Impact of High-Tech Product Import on Export Quality Level

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Abstract. Based on China Customs database, Wind database and China Statistical Yearbook, this paper measures the export quality of high-tech products in 31 provinces of China from 2008–2021 and constructs the export and development level of high-tech economy in each province using variables such as high-tech imports, GDP, number of college students, foreign direct investment, and government fiscal expenditure. Moreover, by studying the impact of high-tech economy on China's export quality, it is found that high-tech product exports can significantly improve the level of high-tech development, and this result still holds after endogeneity test, heterogeneity test, robustness test, and two-stage instrumental variable method. With the increase of product quality differences, the effect of improving the quality of high-tech product exports will be more obvious and there are regional differences. It is particularly prominent in higher income regions, such as the eastern and central regions. However, as provinces become more active in international trade, the impact of high-tech product imports on overall export quality will change as the influencing factors change. In terms of influence channels, high-tech product imports mainly promote export quality through product quality upgrading effect and product reconfiguration effect. From the conclusion of the data, this paper proves that the development model of "import-strong export" is still reasonable. By attracting foreign investment and increasing import efforts, capital and advantages can be obtained to improve the level of export technology. And through the analysis of variables affecting the export level of high-tech products, we can reduce the risks of high cost, high competitiveness and other risks encountered in the export stage and improve economic benefits. This conclusion is important for evaluating the economic benefits of China's digital economy policy.

Keywords: Imports · Exports · Region · High-tech · GDP · Endogeneity · Export quality · Economics development

1 Introduction

High-tech products, as cutting-edge digital products requiring a lot of research and development work and capital investment, not only change people's production and lifestyle, but also have the characteristics of high input cost, high sunk cost, high competitiveness,

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and high risk in the export stage. Moreover, research and development and market development need a lot of time and capital. It is highly uncertainty in future development due to the rapid changes in the market. Thus, it is important to measure a country's export level for its economic development because it represents the degree of economic development and technological development of a country, is of vital relevance and important value to national development. Therefore, how to promote the technological level is worth a country's key development and research areas.

On the one hand, the import of high-tech products can promote the development of domestic high-tech industry and rapidly improve the quality of domestic digital products to increase the competitiveness of products in the international arena [11]. Increasing product differentiation can lead to higher returns. On the other hand, self-developed high-tech products help to improve the characteristics of low-cost, large-scale availability, and externalities that traditional production factors do not have [7]. Firms can use this feature to enhance product functionality and increase the value of physical goods [8]. At the same time, the import of high-tech products makes the trade participants more diversified. Relying on the Internet platform [1], the cost for enterprises and regions to participate in international trade is significantly reduced, enabling them to obtain overseas orders more easily. Simplifying the export process and lowering the "threshold" of access to export markets allows more regions to participate in international trade [2]. Different regions can not only attract many customers more quickly by attracting foreign investment and other help to export high-tech products [9], but also be able to grasp international market dynamics by using big data analysis [10].

In fact, high-tech product imports are an important yardstick to measure the technological level of a country's exports [3]. With the increase in the import and export of high-tech products, the import of high-tech products not only promotes productivity improvement, but also promotes regional coordinated development, giving independence and focus to regional economic development, which makes the region increase its independent research and development [12], which in turn increases the ability to effectively withstand adverse external shocks such as fluctuations in international market demand [4]. Therefore, how to gain advantages in the highly competitive international trade with digital trade and high-tech product resources to seize the first opportunity and promote export upgrading has triggered discussions among many scholars.

This paper hopes to contribute to answering this question through the following three points: (1) Based on the existing literature, using endogeneity analysis, robustness analysis, heterogeneity analysis, two-stage instrumental variables method, to measure provincial export technology level from provincial, regional, and FDI (Foreign Direct Investment) [5] perspectives. (2) Using the import and export volume of high-tech products and control variables such as foreign direct investment, government fiscal expenditure, GDP, number of college students, and R&D investment as entry points, to explore the methods and approaches to improve export quality, emphasize the impact of high-tech product imports on provincial export levels, and provide a theoretical basis for regions to enhance their independent innovation capabilities. (3) It also explores the factors affecting export quality [6] and channel issues as well as how to upgrade the export level through importing high-tech products. Specifically, this paper first makes hypotheses about the relationship between imported high-tech products and export technology

Table 1. Variable Definition Table [Self-graphed]

Variable Type	Variable Symbols	Variable Name	Variable Meaning
Explained variables	Prody	High-tech Product Export Quality Index	Calculated from Prody index
Core explanatory variables	IM	High-tech products import	High-tech products import volume
Control variables	GDP	GDP	Gross Domestic Product
	LN	Number of labor force in high-tech industries	Number of people in the labor force by province
	IP	Provincial R&D investment	R&D investment by province
	OP (USD)	Government fiscal expenditure	Provincial fiscal expenditures
	SN	Number of college students	Number of students receiving university education by province
	DI	Foreign Direct Investment	Amount of foreign investment
	MK	Degree of marketization	The level and extent of market-oriented development

level, whether it can improve export quality, and the factors influencing the improvement of export technology level and its improvement path, and then constructs an econometric model for empirical testing and analysis; secondly, the effect of high-tech product imports on export technology level is analyzed by heterogeneity, robustness, and endogeneity to discuss the effect of different. Finally, tests are conducted to draw conclusions, summarize the influencing factors and their effects, and propose suggestions to promote high quality, high level, and high sustainability development.

2 Study Design

Based on the above research basis and research hypotheses, this paper constructs a panel regression model with high-tech product export quality index as the explanatory variable, high-tech product import as the core explanatory variable, GDP, the number of high-tech industry labor force, provincial R&D investment, government fiscal expenditure, the number of college students, foreign direct investment and marketization degree as the control variables with explicit sign definitions and variable explanations, which are shown in Table 1.

Dependent variable: complexity of technical level of high-tech product exports.

Referring to Hausmann et al. (2007), this paper uses data to calculate the technical complexity Prody of exports of product p.

$$Prody_p = \sum\nolimits_d \frac{(x_{pd}/X_d)}{\sum_d (x_{pd}/X_d) \times gdp_d} \tag{1}$$

According to this paper's research and design on the influence of high-tech products' export quality, the following panel regression model is further constructed in this paper to observe the influence of high-tech products' import on export.

$$\Pr ody_{it} = \beta_0 + \beta_1 IM_{it} + \sum v_j X_{jit} + m_i + \lambda_t + u_{it} \tag{2}$$

where Prody denotes the quality index of high-tech product exports, IM denotes high-tech product imports, X denotes the control variables, including GDP, number of high-tech labor force, provincial R&D investment, government fiscal expenditure, number of college students, FDI, and degree of marketization, β_1 and v denote the coefficients of core explanatory variables and control variables, respectively, m_i denotes individual firm effect, λ denotes time effect, and u_{it} denotes random disturbance.

3 Data Sources and Model Selection

3.1 Data Sources

To deeply analyze the influencing factors of the technical level of high-tech product exports, this chapter combines the data availability, selects the data of 31 provinces in China, and the time span is chosen from 2008 to 2021, and divides the 31 provinces into three regions: east, central, and west. Specifically, these data include the core explanatory variables of 31 provinces in China, GDP, the number of high-tech labor force, provincial R&D investment, government fiscal expenditure, the number of college students, foreign direct investment, and the degree of marketization. These data are obtained from authoritative databases such as National Bureau of Statistics, China Statistical Yearbook, wind database and China Customs database.

3.2 Benchmark Model Selection

According to the steps of empirical analysis of panel model, this chapter firstly implements the mixed cross-sectional model regression for each province's high-tech product import data indicators, and based on the mixed cross-sectional regression, this paper also regresses the individual fixed-effect variable intercept model and individual random-effect variable intercept model specific results are shown in Table 2.

Further based on the regression results, the adjusted goodness of fit of the mixed cross-sectional model is 0.6208, and the goodness of fit meets the requirements. The t-test results of import of high-tech products IM, number of university students SN, government fiscal expenditure OP, foreign direct investment DI are significant, which indicates that GDP, number of labor force in high-tech industry, provincial R&D investment, government fiscal expenditure, number of university students, foreign direct investment,

degree of marketization and import/export amount have strong explanatory effects on the export of high-tech products in each province in the mixed cross-sectional model. The explanatory effect of the mixed cross-sectional model on the export of high-tech products in each province is strong. However, the t-tests of labor force LN and marketization MK are not significant, which indicates that these two indicators do not explain the advanced industrial structure of each province.

Hybrid Cross-Sectional Model

Further, based on the mixed cross-sectional model, this paper further explores the impact of human capital level on the advanced industrial structure at the panel model level since different provinces are also used in the analysis of the model in this paper, mainly wanting to further explore the impact of high-tech product import level on high-tech product export quality index at the national inter-provincial level. According to the individual fixed effects model 2, it can be seen that high-tech product import, government fiscal expenditure (USD), number of college students, and foreign direct investment have significant effects on high-tech product export quality, among which government fiscal expenditure, number of college students, and foreign direct investment are significant at 1% significance level, which indicates that at the inter-provincial level, government fiscal expenditure, number of college students, and foreign Direct investment has a significant role in promoting the quality of high-tech product exports, which is in line with the realistic laws and characteristics.

Further, to further analyze and determine the specific effects of the core explanatory variables as well as the control variables on the explanatory variables, this paper performs Hausmann tests on the panel model [13], the chi-square value of Hausman test result is 355.59, the concomitant probability is less than 0.0000, according to the concomitant probability is less than 0.01, this paper thinks that the coefficient difference of panel regression model is systematic, and the panel model should use individual time double fixed effect model, so this paper takes individual fixed effect model 2 as the benchmark model, and conducts in-depth analysis on the basis of the benchmark model to further explore the precise influence of high-tech product import level on high-tech product export quality index.

Heterogeneity

Heterogeneity refers to the analysis of whether the explanatory effect of the explanatory variable on the variable being explained shows a different pattern in the subsample than in the full sample, and whether the explanatory effect of the explanatory variable on the variable being explained changes significantly across the subsamples. Since the development of high-tech product imports and high-tech product exports in China present significant geographical and economic characteristics, this paper focuses on in-depth analysis and exploration of the influence of high-tech product imports on the technical level of high-tech product exports according to geographical characteristics.

First, by Regional Characteristics

According to the development law of high-tech industry in China and the regular characteristics of industrial transfer and undertaking, this paper firstly divides China's

Table 2. Statistical table of regression results [Self-graphed]

Export product quality	Hybrid cross-sectional model (Model 1)	Individual time double fixed effects model (Model 2)
IM	0.4145*** (0.0284)	0.1142*** (0.0241)
GDP	0.1507 (0.1728)	0.5803** (0.2521)
LN	−0.0264 (0.0239)	0.0146 (0.0108)
IP	0.0961 (0.0789)	−0.1456 (0.1068)
OP	0.0207 (0.1269)	−0.6426*** (0.2151)
SN	−0.5929*** (0.0930)	0.7489*** (0.1932)
DI	−0.0602* (0.0351)	0.1197*** (0.0293)
MK	−0.0297 (0.034)	−0.0264 (0.0292)
Adj.R^2	0.6208	0.2265
F-statistic	82.44	4.84
Prob(F-stat)	0.00	0.00
N	399	399
Province Fixed	No	Yes
Year fixed	No	Yes

Note: *, **, *** indicate significant at 10%, 5%, 1% level of significance, respectively

provinces into three categories: eastern region, central region, and western region according to the geographical characteristics. The eastern region includes 12 provinces (cities) of Shanghai, Beijing, Tianjin, Shandong, Guangdong, Guangxi, Jiangsu, Hebei, Zhejiang, Hainan, Fujian, Liaoning; the central region includes 6 provinces of Anhui, Shanxi, Jiangxi, Henan, Hubei, Hunan; the western region includes 13 provinces (cities, autonomous regions) of Yunnan, Inner Mongolia, Sichuan, Ningxia, Xinjiang, Gansu, Guizhou, Chongqing, Shaanxi, Qinghai, Tibet, Heilongjiang, Jilin. Autonomous regions). Accordingly, individual fixed effects regressions were conducted for the three regions, and the regression results are shown in Table 3.

According to the regression results in Table 3, as far as the east is concerned, due to the high level of economic development, educational resources, and good market conditions, the import and export trade tends to flow to the east, and the introduction of high-tech products will be easy to combine effectively with the capital and other factors

Table 3. Heterogeneity regression table by East, Central, and West [Self-graphed]

	Eastern Region (Model 3)	Central Region (Model 4)	Western Region (Model 5)
IM	0.1256** (0.0503)	0.0941*** (0.0313)	0.0245 (0.0259)
GDP	−0.8429** (0.4177)	−0.5903 (0.4288)	1.7347*** (0.3542)
LN	0.0258 (0.0167)	0.005 9 (0.0099)	0.0036 (0.0156)
IP	0.2402 (0.1705)	−0.0193 (0.1785)	0.0462 (0.1375)
OP	0.1522 (0.3686)	−0.4939 (0.3688)	−0.8006** (0.3064)
SN	0.9512*** (0.2703)	−0.2229 (0.3656)	−0.9382*** (0.3437)
DI	−0.0468 (0.0642)	0.1471 (0.0628)	0.0463 (0.0309)
MK	−0.1539*** (0.0378)	−0.1178* (0.0628)	0.2614*** (0.0467)
C	3.8511 (3.2698)	10.4043 (4.2552)	−7.4404*** (2.4625)
Adj.R^2	0.9444	0.9696	0.7599
F-statistic	5.34	12.08	8.79
Prob(F-stat)	0.00	0.00	0.00
N	161	78	160
Model Type	Fe	Fe	Fe

Note: *, **, *** indicate significant at 10%, 5%, 1% level of significance, respectively

of production in the east to promote the upgrading of the technical level of high-tech product exports. In terms of the central region, the use of the advantage of lower housing prices to attract the gathering of higher quality talent, and then effectively combine industrial undertaking and trade advantages The development of high-tech products has been enhanced, which has played an important role in promoting economic development and upgrading the technical level of high-tech product exports, thus enhancing the advanced level of industrial structure in the central region. As far as the western region is concerned, due to the sparseness of the western region, the basic import and export trade conditions are weaker than those of the eastern and central regions and slightly disadvantaged in promoting the development of high-tech industries. This situation forces human capital transfer to the eastern and central regions, and there are fewer trade ports in the western region, so the lack of human capital and the rising investment cost cannot effectively promote the development of high-tech industries, which makes the economic

Table 4. Heterogeneity regression table of foreign investment amount [Self-graphed]

	The amount of larger foreign investment (Model 6)	Smaller foreign investment amounts (Model 7)
IM	0.2237*** (0.0533)	0.0597*** (0.0156)
GDP	−0.0597 (0.4251)	−0.0757 (0.2349)
LN	−0.0134 (0.0131)	−0.0011 (0.0102)
IP	−0.1163 (0.1806)	0.0931 (0.0828)
OP	−0.5529* (0.3333)	0.0861 (0.2259)
SN	1.5134*** (0.3214)	0.1854 (0.1765)
DI	0.2543*** (0.0693)	0.0059 (0.0218)
MK	−0.0818* (0.0425)	0.1088*** (0.0324)
C	−4.0325 (3.7612)	−1.3711 (1.5391)
F-statistic	6.38	3.66
Prob(F-stat)	0.00	0.00
N	215	184
Model Type	Fe	Fe

Note: *, **, *** indicate significant at 10%, 5%, 1% level of significance, respectively

growth encounter great pressure, so the western region must take effective measures to retain and absorb the human capital in the eastern and central regions in order to play a positive role in promoting economic growth.

Second, the Division of Foreign Direct Investment According to the Amount of
To further analyze in depth, the pattern of the influence of factors promoting the development of high-tech industries on the technical level of high-tech product exports, this paper again conducts a heterogeneity analysis from the perspective of the amount of foreign direct investment. According to the amount of foreign investment, the 31 provinces are divided into large foreign investment and small foreign investment to make a regression on the export of high-tech products, and the regression results are shown in Table 4.

According to the regression results in Table 4, the amount of foreign direct investment, the number of college students, and the labor force quantity also have inconsistent effects on the technical level of high-tech product exports in each province. For the

regions with higher investment, there are significant effects of high-tech product import, number of university students, government expenditure, and marketization on high-tech product export, and for the regions with smaller investment, there are significant effects of marketization and high-tech product import on high-tech product export technology level. Comparing the effects of the core explanatory variables high-tech product imports on the technological level of high-tech product exports shows that the regression coefficient of the effect of high-tech product imports on the technological level of high-tech product exports for regions with larger investment amounts is 0.0533. There is a significant positive driving effect of high-tech product imports on the technology level of high-tech product exports. In contrast, the regression coefficient of the impact of high-tech product imports on the technological level of high-tech product exports is 0.0156, which indicates that the impact of high-tech product imports on the technological level of high-tech product exports in regions with larger investment amounts is much greater than the impact on regions with smaller amounts. Therefore, regions with larger amount of foreign investment need to further explore and play the role of high-tech product imports in promoting the technological level of high-tech product exports, and regions with smaller amount of foreign investment need to create conditions to retain and attract foreign investment, to make effective combinations of production factors, and to play a positive role of capital in promoting the technological level of high-tech product exports, so as to continuously promote high-quality economic.

Robustness Analysis and Endogeneity Analysis

The robustness of a model is defined as a relatively stable trend in the effect of the model's significant explanatory variables on the explanatory variables, which does not change significantly with fluctuations. There are various ways to test the robustness of the model; one way is to increase or decrease the sample size to see if there is a significant effect of the core explanatory variables on the explanatory variables. If the coefficient or effect of the core explanatory variables on the explanatory variables is insignificant, then the model can be considered as a robust model. Another method is to select similar variables of the core explanatory variables for regression and then see if there is a significant effect of the core explanatory variables on the explanatory variables. If the coefficients or effects of the core explanatory variables on the explanatory variables do not change significantly, then the model can be considered as a robust model. In this paper, we choose the first scheme method i.e., reducing the sample size, firstly, the range of 31 provinces is chosen to be unchanged, and ten years of data from 2011 to 2021 are taken for regression analysis to determine whether the underlying model is robust. According to this method, after the empirical regression, the robustness regression results are shown in Table 5. Column 1 in the table showed individual time double-fixed model results performed in Hybrid cross-sectional model above, which were used to compare the changes in the impact of high-tech product import on export technical level after robustness test.

Robustness test 1: Changing sample observations.
Robustness test 2: A 5% tailing of the core explanatory and explanatory variables.

Table 5. Robustness test table [Self-graphed]

	Individual time double fixed effects model (Model 2)	Robustness test 1 (Model 8)	Robustness test 2 (Model 9)
IM	0.1142*** (0.0241)	0.1344* ** (0.0265)	0.1465*** (0.0238
GDP	0.5803** (0.2521)	0.4792* (0.2842)	0.4385** (0.2219)
LN	0.0146 (0.0108)	0.0142 (0.0110)	0.0138 (0.0095)
IP	−0.1456 (0.1068)	−0.0898 (0.1203)	−0.0697** (0.0938)
OP	−0.6426*** (0.2151)	−0.8049*** (0.2353)	−0.4852** (0.1902)
SN	0.7489*** (0.1932)	−0.3955* (0.1993)	0.3709** (0.1709)
DI	0.1197*** (0.0293)	0.1140*** (0.0314)	0.1009*** (0.0259)
MK	−0.0264 (0.0292)	−0.0039 (0.0319)	−0.0232 (0.0256)
C	0.2265	−0.7334 (2.2457)	−2.5559 (1.6734)
F-statistic	4.84	4.09	5.69
Prob(F-stat)	0.00	0.00	0.00
N	399	348	399
Individual fixation	Y	Y	Y
Year fixed	Y	Y	Y

Note: *, **, *** indicate significant at 10%, 5%, 1% level of significance, respectively

According to the regression results in Tables 5, before the robustness analysis (model 2) the coefficient of the effect of high-tech product imports on the advanced industrial structure is 0.1142, which is significant at 1% level of significance. When the robustness analysis is conducted, the coefficient of the effect of high-tech products import on the technology level of high-tech products export is 0. 1344, which is significant at 1% level of significance. Comparing these two coefficients, we can see that the impact of high-tech product import on the technology level of high-tech product export does not change significantly, or even very little change, moreover, the t-test results of these two coefficients are significant, no large data deviation, no positive and negative regression coefficients alternating phenomenon, this coefficient change is small indicates that high-tech product import on the technology level of high-tech product export Product export

technology level of the impact factors regression model 2 is robust, the use of individual fixed effects model for high-tech product imports to assess the impact of high-tech product export technology level is appropriate, explore the impact of high-tech product imports level for high-tech product export technology level is feasible. Further, according to Table 5 Model 2, the regression results of individual fixed effects model are significant and the effects of other control variables, except for the degree of marketization and the number of labor force, are significant for the technological level of high-tech product exports. Among them, the number of college students, direct investment, GDP and the quality of high-tech products imports for high-tech products export technology level of the promotion effect is positive, therefore, China should further increase the attractiveness of foreign investment, promote education, economic development, and increase the accumulation of imports, and constantly form a good combination of economic, technological capital accumulation and independent research and development of capital accumulation. In addition, in recent years, China's provincial government for the development of high-tech products export technology level has played a positive role in promoting the government in industrial restructuring and macroeconomic development has played an important and positive role in promoting. However, the degree of marketization, R & D investment, and the level of government financial expenditure on the formation and promotion of high-tech product export technology level failed to form an effective promotion, therefore, China must further increase the R & D efforts, the degree of openness and financial support and other factors for the positive promotion of high-tech product export technology level of mining, and constantly improve and optimize the level of R & D of high-tech products in China, in order to continuously promote and optimize China's economic development.

Endogeneity Analysis

Endogeneity analysis means that the core explanatory variables high-tech product imports and the rest of the control variables have some explanatory effect on the technology level of high-tech product exports, on the contrary, the technology level of high-tech product exports will also have an impact on the level of high-tech product imports and the rest of the control variables, so, theoretically, there is a mutual influence between high-tech product imports and there is a mutual influence between high-tech product import and high-tech product export technology level, and thus there may be an endogeneity problem. To solve the endogeneity problem, this paper adopts the instrumental variable approach, which means that it is required to be correlated with the explanatory variables but not with the explained variables. In this paper, the explanatory variables have fully responded to the influence of technology level of high-tech products export, and the first-order lag of high-tech products import is used as the instrumental variable, the correlation between the instrumental variables and the explanatory variables may be weakened. According to this idea, the regression results of this paper after dealing with the endogeneity problem are shown in Table 6.

In Table 6, after treatment with instrumental variables, the coefficient of the core explanation of the effect of high-tech product imports on the technology level of high-tech product exports is 0.2176, while the coefficient of the effect of human capital level on the advanced industrial structure without endogeneity problem treatment is 0.1142, Therefore, after the endogeneity treatment, the change in the influence of the number

of labor force, technology level, government fiscal expenditure, openness level and market size on the industrial structure on the advanced level of industrial structure is not significant, therefore, it can be considered that overall, the endogeneity of the effect of individual fixed-effects model control variables on the advanced level of industrial structure is also not significant, so it can be said that the endogeneity of the whole model is not serious and can be analyzed using model 2 for in-depth economic significance.

Summing up, the higher the level of high-tech product imports, the more it can promote local economic development, the more it can raise the funds needed for local economic development, get financial support for high-tech product R&D, and thus the more likely it is to promote high-tech product exports. On the contrary, when the number of high-tech product exports is higher, the better the local economic development, the higher the quality of product and service improvement, the more it can open the market, attract external resources and talents, the more it can promote the prosperity and advanced of local economy. Accordingly, it can be concluded that there may be a mutual promotion and mutual influence role between the technical level of high-tech product import and high-tech product export, and there is a mutual causality logic. Therefore, there may be endogeneity between local financial development and high-tech product imports. To attenuate the endogeneity, this paper uses two-stage instrumental variable approach to address it.

Two-Stage Instrumental Variable Method

In this paper, we choose t-1 of high-tech product import as the instrumental variable, because t-1 of high-tech product import development is highly correlated with high-tech product import development t, which can influence high-tech product import development t, but not correlated with the disturbance term. So, if the instrumental variable t-1 of high-tech product import development can influence high-tech product export, then it can only influence local financial development t through local financial development t-1 first, and then local financial development t will influence high-tech import t.

Specifically, the two-stage instrumental variables were constructed as follows.

Phase 1:

$$IM_{it} = \alpha_0 + \alpha_1 IM_{it-1} + \sum v_j X_{jit} + m_i + \lambda_t + u_{it} \tag{3}$$

Phase 2:

$$\Pr ody_{it} = \gamma_0 + \gamma_1 IM_{it} + \sum v_j X_{jit} + m_i + \lambda_t + u_{it} \tag{4}$$

Based on this, the paper further conducts empirical regressions to derive the regression results of the endogeneity analysis as shown in Tables 6 of the two-stage instrumental variational approach to endogeneity testing.

According to the results in Table 6, before the two-stage instrumental variable method is applied, the regression of local high-tech product import on the technological level of high-tech product export is significant, and the specific influence coefficient is 0.1142. After the two-stage instrumental variable method is applied, the regression of high-tech product import on high-tech product import is still significant, and the specific regression coefficient is 0.2176, which also confirms that high-tech import does not have a serious

Table 6. Two-stage instrumental variable method endogeneity test table [Self-graphed]

Variables	Phase I High-tech products import billion dollars (IM)	Phase II High-tech Product Export Quality Index
IM(-1)	0.4826*** (0.0422)	–
IM	–	0.2176* * * (0.0512)
GDP	1.0051** (0.4516)	0.4831* (0.2778)
LN	−0.03184* (0.0185)	0.0112 (0.0109)
IP	−0.0361 (0.1867)	−0.1661 (0.1095)
OP	−0.7367 (0.3787)	−0.5773** (0.2315)
SN	0.3002 (0.3368)	0.3934* (0.2015)
DI	0.0311 (0.0509)	0.1138*** (0.0306)
MK	0.0683 (0.0509)	−0.0326 (0.0300)
C	−3.4321*** (3.5427)	−2.1865 (2.1012)
F-statistic	16.93	
Prob(F-stat)	0.0000	0.0000
N	368	368
Individual control	Y	Y
Time Control	Y	Y

Note: Standard errors in parentheses, *, **, *** denote bilateral t at 10%, 5%, 1% significant levels, respectively

impact on the technological level of high-tech product export. Even after endogeneity is treated, the influence rule will not change. Therefore, the individual time dual fixed model can be used to analyze and elaborate the law and characteristics of the influence of high-tech import on the technological level of high-tech products outlet.

4 Research Conclusions and Policy Recommendations

Based on the fact that the technological level of high-tech product exports is one of the key factors to measure the high-quality economic development, this paper selects relevant

data at provincial level from 2008–2021, measures high-tech product imports, economic development level and export quality index, tests the influence of provincial high-tech product import index development level on the technological level of high-tech product exports, and conducts heterogeneity analysis, endogeneity analysis. The conclusions of the analysis are as follows: First, the quality of high-tech product imports can significantly contribute to the improvement of export technology level in each province, and this conclusion still holds after the endogeneity test. Second, in terms of heterogeneity, the effect of high-tech product import quality on the upgrading of export technology level of each province increases with the magnitude of product quality differences, and this effect also has regional heterogeneity, with the most obvious upgrading effect in the eastern region, followed by the central region, and finally the western region. Third, the import quality of high-tech products promotes the upgrading of export technology level through marketization degree, foreign direct investment, government fiscal expenditure, GDP enhancement and labor force effect, among which the effects of marketization degree, foreign direct investment, government fiscal expenditure and GDP are more significant. Based on the above findings, we can make the following policy recommendations.

From the national level, firstly, shape the advantages of import and export trade, promote economic development and accelerate the quality upgrade of exports; secondly, improve the R&D capability of high-tech products, attract foreign investment, increase imports, promote exports with imports, increase investment in high-tech product industries and further stabilize the quality improvement of high-tech product imports on exports Finally, we should uphold the concept of sustainable and healthy development, further improve the quality of high-tech export technology level, stimulate the growth of new development modes of digital economy and improve the domestic independent R&D production capacity to achieve high-quality development of the national economy. From the regional level, firstly, build corresponding high-tech economic parks with their own development advantages, form industrial clusters based on advantageous industries, and comprehensively improve the export quality of provinces and cities; secondly, we must accelerate regional high-tech innovation, focus on breaking through core technology, promote the combination of high-tech technology and traditional industries, form a new development model with local characteristics of the new development model, and enhance the effect of high-tech economy on upgrading the quality of exports. From the enterprise level, firstly, grasp the opportunity of high-tech industrial economy development, cater to the market demand under the new situation, optimize and upgrade traditional industries, cultivate and develop new industries, realize product quality growth and industrial scale expansion; secondly, encourage enterprises to widely use the advantages of marketization, attract high technology level talents, actively carry out high-tech industrial transformation, promote product optimization and upgrading and renewal, and give full play to the effect of high-tech industrial upgrading on export quality.

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