

# Empirical Analysis on SDGs of Chinese Fishery Industry: Research on the Effect of Fishery Industry Policy from the Perspective of Enterprises

著者	Jun Xue, Jianwen Ji, Renping Hao
journal or publication title	Annual Journal of the Asian Cultures Research Institute
volume	56
page range	164(89)-179(74)
year	2022-01
URL	<a href="http://doi.org/10.34428/00013104">http://doi.org/10.34428/00013104</a>



# Empirical Analysis on SDGs of Chinese Fishery

## Industry:

### Research on the Effect of Fishery Industry Policy from the Perspective of Enterprises

Jun Xue  
Jianwen Ji  
Renping Hao

#### 要 旨

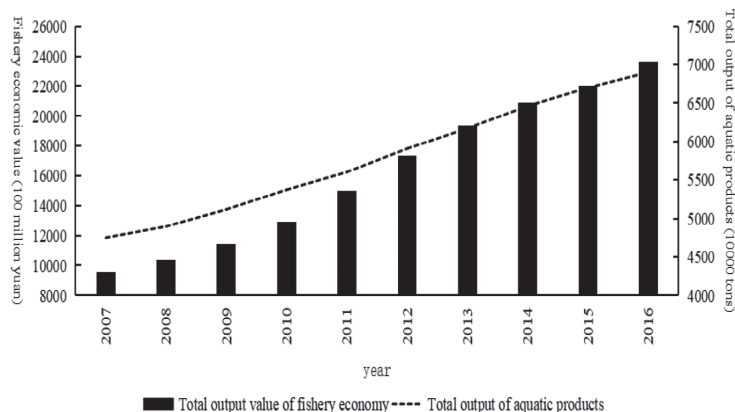
中国は漁業の持続可能な発展をめぐって、積極的な模索を行っている中で、漁業の転業およびその雇用の転職に関する政策が漁業経済の持続可能な発展に対する役割に注目が集まっている。本稿では、中国「工業企業データベース（2000-2005）」での漁業産業データおよびその対応する都市開発データに基づいて、二重差モデルと双方向固定効果モデルを使って、漁業政策の企業サイドに対する影響を測定検証する。総括から言えば、これらの産業政策の実施は、中国漁業産業の持続可能な発展に比較的弱い貢献をした。

キーワード：政策，漁業，総生産率，非国有企業

Keywords: Conversion policy; fishery industry; total factor productivity; non-state-owned enterprises

#### 1. Presentation of Questions

As an important part of the national economy, the agricultural economy plays a vital role in the stable operation of the national economy. As an important product of the agricultural economy, the contribution of agricultural products to the agricultural economy is also increasing year by year. Agricultural products can not only contribute to the "satisfaction" of our people but also play an active role in "eating well", with the development of the economy and the improvement of national living standards. Fish products in agricultural products can provide 40% of the protein for 2/3 of the world's population, and can improve China's national nutritional structure<sup>(1)</sup>. The fishery industry related to fish products, as an important part of my country's agricultural industrial structure, plays a critical role in the transformation of Chinese agricultural development mode<sup>(2)</sup>. Under the context of supply-side structural reforms, fishery economy, as an important way to change the traditional agricultural economic development mode, makes the improvement of agricultural quality and efficiency get more attention: China's central and local governments have issued 287 fisheries laws and regulations, and 1173 laws and regulations related to fisheries (data comes from the legal and regulatory information database) by the end of 2017. At the same time, Chinese policymakers have formulated different supporting policies according to the characteristics of fishery development, which has promoted the transformation and upgrading of the fishery industry and further developed the fishery industry. The



**Fig.1 National Fisheries Development in the past 2007-2016 years**

development of the fishery economy has also shown a good development trend in recent years (Figure 1).

However, my country's fishery economy is mainly concentrated in the traditional fishery industry. The traditional fishery industry has low production efficiency and great damage to the fishery and marine resources, which is harmful to the sustainable development of China's fishery economy<sup>(3)</sup>. During the development process, due to the special attributes of marine fishery resources, it is very easy to cause overfishing and "tragedy of the commons", which will seriously damage China's coastal fishery resources<sup>(4)</sup>. To this end, taking advantage of the implementation of China-Japan and China-Korea fisheries agreements, China has put forward "the conversion policy of fishery ". The policy aims to increase fishermen's income, control fishing intensity, and achieve sustainable fishery development<sup>(5)</sup>. However, after macroscopic research, it is found that the policy did not achieve its desired effect, and caused the further shrinkage of fishery resources due to the "information asymmetry" between the government, fishermen, and fishery-related enterprises<sup>(6)</sup>. Therefore, the effectiveness of the Dual-Transform policy has been questioned<sup>(7)</sup>. As the main body of Chinese market economy, micro-enterprises respond more sensitive to industrial policies<sup>(8)</sup>. However, the research on the impact of fishery industry policies based on the perspective of enterprises is still lacking, so that it is impossible to estimate the role of fishery industry policies on enterprises and the enterprise's reflection degree after the policies are introduced, so they cannot provide a basis for the government to further improve policies.

Based on the "Opinions on the Implementation of the 2003-2010 Marine Fishing Vessel Control System" issued by the Ministry of Agriculture on November 12, 2002, this paper takes the fishery companies in the China Industrial Enterprise Database as the research object for the first time and uses Difference-in-Differences Method (DID) and two-way fixed effects and other methods to conduct an empirical analysis on the effects of fishery companies affected by this policy. Then, this paper analyzes the differences and reasons of the effects of the conversion policy to provide empirical support for future fishery industry policy-making.

## 2. Policy background and theoretical hypothesis

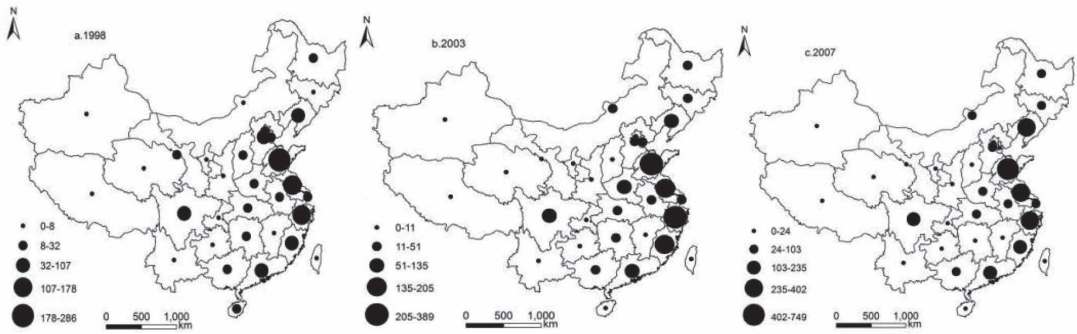
The effectiveness of Chinese industrial policies has always attracted wide attention: some research finds industrial policies can promote industrial development and play a role in the industrial structure transformation<sup>(9-10)</sup>; on the other hand, because of the lack of long-term consideration, China's industrial

policy has not played its due role in industrial development<sup>(11)</sup>. Most of their opinions are about the effectiveness of industrial policies while the analysis of the impact of industrial policies on specific industries is rarely mentioned. Due to the limitation of the data availability, the literature analyzing the fishery industry mostly discusses the development of the fishery industry from the perspective of industrial structure<sup>(12)</sup> and industrial evolution<sup>(13)</sup>. Such research mostly analyzes the status of the fishery industry in the market with the government view. A few studies on industrial policy<sup>(14)</sup> also analyze the development of the fishery industry from the government's perspective. These researches focused on a macro perspective, lack the necessary analysis of the fishery companies that are the main body in the market. Therefore, they cannot accurately reflect the influences of the fishery companies on policy adjustments. The research on fishery enterprises and fishery industrial policies from a micro perspective is still lacking and cannot express the demands of enterprises in the market.

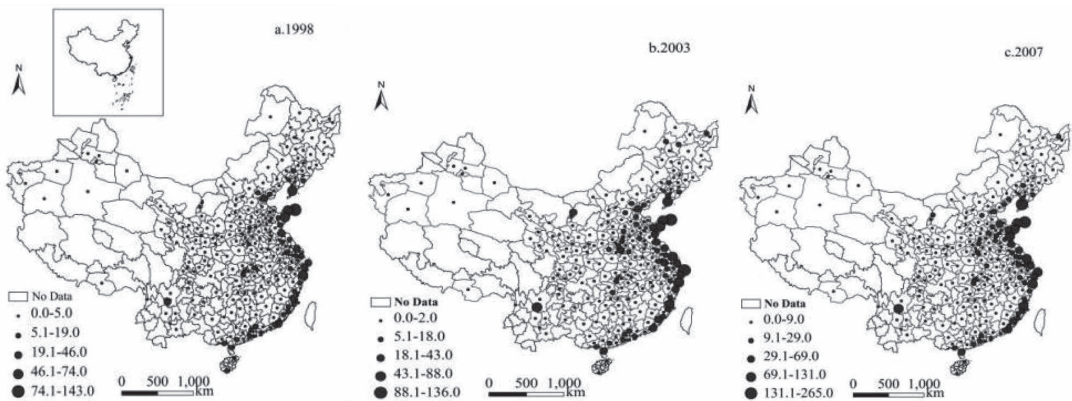
With the fishery resources degradation and the implementation of the China-South Korea, China-Japan, and China-Vietnam fishery agreements, China's fishery industry is facing severe difficulties. In 2002, the fishermen's conversion policy was implemented. The policy transfers the surplus fishery labor force to the relevant industries through the issuance of subsidies to fisherman and relevant enterprises and fishermen skills training<sup>(15)</sup>. The main transferred industries are aquaculture and the aquatic product processing industry. After the implementation of the policy, the central and local governments formulated a series of policies and regulations for the effectiveness of the implementation of the policy, which raised the threshold for conversion policy, and then the opportunity cost of fishermen under the high threshold increased<sup>(16)</sup>. Some fishermen "go to the sea" again under such circumstances, and the increasing difficulty of fishing boat approval has prompted a large number of unlicensed fishing boats to appear. It is difficult for fishery regulatory authorities to supervise and fishery resources are exhausted. At the same time, companies can make adjustments to their business strategies in a short time<sup>(17)</sup>. Enterprises hope to increase their profits through the "profit" of policies, and the number of fishery enterprises and products will increase in a short period "induced" by the policies<sup>(18)</sup>. For the Chinese fishery industry, which is dominated by the traditional fishery industry, under the condition of extensive fishery economic development, a large number of similar and low-quality fishery labor products have flooded into the fishery product market, and fishery companies intend to have disorderly price competition. This can seize market share but reduces the profits of the enterprises and leads to a decrease in the labor productivity of the enterprises. The subsidy policy makes some fishermen reluctant to engage in fishery upgrade industry training, and they are more willing to engage in low-tech fishery-related work, which has led to intensified competition among fishery companies in low-end processing industries and further compression of profits. It further makes enterprises unwilling to upgrade their products and technologies and hinders the improvement of enterprise labor productivity. Given this, the hypothesis is proposed:

H1 :The Conversion policy does not improve the productivity of fishery enterprises.

China's fishery industry has the comprehensive attribute of agriculture and marine industry, which is affected by fishery industry policy and marine industry policy<sup>(19)</sup>. Fishery enterprises and their agglomeration degree will be influenced by dual policies in the market. Using ArcGIS10.0 software, according to the geographical distribution of fishery enterprises in Chinese industrial enterprises database, the distribution of fishery enterprises in China shows obvious geographical distribution characteristics (Figure 2a, 2b): fishery enterprises are mostly located along the coast and the river. Its shows the high location correlation between

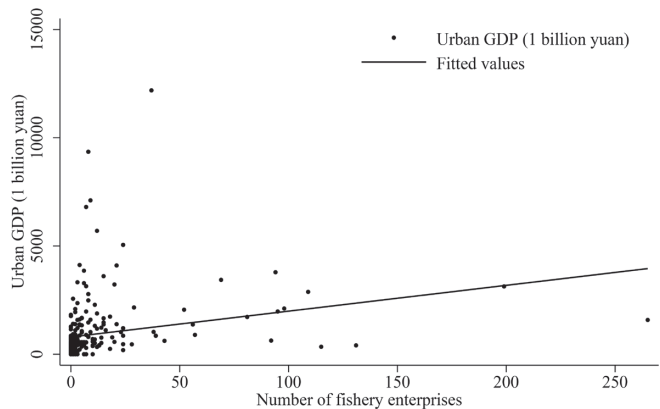


**Fig. 2a** The spatial distribution of fishery enterprises in provinces (1998,2003,2007)



**Fig. 2b** According to the spatial distribution of urban fishery enterprises (1998,2003,2007)

the fishery industry and natural resource endowments. As a traditional advantageous industry, the fishery industry in such areas has a relatively large fishery population and fishery labor force, making it easy to carry out large-scale and specialized production, forming a scale effect, and improving fishery labor productivity. Most of the fishery enterprises are distributed in the economically developed eastern region, and the developed economic environment creates favorable conditions for enterprise production - more capital, better technology and higher quality labor resources.



**Fig.3** National City GDP and Fisheries related statistics (2007)

According to the 2007 "China City Statistical Yearbook" and some fishery enterprises data in the industrial enterprise database, it can be seen that there is a positive correlation between urban GDP and the number of fishery enterprises (Figure 3). The "Jacobs effect" is more significant in big cities, which promotes the rise of corporate profits<sup>(20)</sup>. By optimizing the market environment, fishery

enterprises can reduce their opportunity costs and increase labor productivity. Industrial agglomeration has a strong correlation with regional economic development<sup>(21)</sup>: Cities with better economic environments promote industrial agglomeration through the administrative power of government departments, so that related industries can form an agglomeration effect in the same area, reduce business costs, and increase labor productivity. Fishery enterprises tend to form agglomeration effects in developed cities to reduce corporate costs and provide assistance for corporate development. At the same time, fishery enterprises in economically developed areas can take advantage of highly mature markets to achieve the company's labor rationing and market share improvement through "the invisible hand". Given this, the hypothesis is proposed:

H2: Urban economic development and regional fishery labor force have a positive impact on fishery enterprises in the Conversion Policy.

The main body of the market economy is the enterprise. Due to its special market structure in China, enterprises can be roughly divided into state-owned and non-state-owned. The debate on the efficiency of state-owned enterprises is a major issue<sup>(22-23)</sup>. Because of their special market position, state-owned enterprises are in a dominant position in the formulation of each policy<sup>(24)</sup>. State-owned fishery enterprises are often large and have close ties with the government and related industrial departments. They can often take the lead in obtaining information and can adjust their strategies earlier to maximize their interests. In the fishery market, state-owned companies can easily obtain the status of "price leader", making themselves less impacted. As the main body of the market, non-state-owned fishery enterprises can significantly reflect the impact of policies on the enterprise level. They can flexibly change their business strategies to adjust the relationship between cost and output to maximize their profits. When subjected to policy shocks. But as a "price taker", their strategic adjustments are limited, so policies are more likely to have an impact on them. Given this, we propose the hypothesis:

H3: The impact of the Conversion Policy on non-state-owned enterprises is more obvious.

### **3 research design**

#### **3.1 sample selection and data sources**

Based on the official implementation of the Conversion Policy by the Ministry of agriculture on January 4, 2002, and the implementation opinions on the control system of marine fishing vessels from 2003 to 2010 issued by the Ministry of Agriculture on November 12, 2002, the paper selects the enterprises that conform to the classification of fishery industry according to the national standard GB/T20794-2006 marine and related industry classification based on the enterprise data in China Industrial database. Referring to the existing literature based on China industrial enterprise database<sup>(25)</sup>, and in order to ensure the stability of the experimental results, 2000-2005 is selected as the sample research period. We selected fishery enterprises with continuous data in the China Industrial database from 2000 to 2005. At the same time, this article screens the original data according to usual practices<sup>(26)</sup>: 1. Exclude the data that industrial added value, total assets and intermediate input are negative or equal to zero; 2. The number of employees is less than 8; 3. variables with missing values; 4. There are non-conventional values; 5. The status of the enterprise is abnormal business. After screening by the above principles, data that meets the principles can be obtained, and the sample observation value is 882. To reduce the influence of outliers on the research results, the relevant continuous variables at the 1% level were selected for Winsorize processing.

**Tab.1 The statistical description of total factor productivity variables by LP method**

	Symbol	Name	Observations	Average Value	S.D.	MIN	MAX
nput	l	Employees	735	4.767	1.137	1.609	8.256
	k	Fixed assets	873	8.8187	1.412	3.046	12.332
Central Input	z	Central Input	882	10.027	1.445	1.778	14.089
Output	pro	Industrial output	882	10.305	1.393	4.584	14.275

Data source: collected by the author

### 3.2 Econometric model and variable measurement

According to the judgment of micro-enterprises related to micro-effects, we choose total factor productivity (TFP) of enterprises as the source of enterprise measurement, referring to Lian Yujun's calculation method of total factor productivity of micro-enterprises<sup>(26)</sup>. At the same time, in order to ensure the integrity of data, we choose Levinsohn-Petrin (LP) method as the measure of total factor productivity<sup>(27)</sup>. In the LP method, the output variable is selected as the industrial added value, the capital input is selected as the annual average balance of the net value of fixed assets, the labor input is selected as the number of employees in the enterprise, and the proxy variable is selected as the intermediate input of the enterprise. Without eliminating the interference of price factors, using 2000 as the base period, the industrial product ex-factory price index was used to deflate the total industrial output value; the fixed asset investment price index was used to deflate capital input; and the raw material, fuel, and power purchase price index was used to deflate. The year and region dummy variables are added when estimating total factor productivity<sup>(26)</sup>. The statistical description is shown in the following table (Table 1).

In order to investigate the impact of the Conversion Policy on fishery enterprises, this paper uses the method of Draca et al. for reference<sup>(28)</sup>, takes the one-year lag of policy implementation in 2003 as a quasi-natural experiment, and constructs a Difference-in-Difference (DID) model to explore how the Conversion Policy affects the development of enterprises. The specific model is as follows:

$$TFP_{ijt} = \alpha + \beta_1 treat_i \times post03_t + \eta F_{ijt} + \lambda C_{jt} + \mu_i + \mu_t + \delta_{ijt}$$

Among them,  $i$  represents the enterprise,  $j$  represents the city and  $t$  represents the year.  $TFP_{ijt}$  is the total factor productivity calculated based on the LP method, which represents the total factor productivity of enterprise  $i$  in the city  $j$  in year  $t$ .  $treat_i$  is used to identify the years before and after the impact of the policy, which is 1 in 2000-2002 and 0 in the following years. At the same time, referring to the method of Draca et al., that is, the year before the implementation of the Conversion Policy is set as the reference group, and the year after it is set as the processing group.  $post03_t$  is used to identify the impact time of the Conversion Policy. Since the "Opinions on the Implementation of the 2003-2010 Marine Fishing Vessel Control System" issued by the Ministry of Agriculture on November 12, 2002, is the starting point of this policy<sup>(29)</sup>, after the introduction of this policy, local governments need to formulate and implement corresponding implementation measures based on regional conditions. We use the whole year, that is, 2003 as the time of policy shock.  $\beta_1$  is the core coefficient.

In addition,  $F_{ijt}$  indicates the characteristic variables of the enterprise that may affect the enterprises, including the number of employees (human), enterprise-scale (scale), enterprise age (life-year), enterprise debt ratio (debt), enterprise export status (export), main business profit margin (profit), the nature of the enterprise (soe);  $C_{jt}$  represents the city characteristic variable. Referring to the articles of Jiang lingduo and Lu



Yi (2017), most of them focus on controlling urban price level and economic development status. The selected variables include urban per capita domestic production (pergdp), urban wage level (avgwage), consumer price index (cpi) in the province;  $\mu_i$  and  $\mu_t$  control the fixed effects of enterprises and time;  $\delta_{ijt}$  are random disturbance items. In order to avoid the endogenous disturbance of the relevant data to the total factor productivity, the processing of the relevant data of the enterprise is delayed for one period. The relevant data comes from the database of industrial enterprises and the corresponding statistical years of the "China City Statistical Yearbook" and "China Fishery Statistical Yearbook" 2000-2005. To eliminate the interference of price factors, we take 2000 as the base period, and use the provincial deflator index to deflate. At the same time, in order to reduce the influence of outliers on the research results, the relevant continuous variables at the 1% level were selected for Winsorsize processing. The processing method is shown in Table 2, and the statistical description is shown in Table 3.

**Tab.2 Related variable name and processing method**

	Symbol	Name	Treatment method
dependent variable	tfp	TFP	Calculated by LP method
Enterprise characteristics	human	Employees	ln(Employees)
	scale	Scale	ln(Total assets of enterprise)
	lifeyear	Year	ln(Data year-Setup year+1)
	debt	Debt ratio	ln (Total liabilities of enterprises/Total assets of enterprise)
	profit	Profit margin	ln[(Income-Cost-Taxes and surcharges)/Income*100]
	export	Export status	Yes is 1, Otherwise 0
	soe	Nature	State-owned enterprise is 1, Otherwise 0
Urban characteristics	pergdp	Per GDP	ln(Per GDP)
	awage	Average wage	ln(Average wage)
	priceind	Price	ln(Provincial price level)
	people	Labor	ln(Labor force of fishery industry in provinces)

Data source: collected by the autho

**Tab.3 Statistical description of related variables**

Symbol	Observations	Average Value	s.e.	MIN	MAX
tfp	727	8.799	0.931	7.270	10.238
human	735	4.747	0.943	3.367	6.215
scale	882	10.060	1.070	8.517	11.762
lifeyear	882	2.209	0.653	0	4.007
debt	882	0.576	0.223	0.207	0.899
profit	846	2.326	0.600	1.375	3.290
export	882	0.635	0.482	0	1
soe	882	0.328	0.470	0	1
pergdp	882	6.540	0.826	5.101	7.582
awage	882	9.552	0.281	9.125	9.994
priceindx	882	4.617	0.015	4.588	4.658
people	882	13.560	0.750	9.316	14.391

Data source: collected by the autho



## 4. Empirical test

### 4.1 the difference in difference method (DID) is used to study the impact of the Conversion Policy on the economic efficiency of fishery enterprises.

In order to make the DID test results more robust, limited by the number of sample selections, this paper uses different variable definitions and different measurement methods to test the model<sup>(30)</sup>: add different characteristic variables to compare and analyze the measurement results. The results of measurement are compared and analyzed by adding different characteristic variables, including analyzing the influence of a single variable, the influence of adding enterprise characteristic variables, and the influence of adding enterprise and city characteristic variables. By comparing the effects of different variables on the DID results, the stability of the DID results can be characterized. (model 1-3). Moreover, to examine the influence degree of the Conversion Policy on the different quantiles of the company's total factor productivity, the degree of influence of fishery companies at the 75th, 50th, and 25th quantile levels of the company's total factor productivity is selected (Model 4-6 ). Stata13.0 statistical software was used to obtain the following basic regression results (Table 4).

The results show that when the enterprise and city characteristic variables are added, the core explanatory variable of DID and the total factor productivity of the enterprise are negatively correlated and not significant. When the enterprise characteristic variables and city characteristic variables are added, the core explanatory variables show a negative correlation and are significant at the 10% level. It shows that after controlling the relevant factors, the Conversion Policy has a restraining effect on the total factor productivity of fishery enterprises. Through the selection of different enterprise quantiles, the coefficient is negative, and with the gradual reduction of the sample enterprises, the difference between the reference group and the treatment group is relatively reduced, and the significance is gradually weakened. This shows that the impact of the Conversion Policy on different quantile levels of TFP is different.

In order to ensure the validity of the experimental results, referring to Yu Yongze and Zhang Shaohui<sup>(31)</sup> for the specific methods of DID testing, this paper uses parallel trend testing to test the stability of the entire experiment. When there is a time trend difference between the reference group and the treatment group, the change in the total factor productivity of the enterprise caused by this policy may not exist<sup>(32)</sup>. The test results

**Tab.4 Transfer system of transfer production and economic efficiency of fishery enterprises**

	(1) Standard	(2) Add Enterprise	(3) Add Urban	(4) 75%Quantile	(5) 50%Quantile	(6) 25%Quantile
treati*post03 <sub>it</sub>	-0.002 (-1.22)	-0.001** (-1.76)	-0.001** (-0.95)	-0.002** (-2.32)	-0.001* (-0.99)	-0.001 (-1.24)
Enterprise		Y	Y	Y	Y	Y
Urban			Y	Y	Y	Y
Urban fixed effect	Y	Y	Y	Y	Y	Y
Year fixed effect	Y	Y	Y	Y	Y	Y
Observations	727	698	698	698	610	532
adj R <sup>2</sup>	0.22	0.42	0.56	0.39	0.41	0.37

Notes: \*, \*\*, \*\*\* representative adopt to 10%, 5% and 1% Significance test. The values in brackets are t or z.

Data source: collected by the author

are shown in the following table (Table 5). The insignificant coefficients of the above-mentioned estimated variables indicate that there was no significant difference between the reference group and the treatment group before the policy was issued in 2003.

According to the above-mentioned natural experiment analysis, it is found that the Conversion Policy has significantly inhibited the total factor productivity of fishery enterprises. There may be the following reasons for the above results: China's current fishery economy is mainly based on the extensive fishery economy<sup>(33)</sup>, and the primary fishery industry accounts for a large proportion of the fishery economy. The Conversion Policy

has further increased the accumulation of surplus fishery labor, intensified labor competition in the labor market, and reduced the labor cost of fishery companies. The extensive development of fishery enterprises will inevitably lead to a decrease in labor productivity, so the total factor labor productivity will reduce.

**Tab.5 Parallel trend test**

	(1) TFP
treat*post00	-0.016 (0.58)
treat*post01	-0.013 (0.31)
treat*post02	-0.061 (1.20)
Enterprise	Y
Urban	Y
Urban fixed effect	Y
Year fixed effect	Y
Observations	698
adj R2	0.84

Notes: Same as the table above

#### 4.2 The impact of city development on the economic development of fishery enterprises

The relationship between the development of cities and enterprises can interact through a variety of ways such as the market, capital, and labor<sup>(34)</sup>. Different types of enterprises have different needs for the cities in which they are located. As an agricultural-related enterprise, fishery enterprises are closely related to city development. In response to the above analysis, a two-way fixed-effect model is used to analyze the relationship between fishery companies and city development (considering the data availability and endogeneity, the first-order lag of the fishery labor force population in the province where the enterprise is located is added as the explanatory variable to measure the influence of fishery population on the development of fishery enterprises). At the same time, it is divided into state-owned enterprises and non-state-owned enterprises to conduct heterogeneous research on the special property rights of Chinese enterprises. The regression showed the following results (Table 6).

According to the results presented in the above table, when only urban-related factors are considered, the positive impact of the number of fishery employees on the total factor productivity of fishery enterprises is significant under the conditions of the full sample, state-owned enterprises and non-state-owned enterprises, indicating that the increase in the number of fishery employees can promote the improvement of fishery economic efficiency. during the research period, the priceindex only shows a promoting effect in state-owned enterprises, and its significance is weak. The urban average wage level is not significant, indicating that it has a weak correlation with the total factor productivity of fishery enterprises. Pergdp represents the level of economic development of a city and shows different correlations in the full sample, state-owned enterprises and non-state-owned enterprises: Under the full sample and non-state-owned enterprises, The per capita GDP of cities is positively correlated with the total factor productivity of fishery enterprises and has a strong significance. State-owned enterprises are negatively correlated with GDP per capita but not significant. It

**Tab.6 The relationship between urban development and Fishery Enterprises**

	(1)	(2)	(3)	(4)	(5)	(6)
	All	State-owned enterprise	Non state owned enterprises	All	State-owned enterprise	Non state owned enterprises
2002.year	-0.090 (-1.46)	-0.028 (-0.29)	-0.092 (-1.19)	0.016 (0.36)	-0.019 (-0.23)	0.044 (0.83)
2003.year	-0.237** (-2.30)	-0.063 (-0.42)	-0.266** (-2.00)	-0.049 (-0.80)	-0.053 (-0.51)	-0.030 (-0.39)
2004.year	-0.289** (-2.21)	-0.104 (-0.45)	-0.281* (-1.75)	0.075 (1.62)	0.139** (2.42)	-0.053 (-0.63)
2005.year	-0.393** (-2.36)	-0.142 (-0.45)	-0.380* (-1.91)			
people	0.302*** (5.50)	0.243** (2.54)	0.322*** (4.94)	0.174*** (3.54)	0.171* (1.72)	0.175*** (3.11)
priceindex	-0.139 (-0.07)	5.198* (1.86)	-2.716 (-1.25)	0.667 (0.37)	3.712 (1.07)	0.050 (0.02)
pergdp	0.609** (2.32)	-0.196 (-0.34)	0.858*** (2.86)	0.409* (1.69)	-0.230 (-0.46)	0.661** (2.31)
awage	0.364 (1.06)	0.661 (1.11)	0.0155 (0.04)	0.0822 (0.26)	0.223 (0.39)	-0.214 (-0.56)
scale				0.284*** (3.88)	0.242** (2.05)	0.284*** (3.34)
debt				0.135 (1.07)	0.219 (1.20)	0.144 (0.85)
profit				0.154*** (-3.14)	0.179** (-2.08)	0.162*** (-2.84)
export				0.100* (1.85)	0.242*** (3.41)	-0.0578 (-0.62)
lifeyear				-0.048 (-1.31)	-0.002 (-0.02)	-0.039 (-0.87)
_cons	0.704 (0.07)	-21.72 (-1.24)	14.33 (1.21)	-0.663 (-0.07)	-12.30 (-0.66)	3.371 (0.29)
N	727	234	493	698	222	476

Notes: Same as the table above

reflects that there are certain differences in the correlation between state-owned enterprises, non-state-owned enterprises and urban economic development in the sample. The nature of the two enterprises determines the connection degree between them and the urban economic development: state-owned enterprises have a larger size<sup>(35)</sup>, and the flexibility of system and policy adjustments is weaker than that of non-state-owned enterprises, and they are less adaptable to economic development. When there are some sudden adjustments in the market, the transformation of state-owned enterprises is slow, the economic vitality is weak. They are stick to the original market strategy, and their ability to control the economic situation is not strong.

When added to the analysis of enterprise-related factors, urban factors are more robust. Among the enterprise factors, enterprise-scale and main business profit margin (profit) have a strong positive correlation

with enterprise total factor productivity. It shows that during the research period, the larger the scale of the enterprise, the better the development of the enterprise and the higher the income level of the enterprise. In terms of exports, the full sample, state-owned enterprises and non-state-owned enterprises show different heterogeneity: for the full-sample and state-owned enterprise, there is a significant positive correlation between export and TFP, and the exports of non-state-owned enterprises are negatively correlated with TFP but not significant. On the whole, export has a positive impact on TFP. The promotion effect of state-owned enterprises is more significant. The effect of non-state-owned enterprises is not obvious, and the results need to be further tested.

#### 4.3 Analysis of policy heterogeneity between state-owned enterprises and non-state-owned enterprises

When the policy comes into effect, the heterogeneity of the enterprise nature and the enterprise type will have different interpretations of the policy<sup>(36)</sup>, which will have a heterogeneous impact on the enterprise. Therefore, this paper divides fishery enterprises into state-owned enterprises and non-state-owned enterprises for heterogeneity analysis, further refines the impact of policies on enterprises, and analyzes the internal mechanism. The analysis results are shown in the following table (Table 7).

From the results in the above table, it is found that the impact of the Conversion Policy on state-owned enterprises is negative but not significant, and the negative impact on non-state-owned enterprises is more significant. It shows that the different nature of the enterprise will also lead to the effect of the policy and the significant difference: the "special" market position of the state-owned enterprise is more likely to obtain policy subsidies<sup>(37)</sup>, and the negative impact of the Conversion Policy on its labor productivity is limited and the policy impact is not obvious. Non-state-owned enterprises, as the dominant players in the market, enjoy fewer national policy subsidies. The policy of the Conversion Policy has led to an increase in the number of fishery companies, and the price competition leads to the decline of the profits of fishery enterprises and the obvious decline of the economic efficiency of fishery enterprises.

## 5 conclusion and discussion

The Conversion Policy is new thinking and method proposed by China at the level of macro-industry

**Tab.7 Analysis of enterprise heterogeneity**

	State-owned enterprise			Non state owned enterprises		
	Standard	Add Enterprise	Add Urban	Standard	Add Enterprise	Add Urban
treati*post03it	-0.001	-0.002	-0.002	-0.001	-0.001*	-0.001*
	(0.25)	(-1.57)	(-1.55)	(-2.32)	(-1.85)	(-1.94)
Enterprise		Y	Y		Y	Y
Urban			Y			Y
Urban fixed effect	Y	Y	Y	Y	Y	Y
Year fixed effect	Y	Y	Y	Y	Y	Y
Observations	234	222	222	493	476	476
adj R <sup>2</sup>	0.24	0.58	0.59	0.36	0.55	0.55

Notes: Same as the table above

regulation in order to adapt to the new fishery economic situation and adjust the development model of the fishery industry. It plays a positive significance to a certain extent<sup>(38)</sup>. Due to a series of problems such as information asymmetry, the implementation effect of the policy is not satisfactory<sup>(39)</sup>. This paper uses the data of fishery enterprises in the Chinese industrial enterprise database from 2000 to 2005 to evaluate the impact of the Conversion Policy on the micro-enterprise level using DID. Results have shown that: ① The Conversion Policy harms fishery enterprises, and has not promoted the transformation of the fishery industry and the development of the fishery industry; ② The level of urban economic development has different effects on the development of fishery enterprises, and non-state-owned enterprises enjoy more obvious promotion effect; ③ The negative impact of the policy on non-state-owned enterprises is more significant.

This article infers the reasons for the above results: 1. China's fishery industry focus on the traditional fishery industry model for a long time, and the industrial structure is relatively backward. The Conversion Policy has increased the number of fishery enterprises and products in the market. In the low-end fishery processed product market, disorderly price competition leads to a decline in corporate profits. This policy has a relatively high threshold for fishermen's subsidies<sup>(40)</sup>, fishermen have limited access to skills training, and more fishermen will engage in low-tech threshold occupations. Considering the labor costs, fishery companies will choose to increase the number of low-skill laborers makes up for the technological gap with highly skilled laborers. Under the traditional fishery industry structure, the decline in labor costs has not made up for the loss of profits caused by price competition in the market, resulting in a decline in the economic efficiency of fisheries. The Conversion Policy did not promote the development of the fishery economy.

2. State-owned enterprises are in a dominant position in some special markets in China because of their traditional economic status. During the study period, the "natural monopoly" of state-owned fishery enterprises made it difficult to shake their dominant position in the market, and the economic development of the city had little impact on the state-owned enterprises occupying the dominant position in the market. The flexibility and adaptability of non-state-owned enterprises determine their strong relevance to urban economic development. Non-state-owned enterprises can adjust their management and development methods through the "invisible hand" as the market changes brought by urban economic development. Furthermore, non-state-owned enterprises can better adapt to urban economic development, flexibly adjust business strategies, and increase labor productivity.

3. When policy is formulated, the nature of state-owned enterprises determines that they have a stronger "first-mover advantage" than non-state-owned enterprises. They can obtain "information advantage" through "rent-seeking" and other means, and will make corresponding adjustments to "maximize profits" before the policy comes into effect. When the Conversion Policy is implemented, the state-owned enterprises with a relatively large size can make up for the loss of productivity through policy adjustment and subsidies. The acquisition of "information advantages" allows them to have more capital to withstand the negative impact of the policy. Although non-state-owned enterprises can flexibly adapt to the adjustments brought about by the Conversion Policy, they have to hire more laborers to engage in low-end fishery processing industries because of their "profit-seeking" nature, which hurts the improvement of fishery's total factor productivity.

The Conversion Policy has not played a corresponding role in the development of the fishery economy. Adjusting industrial policies to stimulate market vitality has become a top priority. Especially in the context of supply-side structural reforms, using the market as an "invisible hand" to adjust the fishery industry policy and promote the development of the fishery economy can play a multiplier role. Through our analysis, we found that the degree of adaptation of micro-enterprises to policy adjustments is very rapid, and enterprises

can interpret a policy by adjusting the supply and demand relationship of labor production. Therefore, in the process of making policies, meticulous research on enterprises needs more attention. Industrial policies should adjust the development trends of our relevant enterprises and industries. As a part of the agricultural economy, the fishery industry provides a new growth path for improving the quality and efficiency of the agricultural economy. When formulating fishery industry policies, understanding the needs of fishermen and fishery companies is an inevitable part for fishery policy-making departments.

This article is based on the data of fishery enterprises in the Chinese industrial enterprise database to study the effects of fishery conversion policy on the micro-enterprises level. Due to the availability and stability of the data, only the data of fishery enterprises from 2000 to 2005 are studied. Although it can reflect the effects of policy shocks, the changes in enterprises over the years after the shocks have not been shown in detail. When the technology becomes mature in the future, the company's changes over time can be described with more abundant data.

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**About the authors:**

[1] Jun Xue Professor, School of Economics, Nankai University, Tianjin 300071,China. E-mail: junxue@nankai.edu.cn

[2] Jianwen Ji,Ph.D Candidate,School of Economics,Nankai University,Tianjin 300071,China. E-mail: jjw0211@hotmail.com

[3] Renping Hao,Professor, School of Economics, Toyo University, E-mail: kaku@toyo.jp

薛 军 (客員研究員／中国南開大学经济学院教授)

季建文 (中国南開大学经济学院博士後期)

郝仁平 (研究員／経済学部教授)

