Decoding China's Industrial Policies

Hanming Fang, Ming Li, Guangli Lu

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Motivation

The global trend of industrial policy

- Rising trend and skews heavily towards rich countries (Juhász, et al., 2022)
- China is particularly prominent in the practice of industrial policies

The unsettled debate over industrial policy

- "The best industrial policy is none at all." (Gary Becker, 1985)
- More recent empirical literature produces results that are more favorable to industrial policy

What's Missing

We face a scarcity of basic facts and systematic data about industrial policy practices.

- Multi-faceted nature of industrial policy
 - Objective, target industry, timing
 - Implementation tools, organization details, conditionality
- The rich dynamics and sophistication at the local level
 - ► Top-down pass-through vs. local adaption, experimentation & innovation
 - Policy diffusion, learning
 - Competition and overcapacity

Fundamentally, the real question about industrial policy is not whether it should be practiced, but how (Rodrik, 2009)

Research Question

Utilizing LLM to examine 3 million policy documents from various levels of government departments, we investigate the diverse aspects of China's industrial policies.

- Who are supporting which industry, from when?
- How are industrial policies implemented at each level of government, and for each industry?
- Why do local governments choose specific industries to support and specific tools to use?

Demonstrate the power of LLM in analyzing complicated text data!

Before We Start: Defining Industrial Policy

We follow Juhász et al. (2022) and Naughton (2021) to use a relatively narrow definition of industrial policy.

- The subject of industrial policy must be the government (including various levels of government and subordinate departments).
- Industrial policy must involve government policy measures.
- Industrial policy must be directly biased towards a specific industry or specific economic activity. General policies not targeting specific industries or activities are not industrial policies.
- Industrial policy aims to affect the economy's long-term structure. Policies addressing short-term economic shocks, like responses to the COVID-19 pandemic, do not qualify as industrial policy.

Existing Measurement of Industrial Policy

- Structured policy frameworks or specific policy shock
 - ▶ Five-year plans, keyword search: Barwick et al. (2021); Cen et al. (2024); Chen et al. (2017)
 - Specific policy shocks: InnoCom (Wei et al., 2023), Made in China 2025 (Branstetter and Li, 2023), South Korea's HCI drive (Lane, 2022)
- Data-driven approach: sectors/firms that received more subsidy based on micro-level firm data
 - DiPippo et al. (2022); Aghion et al. (2015); Branstetter et al. (2023)
- Government documents + text-based approach
 - ► Juhász et al. (2023); Evenett et al. (2024): GTA database and manual label of IP
 - Sinclair and Zhang (2023): central government documents + tone analysis

What Can We Learn from Policy Documents?

- Government level, region, date
- Objective
- Target industry
- Implementation Tool
- Requirement
- Intergovernmental relationship
- Organizational arrangement, incentive structure



Large Language Models

Why LLM?

- Strong contextual understanding of complex texts
- Capability of processing and understanding very long texts
- Transparency and understandability in output
- Consistency and low cost relative to human ratings

Hallucination-robust LLM LLM

- Careful step-by-step prompt engineering
- Task separation, response with reasoning & confidence level, text extraction
- Multi-round refinement, self-critique
- Verification

Data

Policy Documents 2000-2022

- Documents continuously scrapped from government websites (0.7 million)
- PKULaw government documents (2.5 million)
- The two overlap with 0.1 million

Politician Database 2003-2019

• Variables: name, position, place of birth, year of birth, education, work history, etc.

Firm Data 2000-2022

- Firm Registration and Annual Reports: New firm entry and performance
- Administrative Tax Survey: Subsidy, Debt, Equity, Tax, TFP, Input, etc.
- VAT: Universal trade network to measure local protectionism

A Snapshot of the Industrial Policy Database

- Distribution of Industrial policy
 - By government level, region, and time
- Objective
- Targeted sector
- Policy implementation tool
- Organizational arrangement
- Policy requirement
- Example with chip, EV, and solar energy industry

Share of Industrial Policy by Level of Government

		Overall		
	#	% in documents	% in all IP	
Central	101,250	30.86	13.18	328,142
Province	344,321	26.82	44.81	1,283,813
City	295,698	23.49	38.48	1,258,638
District/County	27,040	21.60	3.52	125,182
Township	78	12.83	0.00	608
Total	768,387	25.64	100.00	2,996,383

Overtime and Spatial Distribution of Industrial Policy



Direction of Industrial Policy



Rising Importance of High-skill Manufacturing Industries



Industrial Policy Objective by Government Level

	All	Central	Province	City
Key industry				
Promote strategic industry	0.22	0.20	0.21	0.24
Promote pillar industry	0.05	0.03	0.04	0.06
Promote emerging industry	0.10	0.07	0.09	0.13
Support traditional advantageous industry	0.11	0.09	0.12	0.11
Upgrade traditional industry	0.12	0.09	0.12	0.14
Support green industry	0.13	0.09	0.13	0.14
Promote other key industry	0.09	0.08	0.09	0.10
Innovation				
Promote innovation	0.17	0.14	0.16	0.18
Promote new technology adoption	0.08	0.06	0.07	0.10
Social welfare				
Urbanization	0.04	0.02	0.03	0.07
Stimulate employment	0.13	0.10	0.12	0.15
Promote social equity and welfare	0.26	0.19	0.25	0.29
Observations	741269	101250	344321	295698

Industrial Policy Tool Classification Dynamic

	All	Central	Province	City
Subsidy and Finance				
Credit and Finance	0.14	0.11	0.12	0.18
Tax Incentives	0.20	0.20	0.16	0.23
Equity Support	0.05	0.04	0.04	0.06
Fiscal Subsidies	0.41	0.25	0.39	0.48
Entry and Regulation				
Industrial Fund	0.07	0.04	0.06	0.09
Promote Entrepreneurship	0.06	0.04	0.05	0.08
Investment Policy	0.13	0.11	0.12	0.16
Improving Business Environment	0.18	0.13	0.15	0.22
Market Access and Regulation	0.35	0.42	0.34	0.34
Trade Protection	0.09	0.19	0.08	0.07
Observations	741269	101250	344321	295698

Industrial Policy Tool Classification

	All	Central	Province	City
Input				
Labor Policy	0.22	0.16	0.21	0.27
Preferential Land Supply	0.13	0.06	0.10	0.17
Infrastructure Investment	0.18	0.11	0.16	0.23
Technology R&D and Adoption	0.24	0.21	0.23	0.27
Environmental Policy	0.13	0.09	0.12	0.16
Demand-side				
Consumer subsidy	0.05	0.04	0.05	0.07
Government Procurement	0.07	0.05	0.07	0.08
Industrial Promotion	0.10	0.07	0.10	0.12
Supply Chain				
Promote Industrial Cluster	0.14	0.08	0.12	0.18
Localization Policy	0.05	0.03	0.04	0.06
Observations	741269	101250	344321	295698

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Industrial Policy Implementation Method

	All	Central	Province	City
Incentive Scheme				
Setting Target	0.48	0.36	0.49	0.52
KPI	0.13	0.05	0.11	0.18
Supervision & Inspection	0.45	0.37	0.47	0.46
Positive Incentive	0.13	0.06	0.12	0.18
Negative Incentive	0.30	0.25	0.28	0.33
Experimentation and learning				
Pilot & Demonstration	0.21	0.18	0.21	0.23
Encouraging Innovation	0.06	0.05	0.06	0.07
Requiring Local Implementation	0.13	0.14	0.13	0.14
Allowing Mistake	0.02	0.01	0.01	0.02
Learning Experience	0.15	0.14	0.15	0.15
Observations	741269	101250	344321	295698

Industrial Policy Implementation Method

	All	Central	Province	City
Organizational Support				
Strict Enforcement	0.45	0.48	0.44	0.44
Facilitating Coordination	0.65	0.50	0.64	0.71
Funding Support	0.43	0.28	0.42	0.50
Institutional Support	0.36	0.30	0.34	0.39
Local Condition				
Local Industry Advantage	0.12	0.05	0.11	0.15
Local Input Advantage	0.08	0.04	0.07	0.09
Differentiation	0.18	0.17	0.16	0.20
Local Adaptation	0.42	0.24	0.39	0.51
Observations	741269	101250	344321	295698

Four Sets of Facts on China's Industrial Policy

- Sector choice: Economic and political economic determinant Fact 1 (Fact set 1)
- Tool and implementation method: regional variation, across-industry variation Fact 2(a)-2(c), within-industry dynamic Fact 2(d)-2(e) (Fact set 2)
- Policy diffusion, spatial inefficiency, and overcapacity Fact 3 (Fact set 3)
- Effectiveness of policy and tool: benefits, entry, productivity Fact 4) (Fact set 4)

Fact 1(a): Sector Choice and Regional Advantage

We examine the relationship between regional advantage and local governments' choice of targeted industry

$$Policy_{cst} = \exp\left[\lambda_1 RCA^n_{cs(t-1)} + \lambda_2 RCA^p_{cs(t-1)} + \lambda_3 AA_{cs(t-1)} + \delta_c + \eta_s + \gamma_t\right] + \epsilon_{cst}$$

- where c is for city, s for industry (sector), t for year
- $RCA^{p} = \frac{Capital_{cst}}{\sum_{s}Capital_{cst}} / \frac{\sum_{c \in p}Capital_{cst}}{\sum_{s}\sum_{c \in p}Capital_{cst}}$, measures within province RCA • $RCA^{n} = \frac{Capital_{cst}}{\sum_{s}Capital_{cst}} / \frac{\sum_{c}Capital_{cst}}{\sum_{s}\sum_{c}Capital_{cst}}$, measures RCA in the country
- $AA = \frac{Capital_{cst}}{\sum_{s} Capital_{cst}}$, measures absolute advantage

	(1)	(2)	(3)	(4)	(5)
I.RCA ⁿ	0.000779***			0.000432***	-0.00713***
	(7.85e-05)			(7.17e-05)	(0.00103)
$I.RCA^p$		0.00896***		0.00839***	-0.00636*
		(0.000436)		(0.000458)	(0.00369)
I.AA			3.459***	3.138***	6.250***
			(0.127)	(0.120)	(0.373)
I.RCA ⁿ *log(GDP)					0.00326***
					(0.000651)
I.RCA ^p *log(GDP)					0.00144***
					(0.000179)
I.AA*log(GDP)					-0.545***
					(0.0554)
log(GDP)					-0.130***
					(0.0176)
City, Year, Industry FE	Yes	Yes	Yes	Yes	Yes
Observations	2,803,600	2,803,600	2,803,600	2,803,600	2,335,760

Fact 1(a): Sector Choice and Regional Advantage

Fact 1(b)-1(d): Political Economic Determinant of Sector Choice

- City-level government follow upper-level government in policy-targeted sector choice, and the pass-through is heterogeneous on city characteristics
- There is a significant resurgence of policy centralization after 2013
- Sector choice exhibits some persistence within city, and politicians diffuse the policy when moving to a new city.

▶ Skip

Fact 1(b): Policy Top-down Pass-through

We examine the policy pass-through from the central government to local government and its heterogeneity on city characteristics.

 $Policy_{cst} = \exp\left[\beta_1 Policy_{st}^{p(c)} + \beta_2 Policy_{st}^{p(c)} \times X_{ct} + \beta_3 Policy_{st}^n + \beta_4 Policy_{st}^n \times X_{ct} + \delta_c + \eta_s + \gamma_t\right] + \epsilon_{cst}$

- City-level government follow upper-level government in policy-targeted sector choice
- The pass-through of industrial policy sector choice from central to local is heterogeneous on city characteristics
 - ► More developed regions follow upper level government less
 - Pass-through is intensified by political competition
 - ► Pass-through is weaker when local leaders have personal connections with provincial leaders

Fact	1(b):	Policy ⁻	Top-down	Pass-through

		0		
	(1)	(2)	(3)	(4)
Policy ^p	0.354***	1.809***	1.746***	0.385***
	(0.00724)	(0.0382)	(0.0550)	(0.00843)
Policy ⁿ	0.219***	1.609***	1.303***	0.250***
	(0.0210)	(0.127)	(0.180)	(0.0246)
Policy ^p *log(GDP)		-0.200***	-0.202***	
		(0.00502)	(0.00516)	
Policy ⁿ *log(GDP)		-0.189***	-0.196***	
		(0.0163)	(0.0168)	
Policy ^p *log(# Cities)			0.0338	
			(0.0217)	
Policy ⁿ *log(# Cities)			0.163**	
			(0.0708)	
$Policy^{p}*Connection_{s}$				-0.140***
				(0.0140)
$Policy^{n*}Connection_s$				-0.125***
				(0.0422)
$Policy^p * Connection_m$				0.0106
				(0.0163)
$Policy^{n*}Connection_m$				-0.0124
				(0.0501)
Controls	Yes	Yes	Yes	Yes
City, Year, Industry FE	Yes	Yes	Yes	Yes
Observations	2,803,600	2,335,760	2,335,760	2,803,600

Fact 1(c): The Resurgence of Policy Centralization after 2013



(a) Policy Pass-through (Provincial) (b)

(b) Policy Pass-through (Central)

- The correlation between city and province policy sector choice decreases before 2013 and slightly increase after 2013
- The correlation between city and central policy sector choice was insignificant before 2013, and becomes significantly positive afterwards

Fact 1(d): Policy Persistence and Politician Mobility

We first examine policy persistence over time and how it is affected by change in local politician

$$\begin{aligned} \text{Policy}_{cst} &= \exp\left[\beta_1 \text{Policy}_{st}^{p(c)} + \beta_2 \text{Policy}_{st}^n + \beta_3 \text{Policy}_{cs,t-1} + \beta_4 \text{Policy}_{st}^{p(c)} \times \text{Change}_{ct} \\ &+ \beta_5 \text{Policy}_{st}^n \times \text{Change}_{ct} + \beta_6 \text{Policy}_{cs,t-1} \times \text{Change}_{ct} + \delta_c + \eta_s + \gamma_t\right] + \epsilon_{cst} \end{aligned}$$
(1)

We then identify a subsample with politician rotations across cities to decompose the persistence into location-persistence and politician-persistence

$$Policy_{cst} = \exp \left[\beta_1 Policy_{c(p)st}^p + \beta_2 Policy_{st}^n + \beta_3 Policy_{cs(t-1)} + \beta_4 Policy_{c(l)s(t-1)} + \delta_c + \eta_s + \gamma_t\right] + \epsilon_{cst}$$

where $Policy_{cs(t-1)}$ is 1 if the city c target industry s in the last period, and $Policy_{c(l)s(t-1)}$ is 1 if city c's party secretary's or mayor's previous city c(l) target industry s in the last period.

Fact 1(d): Policy Persistence and Politician Mobility

	Full Sample			Lateral Move	
	(1)	(2)		(3)	(4)
$Policy^p$	0.136***	0.117***	$Policy^p$	0.105***	0.108***
	(0.00594)	(0.00762)		(0.0199)	(0.0238)
$Policy^n$	0.0275***	0.0195**	Policy ⁿ	0.0158	0.00229
	(0.00615)	(0.00779)		(0.0213)	(0.0255)
I.Policy	0.367***	0.368***	I.Policy	0.276***	0.252***
	(0.00888)	(0.00893)		(0.0240)	(0.0300)
I.Policy*Change	-0.0497***	-0.0511***	I.Policy (same politician)	0.0910***	0.135***
	(0.0124)	(0.0126)		(0.0271)	(0.0328)
Policy ^p *Change		0.0268**	I.Policy (neighbor)		0.0352
		(0.0111)			(0.0320)
Policy ⁿ *Change		0.0188*			
		(0.0112)			
Change	0.00240	-0.00655			
	(0.00677)	(0.0100)			
City, Year, Industry FE	Yes	Yes	City, Year, Industry FE	Yes	Yes
Observations	2,663,420	2,663,420	Observations	153,162	153,162

Facts 2(a)-2(c): Choice of Industrial Policy Tools

We examine the choice of policy tools across different dimensions. For each tool k,

$$\mathbb{1}(\text{Tool}_{ikgst}) = \exp\left[\sum_{t'=2001}^{2020} \beta_{k,t'}^n \text{Year}_{t'} \times \mathbb{1}\{g=n\} + \sum_{t'=2001}^{2020} \beta_{k,t'}^p \text{Year}_{t'} \times \mathbb{1}\{g=p\} + \delta_s + \gamma_t\right] + \epsilon_{ikgst}$$

where *i* is for policy, *g* for government level, *c* for city, *s* for industry (sector), *t* for year. X_i is one of: government level, city GDP, policy targeted sector. **Proof dynamic**

- Local governments are earlier adopters of new policy tools, central government is heavier user of traditional tools, provincial government is in between, and trends converge over time. Fact 2(a)
- More developed regions are earlier adopters of new policy tools, and new tools gradually diffuse to less developed regions over time. Fact 2(b)
- More developed regions are always heavier users of the fiscally costly traditional tools. Fact 2(b)
- New industrial policy tools are more used in high-skill and emerging manufacturing industries. Fact 2(c)

Fact 2(d): Within-industry Change in Tool Choice

Whether, within each individual industry, local governments are evolving their industrial policy tools over time to accommodate each industry's developmental phase?

$$\mathbb{1}(Tool_{ikcst}) = \exp\left[\beta^{k} Duration_{cst} + \delta_{t} + \gamma_{cs}\right] + \epsilon_{ikcst}$$

where Duration_{cst} measures the number of years since first being targeted



Fact 3(a): Policy Sector Similarity Index

We examine the regional correlation in the choice of policy-targeted industry. The similarity index is calculated as the cosine similarity between within-province city pairs' industry sector vectors and then averaged to the city level.



Fact 3(a): Policy Sector Similarity and Local Protectionism



Policy sector similarity exhibits positive correlation with within city transaction—evidence of the elevated local protectionism

• Stronger correlation for intra-city trade share in intra-province trade

Fact 3(b): Policy Diffusion and Overcapacity

As policy sector choice diffuses to more cities, the effectiveness may diminish. We define, for each industry, the sequence of cities that start to support this industry, and examine the differences between the pioneering cities and those who follow.

At city-industry-year level:

$$Y_{sct} = \beta_1 Policy_{sct} + \beta_2 Policy_{sct} \times Order_{sc} + \delta_{sc} + \gamma_t + \epsilon_{sct}$$

At firm-year level:

$$Y_{fsct} = \beta_1 Policy_{sct} + \beta_2 Policy_{sct} \times Order_{cs} + \delta_f + \gamma_t + \eta_s + \epsilon_{fsct}$$

 $Order_{cs}$ is the sequence of cities that start to support this industry divided by the total number of cities

Fact 3(b): Policy Diffusion and Overcapacity: Entry and Capital

	log(# New Entry+1)	log(Value New Cap.+1)	log(Value Avg. New Cap.+1)
Policy	0.0666***	0.143***	0.0828***
	(0.00466)	(0.0186)	(0.0160)
Policy*Order	-0.0139	-0.123**	-0.141***
	(0.0150)	(0.0598)	(0.0516)
Constant	1.039***	2.930***	2.080***
	(0.000556)	(0.00221)	(0.00191)
City-by-Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
City-by-Industry Trend	Yes	Yes	Yes
Observations	2,172,240	2,172,240	2,172,240
R-squared	0.892	0.754	0.635

Entry effect is positive and gets larger for follower cities, effect on firm size is positive for leaders and becomes negative followers.

Fact 3(b): Policy Diffusion and Overcapacity: Firm Performance

	log(Re	venue)	log(P	$\log(Profit)$		
Policy	0.0434***	0.00959*	0.0593***	0.0155***		
	(0.00478)	(0.00498)	(0.00515)	(0.00411)		
Order	-0.103***		-0.138***			
	(0.0101)		(0.0112)			
Policy*Order	-0.331***	-0.117***	-0.337***	-0.0738***		
	(0.0202)	(0.0218)	(0.0219)	(0.0183)		
Firm FE	No	Yes	No	Yes		
City, Industry FE	Yes	No	Yes	No		
Year FE	Yes	Yes	Yes	Yes		
Observations	5,689,798	5,067,242	3,754,407	3,096,270		
R-squared	0.635	0.839	0.297	0.831		

Positive effect on firm revenue and profit for leaders, and the effects turn negative for followers.

Fact 3(c): More on Policy Diffusion and Overcapacity

There are two possible reasons for the poor performance of the policy followers:

- Too many policies result in excessive entry and overcapacity
- Policy followers are not sophisticated enough to learn all the complications about policy tool bundles and implementation details
 - ► Followers are less likely to choose industries with comparative advantage
 - ► Followers show less savvy in the choice of policy tools and implementation methods
 - Followers are more likely to adopt the policy tool bundles as specified in the upper-level government policies
Fact 3(c): Policy Diffusion and Sector Choice

 $Policy_{cst} = \exp \left[\beta_1 \cdot RCA_{cst} + \beta_2 \cdot Order_{cs} + \beta_3 \cdot RCA_{cst} \times Order_{cs} + \delta_{sc} + \gamma_t\right] + \epsilon_{cst}$

	(1)	(2)	(3)	(4)
RCA ⁿ	0.00319***	0.00258***		
	(0.000329)	(0.000705)		
RCA^p		. ,	0.0159***	0.00673***
			(0.000975)	(0.00129)
Order	-0.773***		-0.749***	
	(0.0104)		(0.0107)	
RCA ⁿ *Order	-0.00509***	-0.00419**		
	(0.000826)	(0.00190)		
RCA ^p *Order			-0.0139***	-0.00766*
			(0.00181)	(0.00393)
City, Industry FE	Yes	No	Yes	No
City-by-Industry FE	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	2,133,450	1,366,005	2,133,450	1,366,005

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Fact 3(c): Policy Diffusion and Policy Tool



Policy followers follow upper government more in the choice of policy tools.

Fact Set 4: The Effectiveness of Industrial Policy: Subsidy, Tax, and Finance

 $Y_{fsct} = \beta^{+} \times Policy_{sct}^{+} + \beta^{-} \times Policy_{sct}^{-} + \delta_{sc} + (\delta_{f}) + \gamma_{t} + \epsilon_{fsct}$

- *Y*_{fcst}: Benefit (tax rate, subsidy, long-term debt); Entry; TFP; Input (labor, capital)
- $Policy_{sct}$: 1 if any city-level policy targeting industry s issued in year t
- Effective in tax reduction, providing subsidy, and increasing firm access to long-term finance. The effect is stronger on the extensive margin. Larger firms benefit more. **Fact 4(a)**
- Effective in boosting new firm entry. Effects exhibit heterogeneity on the tools. Fact 4(b)
- Positive but short-lasting effect on productivity— entry effect (-), competition effect (?), agglomeration effect (+), demand effect (+), etc. Fact 4(c)
- Supportive policies and regulatory policies yield opposite effects

- We use hallucination-robust LLMs to classify and decode China's industrial policies from 2000 to 2022, based on over 3 million government policy documents
- The most granular analysis of China's industrial policies to date
 - We are the first to bring the analysis of industrial policies to the city level;
 - Capture the multi-dimensionality of industrial policies, including objective, target sector, implementation tools, conditionality, intergovernmental relationships, organization arrangement, etc.

Conclusion

- We document four set of facts on China's industrial policy
 - Economic and political rationality of the choice of target sectors;
 - Cross-region, cross-industry, and within-industry dynamic variations in the choice of tool and implementation methods
 - Policy diffusion, spatial inefficiency, and potential overcapacity;
 - Industrial policies lead to more entry, and do give firms the intended benefits, but the effect on productivity is rather mixed, especially for firms in follower cities.
- Understanding China's industrial policies is key to understand both the miraculous industrial upgrading and some of the pitfalls (such as overcapacity, local protectionism, etc) in the Chinese economy;
- A lot of exciting questions to be explored...

舟山市人民政府办公室关于促进粮油产业稳定发展的通知(舟政办发〔2020〕45号)

各县(区)人民政府,各功能区管委会,市政府直属各单位:

为全面落实国家粮食安全战略。加快推进农业供给侧结构性改革。充分调动和保护农民 的种粮积极性。推进粮油产业提质增效。根据省委省政府实施"争先创优"行动部署和《浙 江省农业专班关于印发粮食生猪增产保供工作方案的通知》(浙农专班发〔2020〕1号) 文件精神。结合舟山实际、经市政府同意、现就促进粮油产业稳定发展的有关事项通知如 下:

一、总体目标要求

坚持以习近平新时代中国特色社会主义思想为指导,以实施乡村振兴战略为统领,以新 发展理念为遵循,以保供给、促增改为目标,全面落实国家粮食安全战略,确保我市 25.5 万亩永久性基本农田和 3 万亩粮食功能区保有面积,落实年度粮油考核任务,加大财政投入,创新体制机制,依靠科技进步,大力实施产加销一体化经营,着力推动粮油产业绿色 发展和提质增效,构建高质量的粮食安全保障体系。





二、加大财政政策扶持

(一)实行粮油种植大户直接补贴政策。对种粮大户(指全年稻麦、大豆、玉米和番薯等粮食作物种植面积 50 亩以上农户)或专业合作组织、家庭农场等农业生产主体,按实际种植面积早稻、晚稻、大小麦和早粮分别给予每亩补贴 200 元、150 元、50 元补助。对不以粮食生产为目的或未正常生产管理的原则上不予补贴。对种植油菜和绿肥作物面积在 5 亩以上的大户或合作社给予每亩 30 元补助。

(二)实行大规模流转<u>扩面补助</u>政策。对于流转种植 500 亩及以上的大规模种植户,比 上一年每增加流转种植 100 亩给予 1 万元奖励, 200 亩 2 万元奖励,以此类推,最多奖励 不超过 10 万元。与其他补助可重叠享受。

(三)实行农机装备补助政策。对列入浙江省农机购置补贴范围内的耕整地机械、种植 施肥机械、植保机械、收获机械、谷物烘干机、纯农田拖拉机(轮式、履带式)等粮油生 产机具在享受中央、省补贴基础上,市级财政资金再补贴 10—20%。

(四)继续执行粮油生产政策性保险政策。稻麦、油菜种植由各级财政给予 93%的保费 补贴。

(五)继续执行粮食收购政策。严格执行省定稻谷最低收购价政策,落实《关于促进粮 油产业稳定发展的意见》(浙农计发〔2019〕14号)文件精神,制定粮食收购订单政 策,市财政对按订单向国有粮食收储企业交售的晚稻谷,每50公斤奖励20元,每亩最高 奖励180元。



三、夯实农田基础建设

坚持"藏粮于地"战略,实行最严格的耕地保护制度,确保粮食安全。严格落实《浙江省人 民政府办公厅关于制止粮食生产功能区"非粮化"的意见》(浙政办发(2017)84号),保 持粮食生产功能区种粮属性,确保每年至少种植一季粮食作物,坚决制止粮食生产功能区 "非粮化"现象,引导粮食生产功能区内农户多种粮,种好粮。进一步提升粮食生产能力, 大力实施耕地保护与质量提升促进化肥减量增效和商品有机肥推广。加强农田基础设施建 设,开展高标准农田建设和粮食生产功能区提标改造。加快推进农用地土壤污染防治,根 据农用地详查成果,推进轻度污染耕地安全利用。完善农田土壤污染监测预警机制,加强 土壤安全利用监管。

四、推进粮油绿色生产

推广应用高产优质主导粮油品种和先进高效技术,开展粮油高产示范,促进粮油稳产高 产。扩大粮经轮作、水旱轮作、农牧结合等高效农作制度,支持规模粮油种植开展创意农 业、休闲观光农业等农旅融合发展。全面推行绿色生产方式,开展统防统治与绿色防控。 推进生物治理、精准喷施、测土配方施肥和专业化、社会化、信息化服务。大力推广水稻 机耕、机育、机插、机收、机烘等农机化技术,推进粮油生产全程机械化。严密监测重大 病虫害和灾害性天气发生动态,及时做好预暨预报,加强应急处置和灾后生产恢复,努力 减少粮油生产灾害性损失。



五、培育粮油产业主体

加强新型生产主体培育,鼓励发展多种形式粮油适度规模经营,创新经营方式,加快土 地流转,采取转包、出租、互换、转让及入股等方式实现粮油连片耕种,提高规模种植效 益。认真贯彻《舟山市人民政府办公室关于大力推进粮食产业经济发展的实施意见》(<u>舟</u> 政办发〔2018〕163 号)文件精神,全面实施"1112"粮食产业化龙头企业培育工程,积极 培育大型龙头粮食加工企业。

六、提升应急能力建设

积极落实与各地粮食消费相匹配的粮食应急加工能力、应急供应网点、批发市场及配套 设施,完善粮食安全应急预案。建立健全市、县(区)两级种子、农药、化肥储备制度, 积极落实储备任务。鼓励粮食经营企业到粮食主产区建立稳定粮源基地,鼓励经营企业、 应急加工厂、应急供应网点参与粮食应急保供,全面提升全市粮食应急保障能力。严格按 照省政府要求落实储备规模,优化储备结构,晚稻储备比例达到 30%以上,完成年度储备 粮结构调整任务。





七、强化职责落实

严格落实粮食行政首长负责制,加强组织领导,明确职责分工,压实主体责任,强化粮 食生产目标责任制考核,全面落实保障粮食安全的各项政策措施。各县(区)政府、功能 区警委会要切实增强大局意识和责任意识,自觉承担起保障本地区粮食安全的主体责任, 充分挖掘粮油生产潜力,确保粮油产业稳定发展。农业农村部门要结合"三联三送三落实" 等活动,宣传落实好种粮政策,大力推广应用先进的新品种、新技术、新机具和新型种养 模式,牵头做好政策性农业保险,加强农田基础设施建设,提高粮食生产保障能力,千方 百计提高农民种粮收益;商务(粮食)部门牵头粮食安全责任制考核,落实地方粮食储 备,优化粮食储备结构。制定完善粮食订单政策,抓好粮食收购。健全粮食安全应急保障 体系,确保粮食供应安全;财政部门要加长资金投入,落实粮食扶持政策;发改部门要加 强粮食价格监测;自然资源和规划部门要严格落实耕地保护制度,提高耕地开垦质量,确 保农地农用,对用于粮食生产发展项目用地予以保障等。

本通知自 2020 年 6 月 10 日起施行。

舟山市人民政府办公室

2020年6月10日





How Do We Use LLM?

Model: Gemini-1.5-flash

- It is trained on 6.5 trillion tokens, and ranks higher than certain versions of GPT4 based on user votes
- It can process texts of one million tokens (=750k words)

Multi-stage querying process

- First round: identified the fundamental elements of each document and ALL relevant text, reasoning, and confidence score
- Task separation: identify categories based on the first-round output
- Second round: refine outputs with more detailed definitions and counterexamples summarized by an orthogonal LLM model
- Third round: employ advanced LLM model to further refine key variables

Ensure Quality and Address Hallucination

- Provide comprehensive and clear definitions
- Guide the LLM to analyze and respond step by step.
 - For example, to identify industrial policy, we require the LLM to evaluate whether the text is from government, whether it is about certain industries, whether it includes common policy measures, whether it is about long-term or short-term before determining whether it is about industry policy
- Require the LLM to respond with reasoning, confidence level, and relevant text from the original text for EVERY question
 - The requirement can improve response quality.
 - ► These additional responses can be used to verify the outcome quality.
 - They can be used in further improvements.
- Refine initial results with orthogonal assessment from smarter model or self-critique in a second round
 - LLM performance scales with the number of agents instantiated (Li et al., 2024)

LLM Implementation Roadmap: Determine Industrial Policy



LLM Implementation Roadmap: Policy-Targeted Industry



LLM Implementation Roadmap: Policy Tool and Implementation



Word Cloud: Industrial Policy







(b) Non-Industrial Policy



Word Cloud: EV





(a) Title

(b) Full Text



Word Cloud: Electricity Generation





(a) Title

(b) Full Text



Word Cloud: Tool Dack





(a) Tax Incentive



(b) Fiscal Subsidy



(c) Credit and Finance

(d) Industrial Fund

Prompt

Part 1: Defining Industrial Policy

• Policy measures taken by the government to guide industrial development. The government influences the relative prices of various sectors in the economy or uses other means to guide social resources or allocate the resources it can influence or control to affect the long-term composition of the economic structure.

Part 2: Implementation Tools

 Tax Incentives, Fiscal Subsidies, Credit Policies, Equity Support, Industrial Funds, Trade Protection Measures, Investment Policies, Technology R&D Adoption, Public Procurement Policies, Labor Policies, Infrastructure Investment, Industrial Cluster Policies, Environmental Policies, Market Entry and Competition Policies, Demand-Side Policies, Land Policies, Localization Policies, Entrepreneurship Support, Industry Promotion, Improving Business Environment, Other Tools

Prompt

Part 3: Target Industry

• 4-digit detailed industry category

Part 4: Policy Target & Requirement

• Scale, Age, R&D, Regional, Ownership

Part 5: Policy Goal

- Important industry: strategic, new and emerging, pillar, traditional, green
- R&D and technology adoption
- Social motives: employment, urbanization, equality

Prompt back

Part 6: Implementation

- Top-down enforcement: KPI, positive
- Bottom-up experimentation
- Local adaptation
- Government department coordination
- Goal setting

Part 7: Intergovernmental Relationship

- Directed by the upper level government, adapted to local conditions, etc.
- Directing lower-level government, fiscal support, encouraging experimentation, etc.

Part 8:Policy Citation Network

• Impactful policies and policy innovations

Industrial Policy Target Sector by Government Level

	All	Central	Province	City	
Agriculture	0.17	0.14	0.19	0.17	
Manufacturing	0.29	0.35	0.28	0.28	
Manufacturing (emerging)	0.05	0.05	0.05	0.06	
Manufacturing (high skill)	0.11	0.12	0.11	0.11	
Service	0.49	0.47	0.48	0.50	▶ back
Service (high skill)	0.18	0.15	0.18	0.18	
Production related service	0.40	0.41	0.40	0.41	
Technology related service	0.20	0.21	0.20	0.20	
Life service	0.29	0.28	0.27	0.32	_
Observations	741269	101250	344321	295698	_

Time Trend of Manufacturing Industry





Time Trend of Service Industry





Technology-related Service Industries are Skewed Towards Richer Regions



▶ back

Time Trend of Policy Implementation Tool



Time Trend of Policy Implementation Tools



• New (rapid grow): industrial fund, industrial promotion, industrial cluster, environment, entrepreneurship

- New (moderate grow): procurement, localization, government equity, demand stimulation
- Traditional (strong): infrastructure, labor, R&D, fiscal subsidy
- Traditional (stable): finance, land, investment, business environment
- Traditional (declining): market access and regulation, tax, trade protection

Time Trend of Policy Implementation Tool (New- Rapid Growth)



Time Trend of Policy Implementation Tool (New- Moderate Growth)



Time Trend of Policy Implementation Tool (Traditional- Strong)



Time Trend of Policy Implementation Tool (Traditional- Stable)



Time Trend of Policy Implementation Tool (Traditional- Decline)





The Dynamics of Policy Citation Dack



(a) Upper-level Government

(b) Same-level-government

Industrial Policy Requirement by Government Level • back

	All	Central	Province	City
Firm Location	0.44	0.32	0.45	0.47
Specific Firms	0.16	0.19	0.17	0.15
R&D Technology/Investment	0.11	0.08	0.10	0.12
Firm Age	0.09	0.06	0.08	0.10
Firm Ownership Type	0.13	0.17	0.11	0.12
Firm Scale	0.33	0.24	0.30	0.38
Observations	741269	101250	344321	295698

Time Trend: Chip, EV, and Solar Energy



(a) Chip

(b) EV

(c) Solar
Geographical Distribution: Chip, EV, and Solar Energy



Facts 2(a)-2(c): Choice of Industrial Policy Tools

We examine the choice of policy tools across different dimensions. For each tool k,

$$\mathbb{1}(\text{Tool}_{ikgst}) = \exp\left[\sum_{t'=2001}^{2020} \beta_{k,t'}^n \text{Year}_{t'} \times \mathbb{1}\{g=n\} + \sum_{t'=2001}^{2020} \beta_{k,t'}^p \text{Year}_{t'} \times \mathbb{1}\{g=p\} + \delta_s + \gamma_t\right] + \epsilon_{ikgst}$$

where *i* is for policy, *g* for government level, *c* for city, *s* for industry (sector), *t* for year. X_i is one of: government level, city GDP, policy targeted sector.

- Local governments are earlier adopters of new policy tools, central government is heavier user of traditional tools, provincial government is in between, and trends converge over time.
- More developed regions are earlier adopters of new policy tools, and new tools gradually diffuse to less developed regions over time.
- More developed regions are always heavier users of the fiscally costly traditional tools.
- New industrial policy tools are more used in high-skill and emerging manufacturing industries.

Facts 2(a): Time Trend of Tool Adoption (Central vs. City)



(a) New Tools

Facts 2(a): Time Trend of Tool Adoption (Province vs. City)



(a) New Tools

Fact 2(b): Time Trend of Tool Adoption (By City GDP)

- More developed regions are earlier adopters of new policy tools, and new tools gradually diffuse to less developed regions over time.
- More developed regions are always heavier users of the fiscally costly traditional tools (subsidy, infrastructure, R&D, etc.), and the less developed regions gradually rely more on the less fiscally costly traditional tools (land, business environment, etc.) over time.

$$\mathbb{1}(\text{Tool}_{ikcst}) = \exp\left[\sum_{t'=2001}^{2020} \beta_{k,t'} \text{Year}_{t'} \times \log(\text{GDP}_{ct}) + \gamma_{st}\right] + \epsilon_{ikcst}$$

• where c is for city, k for tool type, s for industry (sector), t for year

Fact 2(b): Time Trend of Tool Adoption (By City GDP)



(a) New Tools

Fact 2(c): Time Trend of Tool Adoption (by Sector)

- New industrial policy tools are more used in high-skill and emerging manufacturing industries, and the trend is relatively stable over time.
- Traditional manufacturing sectors use more traditional market protection and entry subsidy tools, high-skill and emerging new manufacturing sectors use more monetary incentives (fiscal and finance)
- Agriculture sector uses more demand-based and subsidy-based tools.

$$\mathbb{1}(\text{Tool}_{ikcst}) = \exp\left[\sum_{t'=2001}^{2020} \beta_{k,t'} \text{Year}_{t'} \times \text{Industry}_s + \gamma_{ct}\right] + \epsilon_{ikcst}$$

• where i is for policy, k for tool type, g for government level, s for industry (sector), t for year

Fact 2(c): Time Trend of Tool Adoption (Manufacturing)



(a) New Tools

Fact 2(c): Time Trend of Tool Adoption (High-skill Manufacturing) • back



(a) New Tools

Fact 4(a): The Effectiveness of Industrial Policy: Subsidy, Tax, and Finance

	log(Subsidy)		Tax deduction rate		1(Long-term debt)	
	(1)	(2)	(3)	(4)	(5)	(6)
Policy ⁺	0.0599***	0.0184***	0.0533***	-0.00269	0.0229***	0.0110***
	(0.00405)	(0.00349)	(0.00282)	(0.00199)	(0.00321)	(0.00254)
Policy ⁻	0.0327***	0.0159***	-0.00822	-0.00935	0.0183**	0.0107***
	(0.00491)	(0.00429)	(0.000349)	(0.00948)	(0.00992)	(0.00315)
log(Register capital)	0.289***		-0.0560***		0.0228***	
	(0.000725)		(0.000529)		(0.000605)	
City-by-industry FE	Yes	No	Yes	No	Yes	No
Firm FE	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,075,274	3,174,825	5,144,683	5,624,432	5,970,610	6,633,852
R-squared	0.265	0.671	0.211	0.705	0.160	0.566

Fact 4(a): The Effectiveness of Industrial Policy: Subsidy, Tax, and Finance

→ back



Fact 4(b): Effect of Industrial Policy: New Firm Entry

- Industrial policies are effective in boosting new firm entry
 - ► Firms respond more to local policies than to upper level policies

$$Y_{sct} = \sum_{l=-6}^{6} \beta_t^+ \times Policy_{sc(t-l)}^+ + \sum_{l=-6}^{6} \beta_t^- \times Policy_{sc(t-l)}^- + \delta_{sc} + \gamma_t + \epsilon_{sct}$$

- The effect depends on the tools used
 - ► Entry-related policies, subsidies, and industrial clusters have the strongest effect
 - Environmental policies and government procurement policies have negative effect

$$Y_{sct} = \sum_{k} \beta_{k} \times Policy_{ksct} + \delta_{sc} + \gamma_{t} + \epsilon_{sct}$$

Fact 4(b): Effect of Industrial Policy: New Firm Entry Dynamics



Fact 4(b): Effect of Industrial Policy Tools: New Firm Entry • back



Fact 4(c): Effect of Industrial Policy: TFP



Fact 4(c): Effect of Industrial Policy Tools: TFP • back



Figure: TFP Revenue (c-by-i FE)