

Research on Transformation and Upgrading of Equipment Manufacturing Industry and Optimization of Tax Policy Discrepancy: Case of Hebei Province

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Abstract. Operating income of Hebei equipment manufacturing industry exceeded one trillion yuan. In order to further promote the transformation and upgrading, in recent years, the Hebei Provincial Tax Bureau of the State Administration of Taxation has implemented and continued a series of national tax support policies and achieved phased results. However, due to some objective and realistic factors, Hebei equipment manufacturing industry is still lacking. This research takes different stages of enterprise operation as nodes, and gradually sorts out, studies and analyzes the current tax policies according to the links. The results highlight the effectiveness mechanism of the current tax policies for the development of equipment manufacturing industry based on the research. Moreover, based on a variety of real data found in this paper, the data of Hebei equipment manufacturing industry is compared in multiple dimensions to objectively present problems and shortcomings. This paper focuses on the transformation and upgrading of Hebei equipment manufacturing industry and tax policy in a small-cut view and makes policy optimization suggestions based on the tax policy gap, in order to provide reference for the better development of Hebei equipment manufacturing industry.

Keywords: Equipment manufacturing industry; Tax policy; Transformation and upgrading; Hebei Province; Policy optimization.

1. Introduction

There are abundant literature studies on transformation and upgrading. For example, Fang and Zhou believe that the high-quality development of supply and the creation of demand as well as a higher level of dynamic balance between them require the guidance of new quality productivity [1]. Liu and Huang believe that "the transformation and upgrading of traditional productive forces cannot be ignored in the development of new quality productive forces" [2]. Wu and Wang believe that digital transformation "brings unique changes in the upgrading of green development functions and cost decreasing and benefit increasing of enterprises and becomes source of green technology innovation and the key to achieving high-quality economic development" [3]. Liu believes that circular economy, innovation-driven, and industrial integration are the path to achieve green industrial transformation and upgrading [4]. Wang, Zeng and Zuo believe that one of the functions of virtual agglomeration is to promote transformation and upgrading through multi-dimensional analysis [5].

Equipment manufacturing industry as a key industry in China, many domestic scholars have done extremely rich research on its future development direction and development path, although different scholars from different dimensions of research, but achieving digital, green, intelligent high-quality development has become a consensus. Su and Wang believe that the integration of producer service industry and manufacturing industry has a certain impact on the transformation and upgrading of manufacturing industry [6]. Zhu believes intelligent equipment is helpful for various industries to reduce production costs and improve production efficiency and is also a key path to promote the transformation and upgrading of the manufacturing industry [7]. Based on the important position of the equipment manufacturing industry in the industrial relationship, Wang emphasized that the industrial chain should drive the innovation chain, and "select the key nodes of the industrial chain and innovation chain as the focus of industrial policy" [8].

In addition, some scholars have made research and discussion on tax policy and the transformation and upgrading of enterprises. Facing new downward pressure of domestic economy, Yan and Wang believe that using tax policy well is one of the ways to grasp the development direction of enterprises' transformation and upgrading [9]; As a major steel producing province in Hebei Province, Mao put forward some policy suggestions when studying how to resolve overcapacity and promote transformation and upgrading, including providing tax and fee policy support for resource-based enterprises' transformation, differentiated credit policies for financial institutions, and increasing tax and fee cost reduction efforts[10].

The introduction and continuous improvement of supporting tax and fee policies is an important starting point to promote the transformation and upgrading of the equipment manufacturing industry. The combination of tax and fee policies and the equipment manufacturing industry in Hebei is not abundant. This research more clearly discusses the promoting role of tax and fee incentives on the industry from the perspective of small incision and discusses the mechanism and effect analysis of the policy. It provides theoretical guidance for the equipment manufacturing industry of Hebei Province to better grasp the macro-policy transformation and upgrading, and how the government should improve the preferential tax and fee policies for different equipment manufacturing industries.

The normal operation of an enterprise needs to go through many links. This paper classifies stages according to the production process of an enterprise, so as to analyze the action mechanism and effectiveness of the macro-tax preferential policy.

2. Effect Analysis of Policy Mechanism

The normal operation of an enterprise needs to go through many links. This paper classifies stages according to the production process of an enterprise, so as to analyze the action mechanism and effectiveness of the macro-tax preferential policy.

2.1. Fund Preparation

The development of enterprises is highly dependent on funds. In the early stage of the establishment of enterprises, in order to ensure enterprises produce products smoothly, the Chinese government introduced some tax reduction policies for equipment manufacturing enterprises to alleviate financing difficulties. Specific policies are shown in the table 1.

Table 1. Policy in the Fund Preparation Phase

Policy interpretation	year
Interest on loans from financial institutions shall be deducted according to the amount actually incurred.	2011
Interest on loans to non-financial institutions is allowed to be deducted up to a certain amount.	2011
The actual interest paid by an enterprise to a related party is allowed to be deducted up to a fixed percentage.	2008
Interest on loans from enterprises to individuals shall be deducted up to a specified amount.	2009
Interest on bonds issued by enterprises are deductible.	2012

In this process, the above policies have played a supportive role to a large extent, but there are also some problem factors: First, it is not easy for start-ups to obtain loans from financial institutions, most of the loans of enterprises are raised by other types of loans, but these loans are deducted within the limit and the proportion is small; Secondly, in recent years, all kinds of markets in China are very active, and there have been many new financing methods, such as venture capital, which have attracted more and more attention from enterprises, but the current policies have not guided these.

2.2. Technology Research and Development

For the equipment manufacturing industry, the development of technology is the root. After the enterprises have completed the capital preparation, the government has issued corresponding policies and measures for research and development costs, technology transfer and related costs, science and technology research and development personnel and technology research and development materials. Specific policies are shown in the table 2.

The government mainly starts from the aspects of R&D costs, technology transfer, achievement transformation and scientific research awards, but there is still a policy gap for the training of technical talents, and only the bonus of scientific research talents is tax-exempt. At the same time, in the case of uneven development in various regions and obvious gaps in research and development investment in various regions, the preferential policies of research and development costs are adopted in a fixed and uniform proportion, which does not reflect the policy support for the more backward regions.

Table 2. Policy in the Technology Research and Development Phase

Policy interpretation	year
From January 1,2011, domestic R & D expenses for pre-tax deduction or pre-tax amortization.	2021
Overseas R & D expenses shall be deducted before the enterprise income tax according to the regulations.	2018
Related technical consultation and technical services are exempted from VAT.	2016
Income from technology transfer is reduced or exempted from enterprise income tax.	2015
Materials purchased for scientific research are exempted from import value-added tax.	2016
Tax payable on equity awards of high-tech enterprises can be paid in stages.	2015
Enterprises and individuals pay deferred income tax based on investment in technological achievements.	2016
The bonuses in science and technology are exempt from tax.	2016

2.3. Production Preparation

At this stage, the enterprise needs to buy machinery and equipment to prepare for the next product production, at the same time, the enterprise's daily publicity and customer maintenance work should also be carried out. The state has introduced corresponding preferential policies to facilitate the steady development of the equipment manufacturing industry. Specific policies are shown in the table 3.

Table 3. Policy in the Production Preparation Phase

Policy interpretation	year
2018.1.1-2020.12.31 Newly purchased equipment can be deducted in the calculation of taxable income according to the regulations.	2018
Qualified imports of major scientific and technological equipment are exempted from customs duties and import VAT.	2018
2021.1.1-2022.12.31 New energy vehicles are exempted from vehicle purchase tax.	2020
2019.1.1-2020.12.31 Qualified domestic equipment is fully refunded VAT.	2020
The purchase of environmental protection and energy-saving equipment can be deducted or carry-over credit in a certain percentage.	2013
Entertainment expenses shall be deducted on a pro rata basis, and advertising and business publicity expenses shall be deducted before tax.	2012

The above policies have a more comprehensive coverage for the purchase of all kinds of equipment, reflecting the guidance of greenization, intelligentize and digitization of the equipment manufacturing industry, and also have some effect on the promotion and protection of domestic equipment. However, the time period of some policies is about two to three years, and the short period of preferential

policies is conducive to the government's timely and effective adjustment of tax and fee policies according to the actual development of the equipment manufacturing market, and the equipment manufacturing enterprises are technology-intensive enterprises, and technological innovation is one of the important strategies of enterprises, which go against the long-term company technical planning.

2.4. Production and Sales

After the completion of various preparatory work in the early stage, the enterprise gradually enters the production stage, facing the problem of depreciation of equipment, and then the product is sold after the completion of production and sales, in order to reduce the tax burden in the production and sales stage, the state uses a variety of tools for tax concessions, for different special enterprises and excellent enterprises, also enjoy specific tax preferential policies. Specific policies are shown in the table 4.

Table 4. Policy in the Production and Sales Phase

Policy interpretation	year
All manufacturing industries are eligible for accelerated depreciation of fixed assets.	2019
The original tax rate of 16%was changed to 13%; The original tax rate of 10%was changed to 9%.	2019
Small-scale taxpayers are exempted from VAT within a certain amount.	2019
Software products VAT over tax is levied and refunded.	2019
2018.1.1-2023.12.3 The final VAT credit for large civil aircraft accessories will be refunded.	2019
Advanced manufacturing can apply for a refund of incremental retention tax credits after July 2019.	2019
Equipment manufacturing and other specific industries VAT end-of-period tax credits will be refunded.	2018
Equipment required for integrated circuits VAT end-of-period tax credits will be refunded.	2011
Enterprise income tax for high-tech enterprises shall be levied at a reduced tax rate of 15%.	2017
Enterprise income tax for integrated circuit enterprises shall be levied at a reduced tax rate of 10%.	2015
Enterprise income tax shall be reduced or exempted for enterprises producing key special materials and special integrated circuit equipment.	2018
2019.1.1-2021.12.31 Small and low-profit enterprises shall pay enterprise income tax at a reduced tax rate.	2019
Before 2018.12.31, the enterprise income tax of software enterprises shall be exempted or halved on an annual basis.	2019
In that year, the key software enterprises can reduce enterprise income tax.	2016
2021.1.1-2030.12.31 Enterprise income tax shall be reduced for enterprises in the encouraged industries located in the western region.	2020

In the production and sales stage, the government has played a positive guiding role, and different types of equipment manufacturing enterprises have corresponding preferential tax policies, and the preferential objects are targeted and more extensive, and the provisions are more specific and detailed. Through the above policies, it is obvious that the preferential methods are more diverse, almost including every step of the production and sales link of the enterprise.

2.5. Corporate Governance

After going through the preparatory stage and the production and sales stage, the enterprise has basically entered the normal operation track, how to maintain the normal operation of the enterprise, reduce the daily tax expenses, and ensure the welfare of workers is the focus of the enterprise at this

stage. In order to expand the scale of production, occupy more market share, and optimize the industrial structure, the phenomenon of enterprise merger and reorganization continues to appear. In order to support the continuous development of enterprises, China has implemented a series of tax and fee preferential policies. Specific policies are shown in the table 5.

Table 5. Policy in the Corporate Governance Phase

Policy interpretation	year
The proportion of educational expenditure deductions for enterprise employees increased.	2018
In the process of asset restructuring, the transfer of assets and goods will not collect VAT.	2018
The state-owned land or housing ownership change to the reconstruction of the enterprise temporarily not levied VAT.	2013
The proportion of the acquired equity or assets decreases.	2018
From January 1,2018, enterprises with high-tech or technology will extend the period of loss carryover.	2018

From the above policies, it can be seen that the government guarantees the educational funds and operating conditions of enterprise employees, lowers the threshold of enterprise reorganization, and gives preferential treatment to the business links in the process of enterprise reorganization to a certain extent, which is beneficial to the development and growth of company and the improvement of sustainable operation ability.

3. Total Analysis of Industry Advantages and Disadvantages

With the continuous support of the policy, the transformation and upgrading of the equipment manufacturing industry in Hebei has gradually matured from exploring forward, and in 2016,this exceeded the steel industry for the first time; In 2023, it achieved operating income of 1,205.1 billion yuan; From 2013 to 2023, the average annual growth rate is 8.7%, which is 3.4 percentage points faster than the whole industry. Hebei equipment manufacturing industry has made significant achievements, but the industry gap still exists objectively [11].

3.1. Scale of Operation

The overall gap between Hebei's equipment manufacturing industry and Guangdong Province and Jiangsu Province is very large, especially the difference between computer, communications and other electronic equipment manufacturing industry and Guangdong is nearly 70 times, and several other industries also have a multiplier gap. The steel industry accounts for a high proportion, the intelligent industry is underdeveloped, and the transformation and upgrading of industrial structure is difficult. Hebei should focus on the greenization of the steel industry, the digitization of the traditional equipment manufacturing industry, the cluster cultivation of intelligent equipment manufacturing industry, and strive to break through development (table 6).

Table 6: Comparison of operating income of equipment manufacturing enterprises in national and major provinces and cities in 2021 (100 million yuan)

	C21	C22	C23	C24	C25	C26	C27	C28	total
nationwide	49681	49384	37352	87724	18516	86546	147052	9749	486004
Guangdong	8599	5639	5050	9646	1524	19904	46395	1540	98298
Jiangsu	8340	10178	7395	8414	3195	17523	22159	2482	79686
Hebei	3463	833	1238	3231	400	2026	659	202	12051

Note: 1. C21-C28 above are eight classified industries of equipment manufacturing industry, which are: C21 Metal Products Industry, C22 General Equipment Manufacturing, C23 Special Equipment manufacturing, C24 automobile Manufacturing, C25 railway, ship, aerospace and other transportation equipment manufacturing, C26 Electrical machinery and equipment manufacturing,

C27 computer, communication and other electronic equipment manufacturing, C28 instrument and meter manufacturing.

2. Guangdong Province and Jiangsu Province are the top two provinces in terms of business income of equipment manufacturing industry in China. Based on research needs, the corresponding data of Hebei Province are compared.

3. The data in the above table are from the official websites of National Bureau of Statistics, Guangdong Bureau of Statistics, Jiangsu Bureau of Statistics and Hebei Bureau of Statistics.

4. Due to data limitations, it was not possible to obtain all the updated data required for this study.

3.2. Innovation Input

Table 7 collates the data of Hebei equipment manufacturing industry, Guangdong Province and the whole country, and reflects the innovation potential and innovation development gap. There is a large gap between Hebei and the highest level in China about the scientific research funds investment, especially the gap in the computer, communication and other electronic equipment manufacturing industry is still more than 70 times. Overall, the innovation potential of Hebei is limited, and the level of R&D investment is not high, which is one of the important practical factors restricting the transformation and upgrading of enterprises in the province.

Table 7: R & D investment of enterprises in Hebei, Guangdong and national equipment manufacturing industry in 2021 (100 million yuan)

	C21	C23	C24	C26	C27
nationwide	683	1035.4	1414.6	1818.1	3577.8
Guangdong	98.64	133.32	169.51	364.99	1392.61
Hebei	35.1	22.89	75.07	28.08	17.75

Note: 1. R&D funds are scientific and technological funds

2. The above five industries are classified in the equipment manufacturing industry, as shown in the above table.

3. Because some data of C22 and C25 cannot be obtained, this table does not compare them.

4. The data are from the Statistical Bulletin of scientific research Fund Investment of Hebei Province in 2021, the Statistical Bulletin of scientific research fund Investment of Guangdong Province in 2021 and the Statistical Bulletin of national scientific research fund investment in 2021.

3.3. Depletion of Resources

Since the energy consumption of equipment manufacturing industry in Hebei Province is obtained by comprehensive energy consumption indicators, while that in Guangdong Province is calculated by comprehensive energy consumption of the industry, the above data in Guangdong is lower than the actual energy consumption level of Guangdong equipment manufacturing industry and enterprises above the scale of subdivisions, but it does not affect the analysis of energy consumption level of equipment manufacturing industry in Hebei Province. At present, Hebei Province has the realistic factors of a large proportion of energy-consuming industries and strong development of iron and steel industry. Equipment manufacturing industry is the leading one in Guangdong, and comprehensive energy utilization efficiency is significantly higher than that of Hebei Province. Therefore, the green and high-quality development of Hebei equipment manufacturing industry should focus on increasing energy utilization efficiency of energy-consuming industries and transforming leading industries (table 8).

Table 8: Energy consumption of 100 million yuan in 202

	C21	C22	C23	C24	C25	C26	C27	C28	ALL
Hebei	0.0994	0.0398	0.0384	0.0247	0.0313	0.0251	0.0556	0.0085	0.0503
Guangdong	0.0992	0.0402	0.0485	0.0344	0.0438	0.0399	0.0453	0.0375	0.0476

Note: 1. In 2021, Hebei Province published the data of comprehensive energy consumption, but did not publish the data of comprehensive energy consumption of the industry; In 2021, Guangdong

Province announced the comprehensive energy consumption data of the industry, but did not announce the comprehensive energy consumption data. Therefore, the research on the level of energy consumption is reflected by the energy consumption index of 100-million-yuan revenue in the table above.

2.C21-C28 See the remarks in Table 6.

3. The data are from Hebei Statistical Yearbook, Guangdong Statistical Yearbook, Hebei Statistical Bureau and Guangdong Statistical Bureau.

4. Tax Policy Gap Optimization

In Hebei Province, the proportion of traditional industries is high, the proportion of high-end equipment is small, the efficiency is not high, the scale is small, and the growth rate of industrial investment and technological transformation investment continues to decline. In view of these defects, it is absolutely necessary to optimize the problem-oriented macro tax policy gap.

(1) Focus our financial resources on supporting industrial transformation and upgrading, improve fiscal subsidy policies, explore a discount mechanism for science and technology innovation loans, support the creation of "specialized and innovative" small and medium-sized enterprises, provide a certain proportion of subsidies to relevant enterprises, and provide certain scientific research projects and R&D subsidies to early-stage scientific and technological innovation enterprises.

(2) Innovate support methods to promote the digital economy to empower manufacturing. Traditional industries such as steel, petrochemical and equipment in the province will be transformed and upgraded, and preferential tax measures to adapt to the new model of "digital + industry" will be explored.

(3) Make full use of preferential tax policies to seize the opportunity for the transformation and upgrading of the equipment manufacturing industry. We will implement preferential tax policies such as accelerated depreciation of equipment for micro, small and medium-sized enterprises, deferred payment of taxes, income tax reduction for small and micro-profit enterprises, and VAT exemption for small-scale taxpayers, and increase support for small and medium-sized enterprises to enhance their overall competitiveness.

(4) Take multiple measures to promote the implementation of policies and ensure that enterprises enjoy policy dividends. Fiscal and taxation departments should formulate and issue implementation rules and operational methods in a timely manner, increase publicity and guidance efforts, ensure that enterprises should be fully aware of and enjoy, avoid policy delays, and closely track the implementation of policies.

5. Conclusion

This paper takes Hebei Province as an example to explore the transformation and upgrading of the equipment manufacturing industry and macro tax and fee policies. The various and complex policy provisions are sorted out according to the five links of the enterprise, and the advantages and disadvantages are summarized in theory through policy analysis. Then, through sorting and summarizing the real data, Hebei equipment manufacturing industry is compared with the high-level provinces in the country, highlighting the shortage of that in Hebei; Finally, summarize the disadvantages of the above two parts, and make targeted suggestions for policy optimization. To a certain extent, it makes up for the research gap of equipment manufacturing industry and tax policy in Hebei Province and provides a strong theoretical basis for digitization and greenization of that. Of course, due to the availability of data, many data cannot be updated, data comparison is not comprehensive enough, and there are shortcomings in the analysis perspective.

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