

Trade Openness, Social Capital and Total Factor Productivity in Tobacco Industry

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Objectives: The tobacco industry makes crucial contributions to local fiscal revenue and thus how to improve the productivity of tobacco industry has gain great attention by scholars, entrepreneurs, and governments. The present study attempts to explore the role of trade openness and social capital in the improvement of total factor productivity (TFP) focusing on tobacco industry. **Methods:** The present study firstly proposed an estimation model under the framework of new growth theory, and then taking tobacco industries in the top fifty cities in China's GDP list as examples, the present study conducted an empirical study using regression analysis methodology. **Results:** The results demonstrated that social capital contributes to enhancing the utilization effectiveness of material capital in tobacco industry, and it has a more direct influence on total factor productivity relative to tobacco industry economic performance. The influence of trade openness and social capital on TFP in tobacco industry is moderated by the present industry economic performance. **Conclusion:** Both trade openness and social capital play critical roles in promoting the productivity of tobacco industry and the entire industrial economic development. This study thus has practical implications for both tobacco enterprise managers and local governments, and enriches the theory relating to social capital.

Keywords: tobacco industry; trade openness; social capital; total factor productivity

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INTRODUCTION

The monopoly management system has been applied to most countries' tobacco industries for a long time, which has created good conditions for the healthy development of the tobacco industry.¹ It has made good achievements in meeting the consumer demand of residents, improving the quality of tobacco products, increasing national financial accumulation, and supporting the development of national enterprises, which has effectively promoted the great leap forward development of China's tobacco industry. Practice in America has proved that

this system is also a practical and effective tobacco control measure.² However, with the establishment and improvement of the socialist market economic system, the monopoly management system is becoming more and more unsuitable for the development of modern market economy, which makes these problems exist in the development of the tobacco industry.³ Firstly, the economic benefit of tobacco industry is low. Due to the small scale of enterprises, low industrial concentration, many and miscellaneous cigarette brands, and most enterprise managers rely on "monopoly" for administrative management for many years, the innovation ability and management level is difficult to meet the

development requirements of the market economic system, there is an obvious gap in the international competitiveness of China's tobacco industry compared with international well-known tobacco companies.⁴

Secondly, the local blockade is serious and trade openness is not high. Local blockade is a chronic disease in the tobacco industry.⁵ Driven by interests, local governments try their best to refuse the entry of foreign cigarettes, and spare no effort to make self-produced cigarettes popular in the region, gradually turning national monopoly into local monopoly. Thirdly, the value of social capital hasn't been fully recognized and the utilization rate is relatively low relative to human capital and material capital. Social tourism is regarded as one of the most influential theoretical concepts evolved from the new economic sociology.⁶ It can be considered as the situation and traits of the relationships amongst different social subjects, such as individuals, social organizations, nations, and the states, etc.⁷ Notably, the concept and connotation of social capital has not reached a consensus yet and its application is confined to limited areas. But we can summarize several crucial manifestations which have been presented by most scholars, including mutual trust, commitment, norms, social network, authority, social responsibility, criteria of operation, and social morality.⁸ Existing literature on social capital can be

divided into three levels: micro-layer (e.g., individuals and families), meso-layer (e.g., different organizations), and macro-layer (e.g., different societies, nations or countries).⁹ Social capital emphasizes the relationships and networks amongst different individuals and enterprises, so it's difficult for individuals themselves to obtain and utilize social capital.¹⁰

Although there are many literatures about trade openness and total factor productivity/economic development, there is no literature on integrating social capital into the relationship between the two, especially in tobacco industry. Therefore, based on the tobacco industry development data of major urban units in China, this paper attempts to empirically explore the relationships among trade openness, social capital stock and total factor productivity in tobacco industry, and discuss whether the existing economic performance of tobacco industry will affect the positive influence of social capital on the total demand productivity.

METHODS

Following the idea and methods of Miller and Upadhyay, the Cobb-Douglas production function is applied in this study to evaluate the total factor productivity in tobacco industry.¹¹ Then, the following two production functions can be obtained to express the tobacco industry development:

$$Y_{i,t} = A_{i,t} K_{i,t}^\alpha L_{i,t}^\beta \quad (1)$$

$$Y_{i,t} = A_{i,t} K_{i,t}^\alpha L_{i,t}^\beta S_{i,t}^\gamma \quad (2)$$

Among, $\{\alpha, \beta, \gamma\} \in (0,1)$, Y is the gross domestic product (GDP) of tobacco industry, K is the amount of material capital input, L represents the amount of labour input, S represents the social capital, and A represents the TFP index (the level of regional technological progress). Notably, this study considers

the possibility of non-constant returns and thus doesn't limit $(\alpha+\beta+\gamma)=1$. Further, we can get the output equation on a per labour basis through dividing formula (1) and formula (2) by the labour force (L):

$$Y_{i,t} / L_{i,t} = A_{i,t} (K_{i,t} / L_{i,t})^\alpha L_{i,t}^{\alpha+\beta-1} \quad (3)$$

$$Y_{i,t} / L_{i,t} = A_{i,t} (K_{i,t} / L_{i,t})^\alpha (S_{i,t} / L_{i,t})^\gamma L_{i,t}^{\alpha+\beta-1} \quad (4)$$

Among, $Y_{i,t} / L_{i,t}$ represents the gross domestic product per labour in tobacco industry, $\ln K_{i,t} / L_{i,t}$

represents the material capital per labour, and $\ln S_{i,t} / L_{i,t}$ represents the social capital per labour. It should be pointed that: $(\alpha+\beta+\gamma) > 1$ means the

sustainable increase of production function, $(\alpha+\beta+\gamma)<1$ means the sustainable decrease of production function, and $(\alpha+\beta+\gamma)=1$ means no

change relating to the production function. Then, taking logarithm on both sides of the above formulas and the following formulas can be obtained:

$$\ln(Y_{i,t} / L_{i,t}) = \ln A_{i,t} + \alpha \ln(K_{i,t} / L_{i,t}) + (\alpha + \beta - 1) \ln L_{i,t} \quad (5)$$

$$\ln(Y_{i,t} / L_{i,t}) = \ln A_{i,t} + \alpha \ln(K_{i,t} / L_{i,t}) + \gamma \ln(S_{i,t} / L_{i,t}) + (\alpha + \beta + \gamma - 1) \ln L_{i,t} \quad (6)$$

If the estimation of formulas (5) and (6) does not consider the possible city specific or time-specific effects, it may lead to misleading estimated results through using ordinary least squares regression (LSR). To overcome this setback, the fixed effect estimation approach is selected considering that the requirement of the random effect estimation is difficult to meet: the abridged factors are not related to the contained right variables, which is an unrealistic assumption in our model. For the above two formulas, if we use time series and cross-section data to estimate, it is likely that the equation does not take into account the impact of time and regional differences, resulting in wrong conclusions.¹² These neglected variables can be divided into three categories: variable with region but not with time, variable with time but not with region, variable with time and region.¹³ In order to consider

the effect of default variables, the time dummy variables were put into the equation to reflect the cross time effect. At the same time, when using panel data for testing, because one of the premise assumptions of random impact effect estimation is that there is no correlation between default variables and explanatory variables, it is difficult to do this in this model.¹⁴ Therefore, when using panel data to test, the estimation approach of fixed impact effect was utilized in the present study to reflect the different impact of different regions. However, our problem in this study has few elements relating to the time dimension.¹⁴ Therefore, we did not adjust the data as the deviation of the average between cities but included dummy variables of specific time (i.e., four dummy variables of four time periods). Therefore, the revised estimation models are expressed:

$$\ln(Y_{i,t} / L_{i,t}) = \ln A_{i,t} + \alpha \ln(K_{i,t} / L_{i,t}) + (\alpha + \beta - 1) \ln L_{i,t} + \sum_{j=1}^4 \theta_j time_{ij} + \varepsilon \quad (7)$$

$$\ln(Y_{i,t} / L_{i,t}) = \ln A_{i,t} + \alpha \ln(K_{i,t} / L_{i,t}) + \gamma \ln(S_{i,t} / L_{i,t}) + (\alpha + \beta - 1) \ln L_{i,t} + \sum_{j=1}^4 \theta_j time_{ij} + \varepsilon \quad (8)$$

Among, i ($i=1,2,3,4$) is the time dummy variable. Each city's variable measures the deviation of its regional average over time. In equation (7), technological innovation is not an input factor, while in equation (8), basic innovation is an input factor. On this basis, the TFP of tobacco industries in the selected fifty cities can be estimated. It should be emphasized that the TFP here mainly refers to the increase of performance in tobacco industry caused by technological progress (e.g., management technology and production technology) and capacity realization.

And we can calculate the figure of TFP through the disparity between total economic growth and the contribution of factor investors (labour and capital). TFP obtained by equation (7) is denoted as TFP, and TFPs obtained by equation (8). Simultaneously, following the new growth theory, this paper assumes that TFP is affected by the level of trade openness and knowledge accumulation of a region, and then establishes the following mathematical model of regional TFP:

$$\ln A_{i,t} = \eta_1 \ln open_{i,t} + \eta_2 \ln open_{i,t-1} + \eta_3 \ln S_{i,t} + \eta_4 \ln S_{i,t-1} + \zeta_i + \sum_{j=1}^{j=4} \theta_j time_{i,j} + \xi \quad (9)$$

Among, $open_{i,t}$ represents the trade openness of tobacco industries in different cities, $S_{i,t}$ represents the development level of social capital, η_i is the coefficient. A is determined by both trade openness and social capital in the t period and $(t-1)$ period. The

coefficients of trade openness and social capital can be explained as the influence of these two factors on total factor productivity or the influence on technological progress in tobacco industries of different cities.

DATA COLLECTION AND MEASUREMENT

The production function is applied in this study to measure TFP, so we need the data of output, labour input, material capital and social capital in different cities and corresponding tobacco industries. Specifically, the output value is expressed by the gross domestic product in tobacco industries which reflects the level of tobacco industrial economic growth, and the labour input is expressed using the quantity of employees in tobacco industries of different cities. The data are collected and integrated from cities' Statistical Yearbook and public data of tobacco bureaus. The physical capital input is calculated by Klenow and Rodriguez (1997) and then the physical capital stock data of fifty cities and corresponding tobacco industries were obtained. Notably, all data were converted according to the comparable prices in 2004, involving the annual physical capital stock and CPI index. Then, the present study utilised the trade dependence (the ratio of total import and export trade

to total GDP) of cities as the proxy index of trade openness. The sample data used in this paper are the data of 2004-2019 in the top 50 cities with GDP in China. In view of the analysis needs, the data are divided into four periods: from 2004 to 2007, 2008-2011, 2012-2015 and 2016-2019.

It's difficult to obtain social capital directly through statistical yearbook and thus a special measurement instrument needs to be designed to collect data. Based on the social capital assessment tools (SCAT) designed by the World Bank combing with the actual situation in China, four factors consists of trust, sociability, cohesion and regional social network, were established. The tobacco industries in fifty cities were selected as the study objects, and 1000 people were randomly selected from each city relating to tobacco industry to participate in the questionnaire survey. The final score of each item is the average score of each participant. Then, we sum up the scores of each item to get the final score of social capital of each city.

RESULTS AND DISCUSSION

Table 1
The Estimated Results of Production Function in Tobacco Industry

Variables	Ln Y/L (formula 7)	Ln Y/L (formula 8)	Ln Y/L (S*K)
Ln K/L	0.466 (8.93) ***	0.487 (9.32) ***	0.124 (0.743)
Ln L	0.0176 (0.232)	0.042 (0.824)	-0.0083 (-0.83)
Ln S/L		0.492 (5.83) ***	
Ln S*Ln K/L			0.148 (4.249) ***
Time 1	-0.821 (-2.83) **	-0.711 (-2.94) **	-0.691 (-2.716) **
Time 2	-0.294 (-5.244) **	-0.138 (-1.138) **	-0.513 (-3.813) **
Time 3	-0.172 (-1.827)	0.284 (0.917)	-0.243 (-2.648)
Time 4	0.824 (3.018) **	0.681 (2.283) **	0.571 (2.868) **
R ²	0.862	0.824	0.848

Note: *** p < 0.01 significant level, ** p < 0.05, and * p < 0.1.

Table 1 demonstrates the results of production function in tobacco industries of different cities. The first column is the variables to be estimated in the model, the second column is the model estimation results when social capital is not considered, the third column is the model estimation results when considering social capital, and the fourth column is the model estimation results after the cross variables of social capital and material capital investment are added. Table 1 can be concluded as follows: firstly, although

the coefficient of ln L was positive (0.0176), the estimated result was not supported at the significant level of 0.1, which meant that the role of labour investment in the economic growth of Chinese cities was small, and the economic growth of these cities mainly depends on the investment of capital and other factors since 2004. This may be because China is still a country with abundant labour resources. During the process of China's reform beginning from 1978, the labour force has been in oversupply, and there is a surplus of labour supply. Secondly, ln (K/L) indicates

the material capital per labour and its coefficient was statistically significant at the level of 0.01 significance, reflecting that China's per capita fixed assets investment positively influences the economic growth since China joined WTO. The per capita output of workers will increase by 0.466 per cent when the per capita investment in fixed assets increases by 1 per cent.

Thirdly, $\ln(S/L)$ indicates the social capital per labour and its coefficient was also positive ($p < 0.01$). The per capita output will increase by 0.492 percentage points when the per capita social capital of workers increases by 1 percentage point. Compared with the situation without considering social capital, the output elasticity of material capital increases slightly after increasing social capital, which indicates that the improvement of social capital accumulation level is conducive to the rational use of material capital and the improvement of the utilization rate of material

capital, and with the increase of social capital level, the contribution of material capital to economic growth will gradually increase. Fourthly, $\ln S * \ln K/L$ is the cross variable of labour's social capital and material capital per capita, reflecting the joint effect of these two factors on regional economic development. The results showed that this cross variable could achieve a significant level of 1%, which meant: the joint effect of physical capital and social capital on regional output was positive since China jointed the WTO. Therefore, the improvement of social capital is conducive to the rational use of material capital, thereby improving the utilization rate of material capital. Finally, time variable significantly affected the economic development of each city, and to a certain extent, reflecting the effectiveness of the economic development policies of each city on regional economic growth.

Table 2
The Estimated Results of Total Factor Productivity in Tobacco industry

Variables	Ln TFP	Ln TFP	Ln TFP	Ln TFP (S*K)
Ln S	2.829 (1.826) **	3.729 (2.827) **	-1.284 (-2.385) ***	-1.182 (-3.135) **
Ln S ₋₁	2.158 (1.972) **	2.826 (3.194) **	0.719 (0.961)	0.972 (1.214)
Ln open	2.132 (3.017) ***	0.384 (0.834)	0.752 (1.138)	0.782 (1.284)
Ln open ₋₁	0.691 (1.649) **	0.681 (1.813)	0.752 (2.173) **	0.424 (1.692) **
Ln S * Ln open		0.862(1.971) **		0.472(1.935) **
R ²	0.819	0.824	0.849	0.858

Note: *** $p < 0.01$ significant level, ** $p < 0.05$, and * $p < 0.1$.

Table 2 indicates the estimated values of TFP regression of each model. Specifically, the dependent variables in the second and third columns are TFP estimated by equation (7), and the dependent variables in the fourth and fifth columns are TFP estimated by equation (8). H_{-1} represents the situation of social capital in the lag period, $open_{-1}$ is the level of trade openness in the lag period, and TFPs is the estimated total factor productivity including social capital variables. According to the second and third column estimation results, we can get the following main conclusions: firstly, the variable coefficient of trade openness is statistically significant and positive ($p < 0.01$), which indicates that the improvement in trade openness is conducive to the enhancement of total factor productivity. Under other conditions unchanged, every 1% enhancement in trade openness is inclined to enhance the total factor productivity by 2.132%. Secondly, the social capital variable is

statistically significant ($p < 0.05$), which reflects that the enhancement of social capital is likely to lead to the improvement of regional/industrial TFP. Under other conditions unchanged, every percentage point increase in the level of social capital will increase the total factor productivity by 2.829 percentage points.

Thirdly, the cross variable between trade openness and social capital investment on TFP is significant at the level of 5%, which reflects that there is an important relationship between the accumulation of social capital and trade openness. Social capital and trade openness interact and affect total factor productivity. The higher the social capital, the more conducive to the construction of the whole social network structure and the dissemination of information, the more able to exchange more material, energy, and information with the outside world, thus enhancing the regional trade openness to a certain extent. Additionally, the higher the degree of trade

openness, the more help domestic enterprises to learn advanced technology, the more emphasis on mutual trust and commitment between people and enterprises, thus increasing social capital. In addition, when using equation (8) to estimate, we found the following result: the coefficient of social capital to dependent variable become negative, and the estimated value of trade

openness failed to reach the significant level, which indicates that the influence of regional/industrial social capital accumulation level on total factor productivity is more direct than that of economic growth, and social capital mainly affects economic growth by affecting TFP.

Table 3
TFP Regressions by Per Capita Income in Tobacco Industry

Variables	Ln TFP (low 18)		Ln TFP (middle 17)		Ln TFP (high 15)	
Ln S	3.173 (2.193) *	2.879 (1.693) *	3.582 (2.345) **	3.338 (0.272) **	3.296 (3.817) ***	3.361 (3.927) ***
Ln S ₁	3.284 (2.752) *	2.973 (1.693) *	3.183 (2.816) **	2.913 (0.272) **	3.652 (3.725) ***	3.972 (4.282) ***
Ln open	3.137 (2.386) *	2.756 (1.693) *	2.716 (2.384) **	2.718 (0.272) **	3.183 (3.163) ***	3.146 (4.862) ***
Ln open ₁	3.726 (2.972) *	3.133 (1.693) *	3.273 (2.242) **	3.384 (0.272) **	3.283 (3.662) ***	3.184 (4.972) ***
Ln S * Ln open	2.486 (2.192) *	2.183 (1.693) *	2.132 (2.018) **	2.245 (0.272) **	3.183 (3.134) ***	3.274 (4.173) ***
R ²	0.881	0.892	0.887	0.897	0.912	0.915

Note: *** p < 0.01 significant level, ** p < 0.05, and * p < 0.1.

To examine whether the current level of regional economic development will affect the relationship among social capital, trade openness and total factor productivity, cities are divided into three categories according to the per capita income situation: low-income cities (including 18 cities), middle-income cities (including 17 cities) and high-income cities (including 15 cities). Table 3 demonstrates the results of this classification estimation. The main conclusions of table 3 are as follows: firstly, the impact of both trade openness and social capital on TFP was significant in different income level cities, but there are also some differences. Basically, with the improvement of per capita income level, the positive corresponding effect is on the rise. In the high-income urban group, the parameters of the two factors are positive for the total factor productivity, and both of them can achieve a significant 1% level; In the middle-income urban group, this positive effect can achieve a significant 5% level; In low-income cities, it can achieve a significant 10 per cent level. Secondly, the intersection of social capital and trade openness also shows this phenomenon. In high-income cities, it can achieve 1% level, in middle-income cities, it can achieve 5% level, and 10% in low-income cities. This is mainly because of the high level of market-oriented

and high openness in high-income areas, and in economic activities, enterprises and individuals are inclined to pay more attention to mutual trust and commitment.

These results were consistent with several previous studies relating to social capital and regional economic development. For example, the study of Jha confirmed that social capital played a crucial role in improving financial performance.⁹ Murply, Huggins and Thompson held that social capital contributes to social innovation, thus promoting the sustainable development of regional economic.¹⁵ Social capital is a social network with productive characteristics, which is different from material capital and human capital.¹⁶ It is centred on norms, trust and networking, and is generated and developed by the interaction of various social institutions and members.¹⁷ It is embodied in some identification relationships amongst different individuals and groups through conducting frequent communication, long-time cooperation, mutual benefit, historical traditions, and behaviour patterns accumulated behind there relations.¹⁸ In a region, social capital is a social relationship network formed by the communication between formal and informal organizations. It directly exists in enterprises, industrial clusters and other

groups in the region, and becomes the common goal and value pursuit of enterprises, clusters and even the whole region.

According to the World Bank, the characteristic of social capital is that it shapes a system, relationship and norm of social communication quality and quantity. Thus, it plays a crucial role in promoting social welfare and economic development.¹⁹ Social capital is not only the summation of the systems supporting a society, but also the glue to combine these systems.²⁰ Social capital contributes to reducing uncertainty and enterprises' transaction costs, improving transaction efficiency between enterprises, encouraging economic specialization, and increasing investment in promoting other capital forms (e.g., human capital and material capital) and concept innovation.²¹ However, the existing studies rarely explore the links of social capital and total factor productivity. Therefore, this study enriches contents of social capital and broadens its application area.

The promotion of social capital on regional economic development and technological progress are as follows: first, social capital is conducive to reducing transaction costs and promoting trust and cooperation among enterprises.⁶ Social capital is the ability of people to cooperate for the common goal in the organization. It is the ability generated from the popular trust in the society or region. It is an expectation of rules, cooperation, honesty and other behaviours.⁸ Second, social capital is conducive to the formation of regional industrial clusters. Regions with abundant social capital stock are conducive to the networking of industrial clusters, which not only promotes the joint action among manufacturers in clusters, strengthens cooperation, and realizes resource sharing and complementary advantages.¹⁸ Third, social capital is conducive to the development of regional public utilities and creates good infrastructure conditions for the development of regional economy.²⁰ Through the construction of social capital, more enterprises and individuals can be attracted to participate in the discussion and decision-making of regional public affairs, participate in the construction of regional infrastructure by donation, labour and other practical actions, and participate in and develop regional public utilities by means of cooperation, so as to improve the level of regional social trust and establish a mutual support network system.¹⁴ Fourth, social capital can enhance the innovation ability of the whole region. Abundant social capital can effectively reduce the cost of coordination in innovation

cooperation, greatly enhance the possibility of cooperation, thus making cooperation easier.

CONCLUSION

Taking the tobacco industries of top 50 cities in China's GDP as samples, this paper studied the impact of trade openness and social capital accumulation on the improvement of TFP, and we found that open economy and trade were usually conducive to TFP in tobacco industry. More specifically, social capital stock is not only conducive to regional economic growth, but also contributes to the improvement of total factor productivity, which moderated by the present tobacco industry development level and trade openness. Therefore, the more developed the tobacco industry economy is and the more open the trade is, the more attention should be paid to the cultivation and accumulation of social capital.

The main contributions are as follows: firstly, social capital was considered in this model to examine its role in promoting tobacco industry development, which little existing literature conducted before. Secondly, we tested the relationships between trade openness, social capital, and total factor productivity through taking the tobacco industries of top fifty cities in China's GDP list as examples. The data were specifically collected from 2004 to 2019, and thus the empirical results could reflect the performance of China's tobacco industry to some extent after joining the World Trade Organisation. Social capital is not only a kind of social resource, but also an economic resource. This kind of resources is not born, but gradually generated through historical evolution, with strong regional and era characteristics. But once it comes into being, it will be quite independent and become an important factor to promote or hinder economic and social development. Therefore, we believe that we should further strengthen social capital investment and pay attention to the accumulation of social capital in the future policy formulation and implementation. At the same time, we should further strengthen the depth and strength of opening-up, improve the export structure, and actively and effectively attract foreign direct investment. Due to the low level of economic development, trade openness is still at a relatively low level. In order to give full play to the positive role of social capital and Trade Openness on total factor productivity in tobacco industry, we can formulate and implement the opening-up policy.

Conflict of Interest Disclosure Statement

The authors have no conflicts of interest, financial or otherwise.

Author Declaration

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