tations in the
"Papers and

Quarterly Iranian Economic Research \ Spring 2003 \ Volume 14

Sources of Economic Efficiency for China's Township and Village Enterprises

Ali Shirvani-Mahdavi*

Abstract

There is a tension between energy efficiency of the State Owned Enterprise (SOE) sector versus the economic efficiency of the Township and Village Enterprise (TVE) Sector in China. Research has shown that the cokemaking sector in Shanxi Province exhibits contradictory features of having greater overall factor productivity than the SOE cokemaking sector, while at the same time being less energy efficient. In my current research I have shown that this is not a unique feature of the TVE cokemaking sector in Shanxi Province, but that the same paradoxical behavior is exhibited by an overwhelming majority of industrial and service sectors, in addition to the agricultural sector, in Shanxi Province and China as a whole.

Virtually, all productivity studies of state-owned and township and village enterprises in China during the 1980s and 1990s concluded that the growth of productivity in the TVE sector has outpaced that of the NTVE sector. In this paper, I show some of the reasons behind the economic efficiency of the TVE sector as compared to the NTVE sector, despite the fact that my analysis also shows that they are less energy efficient. Using Structural Decomposition Analysis, I show that 28 out of 29 TVE sectors in China are less energy efficient than their NTVE counterparts. This, despite the fact that TVEs in China have enjoyed far better economic performance than NTVEs, particularly SOEs, with among other things total factor productivity being three times as great as that of NTVEs. In order to reconcile this paradox, I examine the direct and indirect labor inputs between the TVE and NTVE sectors in China. It is apparent from the analysis that TVEs direct and indirect labor inputs are much lower than that of NTVEs, which offsets the differences in direct and indirect energy inputs. In order to explain the above differences in economic, energy and labor productivity between TVEs and NTVEs, I have extended previous studies on institutional theories of property and ownership, showing the contribution of many institutional factors to TVEs economic performance. Among the most important of these factors are financing of

* Ph.D. Candidate, Department of Urban Studies and Planning, Massachusetts Institute of Technology (MIT)

investment, security of property rights, transaction costs, urban proximity, collective heritage, government revenue, non-farm employment, and per capita income.

In this paper, I examine the paradox in the energy and economic efficiencies between China's Township and Village Enterprise (TVEs) and Non-TVE (NTVEs), the majority of which are State Owned Enterprises (SOEs). Many analysts (e.g. Jefferson 1999, Steinfeld 1998, Lardy 1997, Liew 1997, Fewsmith 1994) have tried to explain the superior economic efficiency of TVEs and their rapid growth since the beginning of the reform process in 1979. These analysts laud the TVEs economic efficiency as an example of how the privatization process in China is making the entire economy more efficient; however, they overlook two important facts. First, TVEs are not mainly privately owned firms, and, second, even those that are, do not have the basic features of traditional private enterprises.

At the same time, the success of TVEs has been used to criticize the supposedly bloated SOE sector, which constitutes the majority of industries in the NTVE sector and its inefficient and unproductive industries. Although SOEs may be economically inefficient, most analysts neglect to note that SOEs engage in many social functions other than profit maximization and improving productivity. The purpose here is to add another element into the debate between the SOE and TVE sectors, namely, although most TVEs are more economically efficient, SOEs are more energy efficient. I show that the primary reason behind this paradox is the fact that ambiguous property rights in the TVE sector allow these industries to establish informal relationships that often result in lower input and labor costs than in the NTVE sector.

This paper is divided into three parts. In the first part, I give an overview of the differences between TVEs and NTVEs. In the second part, I examine the underlying energy and economic efficiency differences between TVEs and NTVEs by structural-decomposition analysis. Finally, based on the results of the first two parts of this research, I give a theoretical basis for the observed paradox, focusing on the issues of property relations in the TVE sector.

Keywords: Economic Efficiency, China's Township, Village Enterprises.

A Comparison of China's TVE and SOE Sectors

The State Statistical Bureau (SSB) in China divides Chinese enterprises into four broad ownership categories: (1) State Owned Enterprises (SOEs); (2) Collective-owned enterprises, which include Township and Village Enterprises (TVEs), urban collectives and cooperatives; (3) Individual owned enterprises which are private firms that employ no more than seven workers, and (4) "other" ownership arrangements, which include domestic joint ventures, privately owned enterprises, overseas-funded wholly owned firms, foreign funded cooperatives, overseas-funded cooperatives, and share-holding enterprises (Jefferson and Rawski 1999; Steinfeld 1998). In general, TVEs are all those non-rural, non-state enterprises that are subordinate to township or village governments and are owned and operated collectively. They represent an intermediate property form that has been shaped by the changing market environment in China as the result of the reform process dating back to 1978 (Luo 1999).

The TVE sector has experienced a tremendous growth, both in real terms, and in terms of their portion of total economic output. In 1980, there were 1.4 million TVEs with 30 million employees; by 1996 there were 23.4 million TVEs with135 million workers (China Statistical Yearbook (CSY) 1997). In addition, TVEs real total output increased by an average rate of 21 percent per year from 1978 to 1995, and by 1999, industrial value added of TVEs accounted for 44 percent of value added in China, and TVEs output accounted for 20 percent of China's exports (CSY 1997; Yang and Chen 1999).

There are a number of differences between the TVE and SOE sectors. First, TVEs face harder budget constraints than SOEs (Steinfeld 1998; Perotti, Sun and Xu 1999). Unlike SOEs, TVEs did not receive any easy "policy loans" from the central banking system, because all TVEs are historically institutionalized as part of the traditional rural sector, whereas the banking system is part of the modern urban system (Steinfeld 1998). As a consequence, state banks have typically followed the commercial principles in making loans to TVEs. Often, they ask Township and Village Governments (TVGs), which oversee TVEs, to act as guarantors of investment loans (Perotti, Sun and Xu 1999). In addition, TVGs cannot protect their TVEs by erecting trade barriers to keep out competition, because the market within a community is both too small and too limited (Perotti, Sun and Xu 1999).

The second difference between TVEs and SOEs is that historically, SOEs have had many functions other than production and profit seeking. Among

them are political support of the government, expansion of employment, and provision of various social services and securities, such as housing, education, health insurance, and pensions (Perotti, Sun, and Xu 1999). As such, this economic burden of providing a large set of public goods to its community members has severely lessened the profitability of SOEs. In fact, according to Xiao (1991), 40 percent of the difference in profitability between SOEs and TVEs can be attributed to social provisions of the kind described above. In addition to the direct contribution, SOEs provide de facto unemployment insurance payments to theirs redundant employees, also referred to as on-the-job unemployment. Bell (1993) estimates that about 20 percent of employees in the SOE sector are redundant.

Finally, the third difference between the two sectors is the process of investment decision making in the SOE sector. According to Sun (1998, p. 8), "the process of investment decision making in the State sector is a distribution process of rights to possess and use certain scarce State assets, including budget funds, bank loans, land, quotas of power, oil, and other key materials." As such, the first intention of SOEs is to obtain and occupy as much investment and property from the distributive negotiation process as possible, so that they can reap future benefits and justify their power base (Sun 1998). The consequence then is that when trying to establish new investment projects, the decision-makers do not care much about whether or not the project would be profitable in the future, although that is changing dramatically as the reform process moves forward. However, for a long time, this form of investment-expansion drive, combine with the persistent soft-budget constraint, led to inefficient investment projects (Zou and Sun 1996).

However, there is a fourth important difference between TVE and NTVE sectors. Despite their overall superior economic efficiency, TVEs, in general, happen to be less energy efficient than those of the NTVE sector, the majority of which happen to be SOEs. Our team first came across the above paradox between the TVE and NTVE sectors from out study of the coke industry in Shanxi Province. The two-part survey of TVE and SOE coke plants in Shanxi Province was conducted as part of a large-scale study of the relationship between technology, energy, environment and health in the coke industry in Shanxi Province. Below is a summary of the results of our findings regarding economic and energy efficiency issues among the SOE and TVE cokemaking plants in Shanxi Province.

In analyzing the result of our surveys, we found out that, on average, majority of the TVE cokemaking plants (67%) consume 1.39 metric tons or *more* of coal to produce one metric ton of coke. In contrast, almost 70

percent of SOEs consume 1.4 metric tons of coal or *less* to produce one ton of coke. At the same time, the results of our survey showed that a much larger proportion of TVEs enjoyed any level of profitability during the five years prior to our surveys than did the SOEs in our survey. The purpose of this paper is to use structural decomposition analysis to answer two questions. First, would the same characteristics hold true for other TVE and NTVE sectors in Shanxi Province and China? Second, would differences in direct and indirect labor and other-material inputs partially offset the extra direct and indirect energy inputs that would then result in the superior economic efficiency of TVEs? In the next section, I conduct the SDA for Shanxi Province, and in the following section, I expand the analysis to China as a whole.

Direct and Indirect Input Levels Between TVES and NTVES, Shanxi Province, 1995

There are two points to keep in mind when evaluating the following results. First, I chose the 29 sectors directly from the input-output models that were constructed for Shanxi Province and China. Second, and very important for our discussion, is that all the values in the input-output tables that I used for this study are in monetary units. This is significant because it introduces the differences in input prices and labor costs between TVEs and NTVEs, which I will discuss in detail later. Figures 1, 2, 3, and 4 show the results of SDA for Shanxi Province. Figure 1 shows the difference in direct and indirect energy inputs, while Figure 2 shows the direct and indirect labor inputs, and Figure 3 shows the comparison between the percentage of total output, total energy consumed, and total labor inputs between TVEs and NTVEs in Shanxi Province for 1995. Finally Figure 4 shows the direct and indirect input of all other material inputs between TVEs and NTVEs in Shanxi Province.

There are two observations that can be made from Figure 1. First, the monetary value of energy inputs is lower for NTVEs than for TVEs in 28 out of 29 sectors in Shanxi Province, the only exception being the crude petroleum and natural gas sector. The primary reason for this aberration is the fact that TVEs do not produce any crude petroleum and natural gas in Shanxi Province, and the 1.00 RMB input per Renminbi (RMB) of final demand is the mathematical recognition through the identity matrix that one

unit of output must go into meeting the final users in the economy[1]. However for the remaining 28 sectors, directly and indirectly, TVEs, in general, spend between 33 and 50 percent more on energy to generate one RMB of output than non-TVEs. This is a significant difference in energy-input levels between the two sectors, and as such should have a profound effect on the economic performance of the two sectors. Second, there is a significant difference in the level of direct and indirect energy inputs in the 5 energy industries and the 24 non-energy industries, regardless of whether they were consumed by TVEs or NTVEs. This result is similar to those from previous studies (Shirvani-Mahdavi 1999) that show that intra-industry input levels are generally higher than other industry input levels. The results of this analysis show that the same holds true regardless of the sector under examination.

The next question is whether TVEs enjoy an advantage over NTVEs in terms of labor input that makes up for the increased levels of energy input. Figure 3 shows the comparison of direct and indirect labor input, in monetary terms, between TVEs and NTVEs. In this instance, there are no clear patterns that stand out between the two sectors. In the five energy sectors, TVEs tend to have somewhat higher levels of labor input than NTVEs, with the exception of the crude petroleum and natural gas sector, which I have already discussed. Among the remaining sectors, it seems that TVEs have higher labor input levels than NTVEs in the heavy industrial sectors (mining, chemical industries and manufacturing sectors), while NTVEs have greater labor input costs in the commerce, construction and communication sectors. Overall, however, it seems that there is not a significant difference or pattern to the direct and indirect labor input levels between the two sectors.

My final analysis of the direct and indirect input levels is the monetary amount of other-material inputs that goes into producing one RMB of final demand. Figure 3 shows the results of this analysis for Shanxi Province. This chart mirrors the results of Figure 1, showing the same discrepancy in the levels of direct and indirect inputs between TVEs and NTVEs across the sectors, the one exception being the crude petroleum and natural gas sector. Similar to direct and indirect energy inputs, TVEs, on average, consume 15% additional monetary other-material inputs than NTVEs, which range from 40 percent for electricity production to 5 percent for freight transport and communications. Finally, Figure 4 shows the combined results of

---

1. This identity matrix is shown best mathematically by use of the Taylor series: $(I + A + A^2 + A^3 + \ldots + A^n) * Y \cong (I - A)^{-1} * Y$

economy[1]. TVEs, in nerate one in energy- profound there is a uts in the 5 of whether ar to those ra-industry The results ector under

NTVEs in ergy input. input, in here are no five energy input than gas sector, seems that y industrial ors), while ruction and re is not a input levels

e monetary MB of final xi Province. crepancy in Es across the l gas sector. ge, consume which range ght transport d results of

or series: (1 +

Figure- 1. Direct and Indirect Energy Input, TVEs and NTVEs, Shanxi Province, 1995
(Direct and Indirect Input per RMB of Final Demand)

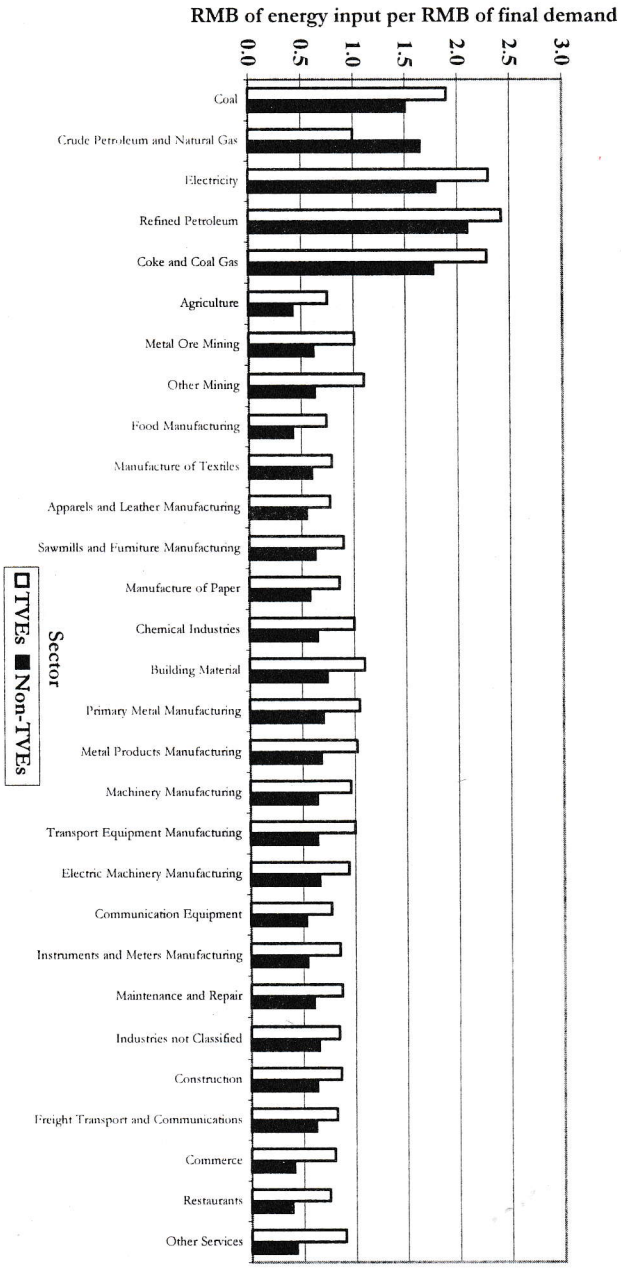


Figure- 2. Direct and Indirect Labor Input, TVEs and NTVEs, Shanxi Province, 1995
(Direct and Indirect Input per RMB of Final Demand)

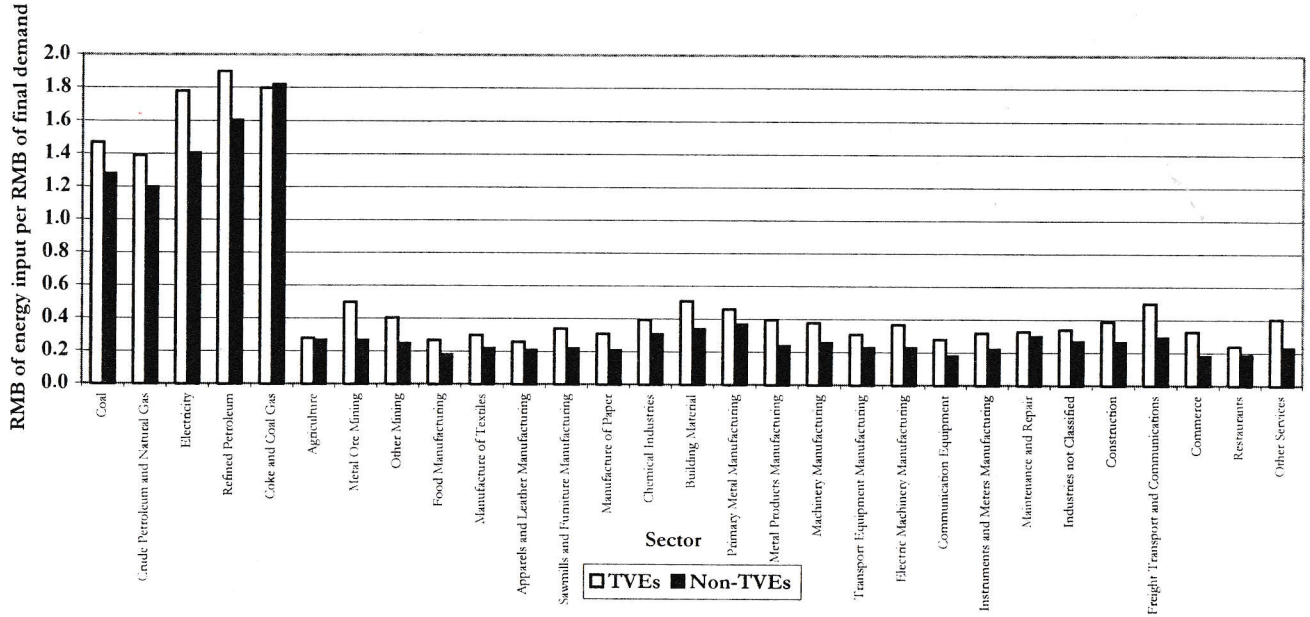


Figure- 3. Direct and Indirect Input of Other Material, TVEs and NTVEs, Shanxi Province, 1995
(Direct and Indirect Input per RMB of Final Demand)

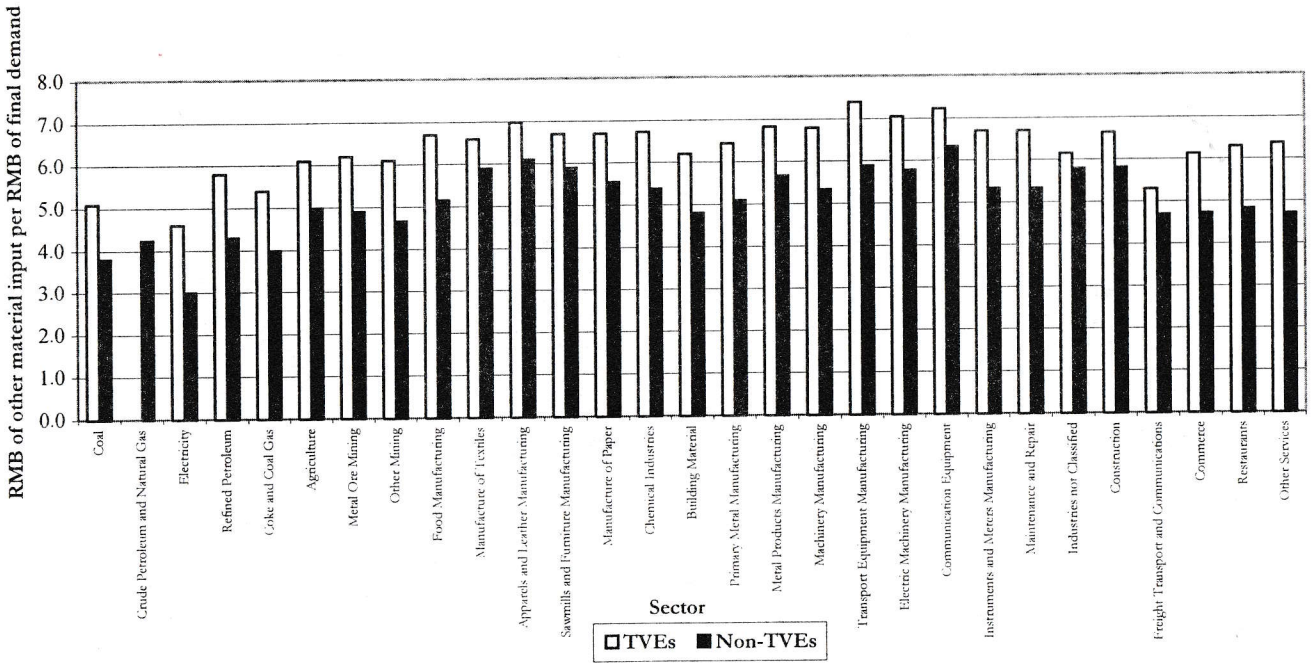
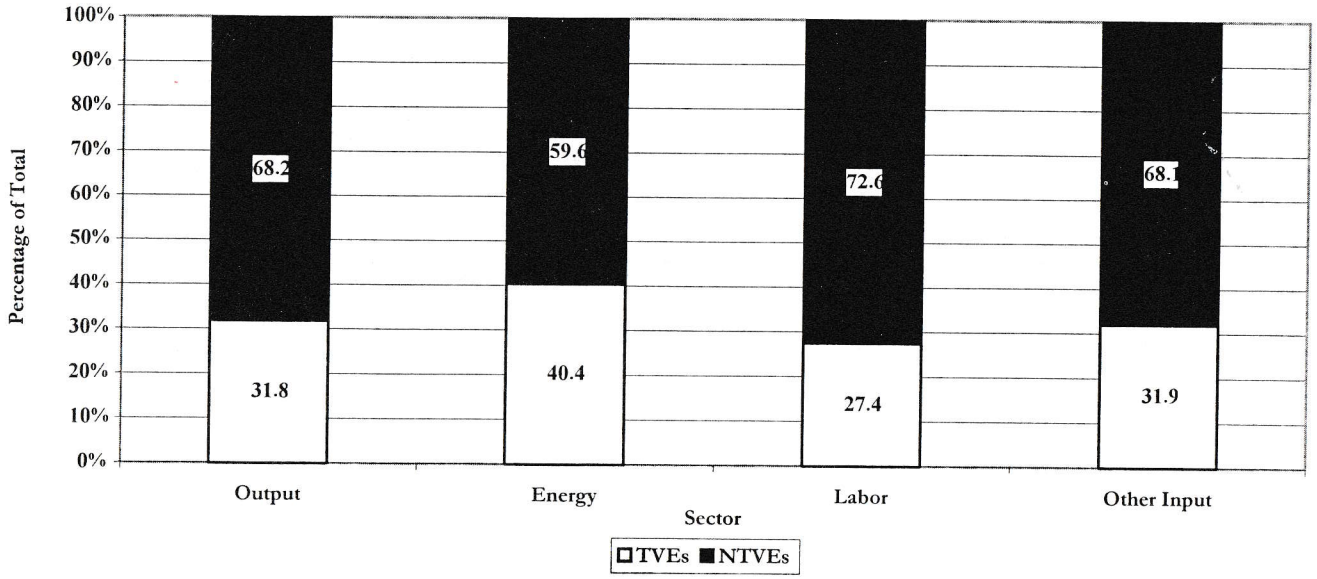


Figure- 2. Direct and Indirect Labor Input, TVEs and NTVEs, Shanxi Province, 1995
(Direct and Indirect Input per RMB of Final Demand)

Figure- 4. Percentage of Total Output, Energy Consumption, Labor Consumption, And Other Inputs, TVEs and NTVEs, Shanxi Province, 1995



Figures 1, 2 and 3, for all 29 sectors of TVEs and NTVEs. This is a simpler representation of the differences in the levels of output, energy consumption, labor compensation and other material input than the previous three, because it represents only the direct proportion of total inputs in each case, rather than the direct and indirect inputs of Figures 1 and 2. Despite the change in the level of analysis, the same trends holds true for energy consumption and labor compensation. In 1995, TVEs produced almost 31 percent of total out in monetary terms, but consumed over 40 percent of the energy, and spent only 27 percent on labor compensation, slightly less than the proportion of total output.

Direct and Indirect Input Levels between TVES and NTVES, China, 1995

In the last section, I showed that almost all TVE sectors in Shanxi Province exhibited the same pattern of lower energy efficiency in 1995 than we observed in the TVE cokemaking sector. In this section, I will make the same comparisons for the TVE and NTVE sectors for China as a whole. Figure 5 shows the results of the energy structural decomposition analysis between TVEs and NTVEs for China in 1995. There are a number of similarities between Figure 5 and Figure 1. First, just as is the case in Shanxi Province, the direct and indirect monetary energy inputs are greater for TVEs than for NTVEs, in 28 out of 29 sectors, including for that of crude petroleum and natural gas. The only aberration is the coke and coal-gas sector, for which the NTVEs have slightly greater energy-input levels than TVEs. In addition, similar to Shanxi Province, the largest direct and indirect inputs come from the sector itself, and this is the case with all five energy sectors. This is just as true for TVEs as it is for NTVEs. Furthermore, similar to Shanxi Province, the sectors, where the difference in energy inputs is the greatest, are the heavy industry and manufacturing sectors, such as mining and manufacturing sectors. There is however a profound difference between Shanxi Province and China, and that is the overall levels of direct and indirect energy inputs. In Shanxi Province the energy-input levels for TVEs range from 2.7 Renminbi (RMB) of energy input per RMB of final demand in the refined petroleum sector to 0.7 RMB of energy input for one RMB of final demand in the restaurant sector. In China, however, the range of energy input is 1.9 RMB per RMB of final demand for TVE refined petroleum sector, to 0.22 RMB of energy input per RMB of final demand for restaurants. Figure 6 shows the direct and indirect labor inputs for TVE and NTVE sectors for China in 1995. Unlike energy, there are major differences between Shanxi Province and China, in terms of labor input for TVEs and

Figure- 4. Percentage of Total Output, Energy Consumption, Labor Consumption,

NTVEs. As is apparent from this chart, direct and indirect monetary labor input is greater for the NTVE sector than for the TVE sector in for 28 out of 29 sectors, the exception being commerce, where there is a negligible difference in labor input between TVEs and NTVEs. This is a clear indication of where TVEs have the advantage over NTVEs in terms of economic efficiency. Again, I emphasize that given the monetary nature of the analysis, the results here do not indicate the productivity of the perspective labor forces, and the difference in input can be entirely due to wage levels and other benefits that NTVE employees enjoy as compared to TVE employees.

Similar to Shanxi Province, the final part of analysis entails the direct and indirect input levels of other materials for TVEs and NTVEs. Figure 7 shows the results for China in 1995. Similar to Shanxi Province, most TVE sectors have larger direct and indirect other-material inputs than NTVEs. However, unlike Shanxi Province, the difference is not across the board, and it is not as large. Furthermore, similar to direct and indirect energy inputs, the overall level of other-material inputs is much larger for Shanxi Province than China, ranging from 7.2 RMB of other-material input per RMB of final demand for TVE transport-equipment manufacturing to 4.3 RMB of input per RMB of final demand for TVE electricity production in Shanxi Province. In China, on the other hand, the range is from 5.2 RMB of input per RMB of final demand for the NTVE construction sector to 2.5 RMB input per RMB of final demand for TVE refined petroleum processing. It appears then, that in general, the level of direct and indirect material input is larger for all TVE and NTVE sectors in Shanxi Province than in China.

Figure 8 shows the summary table of direct input proportions for energy, labor, and other materials for China in 1995. This chart shows the same general trends as Figure 4 did for Shanxi Province, that is the TVEs' share of energy consumption is larger than their share of total output, while their share of compensation to labor is lower than their share of output. However, there are also differences. In China, NTVEs' share of labor compensation is greater than their share of total output. In fact, the 14% difference is very significant, and it plays a major role in the economic inefficiency of the NTVE sector in China. Second, in China, TVEs extra consumption of material inputs is split more evenly between energy input and other material inputs, whereas in Shanxi Province, the majority of extra input is in the form of extra energy consumption, which is primarily due to Shanxi Province's access to a large amount of cheap fuels, namely coal.

monetary labor
in for 28 out of
is a negligible
This is a clear
Es in terms of
etary nature of
uctivity of the
entirely due to
as compared to

ls the direct and
VEs. Figure 7
ince, most TVE
s than NTVEs.
s the board, and
t energy inputs,
Shanxi Province
er RMB of final
RMB of input
hanxi Province.
put per RMB of
input per RMB
ppears then, that
rger for all TVE

ions for energy,
shows the same
TVEs' share of
put, while their
utput. However,
compensation is
fference is very
fficiency of the
consumption of
d other material
ut is in the form
anxi Province's

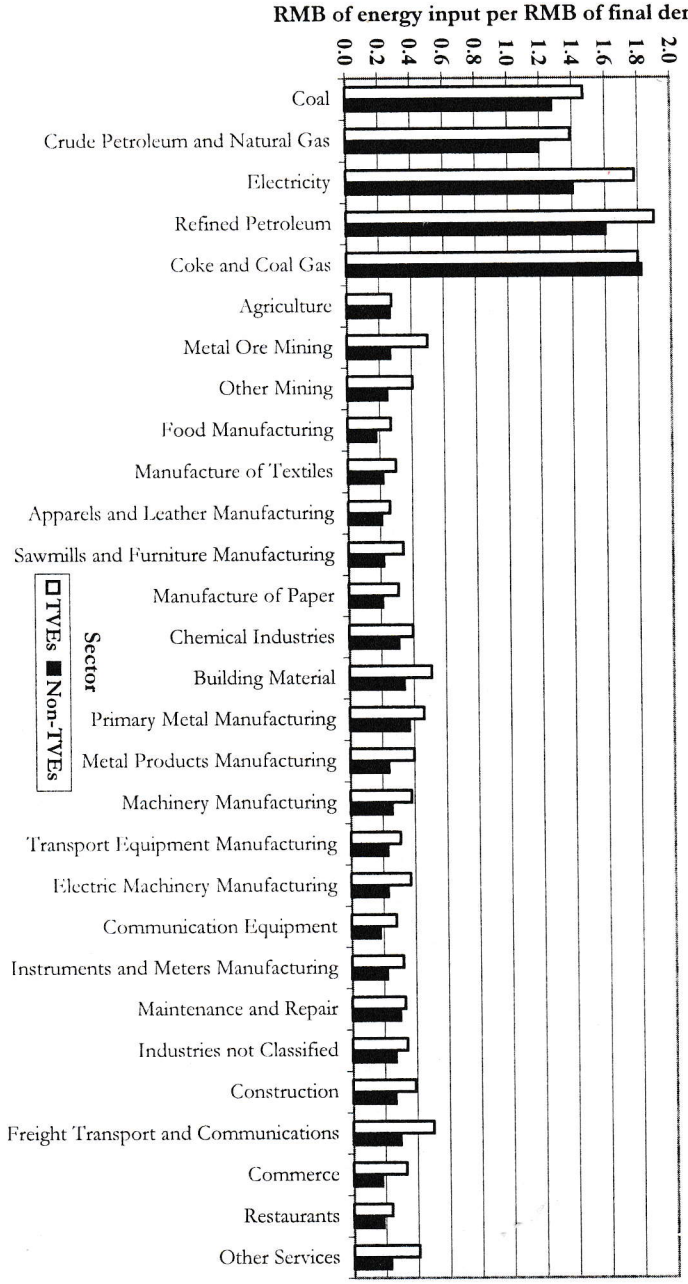


Figure- 5. Direct and Indirect Energy Input, TVEs and NTVEs, China, 1995
(Direct and Indirect Input per RMB of Final Demand)

Figure- 6. Direct and Indirect Labor Input, TVEs and NTVEs, China, 1995
(Direct and Indirect Input per RMB of Final Demand)

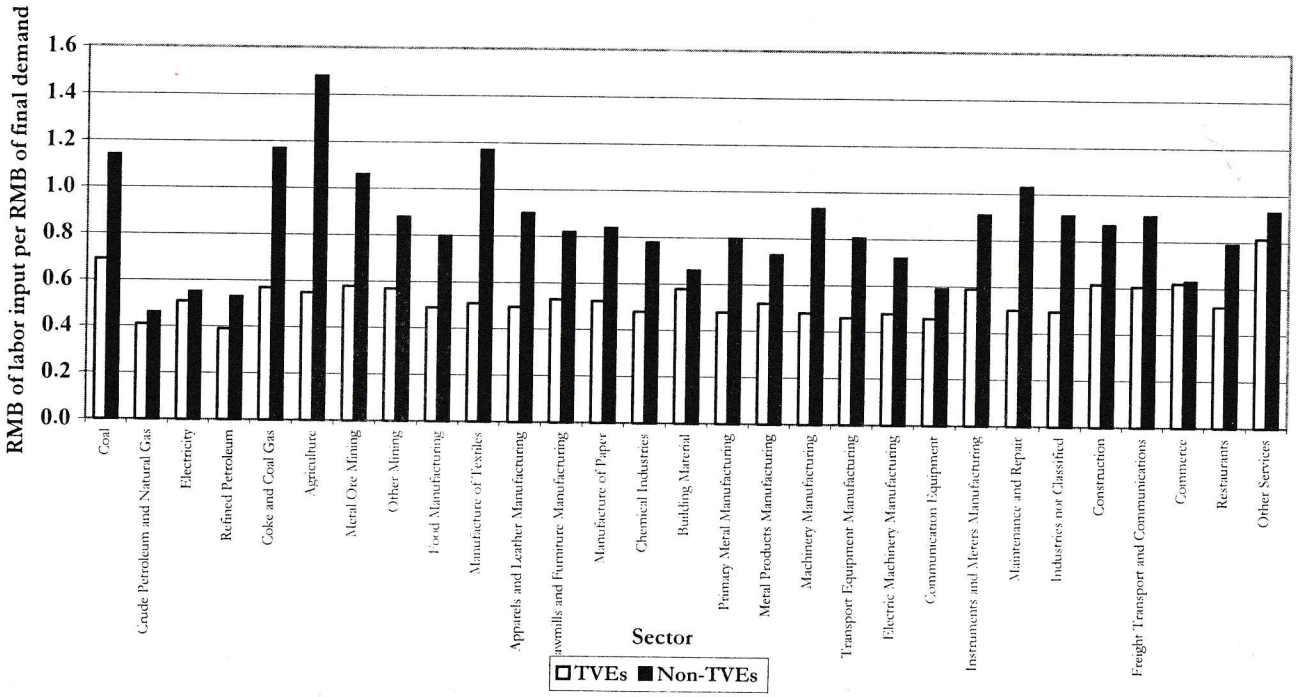


Figure- 7. Direct and Indirect Input of Other Material, TVEs and NTVEs, China, 1995
(Direct and Indirect Input per RMB of Final Demand)

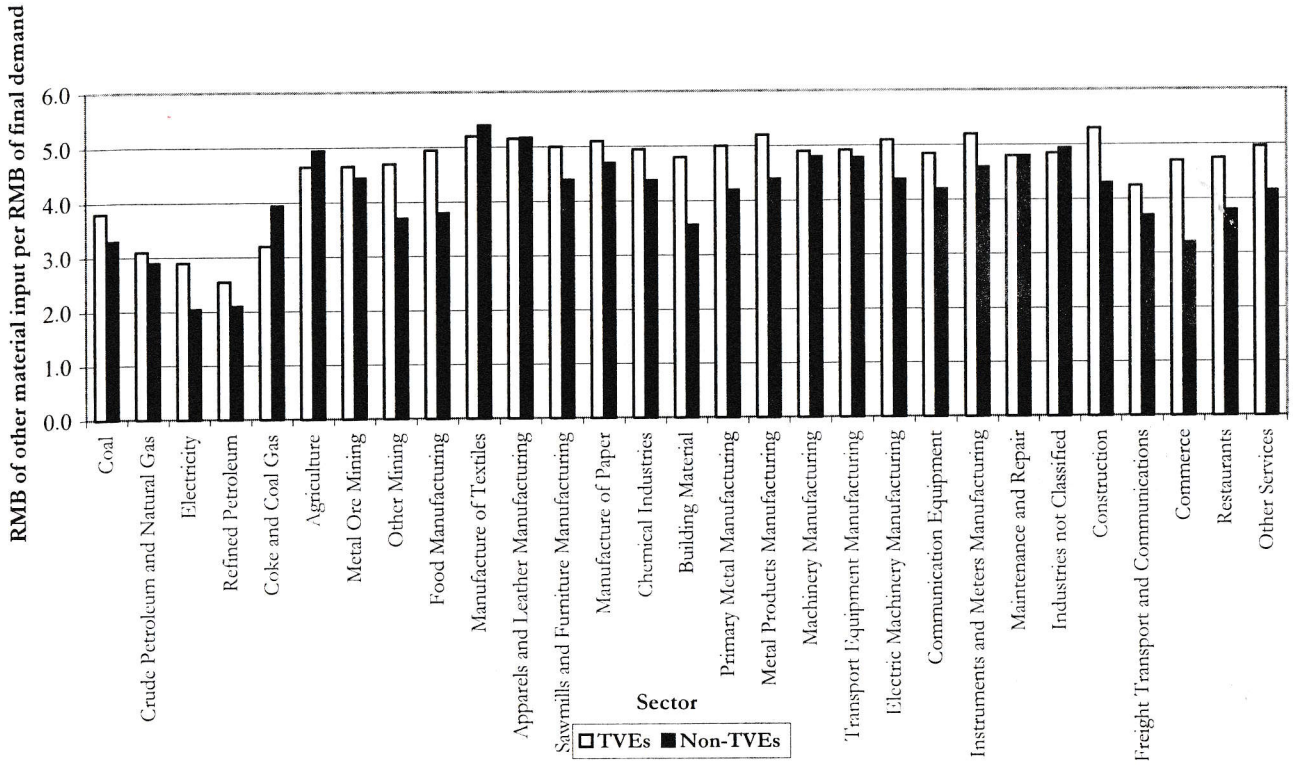


Figure- 6. Direct and Indirect Labor Input, TVEs and NTVEs, China, 1995
(Direct and Indirect Input per RMB of Final Demand)

Figure- 8. Percentage of Total Output, Energy Consumption, Labor Consumption, and Other Inputs, TVEs and NTVEs, China, 1995

Figure- 8. Percentage of Total Output, Energy Consumption, Labor Consumption, and Other Inputs,

Economic Efficiency Differences Between TVES and NTVES in China, 1995

In the first part of this paper, I used the profitability levels of TVE and SOE coke plants in Shanxi Province to claim that the TVE cokemaking sector is more economically efficient than the NTVE cokemaking sector. Here, I expand the number of criteria for economic efficiency, and I extend the region of analysis and sectors to include all of China and all sectors, respectively. My analysis shows that TVEs are indeed more economically efficient than NTVEs, and that the paradox of energy inefficiency and economic efficiency of TVEs over NTVEs can be expanded from the cokemaking sector in Shanxi Province to include TVE and NTVE sectors as a whole in China. Table 1 summarizes some relevant economic data for the TVE and NTVE sectors in China for the period 1979 to 1995. In this case, total factor productivity (TFP) is calculated as a residual after subtracting from output growth a weighted average of the growth rates of labor and capital inputs. The weights I use are 0.7 for labor and 0.3 for capital, corresponding crudely to rough worldwide consensus that labor's share of income is somewhat between 0.66 and 0.75 (Weitzmann and Xu 1993).

Table –1. Comparison of Growth and Efficiency in the NTVE and TVE Sectors, 1979-1995

Economic Factor	TVEs	NTVEs	Ratio of TVEs to NTVEs
	(Percent)	(Percent)	
Growth Rate of Output, 1979-1995	25.3	8.4	3.0
Growth Rate of Capital, 1979-1995	16.5	7.8	2.1
Growth Rate of Labor, 1979-1995	11.9	3.0	4.0
Growth Rate of Total Factor Productivity, 1979-1995	12.0	4.0	3.0

Source: China Statistical Yearbook, various years; Weitzman, Martin L., and Chenggang Xu. (1993). Chinese Township-Village Enterprises as Vaguely Defined Cooperatives. *Journal of Comparative Economics*, 18, p. 128.

Together, Tables 1 and 2 reveal several important insights. First, total factor productivity grows approximately three times faster for TVEs than for the corresponding NTVEs, and TVEs enjoy greater capital efficiency than NTVEs. In fact, the tables show that in almost every respect, TVEs are more capital efficient than NTVEs. For example, TVEs' profits per 100 RMB of capital is over 2.5 times that of NTVEs (16.05 RMB versus 6.37). Similarly, output value per 100 RMB of capital is almost twice as much, and value

added per 100 RMB of capital is 1.5 times as much as NTVEs. Furthermore, capital and taxes per employee is 66 percent greater for TVEs than NTVEs, value added per employee is almost twice as great, while capital expenditure per employee is almost three times as much. In short, TVEs generated more taxes, profits and, output per RMB of capital expenditure and employee than NTVEs in China in 1995.

Table- 2. Comparison of Selected Economic-Efficiency Indicators Between Industrial TVEs and NTVEs, China, 1995

	TVEs	NTVEs	Ratio of TVEs to SOEs
Taxes (billion RMB)	187.56	412.78	0.45
Profits (billion RMB)	366.03	463.49	0.78
Compensation of Employees (billion RMB)	264.55	534.81	0.49
Value Added (billion RMB)	887.14	1748.18	0.50
Output Value (billion RMB)	3,621.93	5,567.57	0.65
Labor Force (million persons)	71.24	75.21	0.94
Total Capital (billion RMB)	2,280.24	7,271.63	0.31
of which: fixed assets (billion RMB)	1,097.53	4,225.00	0.26
Profits and Taxes per 100 RMB Capital (RMB)	24.28	17.05	1.42
Profits per 100 RMB Capital (RMB)	16.05	6.37	2.52
Output Value per 100 RMB Capital (RMB)	158.84	76.57	2.07
Value Added per 100 RMB Capital (RMB)	38.91	24.04	1.62
Profits and Taxes per 100 RMB Output (RMB)	15.30	15.70	0.97
Profits and Taxes per Employee (RMB)	7,771.00	11,651.00	0.67
Compensation per Employee (RMB)	37.13	7,111.00	0.52
Value Added per Employee (RMB)	12,453.00	23,244.00	0.54
Capital per Employee (RMB)	32,008.00	96,684.00	0.33
Ratio of Value Added to Capital (%)	38.91	24.04	1.62
Ratio of Output Value to Capital (%)	158.84	76.57	2.07
Ratio of Value Added to Output Value (%)	24.49	31.40	0.78
Ratio of Intermediate Input to Output Value (%)	75.51	68.60	1.10

Source: Xikang, Chen, Yang Cuihong, Pan Xiaoming, Karen R. Polenske, and Ali Shirvani-Mahdavi. 1999. *Training SOEs and TVEs Plant Managers to Conduct Measurements and Comparisons of Energy Efficiency and Environmental Pollution in China.* Multiregional Planning Group Working Paper, MIT.
RMB: Renminbi, the Chinese currency, equivalent to $0.125.

The same patterns hold true when we expand the level of analysis to include all TVE and NTVE sectors, such as agriculture and commerce.

urthermore,
an NTVEs,
expenditure
erated more
ployee than

Indicators

Ratio of TVEs to SOEs
0.45
0.78
0.49
0.50
0.65
0.94
0.31
0.26
1.42
2.52
2.07
1.62
0.97
0.67
0.52
0.54
0.33
1.62
2.07
0.78
1.10

R. Polenske,
ant Managers
fficiency and
oup Working

of analysis to
nd commerce.

Table 3 shows the results of this analysis. Three phenomenon stand out from this table. First, similar to industrial TVEs, all TVE sectors are more capital efficient than NTVEs. As an example, profits per 100 RMB of capital are almost five times as great in the TVE sector than in the NTVE sector, profits per 100 RMB of sales revenue are over twice as much, sales revenue per 100 RMB of capital are over twice as much and profits and taxes per 100 RMB of capital are almost twice as much. In 1995, TVEs generate a great deal more profits, revenue, and taxes per RMB of capital investment than NTVEs.

Table 3: Comparison of Selected Economic-Efficiency Indicators Between All TVEs and NTVEs, China, 1995

	TVEs	NTVEs	Ratio of TVEs to NTVEs
Total Profit and Taxes (billion RMB)	314.72	552.19	0.57
of which: profits (billion RMB)	196.93	145.81	1.35
Total capital (billion RMB)	2,440.19	8,955.74	0.27
of which: average net value of fixed assets	951.57	4,413.69	0.22
Profits per 100 RMB capital (RMB)	8.10	1.60	5.06
Profits and taxes per 100 RMB capital (RMB)	12.90	6.20	2.08
Sales Revenue (billion RMB)	3,828.40	6,414.89	0.60
Profits per 100 RMB sales revenue (RMB)	5.10	2.30	2.22
Profits and taxes per 100 RMB sales revenue (RMB)	8.20	8.60	0.95
Sales revenue per 100 RMB capital (RMB)	156.90	71.60	2.19

Source: Xikang, Chen, Yang Cuihong, Pan Xiaoming, Karen R. Polenske, and Ali Shirvani-Mahdavi. 1999. *Training SOEs and TVEs Plant Managers to Conduct Measurements and Comparisons of Energy Efficiency and Environmental Pollution in China.* Multiregional Planning Group Working Paper, MIT.
RMB: Renminbi, the Chinese currency, equivalent to $0.125.

Similarly, several analysts (e.g. Jefferson and Rawski 1999; Gordon and Lei, 1995; Lardy, 1999) have shown that TVEs have enjoyed this superior economic performance for at least the past ten years. In their study of factor productivity between TVEs and NTVEs, Jefferson, Singh, Junling and Shouqing (1999, p. 137) reach similar conclusions. Examining total factor productivity performance of China TVE and NTVE sectors between 1980 and 1992, they reach the following conclusions. First, productivity in China's NTVE sector was about 2 to 4 percent during the period of 1980 to 1992. Second, total factor productivity growth with the TVE sector was about twice that of NTVE sector, and finally, productivity growth differed

widely across industries. Productivity growth was typically lowest in extractive industries and highest in light industry, particularly in the electronics industry.

It is apparent from the above discussion then that there is ample evidence to extend the paradox we observed in our survey of the TVE and NTVE cokemaking plants in Shanxi Province to TVE and NTVE sectors as a whole for China. In addition, I have given glimpses of what could be the explanation of this paradox, that is discrepancies in input levels in labor and other material between the TVE and NTVE sectors. There are a number of economic theories that may explain the above paradox, among them the theory of the firm. In this paper, I focus on the theory of ambiguous property rights, because of the findings from our cokemaking surveys that TVEs have very diverse and complex property relationships that do not fit well with standard theories of property. I maintain that informal relationships among the owners, local officials, workers and administrators allows TVEs to have access to cheaper inputs, and as such enjoy better factor productivity, despite the fact that they are less energy efficient than NTVEs.

Theories and Explanations

In this case, I focus on the ownership and governance structure of the TVE sector to explain some of the above paradox. My main argument is that the ambiguous property rights, which allows for informal relationships among providers of inputs, such as labor and energy, permits TVEs to acquire them at lower prices, which can then translate into high plant productivity and lower energy-efficiency levels. According to Porter (1999, p. 6),

> Activities form the basic foundation of competitive advantage in either cost or differentiation, [and] can arise from both operational effectiveness and strategy. Operational effectiveness refers to performing given or similar activities at the state of best practice. A firm's strategy defines its particular configuration of activities and how they fir together.

Furthermore, Porter points out that there are four aspects to the environment in which a firm (or sector) operates that define the context for growth, innovation and productivity: factor (input) conditions; the context for strategy and rivalry; demand conditions; and related and supported industries (Porter 1999). In this paper, I focus on the second of four factors to explain some of the above paradox. Porter's concept "Context for

strategy and rivalry" refers to the notion that certain firms and sectors have advantages in productivity competition if the context of rules, social norms, and incentives foster sustained investment in forms appropriate to a particular industry or sector (Porter 1999). Porter considers the tax system, intellectual property rules, and corporate ownership and governance to have important influences on the productivity levels of firms and sectors.

The Nature of Property Among Township and Village Enterprises in China

TVEs in China are owned by local citizens and controlled by Township and Village Government (TVG), and the TVEs residual benefits are shared among citizens and TVG officials (Chang and Wang 1994). In practice, the most common case is that a community government is regarded as the representative of the residents; thus, it is the de facto executive owner of the TVEs in the community (Weitzman and Xu 1993). On the other hand, Song and Du (1990) indicate that ownership governments are deeply involved in the management of firms, partially to safeguard the collection of taxes from these firms, a theory that is also held by Steinfeld (1998). In general, TVEs are a communal organization very far removed from having well-defined property rights. Overall, the TVE ownership structure is much more complicated than a simple matter of state-owned versus private enterprises, and they represent a complex set of ownership patterns that cannot be very well defined. From our own survey of the TVE cokemaking industry in Shanxi Province, we found that of the 158 cokemaking plants covered in the survey, the managers reported that 37 percent are self-owned; 27 percent are shareholders; 17 percent are village owned; 10 percent are town-owned; 10 percent are joint-owned, including those with foreign firms; 3 percent are rented or leased, and 3 percent are other (Polenske, Chen, Pan, Yang, and Shirvani-Mahdavi 1999).

Given the above complexities of ownership structure among TVEs, the legal system related to the TVE sector is also ill-defined from a capitalist perspective. In fact, the TVE sector seems almost the exact opposite of the type of private organization at the center of the standard model, as TVEs appear to go almost completely against the grain of standard property rights theory (Weitzman and Xu 1994). Basically, the standard model involves making a transition to the standard capitalist economy as quickly as possible, with the essential core of the transition being centered on the aggressive establishment of well-defined private property rights (Polenske 1999; Weitzman and Xu 1993). This model is familiar, because the assumption has been that the existence of well-defined private property rights seems an

absolutely essential precondition to the proper functioning of a capitalist market society. Yet, as is apparent from the phenomenal growth of the TVE sector during the past 20 years and their superior economic performance, TVEs as the dominant form of non-state enterprises are enormously successful, much more successful than any actual applications of the standard model. This raises the central question: what can explain the above paradox? That is, why do TVEs, defined as vaguely defined cooperatives, seem to perform so well?

The essential arguments behind the logic of ambiguous property rights and their relationships to superior economic performance comes from Li (1996), Polenske (1999) and Weitzman and Xu (1993). Li argues that the immature market environment in China, which he calls the gray market, makes ambiguous property rights more efficient than unambiguously defined private property rights (1996). In this view, a gray market is one in which transactions may be blocked due to remnant government regulations. However, a government bureaucrat or a government agency can properly work around the obstacles and make the transaction possible. Thus, the gray market gets its name due to uncertainty regarding whether the transaction will be white (normal market) or black (underground market) state (Li 1996). Li argues that facing a gray market, the entrepreneur may want to include the government as an ambiguous owner. In other words, the arrangement of ambiguous property rights is a response to the grayness of the market, which is a form of market imperfection (Li 1996). This is apparent in the intimate relationships between TVEs and TVGs.

Similarly, Weitzman and Xu claim that the conventional property-rights theory may be inadequate to explain the success of the TVE sector, because it misses a critical dimension of TVEs' property structure. According to Weitzman and Xu, "the key missing element is the ability of a group to solve potential conflicts internally, without explicit rules, laws, rights, procedures, and so forth" (Weitzman and Xu 1994). In the theory, λ represents the outcome to a repeated non-cooperative prisoner's dilemma game, with a value between 0 and 1. A value of λ means a non-cooperative solution that comes close to looking as if it were the outcome cooperative collusion. A low value of λ near 0 means a non-cooperative solution that is far from a cooperative solution, thus yielding low individual payoffs (Weitzman and Xu 1993). As such, in societies where people trust each other (a high λ society), an implicit contract may be more efficient than an explicit contract. There are a number of reasons why high-λ people prefer implicit to explicit contracts. First, there may be some saving of time and energy in negotiating, formulating, and enforcing of the contract (Weitzman and Xu 1993).

Second, if people are cooperative or can trust each other, employees may behave responsibly, as if they are residual claimants or owners, in the sense that they are willing to deal effectively with contingencies that may not be written or may not be able to be written into a formal contract. By contrast, in the case of an explicit contract, employees may do only those things specified in their employment contracts. Thus, an implicit contract here may generate better incentives than an explicit contract (Weitzman and Xu 1993).

Concerning the TVE sector in China, policy makers report that transactions are often based on oral agreements instead of written contracts. Even in the case of written contracts, it is often the case that the contracts are incomplete and unspecified in items, or there is no specific punishment for breaching the contract. This is particularly important because part of the popularity of this kind of practice is the importance of long-term relationships and connections for TVE transactions (Liu 1989). Given the importance of long-term relationships and connections, when there are disputes, many TVEs would rather settle privately instead of relying on the courts because they care more about keeping long-term connections, even though doing so may hurt their business in the short run (Cai 1990).

Finally, Polenske (1999) expands on the ambiguous property rights by showing that, in addition to the above factor, the reasons for the success of the TVE sector are from a "combination of these control rights with the particular governance mechanisms and economic, social, and political power structures that exist" (Polenske 1999). As such, she argues that three major changes in institutions have had an important effect on TVEs in China. First, the property-right systems that are developed are very complex, rather than a simple transformation from state ownership to private ownership. Second, property rights under each of the diverse ownership structures are usually ambiguously defined. Third, the gift economy, defined as personal exchanges and circulation of gifts, favors and banquets, is enabling local officials to affect both the production and consumption patterns of goods and services (Polenske 1999).

However, it is also important to note that some analysts (e.g., Shleifer and Vishny; Sun and Xu) have dismissed the notion that ambiguous property rights have had a positive effect on TVEs' economic efficiency. These analysts fall into two groups. The first claims that although TVEs' property rights may be ambiguous, they are nonetheless better defined than those of SOEs. From their perspective, the fact that TVEs enjoy greater economic efficiency and growth has more to do with the public nature of ownership by the SOEs than the fact that ambiguous property relationships among the TVEs can be responsible for their economic performance. The emphasis is

on the fact that property relationships affect the governance structure of the firm. The governance structure of a firm refers to "the ways in which suppliers of finance to the firm assure themselves of getting a return on their investment." (Shleifer and Vishny 1997, p. 751). This is not a very concrete definition of governance structure. In addition to finance, issues of who has decision rights exist. The governance structure of the SOEs is less defined than TVEs, because the State, in the role of financing SOEs, has no assurance to get adequate returns on its investments, while the governance structure of TVEs is better defined and appears to be much more effective. That is because the main suppliers of investment to the TVEs are the township and village households and outside creditors, who have all the incentives to make sure that their investments will not be appropriated (Steinfeld 1998; Jefferson 1999; Perotti, Sun, and Xu 1999).

The second group looks to Coase (1960) to show that the existence of a property rights market is critical to ensure enterprise efficiency. Coase argued that the means to remedying the inefficient use of public goods is to assign property rights clearly and eliminate transaction costs so that assets can be traded to the individuals or groups who can efficiently use them (Coase 1960). In effect, Coase argued for solving the public-goods problem by creating a property-rights market. From this point of view, absent an effective central contracting agent, the firm assumes the two properties of a public good: non-excludability and non-diminishability. From Coase's perspective, part of the solution to this public good externality problem entails the clear assignment of property rights in order to improve the incentive to monitor and crucial rent-seeking behavior (Coase 1960). The assertion is the extent to which in the absence of an outright change in ownership, managerial reform has created a structure in which a central contracting agent has the authority and incentive to monitor the firm effectively. As such, according to Coase, ambiguous property relationships among the TVEs is not responsible for their economic performance, and is, in fact, hindering their ability to perform even more efficiently.

When comparing input prices between TVEs nad NTVEs in China, the average labor wages for TVEs are significantly lower than NTVEs. Nationally, the average wage for TVE employees is 4,512 RMB per year, while for NTVEs, it is 6,747 RMB per year (1995). This holds true for all industrial sectors (CSY 1999). Second, welfare costs: on average NTVEs spend 490 RMB per worker per year in welfare costs, compared to 149 RMB for TVEs (CSY 1999). Similarly, pension costs are higher in the NTVE sector than in TVE sector (Jefferson 1999). In the end, it is beyond the scope of this paper to make clear empirical connection between ambiguous

property relationships and the performance of TVEs, but I believe that the above-observed property relationships have allowed TVEs to enjoy lower input prices than NTVEs.

Conclusion

Virtually, all productivity studies of state-owned and township and village enterprises in China during the 1980s and 1990s conclude that the growth of productivity in the TVE sector has outpaced that of the NTVE sector. These sectors have not, however, attempted to compare the paradoxical nature of TVEs superior economic performance as compared to their inefficient utilization of energy. In this paper, I show that a majority of TVEs sectors exhibit the paradoxical characteristics of being less energy efficient and more economically efficient than Non-TVEs in both Shanxi Province and China as a whole. Using Structural Decomposition Analysis, I show that 28 out of 29 TVE sectors in Shanxi Province and China as a whole are less energy efficient than their NTVE counterparts. This despite the fact that TVEs in China have enjoyed far better economic performance than NTVEs, particularly SOEs, with among other things total factor productivity being three times as great as that of NTVEs. In order to reconcile this paradox, I examine the direct and indirect labor and other material inputs between the TVE and NTVE sectors in China and Shanxi Province. In order to explain the differences in direct and indirect energy, labor, and materials inputs between TVEs and NTVEs, I have extended previous theoretical discussions of ambiguous property rights in the TVE sector to explain some of my findings in this paper. My primary argument is that vaguely defined relationships among owners, workers, and local administrators allow TVEs to establish informal contract arrangements which gives them access to cheaper inputs.

References

Bell, Micheal W., Hoe Ee Khor, and Kalpana Kochlar. (1993). "China at the Threshold of a Market Economy." *International Monetary Fund (IMF) Occasional Paper*, No. 107,Washington DC: IMF.

Cai, Jinyun. (1990). "A Study on Legislation on TVEs." In *A Collection of Studies on Reform*, pp. 195-207. Beijing: Zhongguo Zhuoyue Publishing Corporation.

Chang, C., and Y. Wang. (1994). "The Nature of the Township-Village Enterprise." *Journal of Comparative Economics* 19, 434-452.

Chen, Xikang, Yang Cuihong, Pan Xiaoming, Karen R. Polenske, and Ali Shirvani-Mahdavi. (1999). Conducting Measurements and Comparisons between SOEs and TVEs of Energy Efficiency and Environmental Pollution in China." *Multiregional Planning Group Working Paper* [Draft]. Department of Urban Studies and Planning, Massachusetts Institute of Technology.

Chen, Xikang, Yang Cuihong, Pan Xiaoming, Karen R. Polenske, and Ali Shirvani-Mahdavi.. (1998). Employment-Energy Tradeoffs in Cokemaking Sector of the Township and Village Enterprises in Shanxi Province, China." *Multiregional Planning Group Working Paper* [Draft]. Department of Urban Studies and Planning, Massachusetts Institute of Technology.

Coase, Donald H. (1960). "The Problem of Social Cost." *Journal of Law and Economics*, 3, 1-44.

Fewsmith, Joseph. (1994). *Dilemmas of Reform in China: Political Conflict and EconomicDebate.* Armonk, New York: M.E. Sharpe.

Jefferson, Gary H., and Inderjit Singh (eds.) (1999). *Enterprise Reform in China: Ownership, Transition, and Performance.* New York: Oxford University Press.

Jefferson, Gary H., Inderjit Singh, Xing Junling, and Zhang Shouqing. (1999). In *Enterprise Reform in China: Ownership, Transition and Performance*, Gary H. Jefferson and Inderjit Singh, Eds. New York: Oxford University Press.

Jefferson, Gary H. (1998). "China's State-Owned Enterprises, Public Goods and Coase. "*American Economic Review* 88(2):428-432.

Lardy, Nicholas R. (1998). *China's Unfinished Economic Revolution.* Washington DC: Brookings Institution Press.

Leontief, Wassily. (1986). *Input-Output Economics.* Oxford, UK: Oxford University Press.

Li, Daokui. (1996). "A Theory of Ambiguous Property Rights in Transitional Economies: The Case of Chinese Non-State Sector." In *Economic Study: Collection of Papers*, edited by Chen Zhangwu, Beijing, People's Republic of China: Tsinghua University, China Economies Studies Center, Tsinghua University Press, pp. 130-158.

Lin, Xiannuan. (1996). *China's Energy Strategy: Economic Structure, Technological Choices, and Energy Consumption*. Westport, CT: Praeger.

Liew, Leong H. (1995). Gradualism in China's Economic Reform and the Role for a Strong Central State. *Journal of Economic Issues*, 29, 3: (September) 883-895.

Liew, Leong. (1997). *The Chinese Economy in Transition*. Cheltenham, UK: Edward Elgar.

Liu, D. (1989). "On Current Disputes of TVE Contracts and their Resolutions." *Rural Economy*, 8, pp. 89-101.

Multiregional Planning Group (MRP), MIT. (1998). Field Trip to Shanxi Province, China.(August).

Multiregional Planning Group (MRP), MIT. (1999a). Field Trip to Shanxi Province, China.(January).

Multiregional Planning Group (MRP), MIT. (1999b). Field Trip to Shanxi Province, China.(August).

Perotti, Enrico C., Laixiang Sun, and Liang Zuo. (1999). "State Owned versus Township and Village Enterprises in China." *Comparative Economic Studies*, 41, 2/3, pp. 151-179.

Polenske, Karen R., and Stephen F. Fournier. (1993). "Conceptual Input-Output Accounting and Modeling Framework." In *Spreadsheet Models for Urban and Regional Analysis*,
edited by Richard E. Klosterman and Richard K. Brail. New Brunswick, NJ: Center for Urban Policy Research, pp. 205-228.

Polenske, Karen R., Ali Shirvani-Mahdavi, Hao Chen, and Wei Guo. (1999). "Cokemaking Supply Chain in Shanxi Province, China." *Multiregional Planning Group Working*
Paper [Draft]. Department of Urban Studies and Planning, Massachusetts Institute of Technology.

Polenske, Karen R. (1999). "A Property-Rights Framework for Economic-Development Strategies." *Multiregional Planning Group Working Paper* [Draft]. Department of Urban Studies and Planning, Massachusetts Institute of Technology.

Porter, Michael E. (1998). *On Competition*. Boston: Harvard Business School Press.

Shleifer, Andrei, and Robert W. Vishny. (1997). "A Survey of Corporate Governance." *Journal of Finance*, 52, 2: 737-783.

Song, L., and H. Du. (1990). "The Role of Township Governments in Rural Industrialization." In *China's Rural Enterprises: Structure, Development, and Reform*, Edited by W. Byrd and Q. Lin. Oxford, UK: Oxford University Press.

State Statistical Bureau of China (SSB). (1992). *China Input-Output Table, 1992* (English Edition). Beijing: China Statistical Publishing House.

State Statistical Bureau of China (SSB). (1997). *Gross Domestic Product, 1952-1995* (English Edition). Beijing: China Statistical Publishing House.

State Statistical Bureau of China (SSB). (1993). *1991 China Energy Statistical Yearbook* (English Edition). Beijing: China Statistical Publishing House.

State Statistical Bureau of China (SSB). (1994). *China Statistical Yearbook, 1994* (English Edition). Beijing: China Statistical Publishing House.

State Statistical Bureau of China (SSB). (1996). *China Statistical Yearbook, 1996* (English Edition). Beijing: China Statistical Publishing House.

State Statistical Bureau of China (SSB). (1997). *China Statistical Yearbook, 1997* (English Edition). Beijing: China Statistical Publishing House.

State Statistical Bureau of China (SSB). (1998). *China Statistical Yearbook, 1998* (English Edition). Beijing: China Statistical Publishing House.

Steinfeld, Edward S. (1998). *Forging Reform in China*. Cambridge: Cambridge University Press.

Sun, Laixiang. (1998). "Estimating Investment Functions Based on Cointegration: The Case of China." *Journal of Comparative Economics*, 26, 1 (March): 175-191.

Weitzman, Martin L., and Chenggang Xu. (1994). "Chinese Township-Village Enterprises as Vaguely Defined Cooperatives." *Journal of Comparative Economics* 18, 121-145.

Xiao, Geng. (1991). "Managerial Autonomy, Fring Benefits, and Ownership Structure."*Research Paper Series, No. 20*, Socialist Economies Reform Unit, Country Economies Department, The World Bank.

Yang, Cuihong, and Xikang Chen. (2000). "Study on Industry Structure Change for Sustainable Development of China Township and Village Enterprises." *Multiregional Planning Group Working Paper* [Draft]. Department of Urban Studies and Planning, Massachusetts Institute of Technology.

Zou, Liang and Laixiang Sun. (1996). "Interest Rate Policy and Incentives of State Owned Enterprises in the Transitional China." *Journal of Comparative Economics*, 23, 3 (December): 292-318.

Zou, Liang, and Laixiang Sun. (1998). "A Theory of Risk Pooling and Voluntary Liquidation Firms: With an Application to Township and Village Enterprises in China."

Tinbergen Institute Discussion Paper, TI 98-123/2. Amsterdam: Tinbergen Institute.