Economic Analysis and Policy 70 (2021) 249–258

Contents lists available at ScienceDirect

Economic Analysis and Policy

journal homepage: www.elsevier.com/locate/eap

Analyses of topical policy issues

Industrial policy, uncertainty, and analysts' earnings forecast: Evidence from China

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ARTICLE INFO

Article history:
Received 7 September 2020
Received in revised form 25 February 2021
Accepted 25 February 2021
Available online 2 March 2021

Keywords:
Industrial policy
Accuracy of analysts' earnings forecasts
Uncertainty
Industry competition

ABSTRACT

On the basis of the revitalization plans of 10 industries implemented by the Chinese government in 2009, this study analyzes the relationship between industrial policies and analysts' earnings forecasts. We find that industrial policies lead to a decline in the accuracy of analysts' earnings forecasts. Our mechanism analysis confirms that the uncertainties caused by these industrial policies have a mediating effect on this relationship. In view of the effects of industrial policies as a mechanism for the government to intervene in the market, the negative effects of these policies on the role of analysts and their increasing effects on uncertainties are both more significant in competitive industries.

1. Introduction

Industrial policy is a significant means by which the government influences the economy (Lin and Chang, 2009), especially in the case of China, which is a highly politically centralized country. This policy also plays a critical role in economic development (Chen et al., 2017). Although the direct purpose of industrial policies is to develop the product market, such policies also trigger the reaction of stock prices (Pástor and Veronesi, 2012; Abbas and Wang, 2020). Therefore, investigating how industrial policies affect capital markets, which is a critical mechanism of resource allocation, offers a novel perspective in analyzing the effects of such policies. However, most studies have focused on the direct effects of industrial policies on product markets (Andreoni and Chang, 2019; Pelli, 2018; Wu et al., 2019), and only few have linked them to capital markets. This study complements the literature by analyzing the effects of industrial policies on the accuracy of analysts' earnings forecasts.

Uncertainty is a key variable in explaining how government actions affect capital markets. However, policies have a double-edged effect on uncertainties. On the one hand, given the unpredictability of policy costs, market entities cannot accurately predict policy changes and withdrawals, thereby creating policy uncertainties. The effects of policies on microeconomic entities, such as companies, are also unclear, thereby leading to impact uncertainties (Pástor and Veronesi, 2012, 2013). On the other hand, policies reduce uncertainties when they respond appropriately to market uncertainties (Pástor and Veronesi, 2012). The asset price level ultimately reflects the change in uncertainties through risk premiums

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https://doi.org/10.1016/j.eap.2021.02.013
0313-5926/

and discount rates (Chen et al., 2020; Liu et al., 2020; Cheng et al., 2020). However, the response of stock prices to uncertainties mainly depends on market participants' information processing and trading behavior (Aabo et al., 2020; Chu and Fang, 2020). For example, institutional investors will arbitrage based on uncertainties. Relative to the arbitrage of investors, stock analysts initially react to the uncertainty caused by a policy. As information intermediaries, analysts mainly absorb and process publicly available information and obtain and disseminate new information (Das et al., 1998). Especially under the condition of uncertainty, investors have great demand for the information provided by analysts (Barniv and Cao, 2009), and analysts are sensitive to company-specific information (Joos et al., 2016). Many empirical studies have confirmed that various uncertainties negatively affect the accuracy of analysts' earnings forecasts (Das et al., 1998; Song et al., 2009; Zhang, 2006; Kong et al., 2021). For instance, Biswas (2019) and Yu et al. (2019) proved that policy uncertainty affects analysts' forecast behavior. In sum, industrial policies affect analysts' forecasting behavior through changes in uncertainties. This study provides empirical evidence for the above theoretical logic in the context of the Chinese market.

The Chinese government rapidly issued revitalization plans for 10 major industries, namely, automobile, steel, textile, equipment manufacturing, shipbuilding, electronic information, light, petrochemical, nonferrous metal, and logistics, in 2009 to prevent an economic downturn caused by the financial crisis. On February 25, 2009, the government approved the planning details of all the above industries. Such rapid introduction of plans can maintain the exogenous characteristics of the policy and provides an ideal quasi-natural experimental scenario for testing the relationship among industrial policies, uncertainties, and analysts' forecasts.

Based on the revitalization plans of these 10 industries, we analyze the effects of industrial policies on analysts' forecasts and their mechanism. Our conclusions are as follows. First, the accuracy of analysts' earnings forecasts, which follow those companies that are affected by an industrial policy, decline after the implementation of a policy. Second, our test of the mediation effect of uncertainty confirms that the increase in uncertainty due to the introduction of an industrial policy also reduces the accuracy of analysts' earnings forecasts. Third, as a form of government intervention in the market, the implementation of these policies has a more significant negative effect on the role of analysts and has more significant increasing effects on uncertainties in competitive industries.

We contribute to the literature as follows. First, our study further supplements the literature on how industrial policies affect capital markets. We provide evidence that can provide a comprehensive understanding of the effects of industrial policies. Our analysis based on analysts' behavior also produces abundant evidence to support the relationship between government behavior and asset prices. Second, we validate the logic that industrial policies negatively affect analysts' forecast behavior and that uncertainty acts as an intermediary variable in such relationship. We also accurately identify the relationship among industrial policies, uncertainties, and analysts' forecasts by explaining the source of uncertainty. Third, our analysis offers a comprehensive and clear evidence of how government actions and macroeconomic policies affect analysts' forecasts. Overall, our results have guiding significance in accurately understanding the role of analysts in capital markets. The government can also use these results to optimize the design of their industrial policies and to realize the best policy effects.

The rest of this paper is structured as follows. Section 2 reviews the literature and develops the hypotheses. Section 3 describes the methodology and data. Sections 4 and 5 present the results and concluding remarks, respectively.

2. Literature review and hypothesis

2.1. Government action and uncertainty

Government action is a critical factor that affects asset prices and capital market efficiency. Many studies have focused on the effects of government behaviors, such as tax policies, environmental policies, and election events, on asset prices (Sialm, 2009; Ramiah et al., 2013; Bradle et al., 2016). Morck et al. (2000) discussed the relationship between government behaviors and the efficiency of stock price information and argued that government actions hinder the integration of information into stock prices. Issuing industrial policies that are aimed at the production activities of a particular sector (Aghion et al., 2015) is a significant means for the government to influence the economy. Accordingly, previous studies have examined the effects of industrial policies on female labor force participation (Freedman, 2017), corporate financing and investment behavior (Chen et al., 2011), industrial development (Pelli, 2018), and economic growth (Wu et al., 2019). However, the effects of industrial policies on the capital market remain relatively unknown.

Pástor and Veronesi (2012, 2013) theoretically demonstrated the mechanism behind the influence of government actions on stock prices and returns based on intermediary variable uncertainty. Policy changes may increase uncertainties through two mechanisms, namely, policy and effect uncertainties. On the one hand, policy uncertainties arise from the inability of market entities to predict whether and when policies will change. On the other hand, effect uncertainties mainly refer to the uncertainties of policies to influence private sector income. Both of these uncertainties can be reduced by the appropriate responses of government policies to unpredictable shocks in the market. One can use the changes in the discount rate and risk premium to realize the effects of uncertainty changes on asset prices. Most of the previous works in this area, as represented by Bradle et al. (2016), directly examined the relationship between government behavior and asset prices yet did not clarify the mechanism of uncertainty in the middle. Therefore, the influence of industrial policies on uncertainties is yet to be empirically tested from the perspective of the double-edged sword effect of government actions on uncertainties.

2.2. Uncertainty and analysts' behavior

Government actions that ultimately affect asset prices also depend on the information and trading behaviors of market participants. This key factor resets the market participants' beliefs (Pástor and Veronesi, 2012). However, most empirical studies have ignored the role of changes in the behavior of market participants – as driven by uncertainties – in the relationship between government policies and asset prices. Aabo et al. (2020) explained how institutional investors can use their information advantages to obtain excess returns under policy uncertainties. A stock analyst acts as the provider of information for institutional investors and as the most critical information intermediary in the capital market. Given the sensitivity of analysts to information (Joos et al., 2016), they initially respond to the uncertainties caused by government actions. Das et al. (1998) found that earnings predictability is associated with the magnitude of bias in analysts' earnings forecasts. Song et al. (2009) revealed a positive relationship between bold forecasts and earnings uncertainty. Zhang (2006) proved that analysts show behavioral biases in cases of great information uncertainty. On the basis of the policy uncertainty index, Biswas (2019) found that a doubled economic policy uncertainty is associated with a 4.29 percentage points increase in earnings forecast errors. By using the turnover of local government leaders in China, Yu et al. (2019) revealed a reduction in forecast accuracy in the presence of policy uncertainties. However, these studies all directly measured uncertainties without analyzing the specific sources of such uncertainties, thereby limiting our understanding of how government actions affect analysts' forecasts.

2.3. Hypothesis development

Industrial policies affect the accuracy of analysts' forecasts depending on how the uncertainties in the policy implementation process will change.

On the one hand, increased uncertainty caused by an industrial policy may manifest as follows. In a poor information environment and in cases of fluctuations in a company's basic value (Zhang, 2006), complex investors face difficulties in making accurate predictions at a controlled cost (Jiang et al., 2005), the cash flow of companies become unstable, and their earnings become less predictable (Das et al., 1998; Song et al., 2009). All these uncertainties make the quality of private information held by analysts difficult to assess. Public information on company value is also noisy, thereby increasing the degree of information ambiguity (Carson et al., 2006). Generally, industrial policies negatively affect the accuracy of analysts' assessment of the value of companies and consequently reduce the accuracy of their earnings forecasts.

On the other hand, industrial policies are issued in response to financial crises and economic recessions. In 2008 and 2009, listed companies in China posted average operating income growth rates of −17% and −20%, respectively, thereby indicating an uncertainty in the market.[1] Industrial policies aimed at stimulating the economy may respond appropriately to market uncertainties and ultimately reduce the uncertainties faced by analysts (Pástor and Veronesi, 2012). Government support is also an important factor in the development of industries and companies (Hausmann and Rodrik, 2003). Industrial policies can also help companies smoothen out their returns with government support, thereby making these returns predictable (Chen et al., 2010). Stabilizing cash flow and improving the information environment can also facilitate an analyst's assessment of a company's value. Ultimately, analysts' earnings forecasts become more accurate. In view of the above arguments, we propose

H1: Industrial policies reduce the accuracy of analysts' earnings forecasts by increasing uncertainties.

H2: Industrial policies improve the accuracy of analysts' earnings forecasts by reducing uncertainties.

3. Methodology and data

3.1. Methodology

Following Chen et al. (2017) and Wu et al. (2019), we use the difference-in-differences method to analyze the effects of industrial policies on the accuracy of analysts' earnings forecasts. We define the listed companies in the 10 industries as the experiment group companies and those analysts who follow these companies as the experiment group analysts. By contrast, we define those companies that are not in the 10 industries and those analysts who follow such companies as the control group companies and analysts, respectively. We formulate the model as

$$Accuracy = \alpha + \beta_1 Policy + \beta_2 After + \beta_3 Policy * After + \beta_n X + FE + \varepsilon, \quad (1)$$

where *Accuracy* measures the accuracy of analysts' earnings forecasts, *Policy* is a dummy variable that reflects whether the company with a corresponding analyst forecast report belongs to the 10 industries, *After* is a dummy variable that indicates whether the year is after the implementation of the policy, and X is a set of control variables. We also control for the year fixed, analyst fixed, and industry fixed effects in the regression as denoted by *FE* in Model (1). All regressions use the heteroscedastic robust standard error.

[1] In the context of the COVID-19 pandemic, many studies, such as Mishra et al. (2020), Phan and Narayan (2020), Song et al. (2020), Iyke (2020), and Sharma (2020), have confirmed the uncertainty brought about by the external shock of this event.

Following Han et al. (2018), we calculate the accuracy of analysts' earnings forecasts as

$$Accuracy_{ijt} = -1 \times \frac{\left|FEPS_{ijt} - AEPS_{jt}\right|}{Price_{jt}}, \tag{2}$$

where $Accuracy_{ijt}$ is the earnings forecast accuracy of analyst i for company j in year t, $FEPS_{ijt}$ is the last earnings per share (EPS) forecast for company j in year t released by analyst i before the earnings announcement, $AEPS_{jt}$ is the actual EPS of company j in year t, and $Price_{jt}$ is the closing stock price of company j at the beginning of year t. We also multiply the formula by -1 to ensure that a larger *Accuracy* value corresponds to a higher earnings forecast accuracy.

We define *Policy* and *After* as follows. If a company followed by an analyst belongs to the 10 industries affected by the revitalization plans, then *Policy* is equal to 1; otherwise, *Policy* is equal to 0. Given that the government issued the industrial revitalization plan in 2009 and its implementation period lasted for 3 years, we take 2009–2011 as the period after the introduction of the industrial policy. For comparison, we select 2006–2008 as the period before the introduction of the industrial policy. Therefore, the dummy variable *After* is equal to 1 if the sample year is between 2009 and 2011 and is equal to 0 if the sample year is between 2006 and 2008.

In theory, we can define the effects of policies on industries through the strength of government support for a specific industry. However, the revitalization plans include various support programs, such as bank loans, government subsidies, and tax incentives. Therefore, we cannot quantify the policy impact from this perspective.

Zhang (2006) defined uncertainty as high risk in a company's cash flow. Therefore, we use the companies' degree of total leverage *DTL* to measure uncertainty at the company level. *DTL* reflects the sensitivity of EPS to changes in sales volume and quantifies companies' comprehensive risk. Uncertainty also pertains to information uncertainty and difficulty in stock market valuation. Following Zhang (2006), we use analysts' forecast disagreement *FDIS* to measure information uncertainty. *FDIS* is computed as the ratio of the standard deviation of earnings forecasts issued by all analysts following the company to the stock price at the beginning of the year. Following this definition, larger *DTL* and *FDIS* values correspond to higher uncertainty.

Following previous studies on analysts' forecast accuracies (e.g., Cowen et al., 2006; Han et al., 2018) and market reaction of companies to shock (e.g., Xiong et al., 2020; Wu et al., 2020), we argue that the characteristics of companies and analysts also affect the latter's forecast behavior. Therefore, we add two types of control variables to the regression to reduce the estimation error. In addition, in view of the possible direct and spillover effects of the 2008 global financial crisis, we add a dummy variable *FinCrisis* to our model and calculate this variable by using the average income growth rate of all listed companies. From 2008 to 2010, during which the average income growth rate of all listed companies was negative, *FinCrisis* is equal to 1, thereby highlighting the great impact of the financial crisis. In other years when the income growth rate of the listed companies was positive, *FinCrisis* is equal to 0, thereby highlighting minimal impact from the financial crisis. Table 1 shows the definition and description of all control variables.

3.2. Data

We obtain data on analysts, their forecasts, financials, and other company-specific data from the China Stock Market and the Accounting Research Database (CSMAR). We screen our samples in three steps. First, we remove the samples of financial listed companies and those of listed companies with abnormal trading status. Second, we remove those samples with obvious errors or missing values in their descriptive statistics. Third, we perform tail-reduction processing for all continuous variables below and above the 1% and 99% quantiles, respectively. We eventually obtain 5820 company–year observations and 40,090 analyst-level annual observations. Table 2 shows the descriptive statistics of all variables. The data distribution characteristics of all variables are consistent with their economic definitions.

4. Results

Fig. 1 shows the time trend of the changes in the earnings forecast accuracy of the experimental and control group analysts. The forecast accuracies of these analysts do not significantly differ before the implementation of the industrial revitalization plans. However, after the implementation, the experimental group analysts show lower earnings forecast accuracy than the control group analysts. This finding initially reflects the negative effects of the industrial revitalization plans on the accuracy of analysts' forecasts. Moreover, it shows that we can use the difference-in-differences model to analyze the relationship between these two factors.

4.1. Industrial policies and analysts' earnings forecasts

By using analysts' earnings forecast accuracy as the explanatory variable, Table 3 shows the results of the multiple regression based on Model (1). In Column (1) of Table 3, we do not add any control variables to prevent multicollinearity. We control company characteristic variables in Column (2) and simultaneously control the companies and analysts' characteristic variables in Column (3). We find that the coefficients of the interaction term $Policy * After$ are all negative and significant at the 1% level in all columns. Therefore, implementing industrial revitalization plans significantly reduces the earnings forecast accuracy of the experimental group analysts.

Table 1
Definition and description of control variables.

Variable properties	Variable symbol	Definition and description
Economic characteristic variable	*FinCrisis*	In 2008–2010, when the average income growth rate of listed companies was negative, *Finrisk* is equal to 1. In other years when the income growth rate of listed companies was positive, *Finrisk* is equal to 0.
Company characteristic variables	*Size*	Company size. The logarithm of the company's total assets.
	ROA	Risk-adjusted return on assets. It is equal to return on assets divided by the annual variance of a company's stock weekly return.
	Lever	Leverage. The ratio of a company's total liabilities to total assets.
	SOE	Nature of ownership. State-owned companies are equal to 1, and private companies are equal to 0.
	BM	Book–market value ratio.
	First	Shareholding ratio of the largest shareholder.
	Follow	Logarithm of the number of analysts who follow the company.
	Big4	Whether the auditors are from the Big Four accounting firms. If yes, this variable is equal to 1; otherwise, this variable is equal to 0.
	Inst	Shareholding ratio of institutional investors.
Analyst characteristic variables	*Bise*	Size of the analysts' organization. It is equal to the logarithm of the number of research reports issued by the organization this year.
	Horizon	Time difference predicted by analysts. It is equal to the difference between the time when the analysts' research report is released and the time when the company's annual report is released.
	Exp	Analyst experience. It is equal to the logarithm of the number of quarters since the analysts made their first forecast.
	Num_F	Logarithm of the number of companies that analysts follow this year.
	Num_I	Logarithm of the number of reports released by analysts this year.

Table 2
Descriptive statistics of variables.

Variables	Mean	Variance	Min	P25	Median	P75	Max
Accuracy	−0.022	0.0320	−0.188	−0.026	−0.010	−0.003	0
Policy	0.270	0.444	0	0	0	1	1
After	0.863	0.344	0	1	1	1	1
DTL	1.704	1.762	0.741	1.049	1.210	1.544	13.80
FDIS	0.019	0.019	0.001	0.006	0.013	0.024	0.112
FinCrisis	0.643	0.479	0	0	1	1	1
Size	22.09	1.326	19.81	21.10	21.86	22.90	25.78
ROA	1.199	1.126	−0.587	0.467	0.925	1.613	6.112
Lever	0.370	0.208	0.009	0.199	0.364	0.528	0.814
SOE	0.544	0.498	0	0	1	1	1
BM	0.851	0.805	0.100	0.331	0.565	1.060	4.242
First	0.390	0.159	0.089	0.260	0.388	0.505	0.758
Follow	2.741	0.736	0.693	2.303	2.890	3.296	3.970
Big4	0.129	0.335	0	0	0	0	1
Inst	0.216	0.177	0.001	0.078	0.173	0.309	0.773
Bise	6.379	0.791	3.932	5.932	6.537	6.937	7.834
Horizon	5.869	0.781	3.219	5.333	6.031	6.443	6.998
Exp	6.770	6.327	0.140	1.970	4.720	9.640	28.28
Num_F	1.865	0.875	0.693	1.099	1.946	2.565	3.951
Num_I	2.170	1.101	0.693	1.099	2.197	3.045	4.663

Note: A total of 40,090 and 5781 analyst- and company-annual observations have been obtained at the analyst and company levels, respectively.

4.2. Mediating effect of uncertainty

We then verify whether uncertainty is behind the negative effects of policies on the accuracy of analysts' earnings forecasts.

First, by using *DTL* and *FDIS* as explanatory variables, we apply the difference-in-differences method at the company level to verify the effects of the revitalization plans for the 10 industries on uncertainty. Table 4 shows the regression results. The coefficient of the interaction term *Policy* ∗ *After* is significantly positive at the 1% level in each column, thereby suggesting that the revitalization plans have significantly increased the uncertainty at the company level.

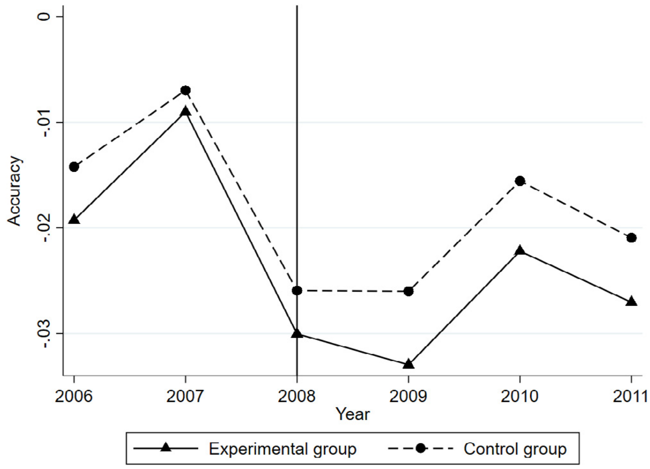

Fig. 1. Time trend of the changes in the earnings forecast accuracy of analysts. Note: Fig. 1 shows the time trend of the changes in the earnings forecast accuracy of the experimental and control group analysts. The forecast accuracy of these analysts does not significantly differ before the implementation of the industrial revitalization plans. However, after the implementation, the experimental group analysts report a lower earnings forecast accuracy than the control group analysts.

Second, we add the uncertainty variables *DTL* and *FDIS* to the regressions in Table 3 to analyze the mediating effect of uncertainty. Table 5 shows the regression results. Similar to the results in Table 3, the coefficients of the interaction term *Policy* ∗ *After* are significant and negative in Columns (1) and (2). However, the coefficients of *Policy* ∗ *After* are positive and less significant in Columns (3) and (4). *DTL* and *FDIS* are significantly and negatively related to the accuracy of analysts' earnings forecasts, respectively, thereby confirming that industrial policy mainly affects analysts' forecast behavior through uncertainty. By combining the results in Tables 4 and 5, we prove that uncertainty has a mediating effect. The reduced accuracy of analysts' earnings forecasts under the effects of industrial revitalization plans can be viewed as a response to an increase in uncertainty.

The observed mediating effect of uncertainty confirms H1 and validates the logic that industrial policy affects both uncertainty and analysts' forecast behavior.

4.3. Influence of industry competition

Many studies on the effects of industrial policies on product markets have mentioned competition-friendly strategies (Aghion et al., 2015). Industry competition is a critical factor that affects the relationship among industrial policies, uncertainties, and analysts' forecasts. When the government implements industrial policies in competitive industries, its intervention and market mechanism faces intense conflicts that introduce great uncertainty, to which the capital market reacts violently. In this context, the cash flow of companies becomes unstable, and analysts face great difficulties in collecting and analyzing relevant information. Eventually, their earnings forecast accuracy is significantly reduced. Therefore, we predict that the effects of industry revitalization plans on the accuracy and uncertainty of analysts' earnings forecasts are particularly evident in highly competitive industries.

We measure the degree of industry competition by using the Hefindar index (*HHI*), which is calculated based on the operating income of all companies in an industry (Song and Ren, 2020). Following its definition, a smaller *HHI* value represents a higher degree of industry competition. By using *HHI* and the interaction term *Policy* ∗ *After*, we construct a new interaction term *Policy* ∗ *After* ∗ *HHI* in Model (1) to examine how industry competition influences the policy effect. We also control the interaction terms *Policy* ∗ *HHI* and *After* ∗ *HHI* in all regressions. Columns (1) and (2) of Table 6 show the regression results. We find that *Policy* ∗ *After* remains significantly negative in the two columns, thereby suggesting that the industry revitalization plans negatively affect analysts' forecast accuracy. The interaction term *Policy* ∗ *After* ∗ *HHI* is significantly positive in the two columns, which suggests that the negative effect of industrial policy on the accuracy of analysts' forecasts increases along with *HHI*. Therefore, analysts are less affected when the government implements industrial policies in monopolistic industries, which is in line with the conclusions and inferences of Pástor and Veronesi (2012) and Aghion et al. (2015).

We contend that uncertainty plays an intermediary role in the relationship between industrial policy and analysts' forecasts. Therefore, we also check whether industry competition affects the relationship between industrial policy and uncertainty. Columns (3) to (6) of Table 6 show the regression results where *Policy* ∗ *After* ∗ *HHI*, *Policy* ∗ *HHI*, and *After* ∗ *HHI* are the controlled interaction terms and uncertainty is the dependent variable. The coefficients of *Policy* ∗ *After* remain significantly positive, indicating that industrial policy can increase uncertainty. However, the coefficients of *Policy* ∗ *After* ∗ *HHI* are negative in all regression columns and are significant at the 1% level in Columns (5) and (6), respectively. This

Table 3
Effects of industrial policies on the accuracy of analysts' earnings forecasts.

	(1) Accuracy	(2) Accuracy	(3) Accuracy
Policy ∗ After	−0.0028***	−0.0029***	−0.0026***
	(−2.784)	(−2.983)	(−2.800)
Policy	−0.0014	0.0007	0.0009
	(−1.402)	(0.792)	(1.023)
After	−0.0277***	−0.0266***	−0.0268*
	(−8.522)	(−8.433)	(−1.804)
FinCrisis		0.0068***	0.0065**
		(13.839)	(2.260)
Size		−0.0025***	−0.0019***
		(−11.728)	(−9.338)
ROA		0.0016***	0.0019***
		(9.907)	(12.148)
Lever		−0.0038***	−0.0026***
		(−4.101)	(−2.945)
SOE		0.0026***	0.0029***
		(6.947)	(8.235)
BM		−0.0066***	−0.0061***
		(−22.548)	(−21.806)
First		0.0109***	0.0106***
		(10.380)	(10.524)
Follow		0.0062***	0.0050***
		(23.128)	(19.645)
Big4		0.0021***	0.0019***
		(4.005)	(3.763)
Inst		0.0038***	0.0042***
		(4.168)	(4.833)
Bise			0.0004
			(0.349)
Horizon			−0.0133***
			(−57.282)
Exp			0.0012
			(1.616)
Num_F			0.0041***
			(6.744)
Num_I			0.0004
			(1.198)
Constant	−0.0201	0.0017	0.0576***
	(−1.020)	(0.088)	(2.836)
N	40 090	40 090	40 090
Fixed effect	Yes	Yes	Yes
R^2.adj	0.2435	0.2921	0.3527

Notes: The coefficients of the interaction term *Policy ∗ After* reflect the net effect of industrial policies. The coefficients of *Policy ∗ After* are negative and significant in all columns, thereby confirming that industrial policies negatively affect the accuracy of analysts' earnings forecasts. The fixed effects controlled in the regressions include annual fixed effects, analyst fixed effects, and industry fixed effects. The *t* statistics are presented in brackets. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

finding suggests that the positive effects of industrial policies on uncertainty are suppressed as the value of *HHI* increases, that is, as the degree of industry monopoly rises.

As a form of government intervention in the market, industrial policies have significant negative effects on the role of analysts and a significant increasing effect on uncertainties in competitive industries.

4.4. Robustness test[2]

Other policy noises that occurred between 2006 and 2011, including the implementation of the 11th Five-Year Plan in 2006, may have affected the reliability of our conclusions. Therefore, we define the dummy variable *Policy*2 for a sample of companies and analysts in 28 industries affected by this plan (e.g., agriculture, forestry, animal husbandry, and fishery) and assign this variable a value of 1. *Policy*2 is equal to 0 for those industries that are not affected by the 11th Five-Year Plan. Our conclusion that the revitalization plans reduce the accuracy of analysts' earnings forecasts still holds after we control the dummy variable *Policy*2 in Model (1).

2 Given space limitations, we will not provide the empirical results tables in this part. If necessary, you can contact us by email.

Table 4
Effects of industrial policies on uncertainties.

	(1) *DTL*	(2) *DTL*	(3) *FDIS*	(4) *FDIS*
Policy ∗ After	0.1234***	0.1063***	0.0049***	0.0042***
	(4.290)	(3.950)	(4.333)	(3.866)
Policy	0.0122	−0.0037	−0.0001	−0.0015
	(0.477)	(−0.155)	(−0.117)	(−1.587)
After	−0.0046	0.0329	0.0052***	0.0036***
	(−0.138)	(1.044)	(3.883)	(2.747)
Constant	1.3698***	1.1813***	0.0076***	−0.0542***
	(20.589)	(6.891)	(3.134)	(−8.137)
N	5528	5528	5781	5781
Control variable	No	Yes	No	Yes
Fixed effect	Yes	Yes	Yes	Yes
R^2.adj	0.1271	0.2382	0.1742	0.2458

Notes: The coefficients of the interaction term *Policy ∗ After* reflect the net effect of industrial policies. The coefficients of *Policy ∗ After* are significantly positive in all columns, thereby confirming that industrial policies significantly increase the uncertainties at the company level. Company-level regressions do not control analysts' characteristic variables. The fixed effects controlled in the regressions include annual fixed effects and industry fixed effects. The *t* statistics are presented in brackets. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 5
Mediating effects of uncertainties.

	(1) *Accuracy*	(2) *Accuracy*	(3) *Accuracy*	(4) *Accuracy*
Policy ∗ After	−0.0019**	−0.0021**	0.0015*	0.0011
	(−2.008)	(−2.378)	(1.667)	(1.338)
Policy	−0.0015*	0.0003	−0.0019**	−0.0007
	(−1.702)	(0.304)	(−2.152)	(−0.901)
After	−0.0281***	−0.0234*	−0.0216***	−0.0141
	(−9.368)	(−1.651)	(−7.308)	(−1.054)
DTL	−0.0082***	−0.0056***		
	(−25.073)	(−17.122)		
FDIS			−0.8081***	−0.7237***
			(−98.670)	(−89.801)
Constant	−0.0051	0.0636***	−0.0097	0.0345*
	(−0.283)	(3.383)	(−0.554)	(1.883)
N	38 668	38 668	39 993	39 993
Control variable	No	Yes	No	Yes
Fixed effect	Yes	Yes	Yes	Yes
R^2.adj	0.2570	0.3518	0.4047	0.4715

Notes: The coefficients of the interaction term *Policy ∗ After* reflect the net effect of industrial policies. The coefficients of *DTL* and *FDIS* reflect the effects of uncertainties. The coefficients of *Policy ∗ After* do not have the same coefficient sign. *DTL* and *FDIS* have significant and negative relationships with the accuracy of analysts' earnings forecast, respectively. These results confirm that industrial policies mainly affect analysts' forecast behavior through uncertainties. The fixed effects controlled in the regressions include annual fixed effects, analyst fixed effects, and industry fixed effects. The *t* statistics are presented in brackets. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

We also use regression methods to verify the parallel trend assumption of the difference-in-differences method. Specifically, we assign a value of 1 to the dummy variable $Before_i$ when the observation in the experimental group ($Policy = 1$) is in year i before the policy implementation; otherwise, this variable is equal to 0. We also assign a value of 1 to the dummy variable $After_i$ when the observation in the experimental group is in year i after the policy implementation; otherwise, this variable is equal to 0. The dummy variable *Current* is equal to 1 when the observation in the experimental group is in the year of the policy implementation; otherwise, this variable is equal to 0. We also replace the interaction term *Policy ∗ After* in Model (1) with $Before_3$, $Before_2$, *Current*, $After_1$, and $After_2$. We remove $Before_1$ because the first year before the policy is set as the base period. We also compare the differences between the experimental and control groups with the base period to check whether the parallel trend hypothesis is satisfied. The regression results confirm the reliability of our analysis method.

We ensure the robustness of our conclusions by measuring *Accuracy* alternatively and by narrowing our research period. We measure *Accuracy* from two perspectives. First, we measure *Accuracy* as

$$Accuracy1_{ijt} = -1 \times \frac{\left|FEPS_{ijt} - AEPS_{jt}\right|}{\left|AEPS_{jt}\right|}, \tag{3}$$

Table 6
Influence of industry competition.

	(1) *Accuracy*	(2) *Accuracy*	(3) *DTL*	(4) *DTL*	(5) *FDIS*	(6) *FDIS*
Policy ∗ *After*	−0.0041***	−0.0049***	0.1616***	0.1425***	0.0084***	0.0074***
	(−3.116)	(−3.954)	(4.041)	(3.808)	(5.366)	(4.981)
Policy ∗ *After* ∗ *HHI*	0.1066***	0.1028***	−0.8475	−0.7082	−0.0963***	−0.0792***
	(4.377)	(4.557)	(−1.146)	(−1.024)	(−3.329)	(−2.860)
Policy ∗ *HHI*	0.0150	−0.0104	0.3529	0.3632	0.0269**	0.0287**
	(1.040)	(−0.779)	(1.092)	(1.201)	(2.133)	(2.382)
After ∗ *HHI*	−0.0206	−0.0225*	−0.4193	−0.5881	0.0087	−0.0034
	(−1.396)	−1.650)	(−0.922)	(−1.383)	(0.502)	(−0.205)
Policy	−0.0019	0.0017	−0.0166	−0.0332	−0.0023*	−0.0039***
	(−1.522)	(1.457)	(−0.459)	(−0.977)	(−1.654)	(−2.850)
After	−0.0338***	−0.0298**	0.0373	0.0632	0.0028	0.0009
	(−9.173)	(−1.998)	(0.733)	(1.321)	(1.360)	(0.471)
HHI	−0.0418***	−0.0165*	0.1475	0.0580	−0.0197**	−0.0226**
	(−3.883)	(−1.657)	(0.592)	(0.249)	(−1.989)	(−2.385)
Constant	−0.0117	0.0598***	1.3313***	1.1642***	0.0103***	−0.0510***
	(−0.590)	(2.921)	(16.680)	(6.629)	(3.419)	(−7.443)
N	40 090	40 090	5528	5528	5781	5781
Control variable	No	Yes	No	Yes	No	Yes
Fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
R^2.adj	0.2444	0.3532	0.1274	0.2386	0.1758	0.2474

Notes: The coefficients of the interaction term *Policy* ∗ *After* ∗ *HHI* reflect the influence of industry competition on the policy effect. The coefficients of *Policy* ∗ *After* ∗ *HHI* are significantly positive in Columns (1) and (2). Therefore, the negative effects of industrial policies on the accuracy of analysts' forecasts grow more severe along with an increasing degree of industry competition. The coefficients of *Policy* ∗ *After* ∗ *HHI* are negative in Columns (3) to (6) and are significant at the 1% level in Columns (5) and (6). Therefore, the positive effects of industrial policies on uncertainties will be suppressed as the value of *HHI* increases. The fixed effects controlled in the regressions include annual fixed effects, analyst fixed effects, and industry fixed effects. In the company-level regression, analysts' characteristic variables and analyst fixed effects are not controlled. The *t* statistics are presented in brackets. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

where $FEPS_{ijt}$ and $AEPS_{jt}$ are defined the same way as in Formula (2). Second, we calculate the average earnings forecast accuracy of all analysts at the company level and set this average as our independent variable. To prevent other exogenous factors from interfering with our conclusions, we only regress the samples of analysts in 2008 and 2009. Regression results show that our conclusions remain robust.

5. Conclusion

As key information intermediaries in the capital market, stock analysts initially respond to changes in uncertainties caused by the introduction of industrial policies and then affect investors' transactions and stock prices through their earnings forecasting behavior. This study takes the industrial revitalization plans implemented by China in 2009 for the 10 industries as the policy background and then analyzes the effects of these plans on the accuracy of analysts' earnings forecasts and uncertainties. We find that the implementation of these plans reduces the accuracy of analysts' earnings forecasts and increases uncertainties. The changes in uncertainties play a mediating role in the logic of industrial policies, which have considerable effects on the accuracy of analysts' forecasts and uncertainties in competitive industries.

Our conclusions offer the following policy implications. First, governments should reduce their direct intervention in the market (by implementing industrial policies) and seek market-oriented policy means to influence the economy. Second, the implementation and withdrawal of industrial policies and the design of policy mechanisms should be transparent and predictable to reduce the effects of uncertainties on market entities. Third, the government's industrial policy formulation process under the influence of an economic crisis should incorporate the characteristics of industry competition as factors that influence industry selection. This process should mainly rely on the role of market mechanisms for competitive industries.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

We are grateful to the editors and the anonymous referees for their invaluable comments that helped improve this paper. Jiangyuan Wang acknowledges the support of the Project of Humanities and Social Sciences of the Ministry of Education of China (Grant No. 18YJC790163). Jiawu Gan acknowledges the support of the National Social Science Foundation of China (Grant No. 71663055).

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