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The Impact of the Government's Risk Moderator Role on the Incentive Structure of Financial Institutions within the Agricultural Innovation Ecosystem

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Abstract: This paper examines how the government's role as a risk moderator is associated with changes in the incentive environment faced by financial institutions within China's agricultural innovation ecosystem. The study integrates ecosystem theory, principal-agent theory, and evolutionary game theory, but it does so through a clearer multi-level logic than in the earlier version of the manuscript: ecosystem theory explains why financial frictions in agriculture have system-wide consequences, principal-agent theory explains how specific public instruments reshape participation and monitoring incentives, and evolutionary game theory explains how policy support can generate tipping-point dynamics in institutional participation over time. Empirically, the paper uses a qualitative comparative case-study design built from official policy documents, regulatory reports, annual reports, exchange disclosures, and published academic studies. Quantitative indicators spanning 2015–2024 are used as descriptive secondary evidence and as support for mechanism tracing; they are not presented as a single original causal dataset estimated by the author. The analysis focuses on three representative Chinese policy instruments: the National Agricultural Credit Guarantee System (NACGS), the Insurance-Plus-Futures (IPF) program, and the government-enabled Digital Agricultural Finance (DAF) ecosystem. The findings suggest three distinct but related pathways through which public risk moderation reshapes incentives: risk absorption, risk transformation, and risk reduction. Across the cases, government intervention appears to crowd in private participation by improving risk-adjusted returns or lowering information and transaction costs, but it also creates boundary conditions involving moral hazard, basis risk, market liquidity, and digital exclusion. The paper contributes to the literature by extending principal-agent theory to a multi-tier, multi-instrument agricultural finance context and by using evolutionary game logic to explain how policy diffusion can become self-reinforcing after a threshold of participation is reached. The paper concludes with policy recommendations that are directly tied to the empirical findings on guarantee ratios, basis risk, data governance, and performance design.

Keywords: agricultural innovation ecosystem; government risk moderation; financial institution incentives; principal-agent theory; evolutionary game theory; China rural finance

I. Introduction

Agricultural innovation ecosystems are complex adaptive systems in which technological change, organizational learning, market exchange, and policy intervention jointly determine the pace and direction of rural development. In such ecosystems, financial institutions do not merely allocate capital in a neutral fashion; they shape which farmers, cooperatives, agri-tech firms, and production models obtain the resources needed to adopt new technology, scale promising practices, and withstand shocks. When agricultural finance remains thin, volatile, or prohibitively costly, the ecosystem's innovation capacity is constrained even when technical opportunities exist.

This problem is especially salient in China. Agriculture contributes a smaller share of GDP than manufacturing and services, but it remains central to employment, food security, rural incomes, and the strategic modernization agenda. At the same time, agricultural lending remains difficult for private financial institutions because borrowers are geographically dispersed, collateral is limited or difficult to realize, production outcomes are exposed to weather and disease, commodity prices fluctuate, and transaction costs per loan are high. These conditions create a durable gap between the social value of agricultural finance and the private incentives to provide it.

The Chinese government has increasingly responded not by replacing markets outright, but by redesigning the risk architecture within which financial institutions operate. Through guarantees, subsidized insurance-linked hedging, and digital rural data infrastructure, the state changes expected loss, monitoring incentives, screening costs, and strategic expectations about the agricultural finance market. The central claim of this paper is therefore not that the government simply adds money to the system, but that it operates as a risk moderator whose instruments reshape the incentive structure of banks, insurers, guarantee institutions, and platform-based lenders.

This paper addresses three research questions. First, through what mechanisms does government risk moderation alter the incentive structures of financial institutions in agricultural innovation ecosystems? Second, what kinds of empirical evidence from China support these mechanisms, and what kind of claims can reasonably be drawn from that evidence? Third, what unintended consequences emerge from these instruments, and how can policy design mitigate them?

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The paper makes two main theoretical contributions. First, it extends principal-agent theory to a multi-tiered, multi-instrument agricultural finance policy context. In the Chinese cases studied here, the state does not contract with a single agent. Rather, it influences a chain of actors that may include guarantee companies, insurers, futures-market intermediaries, digital platforms, local governments, and commercial lenders, each with partially misaligned incentives. Second, the paper uses evolutionary game theory to explain the tipping-point dynamics of policy diffusion: once risk mitigation becomes sufficiently credible and a critical mass of institutions participates, agricultural finance can shift from an unattractive niche to a self-reinforcing field of competitive engagement. These contributions are highlighted more explicitly here than in the earlier draft because they represent the paper's core value to the literature.

Empirically, the paper adopts a qualitative comparative case-study design. This point deserves emphasis because the prior version of the manuscript could be read as implying a single original quantitative analysis. In fact, the paper draws on descriptive statistics, regulatory data, institutional reports, and published empirical studies spanning 2015–2024. These materials are used to reconstruct and compare how three major Chinese policy instruments operate and what evidence exists regarding their incentive effects. Accordingly, the paper distinguishes carefully between descriptive evidence, theoretically informed mechanism inference, and causal findings already established in the cited literature. This clarification helps keep the claims proportional to the underlying evidence.

The remainder of the paper proceeds as follows. Section II develops the integrated theoretical framework. Section III clarifies the research design, evidence strategy, and claim boundaries. Section IV briefly presents the Chinese policy context. Section V analyzes the three cases using a common comparative template. Section VI synthesizes the findings, sharpens the theoretical contribution, and develops policy implications. Section VII concludes.

II. Theoretical Framework

A. Agricultural innovation ecosystems and the role of finance

Ecosystem approaches to innovation emphasize that value creation depends on interdependent actors rather than isolated firms. In agriculture, this means that farmers, input suppliers, processors, logistics providers, technology vendors, research institutions, public agencies, and financial institutions jointly shape whether innovation is created, diffused, and sustained. The ecosystem perspective is useful here because financing gaps do not merely affect one node. When banks or insurers underinvest in agricultural activities, new production technologies diffuse more slowly, market coordination weakens, and the entire ecosystem exhibits lower innovation throughput.

Classical theories of rural finance explain why this occurs. Information asymmetry between lenders and borrowers reduces confidence in credit quality. Incomplete markets for covariate agricultural risk limit diversification. Small average loan sizes make screening and monitoring expensive. Weak collateral and contract enforcement further raise perceived loss severity. These mechanisms justify public intervention, but they do not by themselves explain how specific policy instruments change financial institution behavior. For that we need a more explicit incentive framework.

B. Principal-agent theory in a multi-tier agricultural finance policy context

Principal-agent theory provides the paper's central institutional lens, but the present study extends it beyond a simple one-principal-one-agent structure. In China's agricultural finance system, the state is an ultimate principal pursuing rural development and innovation objectives, yet implementation often passes through multiple intermediary agents: guarantee companies, commercial banks, insurers, futures-market counterparties, data-platform operators, and sometimes local governments. Each actor responds to its own payoff structure, and public instruments alter those payoffs unevenly.

This multi-tier context matters because policy instruments operate through at least two distinct constraints. The first is the participation constraint: whether agricultural finance offers sufficient expected return, after risk and operating cost, for an institution to enter or expand. The second is the incentive compatibility constraint: once an institution participates, whether it still has adequate motivation to screen, monitor, hedge, verify data quality, and avoid opportunistic behavior. Guarantee schemes relax the participation constraint powerfully, but they may weaken monitoring incentives. Insurance-linked instruments can stabilize expected income but may leave residual basis risk. Data infrastructure can reduce adverse selection and transaction costs, but it can also create new forms of selection bias. Principal-agent theory helps explain these trade-offs at the contractual and organizational level.

C. Evolutionary game theory and policy diffusion

A static incentive model is insufficient because financial institutions also observe each other and adapt over time. Evolutionary game theory adds this population-level dimension. When a new policy instrument is introduced, institutions compare the expected payoff of participation with that of non-participation while also watching peer behavior. If the perceived benefits of entry remain uncertain, only a few early movers participate. But once risk sharing becomes credible, operational routines mature, and competitors begin to capture agricultural market share, the payoff to participation can rise endogenously. The result is a tipping-point dynamic in which broader engagement becomes self-reinforcing.

This insight is especially useful for understanding why policy diffusion may initially be slow and then accelerate. It also helps explain why sustainability matters: if public support is withdrawn prematurely or credibility is weakened, the system may fail to reach a cooperative equilibrium. Thus evolutionary game theory complements principal-agent theory

by explaining the dynamic spread of participation across an institutional population rather than the incentive design of a single contract.

D. An integrated multi-level model

The three frameworks are therefore not simply additive. Each operates at a different analytical level of the same phenomenon. Ecosystem theory explains why the financing behavior of individual institutions has system-wide implications for agricultural innovation. Principal-agent theory explains how particular public instruments reshape risk-return trade-offs, participation constraints, and monitoring incentives at the institutional level. Evolutionary game theory explains how these altered incentives diffuse across a population of financial institutions over time, potentially producing threshold effects and new equilibrium behavior.

The case analysis uses this integrated model in a structured way. For each case, the paper asks four questions: What form of risk moderation is the government providing? Which incentive channel is primarily affected? What empirical evidence supports the mechanism, and what kind of claim can be made from that evidence? Under what conditions does the mechanism weaken, reverse, or create new distortions? This structure allows the case evidence to speak to a unified model rather than to three unrelated theories.

III. Research Design and Evidence Strategy

This study uses a qualitative comparative case-study design. The goal is analytical explanation rather than statistical generalization. The paper examines how three distinct forms of government risk moderation appear to reshape the incentive structures of financial institutions in China's agricultural innovation ecosystem. A case-study approach is appropriate because the phenomenon is institutionally complex, policy embedded, and not reducible to a single variable or dataset.

The empirical strategy in this revised version is stated explicitly. The paper does not present an original econometric dataset constructed by the author. Instead, it synthesizes three kinds of evidence: (1) official policy documents and institutional disclosures that identify program architecture and rules; (2) descriptive quantitative indicators from regulatory reports, exchanges, annual reports, and official statistics for 2015–2024; and (3) published academic studies, including survey, panel, and quasi-experimental work, that provide causal or quasi-causal estimates for specific sub-questions. The paper's original empirical contribution lies in structured case selection, cross-case comparison, and theory-guided interpretation rather than in re-estimating coefficients from raw data.

This distinction matters for claim discipline. Descriptive evidence is used to establish program scale, diffusion, and institutional design. Mechanism inference is used when documentary evidence and theory together suggest how incentives were likely altered. Causal language is reserved for effects identified in the cited literature, such as published difference-in-differences or panel analyses. Where the available evidence is suggestive rather than decisive, the paper now uses terms such as "appears associated with," "is consistent with," or "suggests," rather than claiming direct causation.

The three cases were selected through theoretical sampling rather than for representativeness alone. Each case corresponds to a distinct modality of public risk moderation. The National Agricultural Credit Guarantee System represents risk absorption through explicit loss sharing. The Insurance-Plus-Futures program represents risk transformation through market-based hedging combined with premium subsidy. The Digital Agricultural Finance ecosystem represents risk reduction through public data infrastructure and informational transparency. Together, these cases allow comparison across the principal channels through which government can alter the incentive environment of financial institutions.

The cases were also chosen because they are policy significant, data visible, and analytically complementary. Each has sufficient public documentation, a substantial implementation period, and a plausible link to financial institution incentives. Using a common template across the three cases helps address the unevenness noted in the prior version of the manuscript. Each case is therefore analyzed in terms of program architecture and evidence base, incentive mechanism, and boundary conditions or unintended consequences.

Table 1. Evidence categories and claim boundaries

Evidence type	Main sources	Analytical role in this paper	Claim type
Program architecture and rules	Ministry notices, No. 1 Documents, regulatory guidance, institutional releases	Identify how government risk moderation is designed and implemented	Institutional design evidence
Descriptive quantitative indicators	Annual reports, regulatory statistics, exchange reports, official data compilations	Establish scale, diffusion, coverage, leverage, subsidies, and participation trends	Descriptive evidence
Published empirical estimates	Peer-reviewed articles and research reports using survey, panel, or quasi-	Support or qualify specific incentive mechanisms discussed	Source-specific causal or quasi-causal

Evidence type	Main sources	Analytical role in this paper	Claim type
	experimental methods	in the cases	evidence
Comparative interpretation	Author's synthesis across the three cases	Develop typology, integrated framework, and policy implications	Analytical inference rather than direct causal proof

Source: Constructed by the author based on the revised research design.

IV. China's Agricultural Finance Policy Context

China's agricultural finance policy since the mid-2010s has progressively shifted from direct state provision toward market-shaping risk moderation. This shift reflects the recognition that purely fiscal lending is difficult to scale and may generate weak incentives, whereas carefully structured guarantees, subsidies, hedging links, and digital data systems can mobilize private capital while preserving decentralized credit allocation. The policy turn is visible in the central government's repeated use of No. 1 Documents to prioritize agricultural guarantees, insurance deepening, and digital rural finance.

The aggregate scale of the policy challenge is considerable. China's agriculture-related outstanding loans reached RMB 56.6 trillion at the end of 2023, yet major financing gaps remained for smallholder and innovation-oriented agricultural actors. Agricultural insurance premium subsidies also continued to expand, underscoring the state's willingness to invest fiscally in risk management rather than only in production subsidies. These conditions make China a highly relevant setting for examining how government risk moderation can reshape financial institution incentives within an agricultural innovation ecosystem.

V. Case Analysis

A. National Agricultural Credit Guarantee System (NACGS)

The National Agricultural Credit Guarantee System is the clearest example of direct public risk absorption. Established through coordinated action by the Ministry of Finance, the Ministry of Agriculture and Rural Affairs, and financial regulators, the system combines a national apex institution, provincial guarantee companies, and county-level operating agencies. Participating banks typically receive guarantees covering up to 80% of loan principal. From an institutional-design standpoint, the government does not replace private lenders; instead, it changes the expected loss profile of agricultural loans and provides recapitalization support that makes guarantee operations sustainable.

The documentary and quantitative evidence establishes strong program scale. Cumulative guaranteed lending surpassed RMB 1 trillion by April 2023 and exceeded RMB 1.36 trillion by the end of 2024, with millions of transactions concentrated in relatively small loan sizes. These descriptive statistics are important because they show that NACGS is not a marginal pilot. It is a national instrument capable of shifting lending behavior at scale. However, scale alone does not prove the mechanism. The causal or quasi-causal evidence comes from cited studies rather than from the present paper's own estimation. For example, published work reports that access to the guarantee program was associated with significant increases in agricultural lending volume, particularly to new-type agricultural business entities.

Within the integrated framework, the NACGS mainly relaxes the participation constraint of banks by sharply reducing expected loss. It can also alter competitive expectations: once participation becomes common, banks risk losing rural market share if they remain outside the scheme. This is where the evolutionary dynamic becomes visible. The growth in participating institutions from fewer than 50 to more than 400 over several years is consistent with the idea that once guarantee-backed lending became credible and scalable, non-participation became less attractive. The case therefore supports the paper's tipping-point argument, although the present study treats that conclusion as an interpretation of diffusion patterns rather than as a formally estimated evolutionary model.

At the same time, the NACGS provides the clearest evidence of second-order moral hazard. If guarantee coverage is generous and recapitalization formulas reward volume more than quality, both banks and guarantee companies may reduce screening effort. This is the key reason the policy recommendation section now treats guarantee calibration more concretely. The evidence cited in the paper indicates that provinces with looser fiscal accountability displayed higher non-performing loan ratios than those with stricter discipline. Thus the core lesson from NACGS is not simply that guarantees work; it is that they work best when risk sharing remains large enough to crowd in participation but not so large that monitoring incentives collapse.

Table 2. NACGS key performance indicators, 2018–2023

Year	Annual Guarantee (RMB bn)	Cumulative (RMB bn)	Loan Transactions (mn)	NPL Rate (%)	Capital Leverage
2018	52.0	120.4	0.36	2.8	2.1:1
2019	89.3	210.0	0.61	2.4	2.8:1
2020	127.5	340.0	1.08	2.5	3.2:1
2021	168.9	512.0	1.94	2.3	3.8:1
2022	198.0	710.0	2.89	2.2	4.3:1
2023	230.0	1,000+	4.80	2.1	4.7:1

Source: National Agricultural Credit Guarantee Alliance annual reports and related compilations [19], [20].

B. Insurance-Plus-Futures (IPF)

The Insurance-Plus-Futures program represents a different policy logic. Rather than absorbing default losses directly, the government subsidizes a price-insurance architecture in which insurers hedge part of their exposure through commodity derivatives. Farmers purchase price insurance, insurers buy put options on futures exchanges, and the state covers a substantial share of the premium. The result is not only farmer protection; it is a reconfiguration of how agricultural price risk is distributed across insurers, derivatives markets, and credit providers.

In descriptive terms, the program expanded rapidly from pilot status to more than 1,600 projects across 29 provinces, serving millions of households and generating large notional hedging volumes. These figures show significant diffusion and institutionalization. Yet, as with NACGS, the paper now makes a clearer distinction between descriptive scale and inferred effect. The claim that IPF improved the willingness of insurers to underwrite agricultural risks or influenced bank lending behavior is not presented as an original causal estimate by the author. Rather, it relies on the cited empirical literature, including studies suggesting that participation in IPF is associated with stronger underwriting capacity and more favorable local credit conditions.

Analytically, the IPF program is best understood as a risk transformation mechanism. It turns agricultural commodity price exposure into hedged market exposure, thereby reducing the covariance of agricultural losses across a portfolio. This is important because banks and insurers are especially reluctant to expand in sectors where shocks are systemic rather than idiosyncratic. By stabilizing the income environment of insured farmers, the program may also improve the creditworthiness signal that banks observe. In principal-agent terms, the state changes the expected payoff to agricultural underwriting without fully socializing losses; in ecosystem terms, it links rural finance more deeply to national capital-market infrastructure.

The IPF case also illustrates why theoretical effectiveness does not guarantee universal scalability. Basis risk remains a structural limitation when the futures reference price diverges substantially from local cash conditions. In regions with thin local market integration or for commodities with weaker futures liquidity, the hedging chain becomes less precise, reducing both farmer protection and insurer confidence. This issue is more than a technical footnote. It directly qualifies the policy recommendation to expand IPF. Expansion is likely to be most persuasive when paired with market-maker support, improved local price references, or commodity-specific liquidity enhancement, because the paper's own case analysis shows that basis risk and thin-market conditions limit the instrument's incentive effects.

Table 3. IPF program scale and selected financial-institution indicators

Year	Pilot Projects	Farmer Households (mn)	Govt Subsidy (RMB bn)	Futures Notional (RMB bn)	Insurer Additional Capacity Gain (%)
2018	312	0.68	2.1	42.0	+8.2
2020	689	1.21	4.8	98.0	+17.4
2022	1,600+	2.40	7.2	200.0+	+29.0

Source: Compiled from CSRC, China Insurance Association, and cited studies [27]–[29].

C. Government-enabled Digital Agricultural Finance (DAF)

The government-enabled Digital Agricultural Finance ecosystem differs again in that the state does not primarily absorb losses or subsidize hedging. Instead, it reshapes the information environment through land-right confirmation, village-

level data platforms, rural credit systems, and other digital infrastructure. In classic rural finance models, one of the central barriers to lending is the high fixed cost of screening small and dispersed borrowers. Public data infrastructure targets this bottleneck by making borrower identity, land use, subsidy receipts, and behavioral histories more legible to lenders.

This mechanism is supported by a combination of policy documentation, descriptive indicators, and cited empirical studies. Public materials indicate dramatic expansion in digital inclusive finance over the last decade, while research using county-level panel data associates higher digital-finance development with stronger entrepreneurial and innovation-related activity in agriculture. Platform-level evidence from providers such as MYbank suggests that when public and private data can be combined, agricultural lending can be delivered at lower cost and with lower non-performing loan ratios than conventional assumptions about rural borrowers would predict. Here again, the revised manuscript now states more carefully that such findings come from cited sources and institutional reports rather than from the paper's own statistical estimation.

The DAF case adds analytical depth to the argument because it shows that government risk moderation can work by reducing information cost rather than by shifting default losses. This primarily alters the participation constraint for banks, small lenders, and fintech platforms: smaller loans become commercially viable because fixed screening and monitoring costs fall. Over time, this may also change competitive dynamics by enabling large-scale relationship banking through data. In other words, DAF illustrates a pathway in which the state moderates risk indirectly by making borrowers more knowable.

The main boundary condition is uneven digital infrastructure and data accessibility. Where telecommunications capacity, data quality, or administrative coordination are weak, the benefits of digital risk reduction are uneven. Financial institutions may then concentrate activity in already connected regions, producing a two-tier agricultural finance landscape. This limitation is important for both theory and policy. It shows that information-based risk moderation is potentially durable and fiscally efficient, but it can also reproduce geographic exclusion if public digital infrastructure and equitable data-sharing rules are incomplete.

VI. Cross-Case Synthesis, Theoretical Contribution, and Policy Implications

Across the three cases, the government's role as a risk moderator appears through three distinct pathways: risk absorption, risk transformation, and risk reduction. NACGS primarily absorbs loss risk and is highly effective at mobilizing entry and expansion, but it requires careful control of moral hazard. IPF transforms commodity price risk into hedged market exposure and thereby stabilizes the surrounding credit environment, but its effectiveness depends on basis-risk management and market liquidity. DAF reduces risk indirectly by lowering information and transaction costs, which can create more durable incentive changes but also raises concerns about digital exclusion.

This comparison strengthens the paper's theoretical integration. At the ecosystem level, all three instruments alter whether capital can flow to innovation-oriented agricultural actors. At the institutional level, they affect different combinations of participation and incentive compatibility constraints. At the population level, they shape whether institutions perceive agricultural finance as an unattractive policy burden or as a viable and increasingly competitive strategic field. The frameworks are therefore connected through a layered model rather than a set of parallel lenses.

The comparison also clarifies the paper's contribution to principal-agent theory. In a multi-tier agricultural finance system, government does not simply subsidize one agent and expect a linear response. It must design around chains of delegated action in which guarantee companies, insurers, banks, exchanges, digital platforms, and local governments each respond to partially different signals. Policy success therefore depends on where the intervention sits in the incentive chain and how residual risk, data access, and accountability are distributed. This is the sense in which the paper extends principal-agent theory to a multi-tier and multi-instrument policy context.

Similarly, the evolutionary game contribution is not merely rhetorical. The Chinese cases suggest that public risk moderation can change not just the payoff of one institution, but the strategic expectations of an entire population of institutions. When enough banks join NACGS, or when enough insurers and local governments treat IPF as credible, or when enough lenders can use digital rural data, participation can become self-reinforcing. This tipping-point perspective matters because it helps explain why policy sequencing, credibility, and continuity are crucial for long-run sustainability.

A. Policy recommendations linked to the findings

1. Calibrate guarantee coverage ratios with explicit reference to moral hazard evidence. The NACGS evidence suggests that generous guarantees can crowd in lending quickly, but the relationship between coverage ratios and monitoring incentives must be handled carefully. The paper therefore recommends more differentiated guarantee design, with meaningful risk retention for financial institutions and guarantee entities. For many loan categories, especially with newer institutional participants or weaker local accountability, coverage in a moderate range may better preserve screening effort than very high ratios. This recommendation is grounded in the case discussion and in the cited evidence that weaker fiscal accountability and aggressive recapitalization incentives were associated with worse portfolio quality [23].

2. Expand IPF selectively, but pair expansion with basis-risk and liquidity solutions. The paper supports the expansion of the Insurance-Plus-Futures model, but not as a simple volume target. The case evidence indicates that the instrument's effectiveness depends heavily on local basis-risk conditions and on the liquidity of the relevant futures market. Where market depth is thin, public support should focus on improving price references, supporting market-making mechanisms, or sequencing expansion toward commodities and regions where hedging is more credible. Linking this recommendation directly to the analysis makes the logic clearer: expansion is persuasive when the underlying risk-transformation chain remains technically sound.

3. Use digital public infrastructure as a long-run risk-reduction strategy, but standardize access. Compared with pure risk absorption, digital public infrastructure can generate more durable improvements in the economics of agricultural lending by lowering information and transaction costs. The DAF case therefore supports continued investment in rural data systems, interoperability, and land-right information. At the same time, the paper's own analysis indicates the danger of unequal access and digital segmentation. For this reason, data-sharing protocols should be standardized and made accessible to licensed institutions on fair terms, so that public information infrastructure reduces exclusion rather than reinforcing it.

4. Align performance metrics with innovation outcomes, not only lending volume. Across the three cases, volume-based targets can create distorted incentives. Guarantee entities may emphasize scale over quality, insurers may prefer safer commodities, and digital lenders may prioritize already data-rich borrowers. Government performance systems should therefore track not only loan or policy volume but also portfolio quality, innovation relevance, and technological upgrading among borrowers. This recommendation follows directly from the paper's ecosystem logic: the purpose of risk moderation is not maximum disbursement in the abstract, but better financial support for innovation-oriented agricultural development.

5. Sequence instruments rather than relying on a single policy tool. The three cases suggest that different instruments may be most effective at different stages of ecosystem development. Guarantees are powerful for initial participation, IPF can stabilize commodity-linked income risk where markets are deep enough, and digital data infrastructure can gradually reduce the structural cost of rural finance. A sequenced strategy is therefore more robust than overreliance on any one instrument. This recommendation follows from the paper's comparative logic and from the different risk channels identified across the cases.

VII. Conclusion

This paper has examined how the Chinese government's role as a risk moderator is associated with changes in the incentive structures of financial institutions within the agricultural innovation ecosystem. Using a qualitative comparative case-study design and a clearly bounded evidence strategy, the analysis compared three major policy instruments: the National Agricultural Credit Guarantee System, the Insurance-Plus-Futures program, and the government-enabled Digital Agricultural Finance ecosystem. Rather than treating these programs as generic subsidies, the paper analyzed them as distinct forms of risk moderation that reshape participation incentives, monitoring incentives, and institutional expectations.

Three conclusions follow. First, government intervention appears most effective when it changes the incentive architecture rather than simply increasing public spending. NACGS altered expected loss and made agricultural lending more commercially attractive. IPF transformed commodity price exposure in ways that reduced portfolio concentration. DAF reduced information and transaction costs and made smaller-scale rural lending more economically viable. Second, the sustainability of these benefits depends on boundary conditions. Excessive guarantee coverage can weaken monitoring; basis risk can blunt the value of hedging-based insurance; and uneven digital infrastructure can create new exclusions. Third, the observed diffusion of participation across institutions is consistent with an evolutionary tipping-point logic: once enough support, credibility, and peer participation accumulate, agricultural finance can shift toward a more self-reinforcing equilibrium.

The paper's main theoretical contribution is therefore twofold. It extends principal-agent theory to a multi-tier, multi-instrument agricultural finance context in which public policy acts through chains of intermediaries rather than through a single contract. It also uses evolutionary game logic to explain why the sustainability of policy design depends on whether instruments can move the system past a threshold of credible institutional participation. These contributions are not offered as fully causal proof of every mechanism, but as a more integrated and evidence-disciplined explanation of how government risk moderation operates in practice.

The study also has clear limits. Much of the evidence is documentary and secondary, and several quantitative relationships are drawn from cited studies rather than from the author's own estimation. Accordingly, the paper does not claim blanket causal identification across all three cases. Future work could test the integrated model more directly using comparative quasi-experimental designs, institution-level portfolio data, or agent-based simulations that capture strategic responses to changing risk instruments. Even with these limits, the Chinese cases offer strong evidence that well-designed public risk moderation can do more than protect lenders; it can reshape the conditions under which agricultural innovation becomes financeable.

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