

Impact of Tobacco Economy on Local Economy Based on Correlation Analysis

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Objectives: Through the method of correlation analysis, this paper studies the impact of tobacco economy on the local economy of Yunnan Province, China. **Methods:** This paper studies the impact of tobacco industry on Yunnan economy by using the relevant theories of industrial economics, econometrics and regulatory economics combined with the actual situation of tobacco industry in Yunnan Province. Based on the analysis of the overall development of Yunnan tobacco industry, this paper empirically analyzes the relationship between tobacco industry and Yunnan economic growth. **Results:** When the output value of tobacco industry increases by 1%, it will drive the GDP of Yunnan to increase by 0.373%. By comparing the economic benefits of tobacco with the social cost of tobacco, it is found that the social cost caused by tobacco increases year by year with the economic development. The economic benefit is slightly greater than the social cost, and the difference between the two is also increasing year by year. **Conclusion:** The healthy development of tobacco industry can promote the growth of local economy in Yunnan. In the context of tobacco control, we should fully consider the advantages and disadvantages of developing the tobacco industry.

Key words: tobacco industry, tobacco control, local economy, correlation analysis.

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As we all know, the tobacco industry is a special industry¹. At present, only tobacco is clearly implemented in China. Tobacco has a stubborn hobby, and nicotine in tobacco leaves has an adverse impact on human health². Therefore, on the one hand, the tobacco industry should meet the needs of consumers, on the other hand, it can not develop indefinitely. Therefore, all countries implement the policy of high price and heavy tax and "combining prohibition with levy" on the tobacco industry, which leads to tobacco products becoming high tax commodities³⁻⁴. Tobacco tax has become

one of the important sources of government revenue. The tax of tobacco commodities includes import tariff, consumption tax and value-added tax of market commodities. Consumer demand for tobacco products is inelastic, so its tax revenue is considerable. The tobacco industry is an important contribution industry in China's national economy⁵. For some provinces and regions where tobacco planting and cigarette processing are concentrated, the tobacco tax is up to more than 60% of the total local tax revenue⁶.

As the largest tobacco producing and consuming country in the world, the tobacco industry has

become one of the pillar industries of China's national economy and has played an irreplaceable role in the economic development of various places. Tobacco production is more widely distributed in more than 20 provinces and more than 500 counties across the country, with more than 3 million farmers every year, involving more than 15 million rural population. Since tobacco cultivation is concentrated in central and western regions with relatively backward economic development, such as Yunnan, Guizhou, Henan, Sichuan, Hunan, Hubei and Heilongjiang, the development of tobacco industry can not only adjust the agricultural structure of these regions and increase the income of local farmers, but also is of great significance to promote local employment and poverty alleviation and development⁷⁻⁸. Yunnan, the province that took the lead in implementing the separation reform of provincial industrial and commercial management system in the country, deserves more attention to what new pattern the horn of reform and reorganization has built for the whole tobacco industry.

2011 is a year that requires the tobacco industry to have more wisdom in more challenges in order to develop steadily. For the tobacco industry, with the increasing intensity of tobacco control, the continuous improvement of taxes and tobacco product prices, the increasing number of tobacco lawsuits and the continuous spread of economic crisis, the growth momentum of tobacco products will slow down, which has a more and more profound impact on the tobacco industry. In October 1980, Yunnan took the lead in implementing the reform of tobacco management system in the country, established Yunnan tobacco industry company, and implemented the unified management of production, supply and marketing, people, property, domestic and foreign trade. In April 2013, Yunnan tobacco business took the lead in implementing the reform of industrial and commercial management system in the country again, and set up another Yunnan China tobacco industry company⁹.

Over the past 30 years, Yunnan tobacco has produced 55.75 million boxes of cigarettes, sold 42.81 million boxes of cigarettes in the province, and achieved industrial and commercial tax profits of 159.1 billion yuan. Industrial and commercial sales revenue increased from 750 million yuan in 1980 to more than 60 billion yuan in 2020; The tax and profit realized by industry and Commerce increased from 323 million yuan at the beginning of its establishment to 22.5 billion yuan in 2020. In recent years, the tax profits paid by Yunnan Tobacco account for about 9.7% of the total tax revenue of Yunnan, which is higher than the national level of about 7%. In 2020, 1.911 million cases of cigarettes were sold, and the tax included sales revenue of cigarettes was 35.93 billion yuan, an increase of 16.6%; Profits and taxes reached 7.61 billion yuan, an increase of 13%; Taxes reached 3.2 billion yuan, an increase of 45%, ranking within the top five of the country's 18 industrial companies. Therefore, the correlation analysis of the relationship between tobacco industry and Yunnan economic growth is of certain significance¹⁰.

First, we can continue to ensure and improve the contribution share of Yunnan tobacco industry to Yunnan finance. China's tobacco industry has made a great contribution to the national fiscal revenue for many years. Secondly, it can improve the market competitiveness of Yunnan tobacco industry and ensure the sustainable development of tobacco industry. With the continuous development of socialist market economy and the continuous evolution of economic globalization, some background conditions and international environment that originally supported industrial development no longer exist or have undergone profound changes. The institutional obstacles to the development of tobacco industry, the changes of domestic and foreign market environment and consumers' demand for health products make China's tobacco industry facing severe challenges. Thirdly, it can promote technological innovation, improve product quality and ensure consumer consumption safety. Tobacco products are not general consumer goods. They have certain particularity. Consumers will also consider the health problems caused by the consumption of this kind of goods. In recent years, with the improvement of China's per capita income

level, health has gradually become an issue of concern. It is urgent for the tobacco industry to adopt new technologies to improve product quality and ensure consumer consumption safety.

Finally, under the condition of bearing the social cost caused by tobacco, we can fully consider the advantages and disadvantages of developing the tobacco industry and develop the tobacco industry more healthily. The social cost of tobacco is mainly the social cost brought by smoking. However, it is impossible for the tobacco industry to restrict its due development because of social costs. Under the new situation of global economic development, how to reasonably avoid its harm and strive to actively develop its advantages. To promote the healthy and harmonious development of Yunnan tobacco industry as other industries, it is very necessary to have a strategic and long-term vision.

METHODS

Development of Yunnan Tobacco Industry

Yunnan is one of the earliest provinces of flue-cured tobacco production in China and one of the key provinces of cigarette production in China. Yunnan tobacco has symbolic significance in the national tobacco industry. In October 1980, Yunnan took the lead in implementing the reform of tobacco management system in the country, established Yunnan tobacco industry company, and implemented the unified management of production, supply and marketing, people, property, domestic and foreign trade. In 1983, Yunnan tobacco industry company was renamed Yunnan tobacco company, which was designated China National Tobacco Corporation in October of the same year. In 2013, as the "vanguard" of tobacco reform, tobacco implemented the separation of industry and commerce. Yunnan Provincial Bureau (company) governs 17 Municipal Tobacco Monopoly bureaus (companies) as well as two tobacco redrying enterprises of International Tobacco Co., Ltd. and Yuxi Tobacco Co., Ltd. and Wannan Tobacco Co., Ltd. This year, Yunnan tobacco industry company has celebrated its 30th anniversary. Yunnan tobacco company has become a symbol and set an example throughout the country.

Table 1

2020-2020 Yunnan Tobacco Output Value And Its Proportion In Gdp And The Tax Revenue Of Tobacco Industry And Its Proportion In Total Tax Revenue

Particular year	Output value of tobacco industry (10000 yuan)	GDP of Yunnan Province (100 million yuan)	Proportion of tobacco output value in GDP (%)	Tobacco tax profit (10000 yuan)	Total tax of Yunnan Province (10000 yuan)	Proportion of tobacco tax profit in total tax revenue (%)
2020	706869	2743.989	2.576	84300	1445761	5.831
2011	880280	3052.921	2.883	83165	1641648	5.066
2012	1147945	3288.498	3.491	123503	1620119	7.624
2013	1369413	3672.079	3.729	171249	1767740	9.687
2014	1458991	4301.433	3.392	222546	2048296	10.86
2015	1645023	4932.010	3.335	288078	2445450	11.781
2016	1922159	5565.821	3.454	379988	3124220	12.162
2017	2328243	6620.650	3.517	511001	4018799	12.715
2018	2705059	8063.160	3.355	614639	5279349	11.642
2019	3082069	9114.724	3.381	666111	6293236	10.585
2020	3593146	11044.58	3.253	761297	8665517	8.785

It can be seen from table 1 that the output value of tobacco in Yunnan province increased steadily

from 2020 to 2020, and the proportion in GDP showed a steady increasing trend from 2020 to

2013, reaching the highest value of 3.729% in 2013. After 2013, the proportion decreased slightly, but remained at a stable level. This may be related to the first separation of industry and Commerce in Yunnan in 2013. The proportion of tax revenue has a strong growth momentum: the proportion rose all the way from 2020 to 2017, reached the highest value of 12.715% in 2017, and then decreased steadily. However, the average proportion is about 9.7%, which is much higher than the proportion of tourism enterprise tax in the total tax of 0.7% in the same period.

Over the past 30 years, Yunnan tobacco has produced 55.75 million boxes of cigarettes, sold 42.81 million boxes of cigarettes in the province, and achieved industrial and commercial tax profits of 159.1 billion yuan. Industrial and commercial sales revenue increased from 750 million yuan in 1980 to more than 60 billion yuan in 2020; The tax and profit realized by industry and Commerce increased from 323 million yuan at the beginning of its establishment to 22.5 billion yuan in 2020. In recent years, the tax profits paid by Yunnan Tobacco account for about 8% of Yunnan's fiscal revenue, slightly higher than the national level of about 7%. Therefore, Yunnan tobacco industry plays an important role in Yunnan economy, especially in profit and tax. Further research on the relationship between tobacco industry and Yunnan economic growth will not only help to understand the status of tobacco industry in Yunnan economic development, but also help to maintain the healthy and sustainable development of tobacco industry and promote Yunnan economic growth.

The important position of Yunnan tobacco industry in Yunnan economy

In order to measure the contribution of the tobacco industry to economic growth and its contribution to economic growth rate, and accurately reflect the relationship between the impact of the tobacco industry on Yunnan's economic pull, statistically, the industrial contribution rate and GDP growth rate are generally used to calculate the pull coefficient (pull rate). This paper selects the GDP of Yunnan Province from 1980 to 2020 and the annual output

value of tobacco industry, which reflects the overall development direction of tobacco industry, as the basic data for analysis. The data are from Yunnan statistical yearbook and China Tobacco statistical yearbook respectively. The contribution of tobacco industry to economic growth rate can be expressed as follows:

$$g(\%) = RVA * 100\% \quad (1)$$

Where, g represents the contribution of industry to economic growth rate; RVA represents the ratio of the increment of added value of the tobacco industry to the increment of GDP.

$$e(\%) = s(\%) * g(\%) \quad (2)$$

Where, e represents the pulling coefficient of tobacco industry to Yunnan economy; s represents the growth rate of GDP; g represents the contribution rate of the tobacco industry.

From 1981 to 2020, the average contribution rate of tobacco industry to Yunnan's economic growth rate was 4.8532%. This shows that the contribution of the tobacco industry to the economic growth rate is close to 4.85 percentage points. The average annual economic growth rate of 0.614 percentage points is driven by the tobacco industry. Firstly, tobacco is a high tax industry, which drives the economic development. In every link related to tobacco - from tobacco planting, cigarette production, cigarette wholesale and retail, tobacco contributes to tax revenue. There is tobacco leaf tax during planting, value-added tax, consumption tax, enterprise income tax, urban construction tax and education surcharge during cigarette production and allocation and cigarette consumption, and value-added tax, enterprise income tax, urban construction tax and education surcharge for entrusted processing and entrusted processing. The increase of tax revenue directly drives the increase of fiscal revenue, and makes a greater and greater contribution to fiscal revenue, which means that the tobacco industry has a greater and greater impact on Yunnan's fiscal revenue.

Secondly, the tobacco industry is an industry involving many industries such as agricultural planting industry, production and processing industry, logistics distribution industry and retail

service industry. Many industries, departments and enterprises are connected with each other and become an organic whole. Finally, the tobacco industry has also solved a large number of employment problems in Yunnan Province. The tobacco industry covers a wide range. The tobacco planting industry enables a large number of farmers in the province to get rid of poverty and get rich in their hometown without having to suffer from leaving their hometown to work in other places. In addition, Yunnan tobacco industry has a direct relationship with fiscal revenue, labor employment, agricultural economic structure, farmers' economic income, economic development and social stability of the whole province.

RESULTS

Index selection

This paper selects the output value, profits and taxes and sales volume of the tobacco industry to represent the development level of the tobacco industry, the index of the economic development level of Yunnan Province, and the GDP of Yunnan Province from 2011 to 2011 (the actual GDP calculated by taking 1980 as the constant price and eliminating the influence of price factors). Source: China Tobacco statistical yearbook from 2011 to 2011 and Yunnan statistical yearbook from 2011 to 2011. The data from 1980 to 2011 are from Yunnan statistical yearbook and Yunnan tobacco company network in the same period.

Model building

Take the GDP of Yunnan Province in recent 11 years as the explanatory variable, the tobacco output value (CZ) of Yunnan Province in recent 11 years as the main explanatory variable, and the tax profit (SL) and sales volume (XL) of the tobacco industry as the auxiliary explanatory variables. Other factors will not be considered temporarily.

Set the multiple linear regression model as:

$$GDP = b_0 + b_1CZ + b_2SL + b_3XL + u \quad (3)$$

Among them, CZ, SL and XL represent Yunnan Tobacco output value, tax profit and sales volume of tobacco industry respectively. b_0 , b_1 , b_2 , b_3 and u represent constant term, output value coefficient, tax profit coefficient, sales volume coefficient and error term respectively.

Model test

For the model, LS is used for parameter estimation, Eviews 6.0 is used for regression analysis and calculation of Yunnan's GDP and tobacco output value, tobacco tax profit and tobacco sales volume in the same period from 2020 to 2020, and the following formula is obtained:

$$GDP = 5322.574 + 0.003654CZ + 0.000276SL + (-40.59973XL) \quad (4)$$

The following is the table of correlation coefficients for each explanatory variable:

Table 2

Correlation Coefficient Of Independent Variable

	CZ	SL	XL
CZ	1.000000	0.990731	0.949497
SL	0.990731	1.000000	0.932654
XL	0.949497	0.932654	1.000000

It can be seen from the correlation coefficient matrix that the correlation coefficient between explanatory variables is high, and there is indeed multicollinearity. The stepwise regression method

is used to test and solve the multicollinearity problem, and the univariate linear regression of GDP to CZ, SL and XL is made respectively. The results are as follows:

Table 3

Regression Results

Variable	CZ	SL	XL

Parameter estimation	0.002920	0.010928	128.5433
T statistic	25.98201	18.405110	6.785045
R²	0.986843	0.974119	0.836473

Sorted by R²: CZ, SL, XL.

Since the impact of tobacco sales volume (XL) on DGP is negative, only the cointegration test is conducted for GDP and CZ here. During the cointegration test, the data sample size is increased for more accurate analysis. Yunnan GDP and tobacco output value in 31 years are selected.

Most time series are non-stationary. Non-stationary time series may produce false correlation and false regression problems, so we

need to test the stationarity of unit root test. The standard method of unit root test is DF test, which was proposed by Dickey and Fuller in 1979. After improvement, it has been developed into ADF. GDP is a random walk sequence with drift and trend terms. In order to eliminate heteroscedasticity, take logarithms of variables. The ADF test results of lnGDP and lncz are as follows:

Table 4
Lngdp And Lncz Unit Root Test Results

Variable	ADF inspection value	1% critical value	Conclusion
Original LNGDP	-3.020989	-4.309824	Nonstationary
Original LNCZ	-2.501919	-4.296729	Nonstationary
First order difference LNGDP	-3.442201	-4.323979	Nonstationary
First order difference LNCZ	-3.272313	-4.339330	Nonstationary
Second order difference LNGDP	-5.004756	-4.339330	Stable
Second-order bisection LNCZ	-5.205689	-4.356068	Stable

At the significant level of 1%, the second-order difference lnGDP and the second-order difference lncz are stable and meet the cointegration condition. Cointegration means that although it is non-stationary for a single time series, the linear combination of two time series is stationary. Cointegration can be used to describe the long-term stable relationship between the horizontal values of some economic variables. If the two time series are cointegrated, they cannot be separated too far from each other. One impact can only make

them deviate from the equilibrium position in a short time and automatically return to the equilibrium position in a long time.

The cointegration test of two variables can be tested by Engle Granger (eg). Because the order of single integration of the two variables is the same, lnGDP and lncz are cointegrated of order (2,2). Whether there is a causal relationship between variables needs further Granger test, and the results are as follows:

Table 5
Causality Test Between Lngdp And Lncz With Lag Of 4 Periods

Null hypothesis	Lagging period	F statistics	P value	Conclusion
The reason why LNCZ is not LNGDP	1	10.8092	0.0028	Refuse
LNGDP is not the reason of LNCZ		0.8515	0.3643	Accept
The reason why LNCZ is not LNGDP	2	4.8811	0.0166	Refuse
LNGDP is not the reason of LNCZ		2.0617	0.1492	Accept
The reason why LNCZ is not LNGDP	3	3.4351	0.0355	Refuse
LNGDP is not the reason of LNCZ		0.781	0.0517	Accept

The reason why LNCZ is not LNGDP	4	3.7369	0.022	Refuse
LNGDP is not the reason of LNCZ		0.8191	0.0429	Refuse

Analysis of empirical results

By establishing an empirical model, this paper makes an empirical analysis on the relationship between tobacco industry and GDP in Yunnan Province as follows: the model estimation of equation (3) can draw a conclusion:

There is a long-term stable and balanced dynamic relationship between the tobacco industry and economic growth in Yunnan Province. With the increase of the total output value of the tobacco industry, the GDP also increases. When the output value of tobacco industry increases by 1%, it will drive the growth of GDP by 0.373%. It is higher than the contribution of agricultural expenditure (every 1% increase in agricultural expenditure will increase the GDP of Yunnan Province by 0.2179%) and science, education, culture and health expenditure (every 1% increase in science, education, culture and health expenditure will increase the GDP of Yunnan Province by 0.3138%) to the economic growth of Yunnan Province. Therefore, the development of tobacco industry has a significant impact on the economic growth of Yunnan Province, driving the rapid development of Yunnan national economy. The tobacco industry has a great pulling effect on the economy.

Equation (4) is the final result of the model after eliminating multicollinearity. The fitting degree of the model is good, the F value is significant, the DW value is good, and there is no autocorrelation.

The results in Table 4 show that at the significant level $\alpha = 0.05$, when the lag length is 4, $\ln GDP$ is the Granger cause of $\ln CZ$; When the lag length is 1 to 4, $\ln CZ$ is the Granger cause of $\ln GDP$. That is, $\ln GDP$ and $\ln CZ$ are mutually causal when the lag period is 4. According to the expected forecast, the increase of tobacco output value should be the cause of GDP growth, but after verification, they are mutually causal, and the lag period is 4. This may be because the output value of the tobacco industry will not only bring a positive pulling effect to GDP, but also bring a certain

overall social cost, resulting in a certain degree of decline in GDP, which is the social cost to be discussed in the next chapter.

DISCUSSION

Social benefits of Yunnan Tobacco

As a necessity, tobacco not only provides an important tax source from production to consumption, but also drives a series of industrial activities from planting, production, processing, transportation, wholesale and retail, and creates various jobs. Therefore, Yunnan tobacco also has a great impact on Yunnan's social income.

The industrial economic benefits created by the tobacco industry include the output value of tobacco leaves, the output value of cigarette industry, the output value of tobacco related products and the output value of cigarette sales. In recent years, with the expansion of tobacco planting area in Yunnan, the output of tobacco leaves is also increasing. The output of tobacco leaves in recent 6 years is about 27000 tons, and the overall trend is increasing. The output of cigarettes is increasing year by year, and the total industrial output value of tobacco is growing rapidly, of which the added value of tobacco products reached the highest value of 17.71 billion yuan in 2020. The output value of sales links is also increasing year by year.

According to statistics, there were 271264 cigarette retailers in Yunnan Province in 2020. According to Yunnan statistical yearbook, there were 9494, 9554, 11092, 7469, 6979 and 7336 workers in the tobacco industry from 2015 to 2020, accounting for 0.026%, 0.026%, 0.029%, 0.021%, 0.020% and 0.018% of the total employment in Yunnan Province respectively. Because the number of workers of tobacco products only includes the employees of tobacco enterprises, not including the number of tobacco farmers planting tobacco and the number of tobacco business employees, the calculated employment absorbed by Yunnan Tobacco accounts for a small proportion of the total employed population, but in fact, this small proportion is indeed the economic contribution of the tobacco industry to the society.

Social cost of Yunnan Tobacco Industry

According to the data of Yunnan cigarette consumption market survey and Research Report in 2020, the overall smoking rate in Yunnan was 28.85% in 2020. A survey was conducted on the smoking situation of rural residents in Yunnan Province. The results show that the total smoking rate of rural residents in Yunnan Province is 25.66%, and the current smoking rate is 21.93%, which is 1.3 and 4.7 percentage points lower than the rural average level of China's nutrition and health survey in 2012, but the heavy smoking rate of 15.35% is 3.1 percentage points higher than the latter. The average age of smoking was 20 years old; At present, the smoking rate of men is 42.43%, which is significantly higher than that of women, 1.32%, and 31.10% of those aged 45-64 is the highest; The average smoking volume is 20 cigarettes / day. According to the statistics of health resources of Yunnan Provincial Department of health in 2020, the number of hospitalizations in Yunnan Province was 5510363, including 44265 people suffering from tuberculosis and 137 deaths.

The World Health Organization estimates that the air breathed by about 700 million children around the world is polluted by second-hand smoke, especially in the family environment. The results of the global youth tobacco survey participated by China show that 43.9% and 55.8% of adolescents are harmed by second-hand smoke at home and in public places, respectively. The number of smokers in China is 350 million. Although China has officially signed the World Health Organization Framework Convention on tobacco control (WHO FCTC) in 2013, according to the recent report on tobacco control and China's future, the five-year deadline for China's compliance has come, with more smokers in public places and unsatisfactory performance.

From 2016 to 2020, the average social cost brought by tobacco to Yunnan reached 3.701 billion yuan. It can be seen that tobacco has indeed brought a huge economic burden to Yunnan Province, and the economic losses brought by tobacco are expanding over time. The main reasons are: on the one hand, as a developing country, with the increase of income, people's demand for medical care will

increase, and the total medical expenses will rise rapidly, exceeding the rate of economic growth. On the other hand, the peak of harm caused by tobacco in China has not yet come, because the loss of productivity caused by smoking will further expand after decades, and the early death population will also increase.

Whether the economic added value created by Yunnan tobacco industry is enough to make up for the social and economic burden brought by smoking, and whether the tobacco industry is still an industry that can create huge social and economic benefits for the whole social economy? Based on the current situation of the increasing impact of tobacco in Yunnan and the fact that the number of smokers is rising rapidly, starting from the estimation of the social cost loss caused by smoking and combined with the economic benefits provided by tobacco, this paper comes to the conclusion that the economic added value created by Yunnan tobacco industry is slightly greater than the economic burden caused by smoking. Such a conclusion is only the evaluation of the lowest loss. In fact, the net social benefits brought by tobacco may only be less than the net value obtained in this paper.

Due to the particularity of the tobacco industry, its production brings huge economic benefits, especially the government obtains huge tax revenue. At the same time, its consumption also produces a series of medical costs, loss of life, loss of productivity and so on, which increase the economic cost of the whole society. We should not only see its contribution to the economic growth rate and unilaterally pursue its drive to economic and employment development, but also consider how to avoid its harmful aspects. Therefore, the government should avoid the harmful aspects of the tobacco industry, carry out appropriate control and reasonably develop the tobacco industry while meeting the needs of consumers.

Conflicts of Interest Disclosure Statement

The authors declare no conflict of interest in the authorship or publication of this work. The authors declare no sponsored financial sources by any organization related to tobacco production for the undertaken study.

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