



Research article

A qualitative comparative analysis of the evolution path of postgraduate enrollment expansion policies and social development in China

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ABSTRACT

Postgraduate enrollment expansion policies in China have formed a development system of postgraduate education with an expansion of scale and increase of categories. Taking the institutional equilibrium theory as the prerequisite of assumption, this study evaluates 30 postgraduate enrollment expansion policies using the fuzzy set qualitative comparative analysis method (fsQCA method) and explores the matching degree between policy changing path and social development. It is found that path dependence is the main cause and trend of progressive policy change, the construction of the national strategy determines the direction and content of policy change, and the environment induces the abrupt logic and gives early warning to policy change. Therefore, the postgraduate enrollment expansion policy system respects the law of education itself, has contingency and flexibility, adjusts the training structure, and improves the competence of highly specialized talents to serve society. However, it is still necessary to closely follow the social demand to clarify the dialectical relationship between the scale and structure of postgraduate enrollment and highlight the strategic advantages of the government's decision.

1. Introduction

The enrollment scale of higher education institutions reflects the level of social development and is an important indicator to measure the quality of higher education. The public policy of “expanding enrollment scale” is a kind of policy behavior in which the government takes the initiative to adjust the development scale of higher education in view of the change in political and economic situation [1]. The postgraduate enrollment expansion policies in China are the public will and initiative of the Chinese government on the development of higher education, and also the requirement and strategy for postgraduate enrollment [2]. Successful postgraduate enrollment expansion policies should be development strategies that conform to the national behavior and social development needs, which not only meet the demand for high-level talents in social development but also suit the development law of the country's higher education [3].

The development history of China's postgraduate education shows that the number and discipline categories of graduate students are increasing year by year (seen in Fig. 1). Since the resumption of postgraduate education enrollment in 1978, there has been a slight

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increase in numbers, discipline categories, and admission rate each year with a number of 10,800 students enrolled and a 1.7% enrollment rate from 3 enrollment categories that year. By 1985, the number of students enrolled had expanded to 47,000, and the admission rate reached 35%, with the number of enrollment categories reaching 10. Then, starting in 2007, with the increase in postgraduate applicants, the number of enrollments expanded year by year, but the enrollment growth rate declined year by year. By 2009, because of the major change in discipline categories that the full-time professional degrees were increased, the enrollment numbers and acceptance rates rebounded, however, they fell again, reaching the lowest in 2014. In 2017, with the addition of part-time graduate students in the enrollment category, the enrollment number and enrollment growth rate picked up again, and new institutional arrangements appeared in the enrollment scale and degree structure of graduate students. By 2021, although the enrollment categories have been improved to 13, the acceptance rate has declined from 29.55 percent to 24.22 percent as the number of applicants continues to rise, from 63.5 in that year to 4.57 million in 2022 to 4.74 million in 2023. Meanwhile, the public is uncertain about whether the change of postgraduate enrollment policies adapts to the change in social environment, so they do not trust the compatibility between the intensity of postgraduate enrollment policies and the development degree of postgraduate education and have doubts about the matching degree between the change of policies and social development, such as structure disequilibrium, quality decline, and insufficient supply of resources. Therefore, it is necessary to investigate the compatibility between China's postgraduate enrollment expansion policies and social development to dispel public concerns.

Besides, based on the literature review, the existing studies have fully explored the policy system and its historical evolution. However, there is not enough attention paid to the special research on postgraduate enrollment expansion policies. By combing the historical changes in postgraduate education policies, it is found that there are strong path-dependence in policy changes, and there are phenomena of institutional fine-tuning, institutional replacement, institutional transformation, and institutional rupture, the disadvantages of which should be overcome through institutional innovation [4]. Some scholars have made a qualitative description of the development process of China's postgraduate education policies, which can be divided into the initial stage of closedness and singleness, the reform stage of diversified development, the perfect stage of rapid development, and the deepening stage of optimizing quality [5]. Others mostly take the text of policies as the research object on the evaluation of postgraduate policies, and hold that the formulation of postgraduate education policies should pay attention to long-term goals and macro goals, constantly transform government functions, and stimulate the vitality of the postgraduate education system [6]. In the aspect of thematic research, scholars have analyzed the historical evolution and value structure of the educational policies of professional degree postgraduates, and believe that the substantive value of the policies is much more than the symbolic value. Among them, the proportion of technology value and power value in entity value is larger while the proportion of ideological value in symbolic value is the largest [7]. These studies on postgraduate policies focus on the policy itself and the effect of implementation and pay less attention to the process and reason of policy formation. In addition, research on professional degrees shows that scholars are concerned about the change in the structure of postgraduate education, but they do not consider this change in the strategy of postgraduate education policy change. In general, there are a few studies on postgraduate enrollment expansion policies that focus on two aspects: single-factor empirical analysis and theoretical deduction of the necessity and reason for enrollment expansion. The former kind of studies mostly use quantitative research methods, such as analyzing the correlation between postgraduate enrollment expansion and certain factors in the social environment, that is, the degree of coordination between the enrollment expansion and regional economic performance [8] or using the multi-source analysis framework to analyze the scientific nature of the postgraduate enrollment expansion policy agenda in the period of major public crisis [9] or exploring the problems, policy sources and political sources of policy formation of enrollment expansion of professional degree postgraduate education in China [10]. However, due to the consideration of a single factor and the lack of evaluation and analysis of multiple factors under the macro-historical process, most of the conclusions of this kind of study are negative or partially negative on the social significance of the enrollment expansion policies. The latter kind of study focuses on exploring the

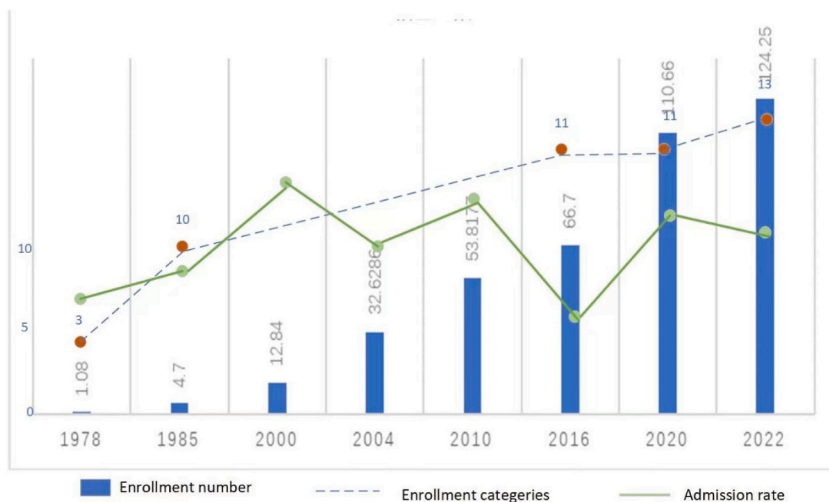


Fig. 1. Postgraduate enrollment number, discipline, and annual growth rate.

motivation and value of the enrollment expansion policies. Based on the empirical summary of the public’s demand for enrollment expansion, they discuss the value basis of the enrollment expansion policy from three dimensions: value choice, legitimacy, and effectiveness [11]. Or they take the enrollment expansion policies of postgraduate education as a comprehensive effect of adapting to the macro-social needs, solving the economic dilemma, and getting out of the cycle of “exam-oriented education” [12].

To sum up, the existing research on postgraduate education policies mainly focuses on the policy results and implementation performance and lacks research on the policies themselves, and the discussion on the path of related policy changes since the enrollment expansion. At the same time, most studies have discussed the influence of a single factor on the enrollment expansion of postgraduate students, and this kind of research paradigm is weak in the systematic complex relationship and investigation among influencing factors, that is, it is difficult to deal with complex logic problems such as the interdependence of antecedent conditions and the equivalence of multidimensional configurations.

In view of these key problems and the lack of related studies, the introduction of the fuzzy set Qualitative Comparison Analysis method (fsQCA method) can identify the matching path of postgraduate enrollment expansion policies and policy environment under different historical conditions. As a case study-oriented theoretical set research method, the fsQCA method can systematically investigate the causes of events, the interrelation between internal generating factors, and the complex combination of causes that trigger events, so as to deepen the understanding of the complex causality of events. However, the fsQCA method mainly focuses on the economic field, while the relevant research on higher education only accounts for 2.9% (seen in Fig. 2). In this way, as an important part of postgraduate education, postgraduate enrollment expansion occupies an important share in postgraduate education research, which needs to be supplemented by new research methods, and the analysis of multiple causality by the QCA method can better fit the complex logic behind postgraduate enrollment expansion. This method has two advantages over traditional research methods. First of all, this method is helpful in accurately classifying the change types of the postgraduate enrollment expansion policies and lays a foundation for future path analysis. Secondly, this method uses configuration analysis to emphasize the influence of the interrelated structure of various variables on the results of the postgraduate enrollment expansion policies and explores the direct relationship between the adjustment of the enrollment expansion policies and the policy environment under different scenarios.

As can be seen from the above, the existing studies on China’s postgraduate education policies focus on the policy results and implementation performance, lacking research on the policies themselves. There is also no evaluation of the policies, that is, the appositeness between the goal effectiveness of the policies and social development, which is worthy of exploration. Public policies are the action plan developed by a national or regional decision-making body in response to a specific problem or challenge, the goal of which is to promote social development and improve social well-being in response to changing circumstances [13]. Meanwhile, policymakers need to constantly innovate and adapt policies to new challenges and needs [14]. This study takes institutional equilibrium as the hypothetical premise of policy evaluation, refines important factors in the policy environment, and uses the QCA method to assess whether these factors match with China’s postgraduate enrollment expansion policies, that is, whether social development and China’s postgraduate enrollment expansion policies are in a balanced state, so as to evaluate multiple public policies and determine whether they contribute to improving the quality of education.

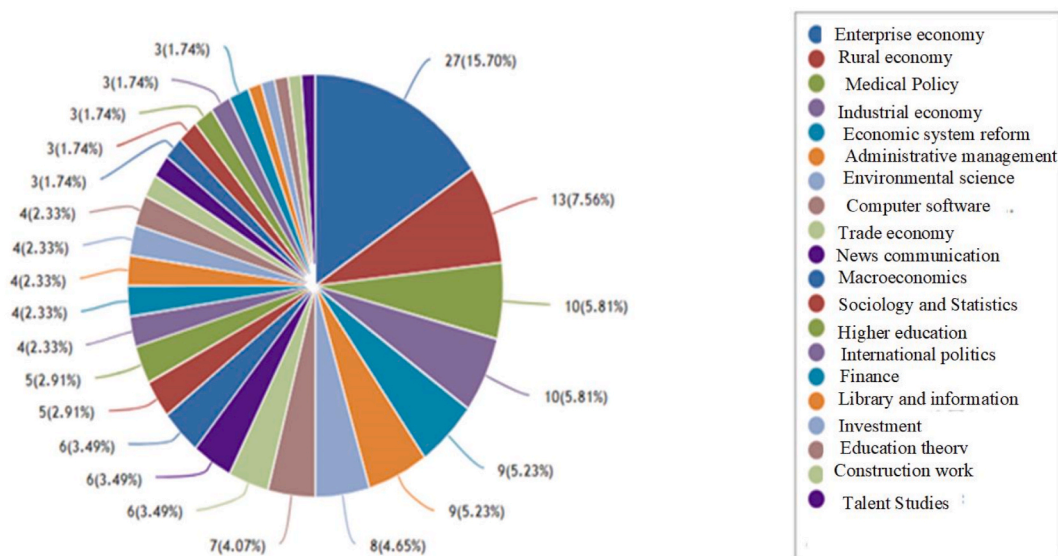


Fig. 2. Use of qualitative comparative analysis method.

2. Theory

2.1. Institutional equilibrium theory

As a kind of public policy, it is necessary to evaluate and monitor the postgraduate enrollment expansion policies comprehensively [15]. There are two kinds of ways to evaluate public policies. One is to evaluate policy results, that is, the effectiveness of policy implementation and the degree of meeting the targets. The other is to evaluate the degree of matching between policy formation and social development and to determine the scientificity and rationality of policies by the degree of timely synchronization between policies and social development. The latter is more conducive to timely adjustment of policies to improve adaptability and sustainability [16]. Postgraduate education is the re-selection of highly specialized talents by the higher education system, which plays a more significant role in social development. Therefore, it is more susceptible to the influence of social environment than undergraduate education, and the relationship between the policy process and social environment is closer. To analyze whether the postgraduate expansion policies and the environment are in a balanced state with the institutional equilibrium theory is conducive to dynamically evaluating the implementation benefits of the policies, and improving the scientificity and sustainability of the policies.

The institutional equilibrium theory of the Neo-institutional school regards the institutional environment in which policies are located and the institutional arrangements formed by policies as two forces, and holds that when either party has no motive and ability to change the status quo, it is “behavioral equilibrium”; On the contrary, when the factors in the institutional environment promote the reorganization of institutional arrangements, it enters the state of “behavior disequilibrium” [17]. This theory was first proposed and used by North to explain the impact of institutional differences in different countries on economic growth in the 1970s [18]. He believes that institutional equilibrium is a kind of behavioral equilibrium that adapts to the will of different groups, and there is no mutually exclusive relationship between institutional environment and institutional arrangement [19]; when the institution and the environment are in a state of mutual adaptation and coordination, the decision-makers have no intention or ability to change the current institution [20]. According to this theory, the policy system for postgraduate enrollment expansion forms an institutional arrangement and conducts institutional allocation of national higher education resources. If it is at equilibrium with the institutional environment, it will maintain the status quo and promote the benign development of graduate education. On the contrary, when the demand for postgraduate enrollment policies is not at equilibrium with the change in environment, it is necessary to adjust the enrollment expansion policies, accordingly, promote the mutual adaptation of policies and the environment, and then maintain the stability of policies until the change of the external environment triggers the re-adjustment of the enrollment expansion policies. This trigger may have two kinds of logic: progressive logic and abrupt logic. The institutional equilibrium theory provides the premise of a logical assumption to better analyze the changes in the policies of postgraduate expansion, that is, it assumes that policies and the institutional environment follow the principle of equilibrium. When the change of postgraduate enrollment expansion policies adapts to social development, it is at the state of institutional equilibrium. Otherwise, there will exist two kinds of policy changes: progressive change and abrupt change. Therefore, this study extracts antecedent variables and result variables from the policy environment to evaluate the process equilibrium and result equilibrium by binary assignment and analyzes the variables and variable combinations that affect the social environment in the process of policy change, deducing the paths of the policy change and internal logic based on weight analysis of the effect of these variables on the policies.

2.2. Variables

Institutionalist scholars Merilee S. Grindle and John W. Thoma defined institutional environment as the “widely understood social reality” including public opinion, views of important figures, the tradition of the education system and the knowledge it imparts, law and its judgment, etc. [21]. These “social realities” are both differentiated and organized. To a certain extent, the interests of the economy, culture, politics, history, and values change, and the environment that influences decision-making has an obvious potential effect on policy choices and changes [22]. Meyer emphasized the need to study and understand various organizational behaviors and explain various organizational phenomena from the perspective of the organizational environment and proposed that if attention is given to the environment, the technical environment should be considered in addition to the institutional environment. It means paying attention to the legal system, cultural expectation, social norm, concept system, and other “widely accepted” social fact systems of an organization, while paying attention to the technical elements such as public media means, administrative management level, and even organizational change technology [23]. In addition to the obvious and potential institutional environment such as power relationships, organization, and interest structure in social reality, which will affect the policy process and restrict the choice of decision-makers and performers, the technological environment is the supporting condition of policy change, affecting the speed and extent to which decision making can change the direction of the policy change and the scope of the role of decision-makers. Therefore, the policy change logic and policy environment are set as vertical and horizontal axes.

The two logics of progressive policy and abrupt policy are located at both ends of the horizontal axis, and institutional environment and technical environment are taken as the two ends of the vertical axis of the policy environment, thus forming four quadrants. According to the logic and environmental factors of each quadrant, five antecedent variables of focus event (V_{I-1}), focus fusion (V_{I-2}), media opinion (V_{II}), policy image (V_{III}), and the openness of agenda (V_{IV}), which affect the policy change of postgraduate student enrollment expansion, and one outcome variable (O_0) of policy change, are extracted. Among them, the factors that affect the process of policy change are antecedent variables while the variables that affect the result of policy change are outcome variables. In addition, 0 and 1 are coded for the attribution degree of each antecedent factor and the explained outcome. The assignment here is different from the distance or the precise value between 0 and 1 of the ordering variables, but to define the configuration of each antecedent variable

and attribution degree of the research objects in each configuration according to the research theory and policy environment. The main explanation is the “strength of correlation” between the factors and the explained outcome. If there is a strong correlation between the factor and the outcome, it is denoted as 1; otherwise, it is as 0. The choice of each variable is based on the institutional school’s interpretation of the policy environment and the logic of policy change (seen in Fig. 3).

2.2.1. Antecedent variables

Antecedent variables should be extracted as much as possible to extract the single factor that has a significant effect on the process and outcome of policy change to facilitate the consideration of multi-factor configuration effects. Two antecedent variables, focus event (V_{I-1}) and focus fusion (V_{I-2}), are extracted from the first quadrant which conforms to the policy’s abrupt logic and belongs to the technical environment. Variable measures the agenda-triggering mechanism, and it points to the force formed by the interaction between policies and the public and media agenda, to generate public opinion pressure on decision-makers, thus promoting the issue to enter the policy agenda. In the process of the smooth operation of the postgraduate enrollment expansion policy, the appearance of V_{I-1} breaks the original equilibrium between the supply and demand of multi-interest groups in the previous enrollment expansion policy, forcing policymakers to adjust the enrollment expansion policy, to achieve a new equilibrium state of policy. V_{I-2} and V_{I-1} belong to the same phenomenon but differ in the degree of abrupt logic. V_{I-2} crosses the boundary of the field and specifically evaluates the effect of V_{I-1} on the process and results of policy change. V_{I-2} is the new interpretation and definition of the problem caused by the fusion of similar events of V_{I-1} . Its occurrence may be regarded as an occasional and single event, but if it is combined with similar events, it may be regarded as the absence of the system or the mistake of the policy, thus inducing the reform or adjustment of the postgraduate enrollment expansion policy. According to the theory of institutional equilibrium, there are two motivations for policy change. One is spontaneous, as the change in the political environment makes decision-makers promote policy change out of the motivation of actively detecting and solving problems. The other is due to the change in the social environment caused by emergencies, which breaks the stability of policy operation and puts pressure on the political system from the bottom up, forcing decision-makers to make changes or maintain the original decision-making method [24].

Therefore, V_{I-1} and V_{I-2} in the first quarter are not only the measurement of focus events and public opinion but also the measurement of technical factors in the institutional environment. Through the process of policy change, the motivation and results of the change of variables are examined to measure the key role of focus events and focus fusion in the process of postgraduate enrollment expansion, which can also measure whether stakeholders create public opinion with the help of focus events, and break the agenda blockade of the policy system in this way, to prompt decision-makers to change the policy image of negative squeezing and promote the change of enrollment expansion policy. Therefore, if there is a focus event that has a deep influence and promotes policy changes in the process of postgraduate enrollment expansion, V_{I-1} is denoted as 1, and vice versa. At the same time, if there are several focus events or fusions with other events to produce a scope effect, then V_{I-2} is denoted as 1, and vice versa.

Media opinion in the second quadrant with policy progressive logic in the technical environment becomes antecedent variable V_{II} . Media opinion (V_{II}) refers to the relevant reports on focus events by official mainstream media (e.g., People’s Net, Xinhua.cn, etc.) and private-public media (e.g., WeChat, Weibo, Zhihu, etc.) as well as tracking and follow-up behaviors. With the development of the socio-technological environment and the increasing public enthusiasm for postgraduate education, V_{II} has become an important way for the public to participate and feedback on policy decisions. This variable determines the basic scope and direction of the change of enrollment expansion policy. With the convergence of the two variables V_I in the first quadrant and the eventual end of the enrollment

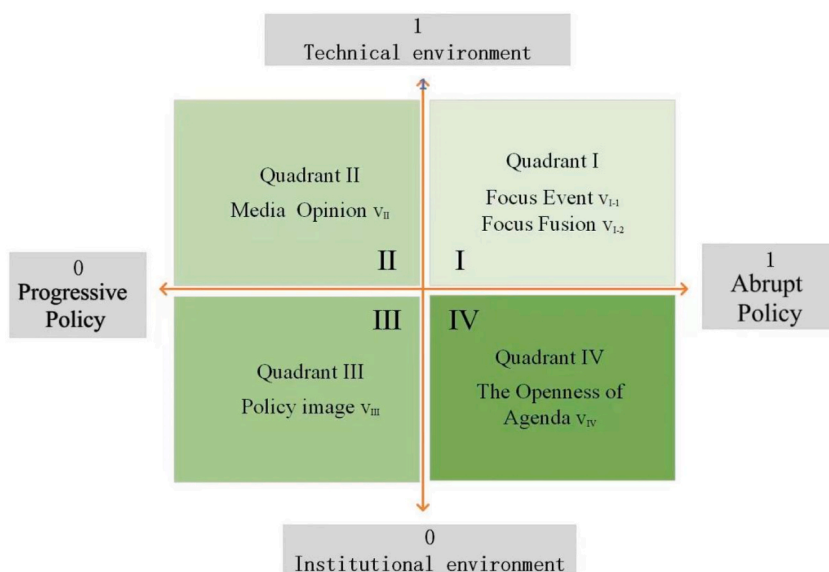


Fig. 3. Variables extraction.

expansion policy in the previous period, both have to consider the support of media actions. V_{II} connects the problems reflected by the two V_I variables with the targeted policies or converges and amplifies the public's negative emotions towards the policy image through interaction, to promote the policy to come to an end. Therefore, if the media plays a driving role in tracking and following up on the adjustment of postgraduate policies, V_{II} is denoted as 1, and vice versa.

The representative element in the third quadrant of progressive logic and institutional environment is policy image (V_{III}). V_{III} measures the extent to which a postgraduate expansion policy is understood and accepted by the public and the media after its introduction, denoting its value. The policy subsystem is highly dependent on the macro-political environment, which largely determines the course of the expansion policy and the degree of openness of the policy agenda. Once the accumulation of the macro-political environment facing negative policy images leads to a reformation of the concept of expansion, the policy-making subsystem will take over and respond quickly, the corresponding agenda will be opened immediately, and the policy-making system will switch and adjust accordingly. The specific content and model of the enrollment expansion policy form the external image of the policy among the public. V_{III} is the socialization expression of the internal value of the policy, denoted as 0. The negative policy image causes the public to question the value of the expansion policy itself, the equilibrium is broken, and the policy maker influences the policy change by adjusting the policy to create a positive policy image, denoted as 1.

Reflecting the logic of abrupt policy change, it belongs to the fourth quadrant of the institutional environment element, refining the antecedent variables of the openness of agenda (V_{IV}). This element refers to the degree of monopoly of the policy system in a specific policy issue. It is an important factor in the promotion of institutional change by actors with a new understanding of the context and with power and is a good measure of the government's coordination and balance ability to construct and regulate social, economic, and political life in particular [25]. In the context of postgraduate expansion, V_{IV} is a measure of the extent to which the policy agenda is open to the participation of stakeholders other than policymakers, as well as the extent to which the three spheres of governmental forces, social organizations, and schools are involved in the policy process [26]. When decision-makers open the policy-making process, universities and the market participate in the decision-making, which is set as 1; On the contrary, when decision-makers close the policy-making process, multi-interest groups such as universities and markets do not participate in decision-making, which is set as 0. Usually, V_{IV} and V_{III} are combined. However, when the policy image changes and the existing expansion policy fails to solve the emerging problems, it is difficult to maintain the policy monopoly with the existing V_{III} . Coupled with the impact of two variables V_I in the first quadrant, the policy monopoly is broken, in this way, V_{IV} appears. In the process of refining and assigning the antecedent variables, the weakness of a single variable in explaining the changes in postgraduate recruitment policy has been implicitly revealed, which is confirmed by the results of the qualitative comparative analysis applied later in the study.

2.2.2. Outcome variables

Institutional equilibrium helps to satisfy the interests of different interest groups, thus avoiding conflicts and wars among interest groups so that each interest group will maintain the existing political system. In contrast, the failure to satisfy the interests of different groups leads to a policy fracture and a failure to balance the policy and the environment. In this regard, this study uses policy disequilibrium as the outcome variable and the "overall policy objective" as a measure of the equilibrium between policy expansion and the policy environment. In other words, if the overall policy objective is different from the past, the expansion policy is judged to be out of balance with the policy environment, which means it is in disequilibrium 1; if the overall policy objective is the same as the past or only partially adjusted, the expansion policy is judged to be in balance with the environment and it is in equilibrium 0.

The antecedent and outcome variables in the sample are calibrated before the group analysis by the requirements of the fsQCA analysis and transformed into affiliations on the set (0, 1), with the specific assignment of the variables shown in Table 1.

3. Methodology

3.1. Methods

The ways public policies are evaluated and monitored can include both qualitative and quantitative approaches to assess the impact of policies through data and social feedback. In this study, the QCA method initiated by Larkin and based on fuzzy set theory is used to

Table 1
Definition and binary coding of antecedent and outcome variables.

Variable	Coded as 1	Coded as 0
Antecedent variable (V)		
V_{I-1}	Presence of unexpected crisis events	No crisis events
V_{I-2}	Several impact events have occurred	Only one focal event exists
V_{II}	There is a push by the media to track and follow policy adjustments, etc.	Media opinion has not contributed to policy adjustments
V_{III}	Change in policy image compared to the past	The policy image remains as it is
V_{IV}	Universities, markets, and multiple interest groups are all involved in decision making	Closed policy-making process for decision makers so that universities and markets are not involved in decision making
The outcome variable (O)		
O_0	The presentation of the overall policy objective is a departure from the past	The overall policy objective is the same as in the previous period or has only been partially adjusted

systematically investigate the causes of events and the interaction between internal generating factors as well as the combination of possible relations, in an attempt to explain the key factors contributing to the occurrence of events, the interrelation between the factors and the combination of factors stimulating the complex causes of events, to deepen the understanding of the complex causal relationship of enrollment expansion policies in different periods [27]. This method has two advantages. First, the framework is good at identifying the combined effect of multiple variables rather than focusing on the net effect of a single independent variable on the dependent variable and holds that the causal chain between policy change and social environment is not one-to-one correspondence [28]. Second, unlike most statistical analysis methods which are difficult to deal with both individual cases and general cases. On the contrary, it is good at integrating qualitative and quantitative research, as well as case induction and interpretation of special cases [29]. The change in postgraduate enrollment expansion policies is the result of a complex multi-factor effect. Conventional statistical analysis of independent or pairwise interaction of national/group strategy, internal and external institutions, historical trajectory, and other factors is far from enough. This method can be used to explore the complex joint effect of many factors from the holistic relationship. In addition, the QCA method is based on Boolean operation, which can combine systematic quantitative analysis (data processing with fsQCA3.0 software) with qualitative research methods to deeply understand the actual phenomenon, and can investigate the typical environment and representativeness of small and medium-sized samples one by one [30]. In this case, the implied meaning and the quantity of the sample of the postgraduate enrollment expansion policies can be well balanced.

3.2. Sample

The selection of policy samples is the process of answering which policies can answer research questions. By combing through postgraduate enrollment expansion policies in China, the system of expansion policies that represents the change in scale and structure of postgraduate education can be determined. This means that the results of the changes in the structure and scale of postgraduate education between these policy samples and postgraduate education should have both positive and negative results, which can be measured by binary 1 and 0. At the same time, the results are heterogeneous enough to determine the attributes of change, namely, the degree of matching and adaptation with the policy environment. Therefore, to ensure the accuracy and representativeness of the policy conclusions, the research texts are selected from the direct documents issued by Chinese government official institutions related to the adjustment of enrollment scale and structure of postgraduate education and indirect policy documents affecting the comprehensive reform, high quality and connotation development of postgraduate education, which also meet the following three conditions.

First, the sample population has sufficient homogeneity and maximum heterogeneity, and the selected samples must share enough background or characteristics to reflect the logical characteristics of the enrollment expansion of postgraduate students in the era. Meanwhile, the selected cases are diversified to achieve the maximum degree of inter-sample heterogeneity in the minimum number of samples.

Second, the source of samples should be authoritative and available, that is, the policies selected in this study should have guidance for the development of postgraduate education in a macro sense, and only the policy texts issued at the national macro level should be considered according to the research topic. The types of policies are all from the laws, regulations, plans, outlines, regulations, methods, and notices published on the official website, embodying government credibility and policy effectiveness at the same time with strong availability.

Third, the integrity of sample collection is also considered. This study not only takes “postgraduate enrollment expansion” as the keyword but also takes into account the provisions of other higher education policies that reflect the structural adjustment and quality development of postgraduate students. After the screening, a total of 30 eligible enrollment expansion policies were finally collected. Meanwhile, for convenience and clarity of measurement, the policies are sorted in chronological order and coded as shown in [Appendix A](#).

3.3. Research design

The logical basis of QCA is set theory and Boolean algebra operation, that is, the relationship between condition variables and outcome variables is investigated from the perspective of a set relationship rather than a non-linear relationship, and the relationship is simplified by Boolean algebra operation. Generally, QCA has relatively strict operating procedures. First of all, literature review, that is, to summarize and discuss the existing studies, and analyze the current research status of postgraduate enrollment expansion policies. Secondly, sample selection, selecting suitable research samples for qualitative comparison. Thirdly, the relevant variables are extracted and the values of (1,0) are calculated according to fixed rules. Fourthly, according to the relevant samples and assigned variables, the necessity conditions are detected, that is, whether there is a single necessary condition affecting the occurrence of diffusion in the extracted variables. Finally, the remaining variables are incorporated into the software and the configuration path is obtained.

4. Results

4.1. Single variable necessity analysis

Necessity analysis is conducted through the fsQCA3.0 software to see if there are cases where a single variable is necessary as an outcome and if any of the variables meet the criteria for necessity. Generally, when the concordance is ≥ 0.9 , the antecedent variable can be considered a sufficient condition for the outcome variable [31]. When policies in AppendixA are coded according to variables in

Table 1 and are imported into the fsQCA3.0 software for calculation, the results are shown in Table 2.

From the results of the single-variable necessity analysis in Table 2, the consistency values of all the antecedent variables do not reach 0.9, which can be tentatively judged that the explanatory power of individual variables is weak and does not constitute a sufficient necessary condition for the change of a single postgraduate expansion policy, which confirms the conclusion of the existing literature on the single factor exploration of multiple negativities. From this, this paper will further study the group effect among the antecedent variables.

4.2. Configuration analysis

Given the lack of determinacy of individual variables on the outcome variable, this study draws on the fsQCA 3.0 software to test the conditional grouping of the sample cases, exclude counterfactual paths, and plot the results of the study presented in the truth table as shown in Fig. 4, concerning the QCA results presentation proposed by Ragin and Fiss [29].

As known from the configuration paths of postgraduate expansion policies in China in Fig. 4, the overall consistency of the paths is 1, indicating that the empirical analysis is valid and has a high explanatory strength of necessity, while the coverage rate is 0.63, implying that it can explain about 63% of the expansion policy cases. In Fig. 4, each column represents one possible conditional configuration. Initially, it is found that the consistency of all conditional configurations is 1, indicating that all cases satisfy the consistency condition, which means all three types of conditional configurations are sufficient essential conditions leading to a break in the postgraduate expansion policy. Based on the above verification of the necessity of conditional configuration for the expansion policies, the corresponding combination of policy samples is explained in the context of the policy environment, and it is found that the changes in the expansion policies of postgraduate students show three paths, namely, P1, P2, and P3. In P1, the policy environment does not change in scale, and the benefits of multiple interest groups such as the government, schools, and the market always remain in equilibrium, making it difficult for the expansion policies and the social environment to deviate from equilibrium in the short term, so P1 is judged to be path dependence. In the process of institutional equilibrium, if an unexpected focal event breaks the balance of income and expenditure between the original interest groups, and the original policy image cannot meet public demand, a second path, P2, named environment induction, will arise. But the expansion policies cannot always be optimally adjusted ex-ante according to the expected path and even unanticipated environmental changes, and in the long run, the original small, neglected path disadvantages will be concentrated at a certain time, damaging the positive policy image, requiring policymakers to macro-control so that policies always maintain equilibrium with the changing institutional environment, so the third path-P3, which means strategy decision, emerges.

5. Discussion and conclusions

5.1. Discussion

5.1.1. Path dependence: follow the laws of education

As shown in Fig. 4, P1 is the configuration of three antecedent variables: the openness of agenda, media opinion, and policy image. According to the variable pointers, the openness of the agenda plays a decisive role in policy change, while media opinion and policy image play a driving role. The original coverage of the path is 0.40, indicating that the causal path has explanatory power for 12 of the 30 expansion policies ($30 \times 0.40 = 12$), with representative policy numbers of S01, S02, S09, S11, S14, S15, S20, S21, S22, S25, S27, and S28. The commonality of these policies is that the motivation for their enactment is influenced by the previous policies, which are mostly the improvement and development of the previous policies. This variable configuration can be judged as whether there is an equilibrium between the postgraduate expansion policies and the environment that originates from path dependence on the previous policies.

According to institutional equilibrium theory, “path dependence” is similar to inertia force in Physics. In specific, once the institutional change enters into a certain path, it may be dependent on this path. This path is constrained by economies of scale, learning effect, coordination effect, adaptive effect, and vested interests, with increasing exit cost, allowing the system to continue self-reinforcing along the established direction [32]. Adaptive expectation means that when the coordination effect is established, some people will benefit from complying with the rules of the system, and this group of people will adapt to and agree with the rules of the system, creating an adaptive expectation for the system to last, and spontaneously removing some uncertainties in the system, thus forming an increasing reward effect, and institution change will form a path dependence due to the influence of the increasing

Table 2
Results of the single variable necessity analysis.

Antecedent Variable (V)	The Outcome Variable (O)	
	Policy Broken (1)	Policy Unbroken (0)
Focus Event V_{I-1}	0.538493	0.3482547
Focus Fusion V_{I-2}	0.353857	0.353589
Media Opinion V_{II}	0.634749	0.639477
Policy Image V_{III}	0.839163	0.864482
The Openness of Agenda V_{IV}	0.413436	0.522673

Antecedent variables		Path Configuration		
Media Opinion	existent		○	
	non-existent	○	○	○
Focus Event	existent	○	●	
	non-existent	○	○	
Focus Fusion	existent	○	○	
	non-existent		○	
Policy Image	negative	○	●	●
	positive	○	⊕	⊕
The Openness of Agenda	existent	●	○	
	non-existent	⊕		○
Path Name		I	II	III
Coverage		0.40	0.23	0.36
Consistency		1	1	1
Overall coverage		0.63		
Overall consistency		1		
Representative Policy		S01 S02 S09 S11 S14 S15 S20 S21 S22 S25 S27 S28	S06 S07 S08 S23 S24 S26 S30	S03 S04 S05 S10 S12 S13 S16 S17 S18 S19 S29

Fig. 4. Configuration Paths of China’s Postgraduate Expansion Policy Changes. Note: ● or ○ means that the condition exists; ⊕ indicates that the condition does not exist; “Blank area” indicates that the condition may or may not exist in the configuration; ● or ⊕ indicates the core condition; ○ indicates an auxiliary condition.

expectation effect. After the rectification of the ten-year Cultural Revolution, China’s cultural and educational undertakings developed comprehensively, the original graduate recommendation system was replaced by a selection system, and the highly qualified talents represented by postgraduate students poured into the market to contribute to the social policy economy, maintaining the balance of income and expenditure of various interest groups.

Economies of scale refer to a certain range of products, as production increases, the average cost continues to decrease. China’s postgraduate expansion policies originated at the beginning of the new century. China’s employment environment has changed along

with the increasing number of college graduates. The increase in the market access threshold makes the base of postgraduate applications expand year by year. As the public demand increases, S01 and S02 are introduced, in line with China's public education demand, so that China's postgraduate education grows out of nothing, promoting the development of high-level education in China.

The coordination effect is the establishment of an institution by various interest groups and organizations to regulate and guide people's social activities; to better communicate and cooperate with others, so that investment in institution building is increased to form a series of related formal or informal institutions, thus forming a coordination effect. The expansion of graduate students has public attributes, S09, S11, S14, and S20 are restructured through enrollment categories, military-oriented training, special rural education master's degree, special free teacher training students, and special retired student soldiers, prompting the expansion policy to improve and optimize based on the original institutions, keeping it compatible and coordinated with the needs of various sectors of society.

The learning effect refers to the fact that after the establishment of the new system, the various stakeholders will make full use of the profitable opportunities provided by the system by learning from each other and by accumulating experience themselves, thus strengthening the learning effect of the system itself. This effect is fully demonstrated in the introduction of S15, S21, S22, S25, S27, and S28, where a series of laws, rules, regulations, and systems that promoted the development of the postgraduate expansion policy in the early stage interlocked and formed an institutional matrix, with obvious learning effects, while the cost of withdrawing from the existing system kept rising, and rashly making large-scale adjustments to the expansion policy involved the redistribution of interests among relevant stakeholders, which would also bring unpredictable social problems. It can be found that the coordination effect occupies a dominant role, focusing on the restructuring and improvement of postgraduate enrolment, fully reflecting that the path dependence of China's postgraduate expansion is in line with both the vested interests of education development itself and the accumulation of social development benefits, as well as the social accumulation effect of several long-standing functions of universities.

5.1.2. Environment inducement: grasp key events in society

As shown in Fig. 4, P2 is the configuration of the four antecedent variables of focal events, policy image, the openness of agenda, and media opinion. According to the variable pointers, focal events and policy image play a determinant role, while the openness of agenda and media opinion play a supporting role. The original coverage of the path is 0.23, indicating that the causal path has explanatory power for 7 out of 30 expansion policies ($30 \times 0.23 \approx 7$), with representative policies S06, S07, S08, S23, S24, S26, and S30. Those policies are enacted mostly due to sudden disasters and unpredictable risks disrupting the development paths of postgraduates themselves, which can be judged as an environmentally induced fragmentation in postgraduate expansion policies, where the outbreak of a sudden focal event causes a rapid change in the policy environment in the short term, and the old system that had maintained equilibrium could hardly adapt to it, presenting a negative policy image, triggering policymakers to make strategic adjustments to the expansion policy, making the expansion policy fit with the social environment again and generating institutional changes.

Contingencies in the institutional environment are more likely to lead to environmentally induced policy changes. At the end of the twentieth century, China was swept by financial turmoil and floods in many basins one after another, and the expansion of education became one of the main ways to drive domestic demand and relieve economic pressure, with the introduction of S06, S07, and S08, which formally proposed to expand the number of postgraduate students and to closely integrate postgraduate education with productive labor and social practice. From the environmental perspective, the institutional environment has provided the cultural soil for the policy change of postgraduate expansion. In addition, changes in the technological environment, such as multimedia information, have influenced the content of the changes in the expansion policy as a booster. In 2020, almost the whole world was influenced by the COVID-19 epidemic. China, as the outbreak point of the epidemic in Asia, took the expansion of professional degree postgraduate students as an important means to break the employment dilemma and relieve economic pressure, which is an important guide for policymakers to adjust the expansion policy of postgraduate students. During the outbreak of the epidemic, China quickly took relevant measures by introducing S13, S15, S26, and S30, which combined the demand for professional talents in society and expanded enrollment mainly for certain majors, taking into account the applicable targets of the expansion, degree attributes, professional structure, and the carrying capacity of different universities, showing expansion policies considering more realistic needs scientifically. It can be seen that the outbreak of sudden and focal events has become a key point for the adjustment of the postgraduate expansion policy. However, although the path follows the logic of abrupt change, it does not play a dominant role. For example, universal online teaching under the influence of the epidemic changes ways of postgraduate re-examinations but does not affect the trend of expansion.

5.1.3. Strategy decision: adjust the policies of the government

As shown in Fig. 4, P3 is the configuration of the four antecedent variables of policy image, focal event, media opinion, and the openness of agenda, with policy image playing a determinant role. The path has a raw coverage of 0.36, indicating that the causal path has explanatory power for 11 of the 30 expansion policies ($30 \times 0.36 \approx 11$), with representative policy numbers of S03, S04, S05, S10, S12, S13, S16, S17, S18, S19, and S29.

The path of strategy decision reflects two situations. One is "natural evolution", which refers to the spontaneous revision of the expansion policy in the light of historical inertia. The other is the "rational construction" of education policies, which means that any education policy is a reflection of the values and interests of the policymakers, reflecting policy subjects' initiative and rational capacity [33]. Both of them are reflected in the changes of expansion policies, which is comprehensive planning of expansion policies, a macro adjustment of previous policies that cannot respond to the changes of the environment in time under the path dependence, reflecting the respect for the development of education itself, and also providing future guidance for the development of the expansion.

Firstly, S5, S12, and S17 are in line with the “natural evolution” of strategy decisions. Since the expansion of undergraduate education in 1999, the number of graduates from colleges and universities nationwide has surged, and the labor market’s absorption of university graduates has declined sharply. To stabilize the employment situation and alleviate the market’s difficulties, policymakers have taken postgraduate education as an important means of regulating social demand and introduced a series of strategic plans for the expansion of postgraduate education. Given the low global ranking of China’s postgraduate training ratio in the early years of the new century, growth in numbers was the main goal of the expansion policy during this period. As the economic benefits of improving the quality of training were relatively limited compared to expanding the scale of enrolment during the initial period of postgraduate recruitment, the education authorities focused mostly on extrapolated growth when implementing the postgraduate enrollment policies, and the degree of participation of the public in the policy was low. For the public, educational attainment is a watershed for individuals to work in the labor market, and entry into postgraduate education becomes a passport to the social position of one’s choice, so the policy of outward growth, featuring mainly expansion in numbers, is continued.

Secondly, S03, S04, S10, S13, S16, S18, S19, and S29 are in line with the path of “rational construction” strategy decision. From the perspective of the emergence and development of China’s postgraduate expansion policy, the “self-generated and spontaneous” component certainly exists, but more often manifests itself as a strategic choice based on the “rational construction” of the state. With the continuous deepening of China’s strategic goal of “developing the country through science and education” and “strengthening the country through talents”, the continuous expansion of postgraduate education has led to various incompatibilities between postgraduate education and the development of the environment and has also exposed a series of problems in its implementation, such as the imbalance of the teacher-student ratio, and has fallen into a quagmire of declining quality in many aspects. The backlog of public doubts about postgraduate education has contributed to the transformation of the originally positive policy image into a negative policy image. The previous policy image of encouraging the growth of the number of externally oriented students has changed in the eyes of policymakers, who tend to believe that the overly sloppy expansion is the root cause of the decline in the quality of training, and the change in policy objectives has become an important trigger for the expansion of postgraduate education.

5.2. Conclusions

This study qualitatively evaluates 30 postgraduate enrollment expansion policies using fsQCA method based on the institutional equilibrium theory and provides evidence for the following conclusions.

Firstly, path dependence is the main trend of change, which is an important manifestation of the policy respecting the law of educational development. Secondly, the national macro-strategic control role ensures a win-win situation for both scale and quality assurance in postgraduate education. Thirdly, the national strategies play a role based on environmental inducement, emphasizing contingencies, enhancing policy predictability, and reducing the difficulty of responding to environmental radical changes, reflecting the abrupt logic in policy changes. The different weighting of the three paths on the role of policy change has important reference value for the healthy development of postgraduate education policy.

The above conclusions lead to the following implications.

First, promoting progressive changes in the expansion policy and respecting the laws of education. The postgraduate enrollment expansion policies are alternate paths of intermittent and progressive institutional changes. With China’s economic development, social needs, and the increasing quality of the population, there will be no fundamental changes like the expansion policy at present and in the future, and progressive institutional changes will remain the main path to be followed in the future period for the reform of the expansion policy of graduate students. Therefore, based on fully respecting the laws of education itself and its carrying capacity, the expansion policy system should be further improved to respond to the problems raised by the current expansion policy. Besides, partial improvement strategies including improving the effectiveness of the supervisor system, strictly controlling the admission threshold, and realizing the unification of student process evaluation and outcome evaluation, should also be actively adopted to provide appropriate guidance to the system’s deviation from the policy. Meanwhile, appropriate measures should be taken to guide students’ behavior and gradually strengthen the scientific and forward-looking construction of policy change strategies.

Second, setting up warning mechanisms and enhancing policy variability and flexibility. Due to the inertia of higher education itself and the natural distance between its profound learning and the social environment, strategic choices and environmental inducements, as important corrective forces for policy changes, are important guarantees for policy changes to adapt to the environment and meet social development. Therefore, it is particularly important to improve the early warning mechanism of policy changes for expansion based on the real environment and actual needs, to meet the flexible adaptation of policies to environmental changes. In the age of fragmented information and the Internet, the role of media opinion has become increasingly prominent, but it should not be used as a direct basis for warning about problems. Policymakers should not only make full use of the current big data network technology to grasp and understand the social opinion on the expansion policy, but also retain the traditional investigation practice, conduct in-depth investigation and research, and fully justify the issues reflected in the network public opinion, grasp the core issues, continuously improve the responsiveness and predictability to the sudden environmental changes, and ensure that the implementation of the expansion always meets the carrying capacity of education itself. At present, after a period of concentrated expansion, China’s postgraduate education should pay close attention to the changes in the type and quality of postgraduate training demanded by social development, and appropriately slow down the expansion, gradually shift the focus to the upgrading and adjustment of the professional structure of postgraduate education, and use the flexibility of policy to strengthen the early warning of the environment, to improve the match between graduates and environmental needs.

Third, improving the quality of postgraduate education through adjusting the enrollment structure. Whether it is path dependence or strategic choice, both changing paths require the current postgraduate expansion policies to seek a balance between structural

adjustment and quantitative increase. At present, the types of postgraduate students are still mainly academic postgraduate students, which cannot meet the national demand for high-level applied talents, and there are problems such as homogenization of training objectives and similarity of curriculum facilities in the training of professional postgraduate students, resulting in the low quality of their training. For this reason, under the situation of a general slowdown in enrollment in higher education, professional master's degrees have bucked the trend and expanded significantly in recent years. Improving the quality of postgraduate education cultivation through structural adjustment has become an effective way to meet the changes in expansion policies and the changing environment. It is not only to adjust the allocation ratio between professional and academic degrees to improve the cultivation structure but also to adjust the cultivation programs of postgraduates of different categories and positioning, to clarify the target positioning of both academic and professional postgraduates, focusing on cultivating the scientific and innovative ability of academic postgraduates and the practical application ability of professional postgraduates, to truly realize the joint improvement of the quality and quantity of postgraduate education cultivation.

6. Limitations and future research

There are some limitations in this study.

First of all, in terms of sample selection, as special policies on postgraduate education development published at present are slightly insufficient, this study covers all the relevant policies affecting postgraduate enrollment expansion, which may easily lead to the disadvantage of affecting the representativeness and internal validity of the conclusion. Future studies will continue to focus on the development of postgraduate education policies, perfecting the policy samples.

Secondly, in terms of the concept of "postgraduate enrollment expansion", which has not been determined at present, it is seen in some studies that focus on the discussion of quantity. However, this concept in this study is defined as "the change of either the quantity or the structure", lacking in the dialectical logical relationship between the two aspects. Detailed discussion on the definition of postgraduate enrollment expansion should be given in future research.

Finally, because of the policy characteristic of the centralization system in China, the postgraduate enrollment expansion policies mainly rely on the strong government authority to promote the implementation, therefore, the path of "strategy decision" has the advantages that other paths cannot have. However, the deep mechanism of strategy decision will be the focus of analysis in the future, so as to provide the operable path selection program for the development of postgraduate education policies in China.

Ethics statement

Review and/or approval by an ethics committee was not needed for this study because no human participants and animals were included in this study.

Data availability statement

The data associated with our study has not been deposited into a publicly available repository.
The data that has been used is confidential.

CRedit authorship contribution statement

Yao Liu: Writing – original draft, Methodology, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Dajuan Chen:** Software, Resources, Project administration, Investigation, Formal analysis. **Yong Liu:** Writing – review & editing, Funding acquisition. **Xiaona Zhou:** Visualization, Validation, Software, Formal analysis.

Declaration of competing interest

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

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Appendix A. Supplementary data

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