Analysis of the Decline in the Competitiveness of New Products in Beijing's High-tech Manufacturing Industry

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Abstract. Clearly stated in the Fourteenth Five-Year Plan for 2035, in order to achieve major breakthroughs in core technologies, one must enter a target innovative country at the forefront, but also insist on the proposed innovation-driven development and adhere to innovation and modernization in our country. With the deepening Sino-US trade friction, the export of various industries in China is facing pressure from the US against globalization, industrial software, and chip manufacturing, which has simultaneously hit China hard through industry development. Data analysis reveals that Beijing's high-tech manufacturing of new products and export earnings decreased year by year, but the main reason for the decline is the decrease in electronic and communication equipment manufacturing sub-industry of its new products in export earnings. It is found that the decline in product competitiveness has nothing to do with the insufficient input of innovation elements, but more with the intermediate links. The link through technological transformation is related to application and absorption. The panel data-fixed effect model was used to verify the assumptions proposed in the previous article. The verification showed that the lack of transformation and application of imported technology and the low efficiency of personnel utilization have led to a decline in the export competitiveness of electronic information manufacturing products. According to the extant research conclusions, three paths for the future innovation of Beijing’s high-tech manufacturing industry to lead sustainable development are given: increased investment in imported technology transformation and adherence to innovation-driven development; improved efficiency of the absorption and absorption of imported technology; and enhanced corporate technology for innovative ability and increased utilization rate of R&D personnel input to stimulate talent innovation vitality.

1. Introduction

The Fifth Plenary Session of the 19th Central Committee of the Communist Party of China put forward a new concept: to pursue scientific and technological self-reliance as the strategic support for national development, and also insist on the core position of innovation in overall modernization. In recent years, Beijing has vigorously developed high-precision industries with the aim of enhancing the innovation and competitiveness of new products and promoting the capital's volume reduction development. However, the statistical data suggest that the new products of Beijing's high-tech industries are declining year by year, both in terms of export competitiveness and new product export income. Looking at other provinces and cities across the country, the export income
of new high-tech manufacturing products in most provinces and cities has shown an upward trend. Within the high-tech manufacturing as the "cabbage" hardcore industry, the competitiveness of its new products and income-generating capacity direct impact the quality development of Beijing, and thus close attention to its progress is essential. It is necessary to identify the problems in the innovation and development process of Beijing high-tech manufacturing industry according to the development of specific industries and combine this with the national analysis of the core factors affecting the export income of new products of the high-tech manufacturing industry. This approach can help solve the existing problems of Beijing's high-tech manufacturing. The study authors found that, in high-tech manufacturing sub-industries, the new product export earnings electronics and communications equipment manufacturing industry from 2009 continued to decline, and this has caused Beijing's new high-tech manufacturing products to become less competitive. Therefore, this article will focus on the analysis of the electronics and communication equipment manufacturing industry to identify the factors affecting the decline in the export competitiveness of the industry's products and innovative countermeasures to lead to the sustainable development of the industry.

2. Literature Review and Questioning

2.1. Questions Raised

Since 2009, the export sales revenue of new products of Beijing's high-tech industry and its share in the country have continued to decline. The new high-tech industrial products exports and sales are important indicators of industry innovation, and the industry in Beijing declined from 60.57 billion in 2009 to 17.02 billion yuan in 2018. Within the national high-tech industry, new products export substantial increases in the average annual growth rate of 20.5%, while Beijing’s new exports exhibited a serious decline, from 2.3% in 2009 to 0.87% in 2018, exhibiting a decline of up to 93%.

Compared with Beijing, from 2009 to 2013, the high-tech industry’s new product export revenue and its share in the country of Shanghai were similar to those of Beijing, and both declined year by year. However, starting in 2013, this situation began to reverse. In 2018, Shanghai’s high-tech industry's new product export income and its share in the country not only stopped its decline, but also showed an upward trend. Looking at the situation in Shenzhen, export revenues of 2009-2013 increased year by year, but its volatility is not significant. Shenzhen and Beijing do not exhibit the same cliff-like drop, coupled with the base in Shenzhen. It can be seen that Beijing has lost to Shenzhen and Shanghai regarding the competitiveness of high-tech industrial products.

This article will focus on this problem, specifically analyzing the industrial situation of Beijing's high-tech manufacturing industry, and determine which industries have affected the export of new products of Beijing's high-tech manufacturing industry. It will also identify the factors that affect the export of new products of the industry through theoretical analysis and empirical analysis within the problematic industry.

2.2. Literature Review

From the perspective of research content, it mainly focuses on the research on innovation ability and the research on competitiveness [1-3]. From the perspective of the research scope, it mainly focuses on the overall research of high-tech manufacturing and the research of sub-industry [4-6]. Some scholars conduct research on the high-tech manufacturing industry as a whole [7-8]; research on sub-industry [9]. The research on the competitiveness of high-tech products includes [10-11] the
research on the electronics and communication equipment manufacturing industry [12-14]. Through combing the literature on international competitiveness, it can be found that the current academic circles, regardless of Scholars at home and abroad have not formed a unified understanding of whether it is the evaluation index of international competitiveness or the influencing factors. Each scholar chooses a different perspective and the result is different. Although there is a lot of literature on international competitiveness research, it lacks practical problem-oriented analysis of specific industries and problematic industries in high-tech manufacturing, mainly focusing on the single-point analysis of the international competitiveness of industries. Index evaluation and comparison, and analysis of influencing factors. There is a lack of research on the existing problems and reasons of high-tech manufacturing in some regions and industries. Based on the phenomenon that Beijing's high-tech manufacturing export income and its share have been declining year by year since 2009, this paper studies the problems of new high-tech manufacturing products and analyzes and verifies the reasons.

3. Model and Hypothesis

3.1. Theoretical Analysis

According to the High-tech Industry (Manufacturing) Classification (2017) issued by the National Bureau of Statistics, the high-tech manufacturing industry is divided into 6 major industries. This article first analyzes Beijing’s high-tech industry (manufacturing) based on the high-tech industry statistical yearbook over the years and the export income of new products in specific industries. The export income of new products in the electronics and communication equipment manufacturing industry has demonstrated a downward trend since 2008, while other industries in the high-tech manufacturing industry have not shown a clear downward trend. The decline in the export competitiveness of new products in the communications equipment manufacturing industry has directly led to the decline in the export income of new products in Beijing’s high-tech manufacturing industry year by year. The above analysis indicates that the decline in the export income of new products in the electronics and communication equipment manufacturing industry has become a common problem in many provinces and cities across the country.

3.2. Research Hypothesis Set

Based on the previous theoretical analysis, it can be concluded that the export income of new products in the electronics and communication equipment manufacturing industry in Beijing and other places has decreased, the export competitiveness may be reduced, the input efficiency of innovation factors is low, and the imported technology lacks application and absorption, transformation, and re-innovation. Therefore, this paper proposes the following three assumptions, using data from 24 provinces from 2008 to 2016 in panel data empirical analysis.

Hypothesis 1: The low utilization efficiency of R&D personnel input leads to the decline of new product sales revenue and export competitiveness.

Hypothesis 2: The low utilization efficiency of R&D capital investment leads to the decline of new product sales revenue and export competitiveness.

Hypothesis 3: The re-introduction of new technologies in the industry and lack of application and absorption, technological transformation, and re-innovation have led to a decline in sales revenue and export competitiveness of new products.
3.3. Model Set

This paper uses the fixed-effects model of panel data to analyze the factors affecting the export competitiveness of new products in the electronics and communication equipment manufacturing industry. The use of data panels has three advantages: first, it uses two dimensions of a common configuration, so the problem may be solved through sectional time series. Second, there will be no missing variables when using panel data. Third, because the panel data contains two dimensions, its sample size is relatively large, which can improve the accuracy of sample estimation. The basic panel data model is as follows:

\[ Y_{it} = \alpha + X_{it}\beta + \mu_i + \epsilon_{it} \]

Among them, i and t represent the cross-sectional dimension and time dimension, respectively, and represent the explained variable and the explanatory variable. \( \beta \) is the coefficient of the explanatory variable, and \( \alpha \) represents the intercept term of the model as a whole. \( \mu_i \) represents the individual effect, and \( \epsilon_{it} \) represents the random error. According to the hypothesis of this article, the utilization rate of R&D personnel, capital investment, industry technology introduction, technology application and absorption, and technological transformation funds affect the sales revenue of new products, so the regression model used in this article is set as follows:

\[ \ln Y_{it} = \alpha + \beta_1 \ln human + \beta_2 \ln cap + \beta_3 \ln tro + \beta_4 \ln indig + \beta_5 \ln trans + Z_{it} + \mu_i + \epsilon_{it} \]

Among these factors, represents the export income of new products of the electronic and communication equipment manufacturing industry, serving as the explained variable of this article; the five explanatory variables are the utilization rate of R&D personnel input, the utilization rate of R&D internal expenditure input cap, and the investment input of technology introduction, technology application and absorption funds, and technology transformation funds. represents the control variable, \( \alpha \) represents the intercept term of the overall model, represents the individual effect, and represents the random error. In order to eliminate data heteroscedasticity and solve the problem of data dimension unit difference, the data are processed logarithmically and dimensionlessly.

3.4. Panel Data Regression Analysis Result

In order to further increase the stability of the data and ensure the credibility of the regression results, this paper performs logarithmic processing on each variable, and on this basis, carries out the least square regression of panel data to study the utilization of capital, human input, and technology. It also demonstrates the impact of the introduction, technological transformation, and absorption on the export income of new products. The regression results obtained are as follows in Table 1.

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<th>(1) Y FE OLS</th>
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<tr>
<td>Human</td>
<td>1.240288*</td>
<td>(1.799585)</td>
</tr>
<tr>
<td>Cap</td>
<td>-0.437941</td>
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Table 1. Panel data regression analysis result.
The regression equation of the panel data is shown in the following formula. The regression results show that technology application and absorption expenditures and the utilization rate of R&D expenditures did not significantly affect the export revenue of new products, while the increase in the utilization rate of personnel inputs will increase the sales revenue of new products. In addition, there is a negative correlation between technology introduction funds and new product sales revenue, indicating that excessive technology introduction investment will reduce the technical content of new products, thereby reducing the export competitiveness and sales revenue of new products. Compared to technology application and absorption, the technological input of technological transformation has a more significant impact on the export income of new products. Technology application and absorption pay more attention to the use and application of introduced new technologies, while technological transformation focuses on the application of technology in various industries, indicating that the application of new technologies demonstrates far greater improvement in the competitiveness of new products than the application and absorption of new technologies. Therefore, further attention should be paid to the transformation of new technologies and their applications in various industries.

Note: The t-value of a single variable t-test in parentheses is calculated based on the robust standard error. * Represents the significance of the coefficient. *p<0.1, **p<0.05, ***p<0.01

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<tr>
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<th>Coefficient</th>
<th>Standard Error</th>
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<tr>
<td>Intro</td>
<td>-0.111988*</td>
<td>(-1.593875)</td>
</tr>
<tr>
<td>Dig</td>
<td>0.071362</td>
<td>(1.208600)</td>
</tr>
<tr>
<td>Trans</td>
<td>0.293069***</td>
<td>(3.426534)</td>
</tr>
<tr>
<td>Z1</td>
<td>1.207028***</td>
<td>(4.469654)</td>
</tr>
<tr>
<td>Z2</td>
<td>-0.187185</td>
<td>(-0.645414)</td>
</tr>
<tr>
<td>Z3</td>
<td>2.623325***</td>
<td>(2.742133)</td>
</tr>
<tr>
<td>Z4</td>
<td>1.158896**</td>
<td>(1.991586)</td>
</tr>
<tr>
<td></td>
<td>Goodness of fit</td>
<td>0.967016</td>
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4. Conclusion

4.1. Increase in the Introduction of Technology Transformation of Inputs

Increased focus on the introduction of technological transformation of funds invested can strengthen the introduction of foreign technology production and application of the entire process within the industry. To master the advanced technology, industries must realize the transformation and upgrading of the backward technology in the production process of the electronic and communication equipment manufacturing industry to the advanced technology and realize the expansion of reproduction based on connotation. Such efforts will thereby improve product quality, promote product upgrading, save energy, reduce consumption, and comprehensively improve the comprehensive economy. Important way to promote the technological transformation of electronic and communication equipment manufacturing enterprises is to provide incentives, provide loans and tax incentives to enterprises that actively carry out technological transformations with imported technologies, or use venture capital to help relevant enterprises take risks and solve the dilemma of weak competitiveness of industrial products and high-tech industrial products. Beijing, as a national science and technology innovation center, should actively adopt new technologies, new processes, and new methods to organize and conquer a number of key common technologies that have long plagued the electronics and communication equipment manufacturing industry for the improvement of the technological content of new products and promote electronics. The technological transformation of the whole industry and the increase in the export competitiveness of new products in the communications equipment manufacturing industry provide sufficient support for the capital’s volume reduction development.

4.2. Improving the Efficiency of the Introduction of Technology Application and Absorption, and Enhancing the Technological Innovation Capability

The application, absorption, and re-innovation of imported technology is an innovative model for many developing countries to achieve curve overtaking. However, the regression results indicate that the application and absorption of imported technology in most provinces and cities in China stay on the surface, and there is no capital investment, but there is no conflict and the output matches the input. The capital investment absorbed cannot have an impact on the export income and export competitiveness of new products and has no substantial effect on the application, absorption, and re-innovation of imported technologies. Therefore, it is necessary to increase the depth of research on imported technologies and promote the efficiency of transforming new technologies into new products. Industries should also give full focus to the link between the introduction of technology research and the transformation of new products, formulate an annual plan for technology introduction and absorption, strengthen the macro-guidance of imported technologies and facilities, and use venture capital to help enterprises take risks or apply imported technologies. Enterprises provide loans and tax incentives, establish interconnected relationships with investment companies and social capital consortia, formulate special funds for the introduction of technology research and link them to the scientific research talent evaluation system, and focus on improving the depth of research on imported technologies and the efficiency of new product conversion. This will influence the competitiveness of new products of the Innovation Center.

4.3. Increase R&D Staff Input Utilization and Stimulate Innovation and Vitality Talent

Among R&D personnel, decreases in capital investment utilization have become common in the electronic and communication equipment manufacturing industry. The results of empirical analysis
indicate that, compared with the utilization rate of capital investment, the utilization rate of R&D personnel input significantly affect the export competitiveness of new products. Therefore, increasing the utilization rate of R&D personnel input will increase the export income of new products in the electronics and communication equipment manufacturing industry, demonstrating an important way to export competitiveness. Supervising agencies can be established in various enterprises to standardize the daily behavior of corporate research and innovation personnel in addition to monitoring but also to establish incentives to promote the application and absorption of imported technology cooperation model of market-oriented and interest distribution mechanism with contractually mandated content and deadlines, thereby devoting more autonomy research R&D personnel to technology innovation. The cultivation of talents is also a way to increase the utilization rate of personnel input. Because the talent required by high-tech manufacturing industries such as electronics and communication equipment manufacturing industries is highly professional, the quality of R&D personnel input will also affect the utilization rate of personnel input. The government focuses on the lead guide universities, research institutions, and enterprises to join hands to develop professional counterparts personnel training programs, tax breaks, and special funding for personnel training and other preferential policies to encourage enterprises to provide employment opportunities and career planning personnel. With the help of the government, enterprises, and universities, as well as the devotion of strong scientific and technical personnel working with the latest technology theories to master and perfect knowledge of technical personnel, the industry can train professional personnel for the introduction of technology and innovation to enhance the re-introduction of technological innovation and thereby promote electronic and communications for the industrial development of the equipment manufacturing industry.

References


