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EXPLORING THE PERFORMANCE PRODUCTION OF SCI-TECH FINANCE POLICY: TYPICAL PATHS AND INNOVATIVE INSIGHTS FROM CHINA PROVINCES

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Abstract: This paper focuses on "how differentiated policy configurations lead to industrial development". It proposes the performance production as a novel perspective for policy management, utilizing China's provincial policies for sci-tech finance development as a case for operational observation. Qualitative data was converted into a quantifiable format using structured calibration procedures, and then three typical paths of system management were simulated via the fsQCA method. The 'limited adaptation' path involves selecting policy objectives and targeted investment of public resources through industrial basis analysis, corresponding to provinces with bright spots in the underdeveloped tier. The 'motivated action' path entails setting policy objectives to drive task arrangement and resource allocation, aligning with provinces demonstrating evident progress in the backward tier. The 'systematic improvement' path signifies that policies are derived through specific, successive steps, corresponding to leading provinces with developed industries. This study constructs a bridge between industrial policy analysis and performance evaluation, emphasizing the mutual guidance of multi-dimensional policy contents and their combined output mechanism. It offers practical and innovative implications for designing and implementing industrial policies across different regions.
Keywords: Industrial policy; Performance production; Configuration path; Sci-tech finance development

1 INTRODUCTION

Industrial policy, as a significant type of public policy, focuses on sci-tech finance, which plays a strategic role in national economic development and exhibits an emerging scale alongside forward-looking technology. Therefore, government cultivation is deemed essential [1]. Existing literature on emerging industry policies primarily adopts two perspectives: one is policy science analysis, which delves into the policy structure or process [2-3]; the other is policy performance evaluation, which examines the effectiveness of specific policy instruments [4-5]. However, these two perspectives are largely independent, leading to fragmented understanding of the intermediate principles from policy allocation to industrial progress, creating "missing links." The consequences of this lack are twofold: firstly, diagnosing problems in industrial policy lacks practical evidence from policy effectiveness, confining discussions to policy itself; secondly, evaluated industrial performance is difficult to attribute to specific policy elements, hindering direct implications for policy improvement. Furthermore, current policy performance evaluation predominantly uses traditional methods like regression models to test the impact of a single content dimension, failing to examine the combined effect of multi-dimensional policy content. This approach diverges from the real logic of policy action, rendering industrial policy performance analysis too abstract and detached from ontology, separating fact measurement from value judgment, and thus unable to assist policy system design through interactive guidance of policy elements.

This paper proposes a novel perspective of the performance production, bridging the gap between policy composition and industrial performance. What does the term "performance production" entail? Essentially, it refers to the process by which relevant subjects of a specific policy gradually create policy performance through their "actionable" behavior within the constraints of environmental conditions [6]. Policy performance production research differs from the evaluation of policy implementation or policy performance. Policy implementation evaluation presupposes established policy objectives, clarity in policy subjects, their responsibilities, and policy procedures, focusing on comparing the consistency of policy implementation paths with expectations [7]. Policy performance evaluation, on the other hand, assesses policy design and implementation from an epistemological perspective, emphasizing value evaluation, outcome evaluation, and incremental evaluation, but with inadequate attention to policy ontology and process [8]. Policy performance production constitutes an associative mechanism from ontology (policy content) to epistemology (policy effect), encompassing the internal structure of the policy system and the behavioral logic of policy subjects, which can be described through paths such as "(policy) demand-goal-responsibility-evaluation" or "(subject) motivation-resource-behavior-result." Thus, policy performance production may partially complement the functions of the aforementioned two types of research.

To analyze industrial policy from the perspective of the performance production, it is imperative to focus on its decision-making basis, goal setting, responsibility division, subject relationships, and implementation processes. These elements are commonly encompassed within industrial policies and are pivotal factors influencing policy performance production. They are interconnected and guide each other, but their interplay requires further interpretation. We aim to refactor the three-dimensional situation of policy management, with the objective of elucidating the following two levels of problems:

Q1: How can we systematically dissect the policy system of a specific region and effectively guide and integrate various policy contents?

Q2: How do implementing actors take rational actions within policy frameworks to achieve their goals? Specifically, how do different policy schemes lead to disparate outcomes in industrial development?

Given the institutional system, China's industrial policy is primarily planned and organized at the local level under the unified guidance of the central government. Its specific implementation exhibits characteristics of content integration and diversified forms [9]. This study systematically collected data on policies related to sci-tech finance issued in 31 provinces in mainland China. We referred to the structural procedure developed by Basurto and Speer [10] to convert qualitative information into scientifically calibrated conditions and outcome variables. Additionally, fuzzy-set Qualitative Comparative Analysis (fsQCA) was applied to simulate various paths of policy performance production, providing a reference for optimizing industrial policy design and implementation across different regions.

2 MATERIALS AND METHODS

2.1 Case Selection and Data Collection

Considering the timeliness of research and data availability, this paper collected policy documents during the period of the "13th Five-Year Plan". This period was chosen because, in October 2011, 8 National Ministries and Commissions of China issued "Several Opinions on Promoting the Integration of Science and Technology with Finance" as a unified action plan. Subsequently, provinces responded by proposing personalized policy deployments based on local conditions. We adopted a holistic approach by attempting to find all sci-tech finance policy documents available through open channels and compiling them into a regional policy system for research.

We searched for policy data through the following three channels, striving for comprehensiveness and forming a "triangular mutual proof". Firstly, we searched for keywords related to sci-tech finance on the official websites of provincial governments and their functional departments, primarily in the "Policy Release" section. Secondly, we searched for the same keywords in the well-known policy database "Pkulaw" (http://www.pkulaw.cn). Thirdly, we searched for "province name + sci-tech finance (or specific industry name)" in mainstream search engines such as Baidu and Sohu. The results from this search were used for review, comparison, and supplementation.

Provinces included as cases for analysis met three criteria: firstly, at the provincial level, at least one sci-tech finance policy was officially issued during the 13th Five-Year Plan period; secondly, at least one of the leading industries was included in the statistical catalog of sci-tech finance industries; and thirdly, the core index data reflecting industrial development in the corresponding years were fully disclosed. Fortunately, all 31 provinces (municipalities and autonomous regions) in Mainland China met these criteria. We compiled 140 policy documents found by province (averaging 4.5 per province) to establish the database for fsQCA.

2.2 The fsQCA Method

This paper used fsQCA to examine the influence of industrial policy deployment on sci-tech finance development. As a method to explore the causation of certain social phenomena, QCA has the following advantages. Firstly, it focuses on the effect of condition configurations rather than individual factors. Secondly, the fuzzy-set calculation helps to reduce multi-collinearity interference. Thirdly, different fitted condition configurations are considered equivalent, breaking the optimal solution thinking. Fourthly, it is suitable for small and medium sample sizes [11]. Since the contents of the sci-tech finance policy system are difficult to measure simply, dividing them into several membership levels between 0 and 1 is more in line with reality [12].

Referring to similar literature, fsQCA should be conducted in six steps [13]. It is necessary to specify some key parameters here to ensure the reliability of the analysis. The first is consistency. For fuzzy sets, the consistency of sufficient conditions refers to the ratio of the intersection of the condition variable membership set (X) and the outcome variable membership set (Y) to X, while the consistency of necessary conditions can be expressed as the ratio of the intersection of X and Y to Y. The closer the consistency is to 1, the better it is. The consistency of sufficient conditions is generally required to be above 0.75 or 0.8, and was set to 0.8 in this study. The threshold for necessary condition consistency was relatively uniform and was set to 0.9 [14]. Secondly, coverage is used to assess how well the condition membership set X physically covers the outcome membership set Y. When fsQCA obtains the solution, it displays three coverage indicators: raw coverage, unique coverage, and overall solution coverage [15]. There is no clear minimum standard for coverage; it is mainly used to demonstrate differences in the explanatory power of several equivalent solutions for the outcome. Moreover, there are two parameters associated with coverage. One is the minimum frequency of the cases. The analysis requires that the number of cases resulting from each conditional configuration should not be too small; this is used as a premise to determine the effective solution. Usually, 1 or 2 is considered in small sample research, and this study sets it as 1. The other is the proportional reduction in inconsistency (PRI). To avoid the situation where all conditional configurations lead to the same outcome with no simple solutions, we manually adjust the truth table row with PRI < 0.7 to 0 after filtering according to the minimum case frequency [16].

3 VARIABLES AND CALIBRATION

3.1 Constructing and Calibrating the Conditions

QCA typically employs four mainstream strategies for condition selection: obtaining guidance from theoretical knowledge, considering the real meaning of condition combinations, using measurement techniques to exclude certain conditions, and comprehensive inclusion [17]. This study integrates the first two strategies and aims to establish a verified analytical model for the policy performance production. On one hand, literature indicates that industrial policy content exhibits complex characteristics. For instance, the policy context perspective necessitates superimposing static and dynamic elements to derive key analytical dimensions, namely, the appeal of industrial development to policy and its response, demand-oriented policy goal setting and decomposition, goal-based key task allocation, responsibility division and coordination, and resource guarantee mechanisms. On the other hand, are these factors indeed considered in real policy design and practice? By conducting a preliminary analysis and induction of the collected policy data's text content, we can find empirical evidence demonstrating the common existence of the aforementioned points.

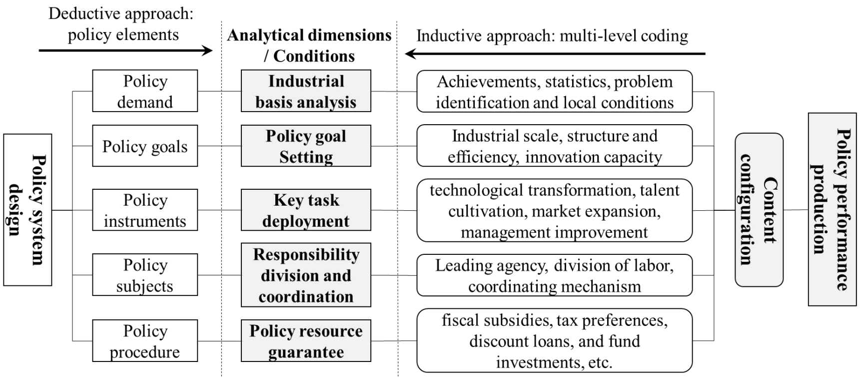

Figure 1 The Analytical Framework of Industrial Policy Performance Production

Both inductive and deductive paths unanimously confirm that the performance production of sci-tech finance policy comprises five conditions, as depicted in Figure 1: industrial basis analysis, policy goal setting, key task deployment, responsibility division and coordination, and policy resource guarantee. The subsequent step is to calibrate each variable. To date, most studies employing Qualitative Comparative Analysis (QCA) have utilized the direct or indirect calibration method proposed by Rihoux and Ragin [18], which presupposes the availability of quantitative measurements for each variable. Basurto and Speer developed a structured calibration procedure tailored for qualitative information, capable of transforming text data into fuzzy sets for QCA while ensuring systematicness and transparency, thereby overcoming the defects of fuzzy measurement and untestability of such variables in previous studies. We drew inspiration from this procedure but noted that it was originally exemplified using interview data. Since our original data consist of policy documents, designing an interview outline for variable measurement is unnecessary. The transformation process can be simplified into the following three steps.

3.1.1 Developing preliminary measures and qualitative anchors of the conditions

The first step is constructing an initial measurement scheme for the conditions and selecting qualitative anchors. This part is purely based on theoretical knowledge and the researchers' operational understanding of the concept. We needed to develop not only a preliminary list of measures for each condition but also the content for observation under each measure and their relative importance. This is akin to the process of making a code book in content analysis. It may be adjusted when we enter the sample.

Industrial basis analysis (IBA) refers to the review and summary of the current or past development of the industry within local policies, which is the accordance for policy formulation and future industrial development [19]. The most valuable elements of policy performance production in industrial basis analysis are as follows. The first is summarizing the highlights of industrial development in previous periods, in terms of dimensions such as industrial scale, layout structure, major projects, and innovation capacity to guide the selection of policy goals. The second is embedding relevant statistical data, providing information on key indicators, quantitative data, directions of changes, and comparison of strengths and weaknesses, as a future reference for goal values. The third is identifying the existing problems of the industry in aspects such as core technologies, value levels, production factors, and industrial linkage, to suggest the deployment of policy tasks and resource investment [20]. To measure this condition, we established a preliminary scheme consisting of the above three measure points and their subordinate 16 observation contents (4 contents per measure point). Although the probability of each observation content appearing in the policy is not completely random, any content can be the most important for the industrial basis analysis of a specific region. We balance the situation and assigned equal weight to each observation content. During calibration, that each measure point covers all observation contents was initially set to be the anchor of full in the "in-depth analysis of industrial basis" set, that no observation content is covered was set to be the anchor of full out of this conditional set, and that half observation contents are covered was set to be the crossover.

Policy goal setting (PGS) refers to the requirements of the policy that industrial development should achieve in the future. According to the need of matching industry statistics, three aspects (i.e., industry scale, structural benefit, innovation capacity) of quantitative goals are usually set by provincial industrial policies. Specifically, the industry scale has requirements for the value added, growth rates, and shares of certain industries; the structural benefit has requirements for the proportions of industries, industrial clusters, and leading industries or enterprises; the innovation capacity has requirements for R&D input, the number of high-tech enterprises and R&D platforms. A measurement scheme consisting of the above three measure points with 14 observation contents could be established for this condition, and equal weights were taken in accordance with the previous condition. During calibration, that each measure point covers all observation contents, that half of the observation contents are covered, and that no observation contents is covered were initially set as the anchors of full in crossover, and full out, respectively.

Key task deployment (KTD) refer to the work that needs to be implemented to promote the development of local industries for a period in the future. In the current theory, the development of sci-tech finance mainly relies on four factors: technology, talent, market and management, and the combination becomes a benign ecology that drives the healthy growth of the industry [21]. Among them: technological tasks generally involve network infrastructure, industrial robots, and digital and intelligent technology development and application; talent-oriented tasks require cultivating top talents, incubating innovation and entrepreneurial teams, and continuously improving personnel quality and industry-university-research collaboration; market-oriented tasks boost demand by establishing brands and benchmarks, accelerating the transfer and diffusion of scienctific & technical (S&T) achievements, and enhancing industrial public services as well as international cooperation; managerial tasks require improving the governance structure and enhancing the effectiveness of assessments, incentives, administrative approval, and intellectual property protection. On this basis, a measurement scheme consisting of four measure points with 16 observation contents was established, and equal weights were assigned to each observation content. Likewise, that each measure point covers all observation contents, that it covers half of the observation contents, and that it covers no observation content were set as the anchors of full in, crossover, and full out, respectively.

Responsibility division and coordination (RDC) refers to various aspects proposed by local policies such as how to organize and implement all or part of the work to develop the industry, who leads the coordination, what departments are responsible for which policy tasks, and how departments communicate with each other. Under this condition, an established leading and coordinating agency, a clear division of responsibilities between departments, and a normative mechanism for communication and coordination were the three measure points. In addition, there were 8 observation contents with equal weights, and the qualitative anchors for calibrating each measure point were initially selected according to the aforementioned logic.

Policy resource guarantee (PGS) refers to the methods and means of public financial resources stated in the policy to support industrial development. Drawing on the classification of mainstream industrial policy tools, we used four types of resource inputs, namely fiscal subsidies, tax preferences, financial support, and market investment as the measure points for this condition. Specifically, fiscal subsidies include the approaches such as setting up special funds, increasing inputs, centralized procurement, and asset allocation; tax preferences include tax deductions and additional deductions for specific market players; financial support includes granting discount loans and exclusive credit products to enterprises; market investment includes cooperation between the government and social capital, setting up investment funds and fiscal equity investment. Based on this, a measurement scheme consisting of four measure points with 11 observation contents was established (with equal weights assigned), and the anchors of calibration were selected according to the aforementioned logic.

3.1.2 Policy coding and summarizing the data for adjustment of measures

The second step is to enter the empirical field of data collected and to revise the measurement scheme through coding the policy text and summarising its classifications. This step consists of three parts. Firstly, Review the occurrence of each initial code (observation content) from all cases and decide whether to delete or adjust the code based on the variation, reliability, and sufficiency of information. Secondly, identify information and its divergence in categories that appears in multiple cases but cannot be covered by existing codes. Thirdly, summarize new information across cases (categories) and add it as a new code.

After this process, the following adjustments were made to the original measurement scheme for the five conditions. First of all, in measure point 1 “using fiscal subsidies”of PRG, the observation content of “asset allocation” was deleted because no provincial policy had mentioned such information (with measured value unchanged across all cases). Additionally, in measure point 2 “a clear division of responsibilities between departments” under the condition of RDC, the last two observation contents were combined into “lead unit or co-organizer” because most policy tasks or key projects are under the responsibility of only one unit, without any co-organizers (the measured value only slightly varied). Besides, one measure point was added in PGS and KTD, respectively. Taking the former as an example, quantitative indicators proposed in some provincial policies, such as “introducing high-level talents/teams”, “obtaining breaking through technologies”, and “building demonstration areas for technique/product use”, could not be classified into the preset three measure points, namely the industry scale, the structural benefit, and the innovation capacity. Based on the summary of the meanings of these indicators, a new measure point “quantifying goals on element cultivation” was added. Moreover, observation content was accordingly added to measure points of other conditions. For example, in terms of measure point 3 “identifying the existing problems of the industry” under IBA, several provincial policies had mentioned “a large gap between advanced countries and regions”, which could not be categorized into the four preset codes such as core technologies, so “regional gap” was added as the fifth observation content. As these adjustments caused changes in the value range of measures for each variable, the anchor points for calibration needed to be reconsidered.

To ensure the accuracy of the categorization for observation contents and measure points, we conducted reliability and validity tests in two ways. Firstly, we randomly selected 20 policy samples, which were independently coded by two researchers. Secondly, after an interval of 15 days, any selected policy sample was repeatedly coded by a same researcher. The consistency of the coding systems by two people (times) was above 90%, indicating that the adjusted measurement scheme was robust.

3.1.3 Determining the fuzzy sets (scales & anchors) and assigning case memberships

The third step is obtaining the memberships of the cases by determining the fuzzy set scale and qualitative anchors of each condition based on the adjusted measurement scheme. On the one hand, the precision of the fuzzy set, three-value, four-value, or other scales, was dependent on the details provided by the data. We took into account the number of observation contents at each measure point and selected a three-value fuzzy set for measure points with two observation contents and a four-value fuzzy set for measure points with three observation contents. For those with more than four observation contents, we further analyzed their interrelationship because observation contents may occur at the same time. For example, although the measure point “embedding indicators and statistical data” included four observation contents, it is almost impossible for the other three contents to appear in the case when the “key indicators” was ignored. Five-value fuzzy sets and ones with larger scales are rarely used in existing studies. Among the 19 measure points under the five conditions of this paper, eight had four to five observation contents, where a four-value fuzzy set could be applied, and only two measure points with more than six observation contents required five-value fuzzy sets. Because of the preset equal weight of each observation content, different anchors could take values according to the setting of average interval.

On the other hand, Basurto and Speer pointed out that the theoretical concept should be adapted based on the sociocultural context of a case located. We can construct an imaginary perfect or very poor case that just fits the sample experience so that the anchor values of full in and full out not are not necessarily equal to the maximum and minimum values of the measure point. In this study, there are three measure points of which the selection of the full-in anchors is deviated from the maximum number of the observation contents. For example, under “quantifying goals on structural benefit”, “industrial clusters” and “leading industries or enterprises” required industrial concentration at the macro and micro levels, respectively, and most provinces only considered one of them. Therefore, the full-in anchor only required “quantifying at least 5 goals”. “Including one observation content or below” was selected for the anchors of full nonmembership of three measure points because: on one hand, very few cases that “do not contain any observation content”, it was necessary to avoid the “right skewed” distribution of variables that may affect the analysis; on the one hand, policy performance production has higher requirements for certain measure points, so only cases with “higher levels” could be given a same membership as compared to other measure points. Seen from “deploying tasks on technological transformation”, almost all provinces made great efforts in this regard as technological improvement is the lifeline of sci-tech finance, therefore “deploying only one task” is viewed as a poor performance. The gradient distribution of values on other anchors (the number of observation contents) was similarly adjusted in a scientific manner.

Here, we obtained the fuzzy membership of each case at each measure point by selecting their closest qualitative anchor for calibration based on the number of observation contents that is found in the coding process of policy texts. And afterward, values of the conditions were aggregated according to the memberships of the measure points. As the measure points within the conditions have basically horizontal, parallel, and equal relationships, we calculated the arithmetic mean for aggregation and then complete the data conversion.

3.2 Constructing and Calibrating the Outcome

The purpose of the outcome is to quantify the development performance of sci-tech finance in each province during the “13th Five-Year Plan” period. However, the current national and local statistical yearbooks lack readily accessible data of this specific nature. A more credible strategy lies in sourcing relevant research findings from reputable institutions. Among the most prominent are: firstly, the "China FinTech Innovation and Development Index" crafted by the Central University of Finance and Economics, encompassing four dimensional quantitative metrics that assess financial technology endowment, business progression, social perception, and core competencies; secondly, the "China Urban Sci-Tech Finance Development Index" introduced by Zero2IPO Research Center, which delves into dimensions such as policy frameworks, innovation dynamism, financial services, and developmental achievements. While the former has been annually published since 2018, the latter has joined the fray since 2020, both utilizing cities as their evaluation units, encompassing over 200 cities spanning all provinces in China. Given the alignment of the measurement period with the conditional variables in our study, we opted to consult the former. Our methodology involved: firstly, sourcing data based on its core indicators and evaluation framework to extrapolate results for 2015, employing estimated values to fill in gaps for missing indicators; secondly, aggregating the city-level indices within each province using a weighted approach, thereby utilizing the outcomes as a proxy for the development level of sci-tech finance within that province.

Based on this, we calculated the growth ratio of the sci-tech finance development index from 2015 to 2020 for 31 provinces, resulting in an interval variable ranging from 17.5% (the minimum) to 132.4% (the maximum). Then the direct calibration method was employed, with the key step being the selection of qualitative anchors. Theoretically, defining any five-year growth rate of sci-tech finance as a “high growth rate” is challenging due to the absence of a fixed standard. Rihoux and Ragin proposed referencing larger data sets to ensure calibration is based on “substantive knowledge” beyond the sample. Some studies determine the level by comparing its growth rate with that of the service industry, which constitutes a larger data set. For instance, a growth rate of sci-tech finance exceeding that of service industrial by more than three times as “rapid growth” and one 30% lower as “stagnation” [22]. According to this principle, we set the full membership anchor at the point where the growth rate of sci-tech finance exceeds that of the service industry by three times during the 13th Five-Year Plan period, and the full nonmembership anchor at the point where it is 30% lower. The crossover point is where the two growth rates are equal. Thus, a five-value fuzzy set was used to measure the outcome, assigning a membership of 1 to cases above the full-in point, 0 to cases below the full-out point, and 0.25 and 0.75 to cases between the full-out and crossover points and between the crossover and full-in points, respectively.

4 RESULTS AND FINDINGS

4.1 Necessary Conditions Analysis

The first step of the fsQCA is to test the necessity of the presence or absence of a single condition. The analysis results using the fsQCA3.0 software are outlined in Table 1. The consistency of PGS is 0.9237, and the consistency of PRG is 0.9142. Both reached a set consistency ≧0.9 threshold. That is, policy goal setting and policy resource guarantee alone may constitute a necessary condition for the high performance of provincial sci-tech finance. The consistency of the presence and absence of other conditions are all lower than 0.9, which is not necessary to achieve high industrial performance.

Table 1 Necessary Conditions Analysis.

Conditions	Consistency	Coverage	Conditions	Consistency	Coverage
IBA	0.6494	0.6347	~IBA	0.6620	0.5659
PGS	0.9237	0.6606	~PGS	0.2941	0.7067
KTD	0.8775	0.5692	~KTD	0.5219	0.6423
RDC	0.3913	0.6836	~RDC	0.8430	0.5556
PRG	0.9142	0.6693	~PRG	0.3107	0.5243

Note: '~' and '*' are the basic symbols of the Boolean calculation. The former means that the corresponding condition variable is missing, and the latter means "and".

As PGS and PRG are both necessary conditions, the empirical relevance between the two needs to be evaluated. A necessary condition X is trivial if its size exceeds the outcome Y, or if both X and Y are very large (close to being constants). We choose to judge their relevance or triviality by calculating the coverage of Y for X [23]. The coverage for PGS is 0.5642 and that for PRG is 0.5738, which implies that neither of these two conditions is trivial for the outcome. Comparing the set sizes in which the two conditions exceed the result, policy goal setting is slightly larger. That is, the condition of policy resource guarantee is more relevant to the outcome –high industrial performance.

4.2 Sufficiency Analyses for Condition Configurations

Second, to examine the sufficiency of different conditional configurations in generating the result. Three types of solutions can be obtained through the standardised analysis, namely a complex solution not including any logical remainders, an intermediate solution that only includes the logical remainders meeting theoretical expectations and empirical evidence and a concise solution that included all logical remainders without assessing their rationality. We considering that the conditions appearing in both the concise and intermediate solutions are the core conditions, the conditions that only appear in the intermediate solution are the marginal conditions and the necessary conditions are regarded as the core conditions to be included.

Table 2 summarises the valid condition configurations in an easy-to-read format, and shows their core conditions, marginal conditions, consistency and coverage. According to the differences in the core conditions, these solutions formed three typical paths for provincial policy performance production. Solution 1 (SI) can be expressed as "IBA * PGS * ~ KTD * ~ RDC * PRG". It provides a model wherein provinces select and set limited policy goals based on an in-depth analysis of the industrial basis, and then guides the inclined investment of public resources, thus is called a "limited adaptation" path of policy performance production. S2 can be expressed as "~ IBA * PGS * KTD * ~ RDC * PRG". It provides a model wherein provinces autonomously set policy goals, deploy key tasks around the goals and focus resource investments on the tasks, thus is called a "motivated action" path of policy performance production. S3 can be expressed as "IBA * PGS * KTD * RDC * PRG". It provides a model wherein provinces set policy goals based on an in-depth analysis of the industry basis, deploy key tasks, clarify the responsibility and coordination mechanisms and input resources according to the goals. This solution demonstrates how their industrial policy contents are derived by steps and how they are connected and implemented successively; thus, it is called a "systematic improvement" path of policy performance production.

Table 2 The Condition Configurations of Provincial Sci-tech finance "High Performance".

Conditions	Solutions		
	S1: IBA+PGS+PRG	S2: PGS+KTD+PRG	S3: IBA+PGS+KTD+RDC+PRG
IBA	●	△	●
PGS	●	●	●

KTD	○	▲	▲
RDC	△	△	▲
PRG	▲	●	●
Consistency	0.8620	0.8643	0.8073
Raw coverage	0.3072	0.4700	0.2821
Unique coverage	0.1320	0.1831	0.1133
Overall solution consistency		0.8135	
Overall solution coverage		0.6718	

Note: ● = Core condition exists; ○ = Core condition is missing; ▲ = Marginal condition exists; △ = Marginal condition is missing.

The above configurations prove the multiple causalities of policy performance production for provincial sci-tech finance; that is, fsQCA deepens the understanding of the link between policy content and industrial development. On the one hand, the consistency of each solution is relatively high, reaching the requirement of consistency for sufficient conditions, signifying that they have strong explanatory power. Among them, the unique coverage of S2 is the largest (0.1831), denoting that S2 has the strongest explanatory power. On the other hand, the overall solution consistency is 0.8135, highlighting that among all cases that met the three configurations of conditions, 81.35% of provinces have achieved high performance in sci-tech finance development. The overall solution coverage rate was 0.6718, which means that combining the three solutions can generally explain 67.18% of the provincial cases.

It is worth noting that PGS and PRG coexist in S1–S3, whether as a core condition or a marginal condition. This point shows that to obtain high industrial performance, the two factors must work together and complement each other. From the relationship between the five conditions, it can be seen that under the limitation of policy resources and the attention of policy executors, the deployment of key tasks often depends on the goals that have been set, and the division of responsibilities is determined according to the needs of the tasks. Finally, the tasks and division of responsibilities clarified the ways and directions of public resource input. Fundamentally, the resource allocation of industrial policies is determined by policy goals, which also ensure the realisation of policy goals. These two factors are indispensable for policy performance. Even if the deployment of key tasks or division of responsibilities is absent, policy resources can still be selectively allocated directly according to the goals.

4.3 Robustness Tests

This study adopts two schemes for the robustness test. The first is to make counterfactual inferences by constructing "non-high performance" and "low performance" results for provincial industrial development, which helps to further verify the existing conditional configurations. According to the principle of "causal asymmetry", X→Y does not necessarily lead to ~X→~Y (Barbara & Jan, 2016). We explored the conditional configurations for cases with high and "non-high performance" and "low performance" based on the calibration settings. The "non-high performance" group has two typical solutions. In the absence of IBA, PGS and RDC (even if there are KTD and PRG), or in the absence of PGS, RDC and PRG (even if there are IBA and KTD), it is impossible for provincial policies to achieve high performance. The core and marginal conditions of these two solutions are different from those of the "high-performance" group, which also shows that the necessary and sufficient conditions analysed above are reliable. The constructed "low performance" group cannot obtain identifiable solutions due to too few cases, and the consistency of its condition configurations is much lower than 0.8.

Second, we recalibrate the variables or adjust some of the parameters. As the conditions in this study are all qualitative variables, their policy text coding is highly structural and difficult to reset, we only chose the outcome for recalibration. The three anchors of full in, crossover point and full out are adjusted to 400%, 100% and 10% respectively, referring to the growth rate of sci-tech finance to service industrial added value. The same solutions could still be identified after repeated analysis, with an overall consistency of 0.8246 and an overall coverage of 0.6487. We also draw on the idea of Schneider and Wagemann to raise the consistency threshold for sufficient conditions from 0.80 to 0.83 and 0.85, or raise the frequency threshold from 1 to 2 (less than 10% of cases were excluded); the solutions acquired are still basically the same. Overall, the aforementioned fitted performance production paths are robust.

4.4 Interpreting The Policy Performance Production Paths

4.4.1 The "limited adaptation" path

The key to this path is to choose and set limited policy goals according to the analysis of the industrial basis and then guide the inclined investment of public resources. Some provinces have achieved success in the development of sci-tech finance, which mainly benefits from their highlights of the three major aspects of industrial basis analysis, goal setting, and resource guarantee in the policy system. Their policy goals are not "targetless" but based on the scientific analysis of the province's industrial basis to seek breakthroughs of key points, such as weak links of the industry and key challenges; then, they should be set as the goals. Meanwhile, with the guidance of the rigid assessment mechanism and quantitative index, the corresponding resource input to the industrial policy is naturally inclined based on the goal, or even the extreme situation of "doing less or none without the restraint of goal". In fact, the industrial development goal of a region is systematic (e.g. it can be divided into multiple dimensions of scale, distribution and innovation, which contain multiple measurement indicators). However, considering the boundary of government powers and responsibilities, the lack of policy information and the limited total amount of resources, it is particularly important to select a few goals and concentrate on the actions, which is more conducive to policy performance production. Researchers have gained extensive experience in goal management and attention distribution theory.

The “limited adaptation” path is represented by provinces and cities such as Hubei and Chongqing. They are areas with “bright spots” in the sub-developed echelons of sci-tech finance, and the industrial scale is at the upper-middle level. The advantages of the two indicators are prominent (even surpassing the leading provinces) in Hubei: industrial agglomeration and the gap between industries. The industrial innovation efficiency measured by input-output in Chongqing is nearly double that of the provinces at the same level. Over time, it may be foreseen that these provinces and cities will drive sci-tech finance with comparative advantages to achieve rapid development. Analysing its provincial-level industrial policy documents, it did not carry out comprehensive task deployment around the four elements of technology, talent, market and management. However, based on an in-depth analysis of the industrial basis, Hubei focused on industrial distribution, and Chongqing focused on industrial innovation; the coordination and responsibility division is more general than it is in other provinces. This type of provincial experience provides a model for fully relying on industrial-basis analysis to guide goal setting and resource input under the conditions of lacking key tasks and responsibility division in policies (or relatively weakened), as they can also derive good policy performance production.

4.4.2 The “motivated action” path

The key to this path is to set provincial policy goals autonomously, deploy the key tasks around the goals and invest resources in the tasks. Some provincial policies do not have an analysis of the advantages and disadvantages of past industrial development, but directly set performance goals based on an objective logic (e.g. the logic of goal integrity, the logic of highlighting key points, the logic of adapting to local conditions, etc.), and then deploy several special tasks under the guidance of the goal, giving targeted resource input to achieve success in policy performance. Target management theory treats each policy subject as rational. They set performance goals as needed, automatically guide performance-producing behaviors and raise corresponding resources. Accordingly, policy task selection and resource allocation around the performance goal can be regarded as the purposeful process of relationship and behavior adaptation within the performance production (inter-subjects). For provinces that conform to this path, their industrial policies often lack responsibility division and coordination, which may be included in the “key tasks”, or according to the aforementioned principles, the responsibility division and coordination mechanism presents a “rational and self-conscious” attribute.

The path of “motivated action” is represented by Sichuan, Gansu and other provinces and cities. These belong to the underdeveloped echelons of sci-tech finance. Their early industrial basis can be described as “all-around weak”, including industrial scale, agglomeration and innovation efficiency. However, during the “13th Five-Year Plan” period, Gansu’s Sci-tech finance averaged an annual growth rate of 13% and Sichuan’s annual growth rate reached 22%. Obviously, its growth engine has been “fully activated”. From the perspective of its provincial-level industrial policies, it has not been analysed too much. The foundation of local sci-tech finance (or the analysis is simple and general) and the development goal setting has not fully covered the three areas of industrial scale, distribution and innovation. However, two provincial governments have placed accelerating industrial development (“to be larger and then stronger”) in a prominent position, such as setting quantitative assessment indicators for scale and growth, and key policy tasks and resource inputs are also deployed around this main line. Their focus on the key points to make efforts is distinctive. Objectively, this type of provincial policy system and goal setting requires neither reference nor special concerns. Therefore, acting boldly according to actual conditions is available. They provide basic backward areas to consolidate their comparative advantages and achieve catch-up experiences through goal selection and resource orientation.

4.4.3 The “systematic improvement” path

The key to this path is that provinces set policy goals based on a comprehensive analysis of the industry, deploy key tasks according to the goals and then clarify responsibility division and coordination mechanisms, as well as input resources corresponding to the tasks. Its experience comes mainly from several advanced provinces in terms of industrial development. From a comparative perspective, the contents of each module of their policy system corresponding to the five condition variables are relatively comprehensive; that is, policy deployment has “overall advantages” compared to other provinces. Although, in terms of condition configuration, goal setting and resource guarantee are still the core elements of supporting policy performance production, the industrial basis, key tasks, coordination and responsibility division have also played important guiding and cohesive functions. At the holistic level, the provincial policies that conform to this path present the characteristics of “gradual deduction”, wherein the industrial basis is used to stimulate goal setting, key tasks are arranged around goal indicators and the division of labour and resource input is clearly defined according to the tasks. This kind of policy is undoubtedly logical, basic and scientific.

The “systematic improvement” path is represented by the two provinces of Guangdong and Shanghai, which belong to the “head” echelon of Sci-tech finance development. Except for specific aspects (such as unsteady growth), the performance of these industries is almost fully ahead, and the fields are relatively balanced. In contrast, Guangdong’s advantages are more prominent. Analysing the industrial policies of the two provinces, it is obvious that the two sets of documents are both complete in structure and content (i.e. the length is several times longer than similar policies in other provinces). Each part is discussed sequentially and pertinently according to the previous part, ranging from the industrial basis to goal setting, key tasks, coordination and responsibility division and resource guarantee. These provincial experiences can provide a model for all parts of the country to guide the performance and output of sci-tech finance through policy design.

5 CONCLUSIONS AND IMPLICATIONS

This paper centers on the inquiry "How do differentiated policy configurations lead to industrial development" and introduces the performance production as a novel perspective. To empirically observe this concept, we gathered policy texts from 31 Chinese provinces during the "13th Five Year Plan" period. We transformed qualitative data into variable measurements using structured calibration procedures and then simulated three typical paths of policy performance production using the fsQCA method. The "limited adaptation" path entails guiding the selection of policy objectives and targeted investment of public resources through an analysis of the industrial base. The "motivated action" path involves setting industry policy objectives to drive policy task arrangement and resource allocation. The "systematic improvement" path signifies that industrial policies are derived step by step and connected successively.

This research contributes to bridging the gap between policy context/implementation analysis and policy (performance) evaluation. It initiates the diagnosis of policy problems based on policy performance, aiding in bridging the divide between factual descriptions and value judgments of policies. In terms of methodology, apart from applying fsQCA to explore the combined impact of multidimensional policy contents—which surpasses traditional regression analysis by focusing on a single policy element and requiring a large sample—this study also deduces the calibration procedure for qualitative data from policy texts and provides reliable examples. At the practical level, by sorting the interaction between industrial policy contents and their performance production paths, it offers a demonstration for differentiated policy design and implementation across various regions.

As previously mentioned, existing related literature does not directly address the policy performance production mechanism but mainly focuses on policy performance management. From the perspective of policy goal management, they largely discuss the impact of different forms of goal setting on policy effectiveness. Our analysis further reveals how it affects, such as arranging key tasks around quantitative goals and preferential allocation of resources (the "motivated action" path). Research on policy element synergy largely explains the possibility of synergy between elements or measures the level of synergy, but this paper further presents a realistic mechanism for different elements to guide and synergize with each other, such as selecting policy goals and investing public resources according to industrial base analysis (the "limited adaptation" path). Regarding policy implementation deviation, scholars generally identify its reasons through policy executors, the institutional environment, or information resources. Our study supplements the analysis from the perspective of the internal interaction between policy and implementation systems. For instance, connecting policy contents sequentially and clarifying the mechanism of responsibility division and coordination are more conducive to achieving high performance in industrial development (the "systematic improvement" path).

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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