



The Interactive Effect of Anti-Dumping, Corporate Productivity, and Global Value Chain Restructuring - An Analysis Based on the Manufacturing Industry in the Guangdong-Hong Kong-Macao Greater Bay Area

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Abstract. This paper utilizes data from the China Customs Database and the China Industrial Enterprise Database spanning from 2000 to 2015 to construct simultaneous equations. Taking enterprises in the Guangdong-Hong Kong-Macao Greater Bay Area as an example, it conducts an empirical analysis on the interactive effects of anti-dumping, enterprise productivity, and GVC position. The research reveals that anti-dumping promotes the improvement of enterprise productivity, which in turn enhances their position in the GVC, and the improvement of GVC also can promote the enterprise productivity, which in turn facilitates the anti-dumping application. However, ultimately, anti-dumping hinders the improvement of enterprises' position in the GVC, and an improvement in the GVC position can also inhibit the initiation of anti-dumping. The fundamental reason lies in the joint suppression by developed countries in Europe and America on Chinese enterprises which try to enter high-end areas of the GVC. To address this dilemma, collaboration among the government, industry associations, and enterprises is essential.

Keywords: anti-dumping; enterprise global value chain; enterprise productivity; Guangdong-Hong Kong-Macao Greater Bay Area

1 Introduction

Enterprises' participation in the global industrial division of labor and integration into the global value chain are typical characteristics of modern economic development. The global distribution of product manufacturing processes is an important way to enhance productivity. However, the existence of national interests has led to the widespread use of anti-dumping. Qiao et al. (2023) [1] pointed out that heterogeneous trade protection policies have an inhibitory effect on enterprises' integration into the global value chain. Correspondingly, enterprises' integration into the global value chain can indirectly reduce their own product export tariffs through investment spanning and trade diversion, and help obtain a ruling to terminate anti-dumping in sunset reviews

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(Ludema et al., 2021; Bown et al., 2021) [2-3]. Reviewing relevant research literature, although scholars have analyzed the relationship between anti-dumping and enterprises' integration into the global value chain, they have been limited to one-way impact analysis. The bidirectional effects between them, as well as the specific pathways through which they impact each other, have not been addressed. The impact of trade policies on enterprises' position in the global value chain is complex, exhibiting bidirectional and interactive characteristics, and does not rely on a single pathway. It affects enterprises' position in the global value chain through changes in enterprise productivity, and also produces interactive effects through pathways such as inter-state political gaming and endogenous incentive mechanisms within enterprises (Zhang et al., 2022) [4]. In view of this, it is necessary to conduct in-depth research on the multiple pathways through which anti-dumping affects enterprises' position in the global value chain.

Since enhancing total factor productivity (TFP) is key to economic development, and enterprises embedding into the GVC helps improve their TFP (Li & Jiang, 2023) [5]. Moreover, a corresponding increase in TFP can also help enterprises improve their positions in the GVC (Ayadi et al., 2024) [6]. Therefore, this paper introduces enterprise productivity as the key variable to analyze the interactive effects of anti-dumping, enterprise productivity, and enterprise GVC positions. What impact does China's anti-dumping measures have on the improvement of Chinese enterprises' GVC positions? And in the GBA, the most economically developed region in China, what is the interaction between anti-dumping and the GVC positions of its enterprises, and what role does enterprise productivity play in it? Studying this issue has important theoretical and practical significance for understanding the specific effects of anti-dumping on the reconstruction of enterprises' GVCs, formulating effective anti-dumping policies, and promoting the improvement of the GVC of the manufacturing industry in the GBA.

This paper utilizes data from the Global Anti-Dumping Database, the China Industrial Enterprise Database, and the China Customs Database spanning from 2000 to 2015 to construct a simultaneous equations system, empirically analyzing the interactive effects of anti-dumping, enterprise productivity, and the position of enterprises in the global value chain. The study concludes that although anti-dumping protection contributes to the improvement of enterprise productivity in the Guangdong-Hong Kong-Macao Greater Bay Area, and the increase in enterprise productivity also promotes its position in the global value chain, the negative effects of trade friction and protection dependence brought about by anti-dumping outweigh the positive effects of productivity improvement, ultimately hindering the enhancement of enterprises' position in the global value chain. The contributions of this paper lie in: (1) Existing literature is limited to analyzing the unidirectional effects of only two factors among anti-dumping, enterprise productivity, and enterprise position in the global value chain. This paper analyzes the interactive effects of anti-dumping, enterprise productivity, and enterprise position in the global value chain by constructing a simultaneous equations system, exploring the bidirectional interactions among the three elements; (2) By constructing a path model of anti-dumping affecting the position of enterprises in the global value chain and combining empirical testing, this paper presents the evolution path of enterprises' position in the global value chain in the Guangdong-Hong

Kong-Macao Greater Bay Area, depicting the actual situation of enterprises climbing up the global value chain, providing a decision-making basis for policy formulation.

The remaining content of this chapter is arranged as follows: the second part explains the research hypothesis, the variables selected for the simultaneous equations model and the data sources for empirical analysis; the third part presents the empirical results and conducts robustness tests; finally, conclusions and recommendations are provided.

2 Hypothesis, Variable selection, econometric model, and data description

2.1 The research hypothesis

Hypothesis 1: Proactive anti-dumping measures contribute to the improvement of enterprise productivity; conversely, the enhancement of enterprise productivity also facilitates the initiation of anti-dumping actions, so anti-dumping and enterprise productivity mutually promote each other.

Hypothesis 2: The relationship between enterprise productivity and its position in the global value chain is mutually reinforcing, meaning that an increase in enterprise productivity will enhance its position in the global value chain, and conversely, an improvement in the enterprise's position in the global value chain will also promote an increase in its productivity.

Hypothesis 3: Anti-dumping inhibits the improvement of enterprises' position in the global value chain, while the improvement of enterprises' position in the global value chain also correspondingly inhibits the initiation of anti-dumping.

2.2 Variable selection

(1) Enterprise Global Value Chain Position Index. This paper adopts the method used by Yue et al. (2015)[7] to measure the position of enterprises in the global value chain. It incorporates the product classification based on the Broad Economic Categories (BEC) and the trade agent problem into the analysis to calculate the enterprise's position in the global value chain.

(2) Enterprise productivity. Compared to the OP method, which introduces investment as an instrumental variable, and the LP method, which uses intermediate inputs as instrumental variables, the ACF method is more reasonable and accurate for calculating enterprise total factor productivity. It relaxes the assumptions of the LP method, assuming that intermediate inputs are influenced by capital and labor inputs, and employs a two-step moment estimation to obtain a more accurate calculation of total factor productivity(Wang et al., 2025)[8].

(3) Anti-dumping preliminary ruling indicators. Anti-dumping is divided into several stages: application, preliminary ruling, final ruling, and sunset review. Among them, the preliminary ruling stage is the most significant, as the anti-dumping effect is fully manifested. At this stage, the measured enterprise productivity and global value

chain position index can accurately reflect the specific impact of anti-dumping. Therefore, I use the dummy variable of anti-dumping preliminary ruling to reflect the effectiveness of anti-dumping (Cheng et al., 2021)[9]. When the preliminary ruling result is affirmative, the value of this dummy variable is 1 from the year following the preliminary ruling, otherwise it is 0.

2.3 Econometric Model

This article employs a simultaneous equations system to measure the interactive relationship among anti-dumping, enterprise productivity, and global value chain position. The constructed simultaneous equations system is as follows:

$$TFP_{it} = \alpha_0 + \alpha_1 AD_{it} + \alpha_2 GVC_{it} + \alpha_3 Output_{it} + \alpha_4 EA_{it} + \varepsilon_{it} \quad (1)$$

$$AD_{it} = \beta_0 + \beta_1 TFP_{it} + \beta_2 GVC_{it} + \beta_3 StateR_{it} + \beta_4 Caplabor_{it} + \mu_{it} \quad (2)$$

$$GVC_{it} = \gamma_0 + \gamma_1 AD_{it} + \gamma_2 TFP_{it} + \gamma_3 ExportI_{it} + \delta_{it} \quad (3)$$

Among them, the subscripts i represent industries and t represent years. TFP_{it} , AD_{it} , GVC_{it} are endogenous variables. $Output_{it}$, EA_{it} , $StateR_{it}$, $Caplabor_{it}$, $ExportI_{it}$ are exogenous variables. ε_{it} , μ_{it} , δ_{it} , and are random disturbance terms. The meanings of each indicator are as follows: TFP_{it} reflects the total factor productivity of enterprises. AD_{it} reflects whether the enterprise is affected by the affirmative preliminary ruling of anti-dumping. If the anti-dumping applied by the enterprise is granted an affirmative preliminary ruling, the dummy variable is set to 1 starting from the year of the preliminary ruling; otherwise, it is set to 0. GVC_{it} represents the position of the enterprise in the global value chain. $Output_{it}$ represents the total industrial output value of the enterprise. In this paper, based on the industrial output price index published by the National Bureau of Statistics, the nominal value of the total industrial output value of the enterprise is adjusted to its actual value, and then logarithmically generated to obtain the indicator value. EA_{it} represents the actual age of the enterprise, calculated by subtracting its founding year from the enterprise year in the China Industrial Enterprise Database. $StateR_{it}$ represents the proportion of state-owned capital in total capital of the enterprise, measured by the ratio of state-owned capital to total capital. $Caplabor_{it}$ represents the capital intensity per capita, generated by logarithmically taking the ratio of total capital to the number of employees. $ExportI_{it}$ reflects the export intensity of the enterprise, measured by the ratio of the export output value to the main business income of the enterprise.

2.4 Data sources and descriptions

Based on data from the China Industrial Enterprise Database and the China Customs Database spanning from 2000 to 2015, this paper selects 794 enterprises headquartered in the Guangdong-Hong Kong-Macao Greater Bay Area to analyze the interactive effects among anti-dumping, enterprise productivity, and enterprise position in the global value chain. The data sources for the three core endogenous variables are as follows: anti-dumping preliminary ruling results are obtained from the Global Anti-Dumping Database; enterprise total factor productivity is calculated using the ACF method based on data such as intermediate inputs from the China Industrial Enterprise Database (Lu et al., 2018) [10]; and enterprise position in the global value chain is determined by calculating the foreign value added in exports, which utilizes import and export data from the China Customs Database, while domestic sales data comes from the China Industrial Enterprise Database.

The raw data for calculating indicators such as total industrial output value of enterprises, enterprise age, proportion of state-owned capital in enterprises, capital intensity per capita, and export intensity are sourced from the China Industrial Enterprise Database. Variable descriptions are provided in Table 1.

Table 1. Descriptive statistics of key variables

variable name	symbol	Observations	mean value	standard deviation	minimum value	Maximum value
Total factor productivity of enterprises	TFP	1634	0.895	0.077	0.793	2.436
Affirmative anti-dumping ruling	AD	1645	0.187	0.39	0	1
Position of enterprise in global value chain	GVC	1854	0.182	0.587	-0.693	0.693
Enterprise production scale	Output	1854	11.191	1.479	7.212	16.709
enterprise age	EA	1854	10.243	8.877	-1	59
Proportion of state-owned capital in the enterprise	StateR	1722	0.054	0.544	0	21.544
Capital intensity per capita of enterprises	Caplabor	1722	3.978	1.704	-5.987	10.158
Export intensity of enterprises	ExportI	1733	0.361	0.404	0	2.367

3 Empirical results and analysis

Compared to the two-stage least squares method (2SLS) and the three-stage least squares method (3SLS), the iterative three-stage least squares method is the most effective for estimating the entire simultaneous equations system. Therefore, this paper adopts the iterative three-stage least squares method to estimate the simultaneous equations, and uses the estimation results of the other two methods as a comparison

According to the order condition identified by simultaneous equations, this equation belongs to an over-identified model. The estimation results are shown in Table 2.

Table 2. Estimation results of simultaneous equations

Variable	2SLS			3SLS			3SLS_iter		
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)	Model (9)
	Equation 1	Equation 2	Equation 3	Equation 1	Equation 2	Equation 3	Equation 1	Equation 2	Equation 3
TFP		0.495 (0.99)	1.620*** (4.19)		0.856* (1.92)	1.611*** (4.18)		8.621*** (4.65)	1.572*** (4.21)
AD	0.148 (1.55)		-0.537 (-0.77)	0.240*** (3.11)		-0.809 (-1.23)	0.116*** (5.32)		-0.179** (-4.33)
GVC	0.003 (0.19)	-0.235 (-1.13)		0.042** (2.38)	-0.492** (-2.78)		0.621*** (631.09)	-5.480** (-62.29)	
Output	0.027*** (17.27)			0.025*** (16.40)			0.001 (0.10)		
EA	0.001** (2.21)			0.001** (2.15)			0.00002 (0.10)		
StateR		0.129* (1.72)			0.087 (1.56)			0.004 (0.10)	
Caplabor		-0.017 (-1.07)			-0.010 (-0.76)			-0.001 (-0.10)	
ExportI			0.072 (1.54)			0.032 (0.74)			-0.0002 (-0.10)
Constant	0.555*** (24.28)	-0.157 (-0.43)	-1.203** (-3.44)	0.552*** (26.45)	-0.460 (-1.38)	-1.131** (-3.26)	0.757*** (9.89)	-6.567** (-3.86)	-1.198** (-3.65)
Observations	1341	1341	1341	1341	1341	1341	1341	1341	1341
R-squared	-0.349	-0.042	-0.055	-1.585	-0.385	-0.172	-28.385	-68.889	-0.0005
F-Stat	102.28 (0.0000)	0.78 (0.5384)	6.22 (0.0003)						
Chi2				423.5 (0.0000)	27.34 (0.0000)	17.83 (0.0005)	1.69e+06 (0.0000)	9.61e+06 (0.0000)	8070.74 (0.0000)

Note: The significance level is as follows: *** represents $p < 0.01$, ** represents $p < 0.05$, and * represents $p < 0.1$.

In Table 2, Equation 1 represents the firm productivity equation, reflecting the effects of anti-dumping and the firm's position in the global value chain on firm productivity. Equation 2 represents the anti-dumping equation, reflecting the impact of firm productivity and global value chain position on the preliminary anti-dumping ruling. Equation 3 represents the global value chain position equation, reflecting the impact of firm productivity and preliminary anti-dumping ruling on the firm's position in the global value chain. To more clearly reflect the interactive effects among firm productivity, anti-dumping, and firm's position in the global value chain, this paper first performs 2SLS estimation on each equation (models (1) to (3)), and then estimates using a simultaneous equations system, testing the endogenous interaction among firm productivity, anti-dumping, and firm's position in the global value chain through 3SLS and iterative 3SLS methods (models (4) to (9)).

The estimation results of Equation 1 indicate that regardless of the method used, the impact coefficient of anti-dumping on enterprise productivity is positive. Furthermore, the coefficients of the impact of the enterprise's position in the global value chain on enterprise productivity obtained by the three methods are all positive.

The estimation results of Equation 2 indicate that, regardless of the method used, the impact coefficient of enterprise productivity on anti-dumping is positive. This suggests that an increase in enterprise productivity tends to make enterprises more inclined to seek anti-dumping protection. There is a mutual reinforcing effect between enterprise productivity and anti-dumping, validating Hypothesis 1. Furthermore, the estimation results of the three methods show that the impact coefficient of global value chain position on anti-dumping is negative. This indicates that an increase in an enterprise's global value chain position can reduce its willingness to seek anti-dumping protection. The improvement of an enterprise's value chain produces two effects. On the one hand, the increase in the added value of enterprise products and profits reduces the enterprise's demand for trade protection. On the other hand, enterprises in the Guangdong-Hong Kong-Macao Greater Bay Area transfer the low-end processing and assembly links of the industrial chain to countries with lower labor costs such as Vietnam and India, while retaining the higher technology content in research and development, design, and other links at their headquarters in China. By utilizing advantageous resources from various countries around the world in this way, enterprises form their own competitive advantages. This makes enterprises require a stable and secure global free trade environment, which to some extent reduces their tendency to lobby for anti-dumping. The combined effect of these two factors leads to a decrease in enterprises' willingness to seek anti-dumping protection.

The estimation results of Equation 3 indicate that, regardless of the method used, the impact of enterprise productivity on the position in the global value chain is positive. The relationship between enterprise productivity and its position in the global value chain is mutually reinforcing, validating Hypothesis 2. Furthermore, the coefficients estimated by the three methods for the impact of anti-dumping on the enterprise's position in the global value chain are all negative, indicating that anti-dumping protection hinders the improvement of the enterprise's position in the global value chain. On one hand, anti-dumping protection encourages enterprises to develop a dependency mentality, reduce investment in research and development and transformation, and slacken internal reforms, thereby inhibiting enterprises from climbing to the higher end of the industrial chain. On the other hand, anti-dumping may trigger trade countermeasures from the other party, hindering domestic enterprises' utilization of foreign advantageous resources and markets, and thus impeding their improvement in the position in the global value chain. Therefore, there is a mutually inhibitory effect between anti-dumping and the enterprise's position in the global value chain, validating Hypothesis 3.

4 Robustness analysis

To further confirm the robustness of the aforementioned research conclusions, I calculate the global value chain position of enterprises using both the basic global value chain position calculation method and a calculation method that only considers the BEC product classification (Yue et al., 2015). Based on this, I estimate the interaction among anti-dumping, enterprise productivity, and global value chain position. The

empirical results indicate that even if other methods are used to measure the global value chain position, the simultaneous equations estimation results are consistent with the previous analysis, that is, anti-dumping and enterprise productivity have a mutually reinforcing effect, enterprise productivity and its global value chain position have a mutually reinforcing effect, while the interaction between anti-dumping and enterprise global value chain position is mutually inhibitory¹. The results indicate that the research findings mentioned above are robust to some extent.

5 Summary

Based on data from the China Industrial Enterprise Database and the China Customs Database spanning from 2000 to 2015, I conduct an empirical analysis of 794 enterprises in the Guangdong-Hong Kong-Macao Greater Bay Area. The results indicate that anti-dumping can promote the improvement of enterprise productivity, and at the same time, the improvement of enterprise productivity can enhance its position in the global value chain. Conversely, the elevation of an enterprise's position in the global value chain can promote the improvement of its productivity, and the improvement of enterprise productivity also increases its willingness to obtain anti-dumping protection. However, anti-dumping protection can hinder the improvement of an enterprise's position in the global value chain, and after the elevation of its position in the global value chain, it will also reduce its willingness to obtain anti-dumping protection. This suggests that although anti-dumping activities promote the elevation of an enterprise's position in the global value chain through its productivity, this impact path does not play a dominant role. The main path through which anti-dumping affects an enterprise's position in the global value chain is that the trade conflicts and enterprise dependence brought about by anti-dumping hinder the elevation of an enterprise's position in the global value chain.

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¹ Due to space limitations, the empirical results are not listed. They can be obtained from the author upon request.

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