.1	143.9	90.37	106.5	135.1
1997	140.8	141.8	92.34	134.4	162.0	87.54	105.5	153.5
1998	156.3	158.6	89.16	143.6	196.4	80.75	110.4	177.9

* variable.

† constant at the value of 1993.

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