



From “Subsidizing Models” to “Subsidizing Capabilities”: Additionality Evaluation and Dynamic Exit of Large Model Industrial Policy

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Abstract— The expansion of filing scale, the decline in publicly listed invocation prices charged by token (Token), and the growth of R&D investment reflect the continued expansion of the visible supply of China’s artificial intelligence large models. However, these indicators cannot directly show how much sustainable industrial capacity public support has formed. In response to the problem that existing research emphasizes policy systems and industrial ecosystems while paying insufficient attention to policy effect determination, this paper proposes a three-tier evaluation framework of “outcome–causality–benefit”: first, identify the sustainable industrial capacity formed by a project; second, determine whether the relevant capacity is additionally induced by policy; and finally, compare the capacity increment and its knowledge spillovers, industrial chain and supply chain resilience, and real option value with real resource costs, external costs, administrative costs, and opportunity costs. To clarify the object of policy action, this paper distinguishes five types of enterprise decisions: intelligent computing power construction or procurement, foundation large model training and iteration, model adaptation and application services, model deployment and system integration, and application in production and operations and public service scenarios. This paper further proposes that policy evaluation should not be treated as a one-time acceptance check; rather, based on *ex ante*, interim, and *ex post* evidence, it should dynamically choose among continuing or expanding support, reducing support intensity or adjusting instruments, time-limited rolling support, and restructuring or exit. This paper thereby forms a conceptual industrial policy evaluation framework centered on capacity increment, causally based on policy additionality, and taking social net benefits as the ultimate criterion.

Keywords— large models, industrial policy, policy additionality, real options, exit mechanism.

I. INTRODUCTION

In recent years, what the media call the “battle of a hundred models” has become a conspicuous marker for observing the supply expansion of China’s large model industry. As of June 30, 2026, the Cyberspace Administration of China had cumulatively announced 988 filed generative AI services, and another 598 applications or functions that directly invoke existing model capabilities had completed registration [1]. These data indicate that the visible supply of large model-related services, products, and applications is still continuously

expanding, but filing and registration objects are neither equivalent to independent pretrained model families nor to the number of firms or continuously active products, and they cannot be used to judge how much sustainable and reusable industrial capacity public support has additionally formed. In other words, the “battle of a hundred models” presents a visible manifestation of large model supply expansion, not the effect of industrial policy itself. To distinguish whether the increase in the number of models and projects corresponds to real capacity accumulation or mainly expands visible supply units, it is necessary to

establish a policy evaluation framework that goes beyond filing numbers, model numbers, and the survival of business entities.

This evaluation framework must also be further implemented at specific policy action units, because industrial policy does not act abstractly on the “large model industry” as a whole; rather, through different funding support and performance assessment units, it changes firms’ relative returns and decisions at different stages. Shenzhen Longgang District’s 2025 support rules provide support respectively according to actual computing power expenditure, number of filed models, and application contracts; among these, computing power subsidies are based on contracts, invoices, and delivery certificates, while filing rewards are measured by the number of models [2]. Even if they serve the same industrial development goal, if policies fall on different units such as computing power procurement, model filing, application contracts, project survival, or business entities, they may affect firms’ choices in computing power investment, model training and iteration, system integration, scenario application, and project continuation. This rule clearly shows that policy effects depend on which enterprise decision unit support and assessment actually target. Therefore, policy evaluation cannot merely compare aggregate input and aggregate output; it should match policy instruments with the enterprise decisions they actually affect, and further identify the industrial capacity, policy additionality, and social net benefits thereby formed.

This paper argues that the object of policy evaluation should not be the quantity of large model supply, but under what conditions public support changes firms’ original decisions and forms capacity that can be continuously used, reused across projects, and generate social benefits; and under what conditions it merely replaces firms’ original expenditures, delays the exit of inefficient projects, or expands superficial supply. This question contains at least three progressive levels: what capacity the project actually forms; how much this capacity increases compared with no policy support; and whether the relevant capacity increment generates positive social net benefits and is superior to other feasible policy instruments. These correspond respectively to outcome identification, causal identification, and benefit judgment, and cannot be replaced by the same set of visible indicators.

Existing large model research has relatively fully discussed “what should be supported” and “how to build an industrial ecosystem.” Qian Guiming et al. [3] construct a large model industrial policy system from dimensions such as industrial technology R&D, industrial talent cultivation, industrial ecosystem construction, and

industrial security; He Jiang et al. [4] analyze the global artificial intelligence industrial ecosystem and its governance models along the main line of “AI industrialization—industrial Alization—industrial ecosystem governance.” These studies provide an important basis for understanding policy instruments, industrial stages, and governance actors, but the completeness of a policy system is not equivalent to policy effectiveness, and the expansion of an industrial ecosystem cannot directly show that public funds have brought incremental capacity. Especially when large model technology iterates rapidly, model inheritance relationships are complex, and application costs largely occur outside the model, without counterfactual and full life-cycle comparisons, the number of models, project survival, R&D investment, or winning bid amounts may all overestimate policy effects.

Research on industrial policy effects provides a further analytical basis. Government investment funds and fiscal subsidies may alleviate financing constraints and share technological risks, but may also replace firms’ original investment; changes in R&D investment, innovation output, and innovation efficiency are not necessarily in the same direction [5-7]. Government procurement can provide initial demand, R&D compensation, and application scenarios, but may also be accompanied by local protection, relational orders, and market segmentation [8,9]. Failure may form organizational learning and knowledge spillovers, but only when negative results truly change subsequent decisions or are transformed into verifiable and transferable knowledge and assets can public value potentially be formed; if negative evidence cannot affect renewal, trial-and-error tolerance may be transformed into continuous bailouts under soft budget constraints [10,11].

Based on the above problems, this paper makes three advances. First, this paper distinguishes large model industrial policy evaluation into three progressive questions: capacity formation, policy additionality, and social net benefits, and clarifies that “project progress” and “policy effect” are not the same proposition. Second, this paper defines the object of policy action through five types of enterprise decisions, connects policy instruments, enterprise behavior, and capacity outcomes, and avoids double counting through model technology pedigrees, beneficiary entities, and full life-cycle calibers. Third, this paper incorporates real options, failure learning, and soft budget constraints into the same dynamic decision logic, explaining when policy can retain parallel technology routes for a limited period, when it should reduce support intensity or adjust instruments, and when it should stop support and promote the orderly migration of knowledge,

data, users, and assets. On this basis, this paper further proposes four testable propositions, respectively discussing the impact of assessment units on business entity behavior, the predictive role of post-phase-out use for commercialization performance and capability diffusion, the relationship between existing investment conditions and policy additionality, and the impact of information value on dynamic support and exit choices.

The remainder is arranged as follows: Part II reviews the literature foundation and defines “subsidizing models,” “subsidizing capabilities,” and sustainable industrial capacity; Part III proposes five types of enterprise decisions, three-tier evaluation, and evidence timing; Part IV analyzes the mechanisms by which different policy instruments change enterprise behavior and their evaluation evidence; Part V discusses rolling evaluation, time-limited support, and exit mechanisms under uncertainty; Part VI concludes the full text and proposes a testable research agenda.

II. LITERATURE FOUNDATION AND CONCEPTUAL DEFINITION

2.1 From Policy System and Industrial Ecosystem Research to Policy Effect Evaluation

Large model industrial policy research first focuses on the structure of policy supply. Qian Guiming et al. [3] incorporate industrial technology R&D, industrial talent cultivation, industrial ecosystem construction, and industrial security into a unified framework, emphasizing coordination among algorithms, computing power, data, talent, market entities, and security safeguards. He Jiang et al. [4] further propose a three-element structure of “AI industrialization, industrial Alization, and industrial ecosystem governance” from the perspective of industrial ecosystems, and compare policy systems and governance models across different countries and regions. These two types of research answer what policy elements are needed for large model industrial development, how different actors participate, and how technology supply and industrial application coordinate.

However, policy system research and industrial ecosystem research do not automatically solve the problem of effect evaluation. The fact that a region simultaneously establishes industrial funds, computing power vouchers, public computing power platforms, and application scenarios does not show what constraints these instruments respectively alleviate, nor how much enterprise behavior has changed relative to the no-policy scenario. This paper therefore shifts the research focus from a list of policy instruments to the causal chain of “policy instrument—enterprise decision—capacity outcome,” and takes policy

additionality as the core concept connecting industrial policy inputs and industrial capacity outcomes.

2.2 Policy Additionality: From Input Increase to Capacity Increment

Policy additionality usually requires comparing the difference between policy implementation and a counterfactual state. For large model industrial policy, three interrelated but non-substitutable levels can be distinguished. The first is input additionality, that is, whether public support increases firms’ total investment rather than merely replacing original own funds with fiscal funds. The second is behavioral additionality, that is, whether policy changes project start time, investment scale, cooperation mode, technology route, or application scope. The third is capability additionality, that is, whether the above behavioral changes further form technological, engineering, application, organizational learning, or supply chain resilience capabilities that would not otherwise have formed.

An input increase does not necessarily bring a capacity increment. For example, computing power subsidies may increase nominal procurement amounts but be absorbed by upstream suppliers; government investment funds may enter firms that are already sufficiently financed, changing only the source of funds without changing R&D plans; government procurement may form one-time orders without fostering reusable products, tools, or implementation capabilities. Therefore, this paper takes capability additionality as the ultimate anchor of policy additionality, while retaining input additionality and behavioral additionality as intermediate evidence for identifying mechanisms.

The policy additionality defined in this paper is not another term for project quality. A project may form relatively strong capacity, but if the firm would still implement it at the same time and scale without policy support, policy additionality may be low; conversely, an early-stage experiment, even if it has not yet formed a mature product, may have stage-specific additionality as long as policy indeed changes technology route choices and generates valuable new information.

2.3 Uncertainty, Real Options, and Soft Budget Constraints

Large model R&D and application have characteristics such as uncertain technology routes, partially irreversible investment, and information arriving in stages. Under this condition, staged investment, retaining switching opportunities, and terminating projects based on new evidence are themselves valuable [12,13]. The logic of real options does not require policy to retain all projects for the long term, but requires dividing support into stages that

can generate information and specifying on which new evidence next-stage support depends.

Failure learning and soft budget constraints constitute the two boundaries of this logic. Failure can generate value by eliminating ineffective routes, improving subsequent designs, and forming transferable knowledge, but “project failure” and “learning from failure” are not the same event [10,14]. When a project continues to generate new information that can change subsequent judgments, time-limited support may have option value; when negative evidence has stabilized, the project no longer generates new information, and renewal is still mainly based on sunk costs, local reputation, or the continued existence of the business entity, policy may fall into a soft budget constraint [11]. Therefore, dynamic exit is not a supplementary institution outside the framework, but a necessary component of policy evaluation under uncertainty.

2.4 “Subsidizing Models,” “Subsidizing Capabilities,” and Sustainable Industrial Capacity

This paper defines “subsidizing models” and “subsidizing capabilities” as two ideal-type policy orientations, rather than a binary classification of real-world policies. “Subsidizing models” mainly uses the continued existence of visible supply units such as models and projects or business entities as the basis for funding support and performance assessment; “subsidizing capabilities” mainly uses capacity increments that are additionally induced by policy, can be continuously used, and have positive social net benefits as the main basis for continued support. Real-world policies often lie between the two, and the same

instrument may produce different effects depending on assessment units, evidence requirements, and exit arrangements.

Sustainable industrial capacity refers to the ability of relevant entities, after special support ends, is gradually phased out, or shifts to regular public services, to still complete R&D, deployment, delivery, or application at acceptable levels of quality, cost, and security, and to use the knowledge, tools, processes, or assets formed for subsequent projects. This concept contains at least three characteristics: first, persistence, meaning it will not immediately disappear after support intensity declines; second, reusability or transferability, meaning it does not serve only a single project or single contract; third, task effectiveness, meaning it can stably complete specific tasks in actual business or public service scenarios.

In specific evaluation, sustainable industrial capacity can be divided into five dimensions. Technological capability includes model performance, training and inference efficiency, and continuous iteration capability; engineering delivery capability includes deployment, operations and maintenance, system integration, and security assurance; application capability includes stable use in actual business scenarios, process improvement, and continuous procurement; organizational learning capability includes cross-project reuse of knowledge, tools, data processes, and implementation experience; resilience capability includes substitution, switching, recovery, and reconstruction capabilities. These five dimensions are observable evaluation directions and should not be simply aggregated into a single score.

Table 1 Ideal-Type Comparison of “Subsidizing Models” and “Subsidizing Capabilities”

Comparison Dimension	“Subsidizing Models” Orientation	“Subsidizing Capabilities” Orientation
Support and assessment unit	Number of models, filing, project completion, or continued existence of business entities	Increment of sustainable industrial capacity additionally induced by policy
Main mechanism assumption	Increasing visible supply can drive technological and industrial development	Support forms additionality only when it targets real constraints and changes enterprise decisions
Core evidence	Process or quantity indicators such as project approval, investment, filing, launch, and winning bids	Independent testing and evaluation, actual operation, continuous procurement, cross-project reuse, and credible counterfactuals
Time caliber	Mainly project approval period, construction period, or acceptance time point	Takes into account ex ante, interim, and ex post performance after support phase-out
Adjustment method	Renewal after meeting standards; cessation if standards are not met	Continue or expand, reduce intensity, adjust instruments, time-limited rolling support, restructuring, or exit
Main risks	Version splitting, duplicated construction, expenditure substitution, and project ossification	Rising evaluation costs, insufficient professional capacity, and expanded discretion

III. ANALYTICAL FRAMEWORK: FIVE TYPES OF ENTERPRISE DECISIONS, THREE-TIER EVALUATION, AND EVIDENCE TIMING

3.1 Grounding Policy Action Objects in Five Types of Enterprise Decisions

Industrial policy does not abstractly “support a certain industrial tier”; rather, it produces effects by changing enterprises’ investment, transaction, R&D, deployment, or adoption decisions. To determine the evaluation unit, this paper distinguishes five interconnected types of enterprise decisions: constructing or procuring intelligent computing

power, training and iterating foundation large models, conducting model adaptation and providing application services, performing model deployment and system integration, and applying models in production and operations or public service processes. The first two types mainly involve technology and infrastructure supply, the third and fourth types undertake the transformation from technology supply to solutions, and the fifth type embodies industrial intelligentization and public service applications.

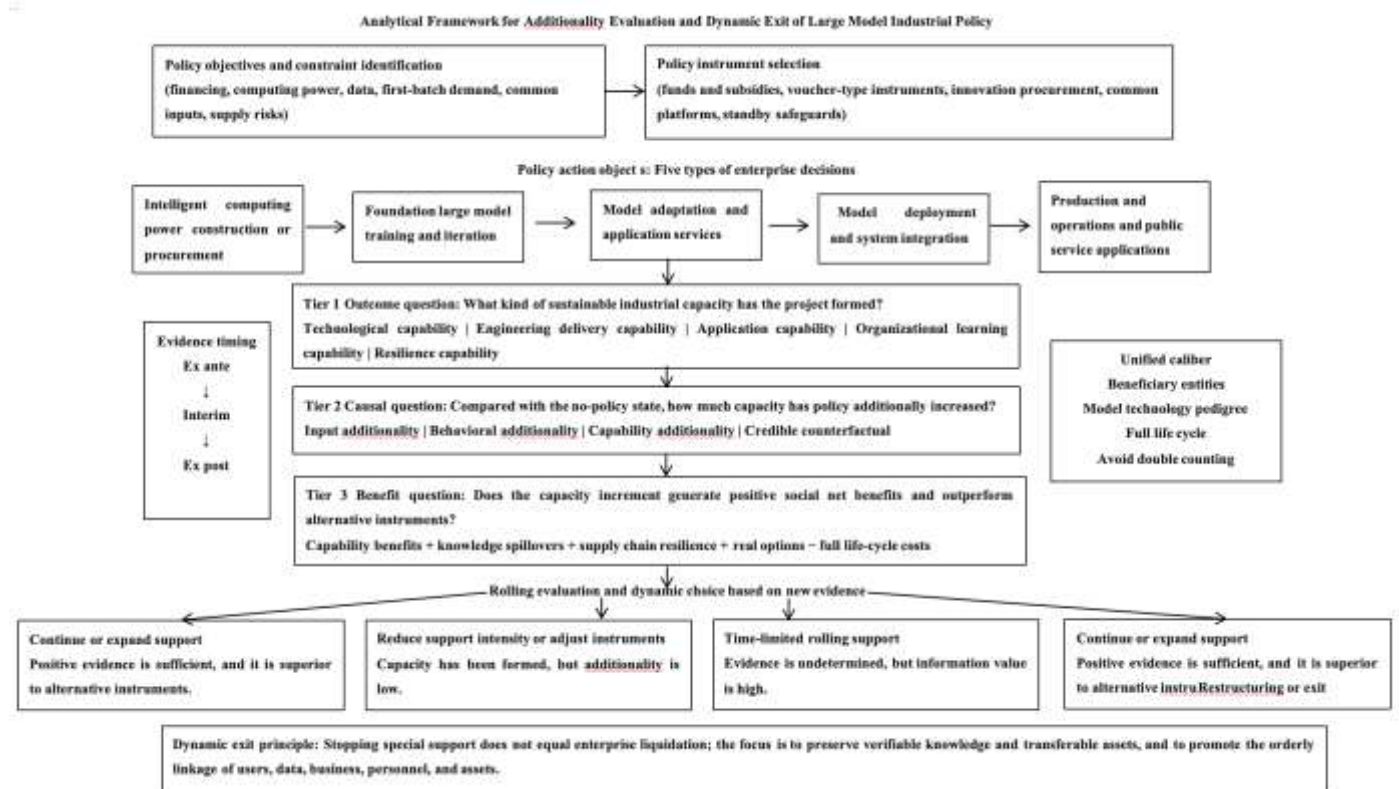


Fig. 1 Analytical Framework for Additionality Evaluation and Dynamic Exit of Large Model Industrial Policy

Table 2 Five Types of Enterprise Decisions, Main Constraints, and Capability Evidence

Enterprise decision	Main policy action object	Possible main constraints	More informative capability evidence
Construction or procurement of intelligent computing power	Intelligent computing facilities, computing power cloud services, or procurement contracts	High fixed investment, insufficient supply-demand matching, scheduling and utilization constraints	Available computing power, resource utilization, reliable scheduling, energy consumption per unit task, and actual use by external entities
Training and iterating foundation large models	Relatively independent model technology routes and their iteration	Long-cycle capital, computing power, data, talent, and technological uncertainty	Performance and cost efficiency under comparable quality conditions, continuous iteration, and improvements in model architecture and toolchains
Model adaptation and application services	Fine-tuning, retrieval augmentation, distillation, model as a service, or agent services	Model acquisition, inference costs, industry knowledge, authorization, and differentiation constraints	Task-specific performance, inference latency, stable services, continuous procurement, and reusable components and tools

Model deployment and system integration	Data access, business interfaces, deployment and operations and maintenance, and security assurance	Data governance, system compatibility, organizational adjustment, migration costs, and responsibility allocation	Trial operation in actual production environments, stability, security, cross-project reuse, and improvement in implementation cycles
Production and operations and public service applications	Real business processes, production stages, or public service scenarios	Insufficient initial demand, uncertain returns, process reengineering, and continuous operation constraints	Business processing efficiency, product quality, operating benefits, service quality, continued use, and subsequent procurement
Enterprise decision	Main policy action object	Possible main constraints	More informative capability evidence

The same enterprise may simultaneously make multiple types of decisions, but this should not lead to double counting of the same support or the same capability in evaluation. In particular, it is necessary to distinguish between the number of models and independent technology routes. This paper uses “model technology pedigree” to describe the source and inheritance relationships among models. The six smaller models publicly released by DeepSeek-R1 use Qwen or Llama as upstream foundation models and use data generated by R1 for distillation and fine-tuning [15]. These derivative models may reduce deployment costs and expand applications, but they cannot all be counted as new independent foundation large model technology routes on this basis. Filing or registration is a regulatory status and is not direct evidence of technological independence.

3.2 Three-Tier Evaluation from Outcome to Causality to Benefit

The first tier is capacity formation evaluation, answering “what has the project actually left behind.” The object of evaluation is not the model name or whether the business entity continues to exist, but whether the project has formed sustainable industrial capacity. More informative evidence includes third-party testing and evaluation, actual operation records, transaction and invocation records, continued use after support phase-out, and actual reuse of knowledge, tools, modules, and data processes in other projects. Model launch, filing, downloads, investment amounts, or one-time winning bids can serve as process information, but cannot alone prove capacity formation.

The second tier is policy additionality evaluation, answering “compared with no support, how much capacity has policy additionally induced.” Let the i -th type of capacity under the with-policy and no-policy states be $C_i(1)$ and $C_i(0)$, respectively; then the capacity increment brought by policy can be expressed as:

$$\Delta C_i = C_i(1) - C_i(0) \quad (1)$$

The above expression indicates that the counterfactual is an indispensable logical step in policy evaluation. Usable evidence includes comparable regions or enterprises, eligibility thresholds, changes in staging rules, differences before and after policy adjustments, and other credible quasi-experimental or structured comparisons. If an enterprise had originally already planned the same investment, and public funds merely replace its own funds; or if the policy merely shifts revenues and costs among enterprises, regions, and accounting categories, then all observed capacity changes cannot be attributed to the policy.

The third tier is social net benefit evaluation, answering “whether the capacity increment caused by the policy is worthwhile.” The net social benefit (NSB) can be conceptually expressed as:

$$NSB = [B(\Delta C) + E + R + OV] - [RC + EC + AC + OPC] \quad (2)$$

Wherein, $B(\Delta C)$ represents the benefits brought by the capacity increment itself, E represents knowledge and application spillovers, R represents industrial chain and supply chain resilience benefits, and OV represents the real option value of retaining choices under uncertainty; RC represents real resource costs, EC represents external costs such as energy, security, competition, and distribution, AC represents administrative costs such as policy design, verification, migration, and exit, and OPC represents the opportunity cost relative to other feasible policy instruments. The amount of fiscal fund disbursement is important information for government budget constraints and fund use efficiency, but in social cost accounting, pure transfers between entities should not be double-counted with real resource consumption; financing costs, administrative costs, resource occupation, and behavioral distortions also need to be identified.

Table 3 Evidence and Decision Implications of the Three-Tier Evaluation

Evaluation tier	Core question	More informative evidence	Typical counterevidence or conflict	Main decision implications
Capacity formation	What kind of sustainable industrial capacity has the project formed	Testing and evaluation, actual operation, continuous procurement, retention after phase-out, cross-project reuse	Only filing, investment, downloads, one-time winning bids, or entity survival	Continue observation or proceed to additionality evaluation
Policy additionality	How much capacity has policy increased relative to the no-support state	Comparable controls, eligibility thresholds, changes in staging rules, and other credible counterfactuals	Original investment already planned, fiscal funds replacing own funds, only transfers between entities	Reduce intensity, adjust instruments, or proceed to social net benefit evaluation
Social net benefit	Whether the capacity increment and its spillovers exceed full life-cycle costs and are superior to alternative instruments	Full life-cycle benefits and costs, external use, resilience testing, and evidence of option value	Alternative instruments have lower costs, external costs and migration costs exceed benefits	Continue or expand, time-limited support, restructuring, or exit

3.3 Distinguishing Ex Ante, Interim, and Ex Post Evidence

The three-tier evaluation is a logical sequence, whereas evidence timing is the policy implementation process; the two cannot be conflated. Ex ante evaluation mainly verifies whether constraints truly exist, business entities’ original investment plans, whether technology routes have substantive differences, whether data and intellectual property arrangements are clear, and whether exit conditions are enforceable. Interim evaluation mainly verifies the actual disbursement and use of funds, staged technological and engineering progress, trial operation in actual production environments, records of negative results, and whether the project has generated new information capable of updating judgments. Ex post evaluation mainly observes continued use after support phase-out, subsequent procurement, cross-project reuse, user and business migration, asset disposal, and knowledge spillovers.

Whether capacity is persistent often requires ex post observation, but policy renewal decisions usually occur before support has ended. Therefore, interim evaluation should not pretend to have observed all ex post outcomes, but should use intermediate evidence capable of predicting persistence, such as external user structure, non-subsidized orders, repeated invocations, module reuse, changes in unit task cost, and degree of exit readiness. The observation period and its adjustment rules should be pre-agreed at project approval according to project type, and should not be arbitrarily changed after results appear to accommodate conclusions.

To avoid double counting, this paper adopts four unified calibers. First, the same capability, even if it involves multiple stages, must not be counted repeatedly. Second, a single support measure is recorded in only one stage according to the contract subject matter or the main constrained enterprise decision. Third, cross-stage effects are recorded as subsequent application, reuse, or spillovers, and are no longer recorded as new policy inputs. Fourth, when aggregating social net benefits, transfer payments between stages, duplicate revenues, and multiple valuations of the same asset are removed.

Taking a computing power voucher used for foundation large model training as an example, the policy input is recorded once in the “procurement of intelligent computing power” stage. If the model is subsequently adapted and deployed to medical service processes, model performance, system integration, and scenario application are recorded respectively as subsequent capability outcomes, but the same computing power voucher must not be repeatedly counted as multiple inputs. Evaluation still needs to answer in sequence: what capabilities the model and system have formed; how much these capabilities have increased relative to the absence of the computing power voucher; and whether the capability increment and its spillovers exceed computing power resources, energy consumption, data security, system migration, and policy management costs.

3.4 Evidence Boundaries of Model Quantity, Public Prices, and R&D Investment

Model quantity can be used in the exploratory stage to confirm project activities and help identify whether different technology routes exist, but it cannot serve as

final performance over the long term. Research on industrial policy shows that quantity incentives may induce strategic innovation, and different policy instruments also have differing impacts on the quantity and quality of innovation [16,17]. When model quantity directly enters support criteria, it must be verified in combination with model technology pedigrees, training sources, and actual uses.

A decline in publicly listed invocation prices charged by token only indicates a change in the nominal usage threshold. The actual total cost to the purchaser also includes model quality, inference latency, throughput capacity, service stability, data governance, system interfaces, operations and maintenance, security compliance, and migration costs. Only when tasks, quality, and service conditions are comparable does the public price have evaluative significance; the lowest public price is neither equal to the actual transaction price nor directly representative of supply cost, enterprise profit, or social welfare.

R&D investment likewise requires a unified caliber. Accounting Standard for Business Enterprises No. 6—Intangible Assets distinguishes expenditures in the research phase from capitalization of qualifying expenditures in the development phase [18]. The DeepSeek-V3 technical report converts approximately 2.788 million H800 GPU hours used in one formal training run at 2 USD per GPU hour into 5.576 million USD, and explicitly states that this number does not include prior architecture, algorithm, and data research [19]. Therefore, this figure is a training computation estimate under specific assumptions, not actual payment, enterprise R&D expenses, full life-cycle model costs, or inference costs. R&D investment constitutes capability evidence only when it is linked to model technology pedigrees, performance and cost efficiency improvements under comparable quality conditions, and reusable outcomes.

Based on the above analytical framework, this paper proposes four propositions that can be tested by subsequent empirical research.

Testable Proposition 1: Assessment Unit and Behavioral Bias. When funding support and performance assessment are directly linked to model quantity, filing quantity, or project survival, while model technology pedigrees and actual cross-project reuse are difficult to verify, business entities are more likely to increase visible supply units rather than increase sustainable industrial capacity that is difficult to observe directly.

Testable Proposition 2: Post-Phase-Out Use and Capability Diffusion. After controlling for initial project technical performance, business entity characteristics, and

policy input, continued use without reliance on subsidies after support phase-out, subsequent procurement, and actual cross-project reuse have stronger predictive power for subsequent commercialization performance and capability diffusion than model quantity, filing quantity, investment scale, and one-time winning bid amount.

IV. BEHAVIORAL MECHANISMS AND EVALUATION EVIDENCE OF POLICY INSTRUMENTS

4.1 Government Investment Funds, Fiscal Subsidies, and Competitive Project Funding

Foundation large model R&D and generic technology breakthroughs generally have characteristics such as large investment scale, long R&D cycles, intangible assets that are difficult to pledge, and uncertain technological outcomes. Government investment funds, fiscal subsidies, and competitive project funding can change enterprises’ R&D scale, start time, and technology routes by providing long-term capital, sharing early-stage risks, and alleviating financing maturity mismatches. Related research on Chinese enterprises regards financing constraints, information improvement, and risk sharing as important mechanisms by which government investment funds affect innovation, but also finds that the effects of government subsidies on R&D investment, innovation output, and innovation efficiency are not consistent [5-7].

Evaluation of such instruments cannot stop at whether funds enter enterprises. Ex ante, it is necessary to verify business entities’ original financing and R&D plans, the division of labor between government funds and social capital, and whether the project belongs to weak links where the market cannot fully play its role; interim, it is necessary to verify fund paid-in capital, actual disbursement of fiscal funds, staged investment, private co-investment, technology route adjustments, and staged capability outcomes; ex post, it is necessary to observe subsequent financing, achievement transformation, cross-project reuse, and exit. The 2025 guiding opinions on government investment funds emphasize the policy positioning of government investment funds, requiring efforts to invest early, in small firms, in the long term, and in hard technology, to develop long-term capital and patient capital, while preventing homogeneous competition, duplicate establishment, and crowding out of social capital, and improving differentiated management and exit mechanisms [20].

Main risks include project selection bias, fiscal funds replacing enterprises’ original investment, multi-layer nesting weakening policy objectives, local return-investment requirements causing resource misallocation,

and continued bailouts based on sunk costs. Corresponding designs should use staged capital contributions, milestone management, differentiated performance evaluation, and full life-cycle assessment, and should pre-specify in contracts the conditions for next-stage support, arrangements for assets and intellectual property, and exit paths. Long-term capital is not equal to unconditional long-term support, and patient capital does not exclude stopping additional investment when negative evidence is sufficient.

4.2 Voucher-Type Instruments Such as Computing Power Vouchers, Data Vouchers, and Model Vouchers

Voucher-type instruments such as computing power vouchers, data vouchers, and model vouchers mainly reduce the initial experimentation costs of small and medium-sized enterprises and application entities, and are suitable for scenarios with small single-investment scale, dispersed demand, and rapid verification needs. Their policy effects depend on enterprises' original expenditures, qualified supply capacity, supplier bargaining power, related-party transactions, and continued use after support phase-out.

Voucher-type instruments are prone to three types of bias. First, enterprises convert expenditures that would have occurred anyway into public reimbursement, forming expenditure substitution. Second, when the supply of intelligent computing power, data, or model services is constrained, subsidies may be mainly absorbed by upstream suppliers. Third, related-party transactions, repeated applications, and fictitious services may inflate nominal usage. Evaluation should verify new real usage, the net payment actually borne by enterprises, quality-adjusted unit task cost, changes in model or business capability, and retained use after phase-out.

Policy design can adopt a unified beneficiary entity caliber, a support ceiling for a single entity, increasing co-payment, regular expiration, service voucher verification, and random spot checks. For entities that have already formed stable commercial demand, the self-payment ratio should be gradually increased; for early-stage experiments that have not yet formed capability but still have high information value, small-amount, short-cycle, repeatedly applicable but non-automatically renewable experimental quotas can be set.

4.3 Collaborative Innovation Procurement, First Purchase and Ordering, and Application Scenario Opening

Government procurement, state-owned enterprise applications, and public service scenarios can provide first-batch demand, R&D compensation, application verification, and data feedback. In its institutional

arrangements for government procurement supporting scientific and technological innovation, the Ministry of Finance proposes comprehensively using first purchase and ordering, publishing demand standards, and collaborative innovation procurement, taking the purchaser's application demand as the orientation, with purchasers and suppliers jointly sharing R&D risks and jointly developing initial markets [21]. This mechanism differs from general subsidies: it changes enterprises' product development and market entry decisions through real functional demand and subsequent orders.

Whether large model procurement forms capability cannot be judged only by winning bid amount. More informative evidence includes whether procurement demand corresponds to real business problems, whether the model enters actual production and operations or public service processes, whether functional indicators and security requirements are met, whether implementation outcomes can be reused across users, whether procurement continues after the contract ends, and whether data, interfaces, and business can be migrated when suppliers are changed. Beraja et al. [22] studied public security contracts of Chinese artificial intelligence enterprises and showed that data-rich government contracts may promote subsequent software output, but the research object is not general-purpose large models, nor does it fully account for privacy, competition, and fiscal costs. Therefore, when applying the mechanism of that paper to large models, it is still necessary to separately verify data use boundaries, intellectual property, interface dependence, and external costs.

Main risks include implicit market barriers formed by local registration, existing performance, or designated technology routes; relational orders replacing competitive procurement; purchasers transferring responsibility and migration costs to suppliers or subsequent departments; and long-term lock-in caused by closed interfaces. Corresponding institutions should strengthen procurement demand standards, functional acceptance, fair competition review, multi-supplier arrangements, regular re-competition, data and business migratability requirements, and service continuity contingency plans. For projects where the market has no mature products and R&D is truly needed, collaborative innovation procurement can be used; for products and services that are already mature, greater reliance should be placed on open competition and real demand testing.

4.4 Application Pilot-Test Bases, Industry Common Platforms, and Public Service Capacity

National artificial intelligence application pilot-test bases, industry application common platforms, intelligent

computing power public service platforms, high-quality datasets, model testing and evaluation, and security governance tools have strong public good or quasi-public good attributes. The State Council’s Opinions on Deeply Implementing the “Artificial Intelligence+” Initiative proposes enhancing model foundation capabilities, strengthening data supply innovation, reinforcing intelligent computing power coordination, laying out national artificial intelligence application pilot-test bases, and building industry application common platforms [23]. Such inputs can reduce the fixed costs that individual business entities would otherwise bear repeatedly, and promote supply-demand matching, data openness, resource sharing, and pilot-test verification.

The evaluation focus of common inputs is not whether the platform has been built, but whether it has formed public service capacity that can actually be used by external entities. More informative indicators include the number and structure of external users, cross-regional and cross-industry use, resource utilization, service reliability, unit service cost, model and data migration capability, full

life-cycle operations and maintenance costs, and exit or integration plans. For facilities that undertake emergency support or industrial chain and supply chain resilience functions, common failure point analysis, switching drills, recovery time, and annual maintenance cost testing should also be conducted.

Main risks include duplicate local construction, low platform utilization, disconnect between construction and operations and maintenance responsibilities, closed data and interfaces, high energy consumption, and long-term maintenance of inefficient projects in the name of public services. For projects with insufficient external use and capabilities that can be provided by other platforms, integration, transfer, or exit should be promoted; for projects with clear public good spillovers but insufficient commercial revenue, they can be converted into public services with transparent rules and sustainable budgets, rather than maintaining the survival of business entities through temporary special subsidies over the long term.

4.5 Correspondence Among Policy Instruments, Evidence, and Adjustment Methods

Table 4 Main Constraints, Policy Instruments, Evaluation Evidence, and Adjustment Methods

Main constraint	Policy instruments that may be considered	Enterprise decisions mainly affected	Evidence that must at minimum be verified	Main risks	Adjustment or exit method
Mismatch in frontier R&D time horizon and excessively high risks	Government investment funds, competitive funding, staged subsidies	Foundation large model training and iteration, key generic technologies	Original investment plans, actual availability of funds, private co-investment, route adjustments, performance and cost efficiency	Selection bias, expenditure substitution, multi-layer nesting, continuous bailouts	Staged suspension of disbursement, reduction of intensity, adjustment of instruments, fund exit, or project restructuring
High threshold for small-scale experimentation	Computing power vouchers, data vouchers, model vouchers, increasing co-payment	Intelligent computing power procurement, model adaptation, and early-stage applications	New real usage, net payment, unit task cost, capability changes, retention after phase-out	Related-party transactions, repeated applications, absorption by suppliers, subsidy dependence	Increase co-payment ratio, set ceilings and expiration dates, random spot checks, recover funds for violations
Lack of first-batch demand and joint R&D conditions	Collaborative innovation procurement, first purchase and ordering, opening of application scenarios	Model services, system integration, production and operations and public service applications	Real business demand, functional performance, actual operation, cross-user reuse, subsequent procurement, and migration time	Local protection, relational orders, interface lock-in, responsibility transfer	Open competition, multiple suppliers, regular re-procurement, data and business migration contingency plans
Strong spillovers from common inputs	Application pilot-test bases, industry common platforms, intelligent	Common support for multiple decision stages	External users, utilization, reliability, cross-regional use, full life-cycle costs	Duplicate construction, low utilization, absent maintenance, platform	Integrate, transfer, or exit according to actual use; convert to regular public services

	computing power public services, high-quality datasets			dependence	when necessary
High re-entry costs or supply risks	Time-limited technology portfolio and standby safeguard capability support	Foundation models, computing power, and key supply routes	Route independence, common failure points, recovery time, switching drills, annual maintenance costs	Continuous bailouts in the name of resilience, homogeneous duplication, resource freezing	Regular reassessment; terminate when risks decline, routes converge, or costs are too high

Table 4 does not require all projects to adopt equally complex indicators; rather, it requires evidence to correspond to the policy mechanism. Government investment funds must demonstrate that enterprise behavior and capability trajectories have indeed changed after financing conditions change; voucher-type instruments must demonstrate that new usage has not been replaced by expenditure substitution or absorbed by suppliers; government procurement must demonstrate that the project has entered real business processes; common platforms must demonstrate external use and public service capacity; and standby safeguard support must demonstrate route independence, feasible switching, and reasonable annual maintenance costs.

Testable Proposition 3: Existing Investment Conditions and Expenditure Substitution. When business entities already have implementable financing sources, clear investment plans, or certain demand before policy implementation, the marginal additionality of unconditional subsidies is relatively low, and the risk of expenditure substitution is relatively high; compared with universal subsidies, enterprise co-payment, staged support, and competitive procurement linked to new demand are more conducive to identifying and improving policy additionality.

V. DYNAMIC ADJUSTMENT AND EXIT MECHANISMS UNDER UNCERTAINTY

5.1 Policy Stages Should Be Determined by Information State Rather Than Project Age

Large model projects should not be divided into stages solely according to project approval years; rather, they

should undergo rolling evaluation based on information already obtained. The main task of the exploration stage is to confirm whether business entities have made real investments, whether technology routes have substantive differences, whether experiments have left verifiable records, and whether key constraints truly exist. At this stage, model versions, staged milestones, and failure records can serve as process indicators, and honestly reporting negative results should not automatically reduce eligibility for subsequent applications.

The verification stage should shift the evaluation focus to capability evidence that matches enterprise decisions. Foundation large models need to examine performance under comparable quality conditions, training and inference efficiency, continuous iteration, and model architecture improvements; public computing power and common platforms need to examine external use, resource utilization, reliability, and full life-cycle costs; model deployment and system integration need trial operation verification in actual production environments; and industrial applications need to examine business processing efficiency, product quality, operating benefits, service quality, and continued use.

The screening stage then comprehensively judges policy additionality, social net benefits, and information value. A project may form capability but have low policy additionality, or it may have additionality but be less economical than other instruments. Policy decisions therefore should not be limited to only “continue” or “stop,” but should include continuing or expanding support, reducing support intensity or adjusting instruments, time-limited rolling support, and restructuring or exit.

Table 5 Evidence States and Dynamic Policy Choices

Evidence state	Main judgment	Appropriate policy choice
Relatively sufficient positive evidence on capability, additionality, and social net benefit	Policy is effective and has advantages relative to other instruments	Continue or expand support, and gradually shift to rule-based, competitive arrangements
Capability has been formed, but additionality	The project has value, but	Reduce support intensity, increase

is low or the substitution effect is strong	existing instruments are not necessary or the intensity is too high	enterprise co-payment, switch to procurement or public service instruments
Evidence remains insufficient, but the technology route is independent, and information value and re-entry costs are high	Immediate exit may forfeit valuable learning and choice opportunities	Implement rolling support after setting a time limit, amount ceiling, and new evidence requirements
Negative evidence continues to accumulate, routes are highly homogeneous, and capabilities can be migrated or rebuilt at low cost	The opportunity cost and soft budget risk of continued support are high	Suspend subsequent disbursement, promote project restructuring, asset migration, or exit

5.2 Appropriately Preserving the Real Option Value of Parallel Technology Routes

The State Council’s Opinions on Deeply Implementing the “Artificial Intelligence+” Initiative proposes supporting multi-path technology exploration and model architecture innovation [23]. When the technology direction has not yet taken shape, investment is partially irreversible, and new information arrives in stages, appropriately preserving parallel technology routes may reduce the risk of failure of a single path. At this point, the object of evaluation should be the technology portfolio, not isolated projects.

Time-limited retention of parallel routes must satisfy at least four conditions: the technology routes have substantive differences in model architecture, data methods, toolchains, or supply sources; different routes have few common failure points; the costs of re-entry, reconstruction, or emergency switching after project exit are high; and the project still continuously generates new information capable of changing subsequent judgments. Main evidence includes model technology pedigrees, route correlation, common supply chains and failure points, reconstruction time, switching success rate, stress test results, and annual maintenance costs. Li Xiaohua [24] regards substitutability, diversity, and redundancy as important conditions for industrial chain and supply chain resilience, which means that whether simultaneous deployment in multiple locations or by multiple entities constitutes valuable diversification cannot be judged solely by the number of projects.

If multiple routes share the same upstream foundation model, key supply chains, and failure points, the project no longer generates new information, and relevant capabilities can be restored at low cost, continued support cannot be justified solely on grounds of “strategic security” or “industrial chain and supply chain resilience.” Appropriate redundancy must pre-set support ceilings, stress scenarios, rolling evaluation time points, and termination conditions, avoiding converting real options into indefinite support.

5.3 Failure Has Public Value Only When It Is Transformed into Verifiable Knowledge and Transferable Assets

Enterprise losses, investor exit failures, or model maintenance cessation are not equivalent to social losses. Public evaluation also needs to consider knowledge spillovers, talent mobility, user service discontinuation, fiscal opportunity costs, energy consumption, and market competition. Research on learning from failure shows that whether failure experience can be transformed into innovation performance depends on ex ante decisions, organizational absorptive capacity, prior experience, and failure scale [10,14].

Failure may form public value through two paths. First, negative results prompt subsequent projects to adjust model architecture, data governance, task selection, or deployment methods. Second, code, model weights, data processing pipelines, testing and evaluation tools, technical documentation, governance methods, or talent experience are actually used by other projects. Open sourcing, patents, downloads, mergers and acquisitions, or personnel mobility only indicate the existence of reuse channels; version dependencies, operation records, contracts, subsequent invocations, and explicit design changes are closer to evidence that knowledge has been absorbed.

Public funding can, at project approval, stipulate preservation responsibilities for negative results, models, code, data processing pipelines, and testing and evaluation materials, and, in accordance with requirements for trade secrets, personal information protection, data security, and national security, adopt classified and tiered handling, de-identification, delayed openness, or controlled review. The goal is to enable authorized entities to verify, absorb, and migrate relevant knowledge while protecting the legitimate rights and interests and intellectual property of business entities.

5.4 Boundaries of Dynamic Exit

The key to soft budget constraints is whether policy actors can make credible commitments regarding subsequent

support. When negative evidence has accumulated and renewal is still mainly based on sunk costs, continued existence of business entities, or local reputation, enterprises’ expectations of continued bailouts will change their ex ante choices [11]. Long-term projects, a single renewal, or staged losses do not in themselves constitute soft budget constraints; the real question is whether new evidence can still change judgments, and whether continued support still has a clear social net benefit basis.

Support contracts should ex ante specify stage objectives, conditions for next-period fund disbursement, negative evidence thresholds, and exit arrangements. Supported entities should submit versioned records of inputs, experiments, model sources, and negative results; third-party institutions are responsible for testing and evaluation, conflict-of-interest avoidance, and random review; fiscal departments, fund contributors, or purchasers bear ultimate responsibility for renewal and exit. Once suspension conditions are met, next-period funds shall in principle stop being disbursed; if continued support is truly necessary, new evidence sufficient to change the original judgment should be submitted, and the reasons for the exception should be documented in writing.

Appeals and reviews should have clear time limits. Business entities changing names, splitting projects, or replacing model versions should not erase historical records accumulated according to the unified social credit code, actual control relationships, and model technology pedigrees. Exit clauses should also pre-specify user notification, data return or disposal, service continuity, business migration, migration costs, asset disposal, and personnel placement and mobility support, avoiding transferring exit costs to users, employees, or other public departments.

5.5 Evaluation Intensity Should Match Project Scale and Verifiability

Complex capability evaluation itself has costs and may expand the discretion of local departments, fund managers, and third-party evaluation institutions. Zhou Li’an [25] pointed out that in multi-task environments, measurable indicators may distort behavioral allocation. For large model industrial policy, more complex indicators are not necessarily more effective. When project scale is small, local professional capacity is insufficient, conflicts of interest are strong, or results are difficult to verify, transparent experimental quotas, support ceilings, enterprise co-payment, random review, and expiration-based termination may be superior to nominally refined but unenforceable capability assessment. Major projects and public platforms require more complete full life-cycle

evaluation, third-party testing, data trails, and exit contingency plans.

Central departments can unify basic concepts, cross-regional data calibers, minimum contract clauses, and exit rules; local departments are responsible for verifying transactions, scenarios, and actual use, and for documenting specific support decisions; fund managers are responsible for staged capital contributions, follow-on investment, and asset disposal; purchasers are responsible for procurement demand, functional acceptance, data and business migration, and service continuity; third-party evaluation institutions are responsible for evidence verification but do not replace policy actors in making final decisions. Beneficiary entities, fund-paying entities, and entities bearing migration, personnel placement, and asset disposal costs should be included in the same record, to reduce performance overestimation caused by cross-departmental transfer costs.

Testable Proposition 4: Information Value and Dynamic Support. Other things being equal, the stronger the independence of the technology route, the higher the re-entry cost, and the greater the information increment provided by the project, the higher the real option value of time-limited rolling support; when technology routes converge, negative evidence no longer updates judgments, and relevant capabilities can be migrated or rebuilt at low cost, continued support is more likely to manifest as a soft budget constraint.

VI. CONCLUSION

Starting from industrial policy effect evaluation, this paper proposes a three-tier framework of “capacity formation—policy additionality—social net benefit.” Its core implication is that model quantity, filing or registration, public invocation prices, R&D investment, winning bid amounts, and continued existence of business entities can all provide information, but cannot independently prove that policy is effective. Policy evaluation must first identify what sustainable industrial capacity the project has formed, second establish a credible counterfactual relative to the no-policy state, and finally compare capacity increment, knowledge spillovers, industrial chain and supply chain resilience, and real option value with real resource costs, external costs, administrative verification costs, and opportunity costs.

“From subsidizing models to subsidizing capabilities” means that the same evaluation framework may lead to policy choices in different directions. When technology routes are relatively independent, the project continuously generates effective information, and re-entry costs are high, time-limited retention of parallel routes may have

real option value; when a project has formed capability but policy additionality is low, support intensity should be reduced or switched to procurement, guarantees, and rule-based public services; when routes are highly homogeneous, negative evidence no longer changes judgments, and assets can be migrated, subsequent disbursement should be suspended and restructuring or exit promoted.

Compared with previous research on policy systems and industrial ecosystems, this paper completes three shifts: from a list of policy instruments to the mechanisms by which policy instruments change enterprise decisions; from observing project outcomes to identifying policy additionality; and from one-time project approval and acceptance to dynamic adjustment and exit based on information updates. Accordingly, fault tolerance in industrial policy is no longer equivalent to maintaining every project and business entity, but rather allows controlled experimentation, preserves verifiable knowledge and transferable assets, and enables resources that no longer generate incremental value to be promptly redirected to more valuable uses.

The four testable propositions proposed in this paper provide operable observational directions for subsequent empirical research. Specifically, the framework can be tested and revised from six aspects: using computing power voucher eligibility thresholds, subsidy ratios, or expiration rules to identify real usage and capability additionality; comparing changes in enterprise R&D plans and model technology pedigrees before and after local policy adjustments; examining differences between collaborative innovation procurement, first purchase and ordering, and general subsidies in terms of cross-user reuse and subsequent procurement; tracking continued use and business performance after support phase-out; evaluating cross-regional use and full life-cycle costs of public computing power platforms, application pilot-test bases, and industry common platforms; and constructing data on migration of models, code, data pipelines, users, and talent after project exit. The above research needs to record policy issuance, qualification determination, actual fund disbursement, enterprise use, and final capability outcomes separately, avoiding substituting policy texts for policy implementation.

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