

The Non-linear Impact of Industrial Policy on the Disposal of Zombie Enterprises

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Abstract:

Based on data from China's industrial enterprise database from 2006 to 2013, combined with industrial policy data, this article empirically examines the impact of industrial policies on the disposal of zombie enterprises, explores the heterogeneity of the impact in different regions, and tries to put forward specific solutions. This study found that the strength of industrial policies has a non-linear impact on the disposal of zombie enterprises, that is, the enhancement of industrial policies firstly helps to promote the disposal of zombie enterprises and reduce the number of zombie enterprises, but after reaches a certain intensity level, the increase in the intensity of industrial policy will restrain the disposal of zombie enterprises and increase the number of zombie enterprises. At the same time, compared with the non-linear impact of the eastern coastal areas, the industrial policy in the central and western regions only shows a promotion effect on the disposal of zombie enterprises. When relevant policy departments formulate, implement, and adjust the intensity of industrial policies, they should consider the non-linear impact of industrial policies on the disposal of zombie enterprises, and select appropriate industrial policy intensity based on the characteristics of regions and industries to solve the problem of zombie enterprises.

Keywords: Industrial policy, Zombie enterprises, Non-linear.

I. INTRODUCTION

After more than three decades of rapid and extensive development, China's economy has entered a new stage of high-quality growth. It reported that in order to promote the high-quality economic development, strengthen the points of weakness should be focused in the supply side structural reform, and the achievement of "three removal, one reduction and one supplement" should be consolidated. In particular, the proper disposal of zombie enterprises has become one of the main points of supply side structure reform.

Zombie enterprises refer to the insolvent enterprises that maintain business due to receive government subsidies or financial institution forming unactive and undying situation, large affected by the industrial policy of the government. Some studies have found that industrial policy may lead to overcapacity and thus result in the formation of zombie enterprises[1-3]. However, the implementation of industrial policy does not only have negative impact on zombie enterprise disposal. The implementation of industrial policy aimed at supporting the development of new, immature industries, or correcting the development imbalances and the misallocation of resources under the market failure, and if used properly, industrial policy contributes to promote the transformation of local industry, enhance the market dynamic, and promote the disposal of zombie enterprises through increasing the quantity and quality. *The 14th five-year plan and the 2035 long-term goal outline* notes that, primarily rely on the function of the market at the same time all levels of the government to create the favorable policy environment. In this context, it is pressing and necessary to deeply delve the “double-edged” effect of industrial policy on the disposal of zombie enterprises.

Furthermore, it exists imbalances of regional development in China for a long time. Compared to the eastern region, the economic development in the central and western regions has been slow, and the marketization degree has been low. The impact of industrial policy on the disposal of zombie enterprises is closely related to the marketization degree in the implementation areas. In the high marketization degree areas, the market can spontaneously allocate resource elements, while at this time too strong industrial policy is not conducive to the enterprise development. Therefore, it is necessary to further explore whether there are regional differences under the impact of industrial policy on the disposal of zombie enterprises.

Based on the above research purposes, this article uses the data from China’s industrial enterprise database and industrial policy data from 2006 to 2013, empirically examines the impact of industrial policies on the disposal of zombie enterprises. On this base, this paper further compares that the impact of industrial policy on the disposal enterprises whether exists heterogeneity between eastern region and central and western regions. It can be found that the increase of the strength of industrial policy first contribute to the disposal of the zombie enterprises, but after more than a certain intensity, instead, the increase will restrain the disposal of the zombie enterprises. Meanwhile, the non-linear impact only occurs in the eastern region, while in the central and western regions, the industrial policy only shows a promotion effect on the disposal of zombie enterprises.

The Contributions of the paper are reflected in the following two aspects: first, although the existing studies concerned about the impact of industrial policy on the zombie enterprises, more researches suggest that industrial policy promote the formation of the zombie enterprises through overcapacity. This article innovatively reveals the “double-edged” effect of industrial policy on the disposal of zombie enterprises and compensates the weakness of the perspective from the linear relation of the impact at the

present stage; second, this article reveals the regional heterogeneity of the impact of industrial policy on the disposal of zombie enterprises, and provides new evidence for a comprehensive and objective evaluation about the influence of industrial policy in the supply side structure reform.

II. LITERATURE REVIEW AND HYPOTHESIS

Theoretically the increase in the strength of the industrial policy has both positive and negative impact on the disposal of zombie enterprise. The strength of industrial policy, mainly through improving the total factor productivity to promote the disposal of zombie enterprises[4,5]. On the one hand, demand-oriented industrial policies reduce the uncertainty in the market for the new products through government procurement, user allowance and other measures, which promote the innovation of enterprises and improve productivity[6-8]. On the other hand, supply-oriented industrial policies improve the supply of related production factors from the aspects of personnel training, financial support, technical support, public service and so on, thereby improve productivity. The profitability of enterprise depends on productivity, and enterprises with higher profitability less prone to become zombie enterprises[9,10].

Industrial policies also have the possibility to hinder the disposal of zombie enterprises through overcapacity. The one hand, the implementation of industrial policies may send the wrong signals to enterprises or cause “investment surge” by changing its investment expected returns, which leads to the formation of overcapacity. The other hand, after industrial policies attracting a large number of enterprises enter the industry with the policy preference, even if the overcapacity leads to lower the profitability, which influence enterprises’ debt paying ability, the government with the purpose of “preserving employment” has a motive for direct relief inefficient enterprises, which make it difficult to out of the market via bankruptcy, so that they alive in the market with the identity of zombie enterprises.

Although the increase in the strength of the industrial policy has both positive and negative impact on the disposal of zombie enterprise, this paper think that the two effects render the counter-balance trend with the increase in the strength of the industrial policy. When the industrial policy maintains at the low intensity level, at this time because the government subsidies and other incentives are relatively small, it is hard to attract a large number of enterprises to enter the industry, thus less likely to lead to overcapacity, so the negative impact is relatively limited. However, with the increasing in the strength of the industrial policy, on the one hand, the marginal utility of industrial policy to correct market failures is diminishing; on the other hand, higher benefits will attract the outside enterprises enter the policy preference industry, which result in overcapacity, so that it is more obvious that the impact of industrial policy on the disposal of zombie enterprises is negative. Accordingly, the paper proposed that:

H1: The strength of industrial policies has a non-linear impact on the disposal of zombie enterprises.

In addition, compared to the Midwest, the degree of the marketization is higher in the East, therefore, the market plays dominant role to stimulate the market's vitality and improve the misallocation of resources. Meanwhile, too strong industrial policy is not only detrimental to the zombie enterprises disposal, also could create the new kind of the misallocation of resources. While in the Midwest, due to the relatively lower degree of the marketization, the government intervention is more urgently needed. The government in China implement a series of economic support policy for the Midwest to better support the development of these regions, for example, give priority to infrastructure development, give support to investment and financing and so on. Industrial policy may further contribute to the disposal of zombie enterprises in the Midwest, improving the misallocation of resources. Therefore, theoretically, if the strength of industrial policy has a non-linear impact on the disposal of zombie enterprises, compared with the impact of the central and western areas, the eastern areas should reach the inflection point with lower intensity of the industrial policy, that is, at the lower intensity level, the impact performances inhibitory effect. Accordingly, this paper proposed that:

H2: The non-linear impact of the strength of industrial policies on the disposal of zombie enterprises has heterogeneity between the East and the Midwest.

III. EMPIRICAL RESEARCH DESIGN

3.1 Data Sources

The industrial policy data in this paper come from Chinese Research Data Services Platform (CNRDS). The data at the enterprise level come from the China's industrial enterprise database. Because the available, industrial policy related data began in 2006, the sample in this paper range from 2006 to 2013. On this basis, we remove the samples which miss the key data such as total assets and total liabilities and drop the samples in which the total assets less than the current assets, the total assets less than the fixed asset, and the number of employees less than 8. What's more, due to the serious lack of data from industrial enterprises database in 2010, the related data in 2010 was deleted.

3.2 Variables

3.2.1 Zombie enterprises ($Zombie_{i,t+1}$)

The baseline model in this paper mainly uses the FN-CHK method[11,12] to recognize zombie enterprises. The method defines the zombie enterprises that satisfy the following three conditions: a. the current actual interest payment less than the interest payment for the debt calculated at the lowest market

rate; b. the current earnings before interest and taxes less than the minimum interest payable; c. last period's balance sheet ratios more than 50% and current period's borrowing is still increasing. In the robust analysis section, this paper further uses FN-CHK correction method and FN-CHK (S) correction method[13,14] to identify zombie enterprises, for robust testing.

In the process of identifying zombie enterprises, enterprise-related financial data could be obtained directly from the industrial enterprise database, but the minimum market rate need manual calculation. Since corporate loans are divided into long-term loans and short-term loans, and there are significant differences between the two kinds of loans in the interest payment rate. Therefore, refer to the study[13], we calculated the average of loan interest rates for different options based on the time interval before and after each year's interest rate adjustment and the benchmark lending rate from The People's Bank of China (PBOC). Assuming that the short-term loan terms satisfy the uniform distribution, the market minimum short-term interest rate could be constructed in the following way:

$$rs = \int_0^{1/2} r_{0-6} t dt + \int_{1/2}^1 r_{6-12} t dt \quad (1)$$

r_{0-6} represents the benchmark interest rate for loans with the term of within six months (inclusive), r_{6-12} represents the benchmark interest rate for loans with the term of six months to one year (inclusive). In addition, use the arithmetic average of the benchmark interest rates of the term of 1-3 years (inclusive), 3-5 years (inclusive) and beyond 5 years as the market long-term minimum interest rate. The following Table I shows the minimum short-term and long-term interest rates:

Table I. The minimum short-term and long-term interest rate (unit: %)

years	The minimum short-term interest rate	The minimum long-term interest rate
2006	2.87	5.82
2007	3.27	6.1
2008	3.48	6.47
2009	2.6	6.48
2010	2.62	6.44
2011	3.11	6.53
2012	3.07	6.43
2013	2.95	6.21

Data sources: based on the benchmark interest rate data provided by the official website of People's Bank of China and

author's calculation

The minimum interest payable for the period is calculated using Model (2):

$$\min interest_{i,t} = rs_t \times Shortloan + \left(\frac{1}{5} \sum_{j=0}^4 rl_{t-j}\right) \times Longloan \quad (2)$$

In Model (2), we use the current liability to measure and represent short-term loans (denoted as *Shortloan*), and use the long-term borrowings to measure and represent long-term loans (denoted as *Longloan*).

3.2.2 Industrial policy

The industrial policy data comes from CNRDS, which combined the related industrial policy from the “five-year plan” of provinces, municipalities and autonomous regions. We first matched the industry classification and code involved in each industrial policy, and assumed that the industrial policies in all provinces, municipalities and autonomous regions would be consistent during the implementation of the “five-year plan”. Then, we construct the number of industrial policies in industry *j* in year *t* in region *i* (noted as *INDPOLICY_{i,t}*) by summing up the classification of year, region, and industry code. The more industrial policies, the higher the intensity of industrial policies. Subsequently, we matched the firm and its industry code to obtain the industrial policy intensity faced by firm *i* in year *t*. On this basis, we only kept the regional key-industry policies and construct the number of key-industry policies (noted as *AREAPOLICY_{i,t}*) used in robustness analysis.

3.2.3 Other control variables

(1) Enterprise age. This paper uses the natural logarithm of the difference between the current year and the year of the establishment to measure the age of the enterprises, and related research shows that the longer the enterprises have survived, the more likely it is to become zombie enterprises; (2) enterprise scale. The natural logarithm of the total assets is used to measure the enterprise scale; (3) enterprise profitability. The measurement method is the ratio of total corporate profit to total assets. And the larger the profit margin of the enterprises, the less likely it is to become zombie enterprises; (4) nature of enterprise equity. When the enterprise holding situation is state-owned, we consider the enterprise as the state-owned enterprise and record it as 1, otherwise record it as 0. The proxy variable for the nature of enterprise equity is constructed. Since the government intervention and bank risk aversion are easier to flow resources to state-owned enterprises, theoretically, state-owned enterprises are more likely to become zombie enterprises.

3.3 Empirical Model Design

$$ZOMBIE_{i,t} = \alpha_0 + \alpha_1 POLICY_t + \alpha_2 POLICY_t^2 + \alpha_3 X_{i,t} + \eta_{area} + \eta_i + \varepsilon_{i,t} \quad (3)$$

$ZOMBIE_{i,t}$ is the core independent variable in this paper, we noted the variable is 1 if the firm i identifies as the zombie enterprise in the year t , otherwise it is 0. $POLICY_t$ is the core dependent variable, which could be industrial policy: $INDPOLICY_t$ or regional key-industry policy: $AREAPOLICY_t$. $X_{i,t}$ is the other control variables, including enterprise age (noted as AGE), enterprise scale (noted as ASSET), enterprise profitability (noted as PROFIT) and nature of enterprise equity (noted as SOE). With the consideration of the possible impact of the omitted variable on the results in this paper, we controlled the regional fixed effects and firm-level fixed effects.

3.4 Descriptive Analysis

The results of the descriptive statistics are shown in Table II. We found that the percentage of zombie enterprises identified by FN-CHK is about 10.5% of the full samples. In addition, we used Variance Inflation Factor (VIF) to examine whether there was the multicollinearity problem between the variables and found that the VIFs were all less than 3, so there was no significant multicollinearity problem.

Table II. Descriptive Analysis

Variable	Variable meaning	Observations	Mean	Std.	Min	Max
ZOMBIE	Whether the enterprise is a zombie enterprise	1,375,768	0.1046	0.3061	0.0000	1.0000
INDPOLICY	Number of industrial enterprises	1,375,768	1.4654	1.6637	0.0000	13.0000
AREAPOLICY	Number of regional key-industry policies	1,375,768	0.7521	1.0533	0.0000	9.0000
AGE	Enterprise age	1,375,768	2.1859	0.7035	0.0000	3.9890
ASSET	Enterprise total asset	1,375,768	10.2492	1.4720	7.3582	14.6108

PROFIT	Enterprise net profit	1,375,768	0.1229	0.2096	-0.1836	0.9870
SOE	Nature of enterprise equity	1,375,768	0.0664	0.2490	0.0000	1.0000

Data: author's calculations

IV. EMPIRICAL RESULTS AND ANALYSIS

4.1 Baseline Model Regression Results

Table III is the regression result of the Model (3), in which the Columns (1) to (3) report the regression results under using the number of regional industrial policies as the core independent variable. Column (1) contains only regional industrial policies and their quadratic terms, Column (2) controls the province fixed effects based on Column (1), and Column (3) controls the other control variables and firm-level fixed effects based on Column (2). The results in Columns (1)-(3) show that the monomial coefficient of INDPOLICY is significantly negative at the 1% statistical level, and the quadratic coefficient of INDPOLICY is significantly positive at the 1% statistical level. The results show that regional industrial policy has a non-linear impact on the disposal of zombie enterprises, which means, the increasing number of regional industrial policies initially reduce the number of zombie enterprises, but after exceeding a certain threshold, the increasing number will increase the number of zombie enterprises instead. That is, the enhancement of industrial policies firstly helps to promote the disposal of zombie enterprises, but after reaches a certain intensity level, the increase in the intensity of industrial policy will restrain the disposal of zombie enterprises.

In Table III, Columns (4)-(6) report the regression results when the number of regional key-industry policies is used as the core independent variable. Column (4) contains only regional key-industry policies and their quadratic term, Column (5) controls for provincial fixed effects based on Column (4), and Column (6) controls other control variables as well as firm-level fixed effects based on Column (5). The results show that the monomial coefficient of AREAPOLICY is negative and significant at the 1% statistical level, and the quadratic coefficient of AREAPOLICY is positive and significant at the 1% statistical level, indicating that regional key-industry policies also have the effect of promoting and then reducing the disposal of zombie enterprises. The above results confirm the H1 in this paper.

In addition, after observing the coefficients and significance of the control variables, we also found that longer surviving and more profitable enterprises are less likely to become zombie enterprises, while larger enterprises and state-owned enterprises are more likely to be zombie enterprises.

Table III. Baseline model regression results

	(1) ZOMBIE	(2) ZOMBIE	(3) ZOMBIE	(4) ZOMBIE	(5) ZOMBIE	(6) ZOMBIE
INDPOLICY	-0.0051*** (-16.3208)	-0.0042*** (-11.3754)	-0.0024*** (-6.4623)			
INDPOLICY2	0.0004*** (10.6455)	0.0003*** (6.8687)	0.0002*** (3.5384)			
AGE			-0.0684*** (-50.2843)			-0.0680*** (-50.2404)
ASSET			0.0515*** (75.5499)			0.0516*** (75.7238)
PROFIT			-0.1842*** (-1.1e+02)			-0.1843*** (-1.1e+02)
SOE			0.0121*** (2.8759)			0.0121*** (2.8867)
AREAPOLICY				-0.0078*** (-13.8727)	-0.0067*** (-9.4273)	-0.0054*** (-7.4974)
AREAPOLICY2				0.0014*** (9.2511)	0.0007*** (3.7620)	0.0006*** (3.1206)
CONSTANT	0.1100*** (271.6893)	0.1085*** (251.3055)	-0.2501*** (-41.8765)	0.1082*** (308.7551)	0.1079*** (285.6442)	-0.2524*** (-42.1938)
Firm-level fixed effects	uncontrol	uncontrol	control	uncontrol	uncontrol	control
Provincial fixed effects	uncontrol	control	control	uncontrol	control	control
R-squared	0.0144	0.4870	0.4959	0.0143	0.4870	0.4959
observation	1375768	1248256	1248256	1375768	1248256	1248256

Notes: Significance levels indicated by *p < 0.05, **p < 0.01, and p*** < 0.001.

Data: Author's calculation

4.2 Heterogeneity Test Results

Table IV shows the regression results of the heterogeneity test, where Columns (1) and (2) report the regression results only for the sample of the eastern coastal areas in China. The result in Column (1) shows that the monomial coefficient of INDPOLICY is negative and significant at the 1% statistical level, and the quadratic coefficient of INDPOLICY is positive and significant at the 1% statistical level.

The result in Column (2) shows that the monomial coefficient of AREAPOLICY is negative and significant at the 1% statistical level, and the quadratic coefficient of AREAPOLICY is positive and significant at the 1% statistical level, indicating that the strength of industrial policies has the non-linear impact of promoting and then reducing on the disposal of zombie enterprises, and this conclusion in the main test is also applicable to the eastern coastal areas.

In Table III, Column (3) and Column (4) report the regression results under retaining only the central and western areas in China. Column (3) shows that the monomial coefficient of INDPOLICY is negative and significant at the 1% statistical level, and the quadratic coefficient of INDPOLICY is not significant. In addition, Column (4) shows that the monomial coefficient of AREAPOLICY is negative and significant at the 1% statistical level, and the quadratic coefficient of AREAPOLICY is not significant. The results indicate that at this stage, in the central and western areas, the strength of industrial policies does not have the non-linear impact on the disposal of zombie enterprises. The strength of industrial policy in the central and western regions helps to reduce the number of zombie enterprises, that is, the industrial policy shows a promotion effect on the disposal of zombie enterprises. The above findings confirm the H2 in this paper.

The above results perhaps caused by the fact that the eastern regions have higher economic development level and better market environment. So, the too strong industrial policy is not only detrimental to the operation of the market mechanism, but also may distort the market and lead to overcapacity, thus showing that too strong industrial policy has a negative impact on the disposal of zombie enterprises. While the central and western regions have lower economic development level and less perfect market, which require government intervention, thus the increased intensity of industrial policy at this stage helps to promote the disposal of zombie enterprises.

Table IV. Heterogeneity testing results

	(1) The eastern coastal areas ZOMBIE	(2) The eastern coastal areas ZOMBIE	(3) The central and western areas ZOMBIE	(4) The central and western areas ZOMBIE
INDPOLICY	-0.0024*** (-5.6741)		-0.0024*** (-2.8304)	
INDPOLICY ²	0.0001*** (2.9347)		0.0001 (1.2873)	
AGE	-0.0660*** (-43.2386)	-0.0657*** (-43.4471)	-0.0780*** (-26.1037)	-0.0773*** (-25.6947)
ASSET	0.0557*** (70.4795)	0.0559*** (70.5823)	0.0419*** (31.0213)	0.0420*** (31.1176)

PROFIT	-0.1792*** (-94.2364)	-0.1792*** (-94.2368)	-0.1974*** (-61.3006)	-0.1975*** (-61.3741)
SOE	0.0046 (0.8471)	0.0046 (0.8464)	0.0215*** (3.2626)	0.0216*** (3.2738)
AREAPOLICY		-0.0051*** (-6.1269)		-0.0045*** (-3.0938)
AREAPOLICY ²		0.0004** (2.0239)		0.0004 (1.2396)
CONSTANT	-0.3050*** (-43.9212)	-0.3067*** (-44.0840)	-0.1123*** (-9.5828)	-0.1155*** (-9.8181)
Firm-level fixed effects	control	control	control	control
Provincial fixed effects	control	control	control	control
R ²	0.4837	0.4837	0.5208	0.5208
Observation	919867	919867	328384	328384

Notes: Significance levels indicated by *p < 0.05, **p < 0.01, and p*** < 0.001.

Data: Author's calculation

4.3 Robust

In order to examine the robustness of the benchmark model in this paper, this section uses the following three methods for robustness testing: 1. IV; 2. Constructing the independent variable ZOMBIE through FN-CHK correction method; 3. Constructing the independent variable ZOMBIE through FN-CHK (S) correction method

4.3.1 IV

Although the independent variable in this paper is the number of industrial policies at the industry level, and the dependent variable is the number of zombie enterprises the micro level, the endogeneity issue caused by reverse causality will be mitigated since the individual micro-firm behavior is less likely to influence the industry variables. However, in this section, in order to further exclude the impact of possible endogeneity issue, we used the instrumental variables to test the robust of the benchmark model. Since the national key-industry policies and the differences between national and regional are closely related to the choice of regional industrial policy, local zombie enterprise behavior is difficult to influence the national industrial policy. National key-industry policies and differences between national and regional key-industry policies could be used for robustness testing as the instrumental variables of the regional industrial policy and regional key-industry policy, due to the satisfaction of both correlation and exogeneity. The data of national key-industry policies are obtained from CNRDS. For the situation

in which there are the differences between national key-industry policies and regional key-industry policies, we record as 1, otherwise we record as 0. The variables of national and regional key-industry policy differences are constructed by such above process.

The regression results of the instrumental variable are shown in Column (1) and Column (2) in Table V. Among them, the monomial coefficients of INDPOLICY and AREAPOLICY remain significantly negative and the quadratic coefficients of INDPOLICY and AREAPOLICY are significantly positive, indicating that regional industrial policy and regional key-industry policy have the impact of promoting and then inhibiting on the disposal of zombie enterprises, which shows that the results of the benchmark model still hold true after considering endogeneity issue, and the findings of this paper are robust. In addition, the results of Kleibergen-Paaprk LM statistic, Kleibergen-PaaprkWald F statistic and Hansen J statistic, show that the instrumental variables used in this section were not weak instrumental variables, and satisfy both correlation and exogenous.

4.3.2 FN-CHK correction method

The zombie enterprises identified by FN-CHK may include “One-shot Zombie Firm”[11], in which the operation has temporary difficulties and does not lose earning power. Therefore, such enterprises should be excluded because they do not have to rely on government support or external financing to survive. FN-CHK correction method identify the zombie enterprises which are considered as zombie enterprises in two consecutive years, otherwise they are considered as normal enterprises. Under the above way, the screened enterprises are denoted as ZOMBIE2. The relevant results are shown in Column (3) and Column (4) in Table V, where the Column (3) shows the consistent results, and in Column (4), the quadratic coefficient is not significant but it is still positive, which basically indicates the robustness of the results in this paper.

4.3.3 FN-CHK (S) correction method

It is argued that since China is a transition economy[14], business development and resource allocation are inevitably influenced by the political institution, government subsidies should be taken into account in the criteria for distinguishing the profitability of zombie enterprises. Since government subsidies are also included in operating revenue, government subsidies should be excluded from income before interest and tax. That is, we will use “whether the income before interest and tax minus subsidized income is less than the minimum interest” to identify whether the enterprise is the zombie enterprise instead of using “whether interest income before interest and tax is less than the minimum interest” as the standard. The binary variable is denoted as ZOMBIE3 under the above method. The regression results are shown in Columns (5) and Column (6) in Table V. The conclusions remain consistent with the results of the benchmark model in this paper.

Table V. Robustness test results

	(1)	(2)	(3)	(4)	(5)	(6)
	ZOMBIE	ZOMBIE	ZOMBIE2	ZOMBIE2	ZOMBIE3	ZOMBIE3
INDPOLICY	-0.0029*** (-4.0313)		-0.0016*** (-4.8384)		-0.0023*** (-6.5685)	
INDPOLICY ²	0.0002* (1.7527)		0.0002*** (3.1248)		0.0002*** (4.2144)	
AGE	-0.0681*** (-49.2553)	-0.0685*** (-50.2066)	-0.0439*** (-32.5740)	-0.0440*** (-32.9746)	-0.0463*** (-33.9355)	-0.0467*** (-34.5784)
ASSET	0.0515*** (75.5634)	0.0516*** (75.6118)	0.0294*** (51.3476)	0.0294*** (51.4183)	0.0299*** (51.6180)	0.0300*** (51.6929)
PROFIT	-0.1842*** (-1.1e+02)	-0.1842*** (-1.1e+02)	-0.0491*** (-40.9540)	-0.0491*** (-40.9429)	-0.0500*** (-41.0382)	-0.0500*** (-41.0101)
SOE	0.0121*** (2.8741)	0.0121*** (2.8889)	0.0026 (0.7599)	0.0026 (0.7633)	0.0017 (0.4773)	0.0017 (0.4833)
AREAPOLICY		-0.0058*** (-5.7192)		-0.0024*** (-3.5731)		-0.0031*** (-4.5148)
AREAPOLICY ²		0.0010*** (3.3308)		0.0002 (1.0701)		0.0004* (1.6583)
CONSTANT			-0.1471*** (-28.2174)	-0.1475*** (-28.2829)	-0.1452*** (-27.4486)	-0.1451*** (-27.4320)
Firm-level fixed effects	control	control	control	control	control	control
Provincial fixed effects	control	control	control	control	control	control
R ²	0.0175	0.0175	0.5120	0.5120	0.5125	0.5124
Observations	1248256	1248256	844830	844830	844830	844830

Notes: Significance levels indicated by *p < 0.05, **p < 0.01, and p*** < 0.001.

Data: Author's calculation

V. CONCLUSIONS

5.1 Research Conclusions

Based on the data from China's industrial enterprise database and industrial policy data from 2006 to 2013, the paper empirically examines the impact of the industrial policy on the disposal of zombie enterprises and the heterogeneity of the impact between the East and the Midwest. The paper found that: first, as a whole, the non-linear impact of the strength of industrial policy on the disposal of zombie

enterprises represents the suppression after promotion. The enhancement of industrial policies firstly helps to promote the disposal of zombie enterprises, but after reaches a certain intensity level, the increase in the intensity of industrial policy will restrain the disposal of zombie enterprises and increase the number of zombie enterprises. Second, the strength of industrial policies has a non-linear impact on the disposal of zombie enterprises only in the eastern regions, while in the central and western regions, the industrial policy only shows a promotion effect on the disposal of zombie enterprises.

5.2 Policy Implications

The research has the following policy implication:

Firstly, it should be properly understood that the industrial policies play an important role in the disposal of zombie enterprises, and the “double-edged” effect should be substantially realized. This research found that in the range of appropriate intensity, the enhancement of industrial policies firstly helps to promote the disposal of zombie enterprises and has the positive impact on the market adjustment of misallocation resources. Meanwhile, this study also found that too strong industrial policy is not detrimental to the disposal of zombie enterprises, instead, it will further promote the formation of zombie enterprises. As a result, the government should fully be aware of the “double-edged” effect of industrial policy, rational use the industrial policy to deal with market failure and focus on avoiding negative impact caused by high strength industrial policy.

Secondly, industrial policy should be implemented according to regional differences, and be used to promote the supply side structure reform. The paper found that there was an obvious difference in the impact of industrial policy on the disposal of zombie enterprises between the East and the Midwest. Therefore, the government should make full consideration about the regional differences with the implementing of industrial policy. For the areas with better market mechanism, it is better to fully use the market regulation and avoid the negative impact caused by the high intensity industrial policy. While for the regions with imperfect market mechanism, in order to maximize the effectiveness of the industrial policy, we could appropriately strength the industrial policy to deal with market failure through policy intervention.

Thirdly, correctly understand and accept the existence of the regional differences of the industrial policy, and take preventive measures. Although for the Midwest, the industrial policy shows a promotion effect on the disposal of zombie enterprises, the government should stay alert for the possible appearance of the inflection point in the future. Under these circumstances, the government need use industrial policy cautiously, establish long-term targeted incentive and avoid negative consequences caused by focusing short-term target.

Finally, the local implementation of industrial policy should utilize the regional comparative advantage, deploy around the key industrial policy, unify old capacity exiting and develop new supply, and establish capacity clearing, capacity entering and other mechanism constructions. In the process of capacity exiting and clearing, we should properly dispose zombie enterprises and guide the reallocation resources.

ACKNOWLEDGEMENTS

This paper is supported by the Major Program of National Social Science Foundation of China (Project No. 20&ZD105). The authors would like to express appreciation to the anonymous reviewers for their valuable comments on this paper.

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