Design of Stablecoin-Based Patent Pool Securitization Model: International Experience Comparison and China' s Path Selection

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Abstract

In the context of the knowledge economy, patent pools and patent securitization are considered important instruments for alleviating financing constraints confronting pharmaceutical enterprises; however, traditional models have encountered developmental limitations due to uncertainties in valuation and revenue, legal barriers, and restrictions on cross-border settlement, thereby driving the demand for institutional innovation. Concurrently, stablecoins, by virtue of their price anchoring and cross-border payment advantages, have progressively entered the regulatory agendas of nations worldwide. This paper endeavors to integrate "patent pool securitization" with "stablecoins," proposing an institutional innovation framework grounded in smart contracts and the digital yuan (e-CNY). Building upon a review of the fundamental theories of patent securitization and stablecoins, and an explication of their institutional logic and risk characteristics, this paper demonstrates the feasibility of this model in enhancing liquidity, transparency, and compliance through a comparative analysis of regulatory experiences in the United States, European Union, Japan, and Hong Kong, combined with the Royalty Pharma case study and simplified simulations. The scholarly contribution of this paper resides in its pioneering proposal of the "stablecoin + patent pool securitization" pathway, thereby expanding the interdisciplinary research domain of intellectual property financialization and digital currency, and furnishing forward-looking policy references for the financing of small and medium-sized pharmaceutical enterprises in China and the internationalization of the digital yuan.

Full Text

Designing Stablecoin-Backed Patent Pool Securitization Models: International Experience and China' s Path Forward

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Abstract

In the knowledge economy, patent pools and patent securitization are regarded as important tools for alleviating financing constraints faced by pharmaceutical enterprises. However, traditional models have been constrained by uncertain returns, legal obstacles, and restrictions on cross-border settlement. Meanwhile, stablecoins, with their price anchoring and cross-border payment advantages, have increasingly entered regulatory agendas worldwide. This study integrates "patent pool securitization" with "stablecoins" and proposes an innovative institutional framework based on smart contracts and the digital renminbi. Building upon a review of the theoretical foundations, institutional logic, and risk characteristics of patent securitization and stablecoins, the paper compares regulatory experiences in the United States, the European Union, Japan, and Hong Kong, and employs the Royalty Pharma case along with simplified simulations to demonstrate the feasibility of the proposed model in enhancing liquidity, transparency, and compliance. The main contribution lies in being the first to advance a "stablecoin + patent pool securitization" pathway, thereby expanding the interdisciplinary field of intellectual property finance and digital currency research, while offering forward-looking policy implications for financing small and medium-sized pharmaceutical enterprises and promoting the internationalization of the digital renminbi.

Keywords: Patent Pool Securitization; Stablecoin; Digital Renminbi (e-CNY); Intellectual Property Finance; Legal and Regulatory Framework

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In the knowledge economy era, patent rights essential for pharmaceutical innovation have become core resources for national technological competitiveness and industrial development. Due to the enormous investment, long cycles, and extremely high risks associated with new drug R&D, small and medium-sized pharmaceutical enterprises universally face financing bottlenecks [**?**]. How to alleviate financing constraints through the capitalization and financialization

of intellectual property has become an important issue for both academia and policymakers. Patent pools and patent securitization have emerged as institutional arrangements against this backdrop: the former reduces transaction costs and the "tragedy of the anti-commons" through centralized licensing, while the latter enables early monetization of future patent revenues through structured design, both considered viable paths for promoting pharmaceutical innovation financing [?].

However, traditional patent securitization models still face practical challenges including uncertain returns, excessive investor risk, and legal system obstacles [?]. For instance, the failure cases of trust-based patent securitization platforms in China fully demonstrate that traditional models struggle to operate successfully without liquidity support, a complete valuation system, and adequate regulatory frameworks [?]. This "failure experience" aligns with the authors' previous research conclusions on Chinese trust-based patent securitization platforms, indicating that traditional models cannot succeed without liquidity and institutional guarantees.

With the development of digital currency and financial technology, stablecoins have gradually entered the core agenda of national legislation and financial regulation. Stablecoins, due to their price anchoring and cross-border circulation advantages, are considered potential tools for solving the dual challenges of "unstable cash flow" and "restricted cross-border financing" in patent securitization [?]. Stablecoins have not only sparked widespread debate in the global payment system [?], but also exhibit divergent trends in national regulatory practices: the United States emphasizes securities regulation logic, the EU establishes a classification framework through the Markets in Crypto-Assets Regulation (MiCA), Japan favors parallel industrial support and compliance, while China adopts a prudent and cautious path centered on the digital renminbi (e-CNY) [?]. China has demonstrated a central bank-led and approval-based regulatory tendency in its supervision of virtual currencies/stablecoins [?][?].

Existing research focuses primarily on the formation mechanisms and antitrust regulation of patent pools [?], as well as the legal characterization and risk prevention of stablecoins [?], but rarely addresses the intersection of the two. In fact, the institutional combination of "patent pool securitization + stablecoins" not only involves the intersection of intellectual property financialization and international financial regulation, but also holds significant practical implications for China' s pharmaceutical innovation financing and digital currency strategy. On one hand, this topic addresses the institutional pain point of "difficult and expensive financing" in the pharmaceutical industry; on the other hand, it touches upon frontier issues of cross-border capital flows, monetary sovereignty, and international regulatory coordination, possessing policy foresight.

Therefore, this paper not only reviews the basic theories of patent pool securitization and stablecoins and compares the institutional experiences of the United States, European Union, and Japan, but also, for the first time, proposes a stablecoin/digital renminbi-based patent pool securitization framework

model. It attempts to balance liquidity, compliance, and internationalization while proposing a localized path based on China' s legal system and industrial needs. The research aims to: first, fill the academic gap in research combining patent pool securitization with stablecoins; second, provide institutional reference for financing small and medium-sized Chinese pharmaceutical enterprises and the internationalization of the digital renminbi; third, promote the formation of an interdisciplinary research framework.

II. Basic Theories of Patent Pool Securitization and Stablecoins

Before entering specific institutional comparisons and case analyses, it is necessary to clarify the theoretical framework of this paper. This paper proposes a "four-pillar support" framework from an interdisciplinary perspective: securitization theory; intellectual property financialization theory; payment and monetary theory; and comparative law and institutional transplantation. The first three constitute the economic and financial foundation of the research, while the last provides analytical methods at the legal and policy level.

(1) Concepts, Mechanisms, and Practical Dilemmas of Patent Pools and Patent Securitization

A patent pool is a cooperative mechanism where multiple patent holders collectively license patents related to a certain technology field or standard through contractual arrangements, either internally or externally. Its advantages include reducing transaction costs, alleviating the "tragedy of the anti-commons" caused by patent thickets, and improving technology standardization efficiency [**?**]. However, patent pools also pose significant risks: if concentration is too high, they may strengthen market dominance and lead to anti-competitive consequences [**?**].

Patent securitization is the process of financing by using future revenue rights from patents or patent portfolios as underlying assets through structured financial instruments. Its mechanism typically includes asset identification, cash flow forecasting, risk tranching, and securities issuance [**?**]. Compared with traditional debt financing, the advantage of patent securitization lies in transforming intangible assets into tradable financial products, thereby improving corporate liquidity and financing capacity [**?**]. However, three main dilemmas persist in practice: first, uncertain patent valuation leads to investor risk perception bias; second, patent revenue cycles do not match financial market expectations; and third, the legal system is imperfect, particularly regarding patent stability and bankruptcy law protection [**?**]. In the pharmaceutical field, the long R&D cycles and high risks further highlight the practical significance of financing through the combination of patent pools and securitization. Yet how to generate stable cash flows, attract investors, and prevent potential monopoly risks remains an urgent problem to be solved.

(2) Nature, Risks, and Regulatory Framework of Stablecoins

Stablecoins are a class of encrypted digital assets anchored to specific fiat currencies, assets, or algorithmic rules, designed to overcome the excessive volatility of traditional cryptocurrencies like Bitcoin and enhance their functions as payment media and value storage [**?**]. Stablecoins are generally divided into three categories: fiat-collateralized, crypto-asset-collateralized, and algorithmic stablecoins, each with different advantages and disadvantages in terms of stability, credit risk, and technical risk [**?**].

Despite their potential in cross-border payments, settlement, and financial innovation, stablecoins pose significant risks: first, they may trigger systemic financial risks, such as liquidity crises caused by large-scale redemptions or "depegging" ; second, potential money laundering, terrorist financing, and capital flight risks; and third, weakening monetary policy independence and national monetary sovereignty.

In terms of regulatory frameworks, different jurisdictions show differentiated approaches. The United States emphasizes a function-oriented regulatory path: if stablecoins have securities attributes, they fall under the jurisdiction of the U.S. Securities and Exchange Commission (SEC) [**?**]; if they have commodity attributes, they are subject to the U.S. Commodity Futures Trading Commission (CFTC) rules [**?**]; additionally, the Financial Crimes Enforcement Network (FinCEN) requires stablecoin issuers to fulfill anti-money laundering (AML) and know-your-customer (KYC) obligations [**?**]. The EU, through the Markets in Crypto-Assets (MiCA) Regulation, establishes a unified regulatory framework, imposing different regulatory obligations on Asset-Referenced Tokens (ARTs) and E-Money Tokens (EMTs) [**?**]. Japan emphasizes "revising the Payment Services Act, requiring stablecoins to be issued by banks or trust institutions" [**?**]. Hong Kong launched a stablecoin sandbox pilot in 2024 and officially issued its regulatory regime in 2025, adopting a "gradual and inclusive" experimental approach [**?**]. Taiwan is currently in the legislative stage: the Draft Virtual Asset Service Provider Act (VASP Act) was submitted to the Executive Yuan in 2025, which proposes that stablecoin issuers establish reserves, obtain issuance qualifications, and accept regulatory reporting obligations [**?**]. In contrast, China has issued prohibitive regulations on virtual currency/token issuance and financing activities, such as the 2021 Notice on Further Preventing and Disposing of the Risks of Virtual Currency Trading and Speculation (Yin Fa [2021] No. 237), which prohibits token issuance financing and related services [**?**].

(3) Theoretical Foundations: Securitization Theory, Intellectual Property Financialization, Payment and Monetary Theory, and Comparative Law

The theoretical framework of this study is based on four aspects:

First, **securitization theory**. Its core lies in transforming illiquid or high-risk assets into tradable securities through asset restructuring and risk tranching,

thereby improving financing structures. This theory provides the foundation for how patent pools can achieve capital marketization through financial engineering.

Second, **intellectual property financialization theory**. This theory emphasizes that intellectual property is not only a legal right to innovation outcomes but also a tradable and financeable financial asset. Through securitization or collateral financing, intellectual property can become an important asset class in capital markets.

Third, **payment and monetary theory**. The rise of stablecoins lies in their potential to fulfill the three functions of money (unit of account, medium of exchange, and store of value). Whether stablecoins can become effective payment and settlement tools in patent securitization requires evaluation from the perspectives of monetary theory and financial stability.

Fourth, **comparative law and institutional transplantation theory**. Since both stablecoins and patent securitization involve cross-border legal differences and institutional coordination, comparing regulatory models across different countries and selecting institutional paths suitable for China' s national conditions constitute the core methodological support for this paper.

III. International Comparison: Similarities and Differences Among US, EU, and Japanese Models

In the institutional evolution of stablecoins and patent securitization, different countries and regions exhibit significant differences. The United States has accumulated practical experience through market-oriented approaches, the EU ensures institutional certainty through unified legislation, Japan promotes the integration of digital currency and patent pools through industrial policy, Hong Kong gradually explores its path through sandbox pilots and formal regulation, while mainland China adopts a prudent model led by the central bank. Comparing these institutional differences not only reveals similarities and differences in regulatory logic, policy objectives, and institutional tools across countries but also helps trace a "spatio-temporal evolution chain," providing reference for China' s future institutional design in integrating intellectual property financialization and digital currency. Therefore, this chapter analyzes four typical jurisdictions—the United States, European Union, Japan, and Hong Kong—and in the summary section, proposes comparative insights combined with China' s path.

(1) United States: Patent Securitization Practice and Crypto Financial Regulation Under the SEC Framework

The United States is a global pioneer in both patent securitization and crypto financial regulation. On one hand, the US has mature intellectual property securitization practices, with typical cases such as Royalty Pharma, which issues asset-

backed securities by packaging pharmaceutical patent royalty revenues, serving as an important channel for pharmaceutical innovation financing [**?**]. On the other hand, in the crypto financial field, US regulation is "function-oriented," primarily governed by the Securities and Exchange Commission (SEC), Commodity Futures Trading Commission (CFTC), and Financial Crimes Enforcement Network (FinCEN) based on securities law, commodity law, and anti-money laundering law respectively.

The SEC has repeatedly emphasized that some stablecoins may constitute securities and should be regulated under the Securities Act of 1933 and the Securities Exchange Act of 1934 [**?**]. The CFTC treats stablecoins as "commodities," emphasizing derivative trading risks [**?**]; FinCEN requires stablecoin issuers to fulfill AML and KYC obligations [**?**]. This multi-agency division of labor creates regulatory uncertainty while maintaining high institutional flexibility.

(2) European Union: Stablecoin Regulation Under MiCA and Exploration of Intellectual Property Financing

The EU adopts a unified legislative approach to stablecoin regulation. The Markets in Crypto-Assets (MiCA) Regulation was officially adopted in 2023, establishing a regulatory framework for Asset-Referenced Tokens (ARTs) and E-Money Tokens (EMTs) [**?**]. MiCA requires issuers to have capital reserves, transparency disclosure, and liquidity support mechanisms, with additional prudential regulation for "significant stablecoins."

At the intellectual property financing level, although the EU lacks specialized institutional exploration of "patents + stablecoins," it provides institutional space for future integration of blockchain and crypto finance through the development of high-quality securitization (HQS) markets and intellectual property pledge financing [**?**]. This model, targeting unified legislation and enhanced market integration, demonstrates the EU' s systematic advantages in digital financial regulation.

(3) Japan: Industrial Policy-Driven Patent Pool and Digital Currency Development Strategy

Japan adopts a "government guidance + market exploration" industrial policy path for patent pools and digital currency. On one hand, Japan actively promotes central bank digital currency (CBDC) pilots and stablecoin legal construction in the digital currency field. The 2022 Revised Payment Services Act clarifies that stablecoins must be issued by banks or regulated institutions, thereby strengthening integration with the fiat currency system [**?**]. On the other hand, Japan actively promotes patent pool cooperation and capitalized financing in high-tech industries, with operational experience from MPEG LA and LTE patent pools providing institutional reference for pharmaceutical patent pool financing models [**?**]. Through industrial policy support, Japan has gradually formed a composite development path with government regulatory guarantees

and industry alliance promotion.

(4) Hong Kong: Sandbox Pilot and Gradual Regulatory Path

Hong Kong adopts a "gradual and inclusive"experimental approach to stablecoin regulation. In 2024, the Hong Kong Monetary Authority (HKMA) launched a stablecoin sandbox pilot, allowing selected regulated institutions to test compliant scenarios for stablecoin payment and settlement; in 2025, Hong Kong officially issued the Stablecoin Issuers Ordinance, establishing a licensing system, capital requirements, and prudential regulatory obligations [**?**]. This "pilot first, then legislation" path forms a sharp contrast with mainland China' s "prohibition + digital renminbi" model and provides a unique experimental field for cross-border capital flows and international integration.

(5) Taiwan: Gradual Regulation and Virtual Asset Norm Exploration

Taiwan has not yet issued specialized legislation for stablecoins but has gradually strengthened regulation of virtual assets and service providers (VASPs) in recent years. Since 2021, the Financial Supervisory Commission (FSC) has brought virtual asset trading platforms under the Money Laundering Control Act, requiring customer due diligence (CDD) and suspicious transaction reporting. In 2023, the FSC announced it would promote legislative drafts for the Virtual Asset Management Regulations and officially submitted them to the Executive Yuan for review in 2025, proposing to establish a licensing system and capital requirements for virtual asset service providers [**?**]. Regarding stablecoins, the FSC emphasizes their potential payment and e-money functions and will conduct specialized regulation with reference to international standards in the future. Currently, Taiwan adopts a "gradual + prudent" regulatory approach, using the anti-money laundering framework for risk prevention on one hand while preserving space for financial innovation on the other.

(6) Summary: Differences, Borrowable Experiences, and Implications for China

Comparatively, the US model features multi-agency regulation and market-first approaches but suffers from fragmented rules; the EU model achieves unified legislation through MiCA with high institutional certainty but may limit innovation space; the Japanese model emphasizes industrial policy leadership, forming dual support for intellectual property and financial regulation; the Hong Kong model highlights regional experimental characteristics through sandbox pilots and gradual legislation; and the Taiwan model uses anti-money laundering as an entry point, gradually transitioning to a comprehensive licensing system, highlighting a gradual regulatory approach (see Table 1).

Table 1 Comparison of Regulatory Approaches to Stablecoins and IP Securitization

Jurisdiction	Stablecoin Regulation	IP Securitization Experience	Institutional Characteristics	Borrowable Experience for China
US	Function-oriented, multi-agency regulation (SEC, CFTC, FinCEN)	Mature market (Royalty Pharma)	Market-first, flexible regulation, innovative	Reference the flexibility of multi-agency regulation in pilots
EU	Unified legislation (MiCA), classified management of ARTs and EMTs, high transparency	High-quality securitization (HQS) market	High institutional certainty, strong market integration	Reference unified legislative design, incorporate IP elements
Japan	Government guidance + industrial policy; stablecoins must be issued by banks/trusts; promotes patent pools	Patent pool cooperation + capitalized financing	Policy-driven, dual IP and financial support	Combine with national strategy to promote "patent + digital currency"
Hong Kong	Gradual inclusion, sandbox pilot → 2025 licensing system	Regional financial center advantages	Regional flexibility, cross-border advantages	Provide "pilot first, then legislation" regional experimental model

Jurisdiction	Stablecoin Regulation	IP Securitization Experience	Institutional Characteristics	Borrowable Experience for China
Taiwan	Gradual regulation, VASP under Money Laundering Control Act; 2025 draft	Progressive legislation	Prudent inclusion, gradual establishment	Demonstrates gradual legislative path, conducive to risk control
China	Prudent prohibition, central bank-led approval system	Limited pilot scale	Maintains financial stability, strengthens supervision	Core path is "digital renminbi + IP securitization"

This table summarizes the institutional characteristics and differences across countries/regions, reveals the logic of the "spatio-temporal evolution chain," and further highlights the uniqueness and necessity of China' s model selection.

From a spatio-temporal evolution perspective, a path can be outlined: United States (market-first) → European Union (unified legislation) → Japan (industrial policy-driven) → Hong Kong (gradual sandbox) → Taiwan (gradual legislation) → China (prudent prohibition + digital renminbi leadership). This logical chain not only reveals the diversity of global stablecoin regulation but also provides a more complete reference for China' s future institutional choices in integrating digital finance and intellectual property (see Figure 1 [Figure 1: see original paper]).

For China, the main borrowable experiences are threefold: drawing on the US' s flexible and diversified regulatory framework to allow exploration of stablecoin and patent securitization integration within pilot scopes; learning from the EU' s unified legislative advantages to incorporate intellectual property securitization elements in future digital finance legislation; and referencing Japan' s industrial policy-driven model to combine with national scientific and technological innovation strategies to promote the integration of pharmaceutical patent pools and digital currency tools. These provide multiple international comparative insights for China' s institutional design in integrating digital finance and intellectual property.

Figure 1: Spatio-temporal Evolution of Stablecoin Regulation across Jurisdictions

IV. Designing the Stablecoin-Backed Patent Pool Securitization Model

Building upon international comparisons, this paper further proposes an institutional innovation model of "patent pool → securitization → stablecoin/digital renminbi settlement." This model not only inherits the logic of traditional intellectual property securitization but also incorporates the latest developments in blockchain and digital currency, thereby achieving breakthroughs in liquidity, transparency, and risk management. The following sections elaborate on five aspects: model logic, innovation highlights, comparative advantages, risks and prevention measures, and the spatio-temporal evolution framework.

(1) Model Logic: Patent Pool → Securitized Product → Stablecoin Payment/Settlement → Profit Distribution

In its basic logic, the stablecoin-backed patent pool securitization model can be divided into four stages:

First, **patent pool formation**. Multiple pharmaceutical enterprises concentrate their patents into a pool to achieve unified licensing and management, reducing transaction friction caused by "patent thickets."

Second, **securitized product design**. Using future licensing revenues from the patent pool as underlying assets, an asset-backed securities (ABS) structure is adopted for risk tranching and securities issuance, thereby transforming long-term revenues into liquid financial products [**?**].

Third, **stablecoin/digital renminbi settlement**. Introducing stablecoins or e-CNY in securities trading and revenue distribution stages enables cross-border payments and on-chain settlement, improving capital flow efficiency and reducing foreign exchange conversion and clearing costs.

Fourth, **profit distribution**. Through blockchain smart contracts, cash flows from securitized products (such as licensing fees and dividends) are automatically distributed to investors, achieving transparent and real-time revenue transmission [**?**].

(2) Model Innovation: Cross-Border Applications Supported by Smart Contracts and Digital Renminbi

The core innovation of this model lies in combining smart contracts with central bank digital currency support. Smart contracts can automatically trigger revenue distribution, redemption, or risk control mechanisms through preset terms, avoiding delays or default risks from manual operations [**?**]. Simultaneously, if "digital renminbi (e-CNY)" is incorporated, it can leverage the stability and compliance of fiat currency in cross-border settlement while replacing the potential risky asset attributes of foreign stablecoins, thereby achieving a balance between compliance and efficiency [**?**]. Furthermore, theoretical frameworks

for smart contract risk management have initially formed, such as the six-step method based on the NIST risk management framework (identification, assessment, prioritization, mitigation, testing, monitoring), which helps improve the security and transparency of financial contract execution [**?**]. This provides institutional guarantees for revenue distribution and cross-border settlement in patent pool securitization.

(3) Comparison with Traditional Models: Liquidity, Transparency, and Risk Management

Compared with traditional patent securitization models, the "stablecoin + patent pool" model offers the following advantages:

- **Enhanced liquidity**: Traditional models rely on domestic currency markets with limited cross-border liquidity; introducing stablecoins enables securitized products to be traded more conveniently in international markets.
- **Improved transparency**: Blockchain ledgers and smart contract mechanisms can make capital flows and revenue distribution publicly transparent, reducing information asymmetry.
- **Better risk management**: Under stablecoin payment and digital currency regulatory frameworks, fund security is relatively high, and combined with smart contracts, automated risk control can be achieved.

However, the model also has three shortcomings: - Stablecoins may experience "de-pegging" or liquidity crises, leading to payment and settlement risks [**?**]. - Smart contracts still have vulnerabilities and attack risks, such as reentrancy attacks and code defects [**?**]. - Legal compliance is insufficient, and cross-border payments may touch upon capital controls and monetary sovereignty boundaries.

(4) Risk Prevention: Systemic Risk and Regulatory Arbitrage

To prevent potential risks, three approaches are necessary:

Systemic risk prevention: Strengthen capital constraints and liquidity reserves for stablecoin issuers, referencing the EU' s MiCA prudential regulation model for "significant stablecoins."

Smart contract security: Promote formal verification and full lifecycle risk management of smart contract development to avoid securitized product redemption failures due to technical vulnerabilities [**?**].

Prevention of regulatory arbitrage: Establish a "regulatory sandbox" mechanism to explore the integration of patent pool securitization and stablecoins under a pilot framework, and reduce policy risks from stablecoin cross-border circulation through central bank digital currency participation.

Table: Risk Prevention Measures

Risk Type	Manifestation	Prevention Measure
Systemic risk	Stablecoin de-pegging, liquidity crisis	Strengthen capital constraints and reserve requirements, reference EU MiCA regulation of "significant stablecoins"
Technical risk	Reentrancy attacks, code defects	Promote formal verification and full lifecycle risk control (e.g., Securify/NIST framework)
Compliance risk	Cross-border payments may touch capital controls, AML requirements	Establish "regulatory sandbox," introduce e-CNY to replace foreign stablecoins, reduce policy risks

(5) Spatio-Temporal Evolution Framework Summary

In terms of institutional evolution, this model is not only the result of horizontal comparison but also reflects spatio-temporal dynamics. From a temporal perspective, the United States first proposed securitization regulatory logic (2014–2018), the EU achieved institutional unification through MiCA (2018–2023), Japan revised its Payment Services Act and strengthened bank/trust issuance (2020–2023), Hong Kong adopted sandbox pilots gradually transitioning to legislation (2024–2025), while China leads prudent regulation with its central bank digital renminbi strategy (2021–present). This evolutionary path demonstrates a "US–EU–East Asia" spatio-temporal transmission effect. From a spatial perspective, different jurisdictions show obvious differences in regulatory focus: US marketization, EU unification, Japanese industrial policy-driven, Hong Kong experimental inclusion, and Chinese central bank leadership. This "time + space" evolution framework not only reveals the progressive relationship of global regulatory logic but also provides a gradual and differentiated reference path for China' s future institutional choices.

V. Case Studies and Simulation Analysis

This chapter demonstrates the feasibility and limitations of the "stablecoin + patent pool securitization" model through international case references, identification of implementation obstacles in China, and scenario simulations based on simplified models, enhancing the empirical relevance and practical value of the theoretical discussion.

(1) International Case: The Reference Value of Royalty Pharma

US-based Royalty Pharma is the world' s largest pharmaceutical patent royalty acquisition and securitization company. Its business model core lies in securitization financing by acquiring future licensing fee revenues from pharmaceutical

patents, providing important funding sources for pharmaceutical R&D enterprises [**?**]. Research shows Royalty Pharma' s success rests on three points: first, future cash flow acquisition—using professional teams to evaluate patent portfolios and acquiring future royalty revenue rights to ensure cash flow stability; second, securitization financing—using securitization technology to package future cash flows into asset-backed securities (ABS) for rapid capital recycling, breaking traditional venture capital cycle limitations; and third, risk-sharing mechanisms—through structured securities tranching, forming a virtuous cycle among patent holders, investors, and capital markets to meet the needs of different risk appetite investors and promote continuous innovative drug R&D [**?**]. Studies indicate Royalty Pharma' s success benefits from the organic combination of specialized patent evaluation + securitization engineering + capital market mechanisms [**?**][**?**].

For China, the Royalty Pharma model provides referable experience—utilizing patent pool centralized management and revenue rights securitization, combined with the advantages of stablecoin or central bank digital currency payment and settlement mechanisms, could potentially replicate this model in pharmaceutical industry innovation financing to achieve more efficient financing and innovation incentives.

(2) Analysis of Implementation Obstacles in China

Despite providing a referable paradigm, three major obstacles remain for implementing the Royalty Pharma model in China:

First, **legal and regulatory obstacles**: China adopts a "prohibitive" attitude toward foreign stablecoins, strictly restricting their trading and payment in domestic markets, creating legal obstacles for this model in practical operation. Direct introduction of stablecoin settlement would touch legal red lines [**?**].

Second, **uncertainty in patent valuation**: The securitization process involves issues such as patent authenticity and valuation stability. If underlying assets in the patent pool are declared invalid, cash flow disruption may occur, potentially causing significant investor losses and litigation [**?**]. This problem is particularly prominent in China, as the patent evaluation system is not yet mature.

Third, **cross-border capital flow controls**: Using foreign stablecoins in cross-border payments may trigger capital outflow and financial security risks; even with digital renminbi substitution, issues such as international clearing, compliance mutual recognition, and anti-money laundering (AML) and cross-border regulatory coordination must be resolved under international regulatory frameworks [**?**].

In summary, while drawing on the Royalty Pharma model, China should focus on the compliance boundaries of financial instruments in future policies, replace foreign stablecoins with central bank digital currency to reduce legal risks and regulatory arbitrage space, and adopt a "central bank-led + regulatory sandbox"

gradual path to explore innovation within compliant boundaries.

(3) Scenario Simulation: Digital Renminbi Pilot in China's Free Trade Zones

To demonstrate the potential effects of this model, this paper designs a simplified scenario simulation: assuming a "digital renminbi + patent pool securitization" pilot in the Shanghai Free Trade Zone with a financing scale of 100 million RMB.

The simulation method adopts a simplified discounted cash flow (DCF) model:

$$PV = \sum_{t=1}^{n} \frac{CF_t}{(1+r)^t}$$

where CF_t represents future licensing fee cash flows and r is the discount rate.

Simulation results show that compared with traditional cross-border financing paths: - Traditional financing discount rate $r = 6\%$; if digital renminbi is introduced, due to its compliance and settlement efficiency, the rate decreases to 5%. - With total cash flows of 100 million RMB, the present value of financing increases by approximately 20–30%. - Settlement cycle shortens from T+2 to T+0.5, improving capital turnover efficiency by about 20%. - Cross-border exchange and compliance costs decrease by 1–2%, enhancing net financing returns.

Although this scenario simulation is based on assumed parameters, the results indicate that embedding digital renminbi in patent securitization can effectively improve financing efficiency, reduce capital costs, and enhance cross-border payment transparency. This demonstrates the potential gains of institutional innovation in liquidity, transparency, and compliance, while providing an operational reference for future empirical research and pilot policy design for "free trade zone pilot + digital renminbi internationalization."

If the "patent pool + securitization + stablecoin" model is introduced among small and medium-sized Chinese pharmaceutical enterprises, its potential financing effects can be deduced through simulation experiments:

First, **increased financing scale**. Traditional pharmaceutical enterprises mostly rely on bank loans with limited financing amounts, while patent securitization can obtain larger financing based on future drug licensing fees. Assuming a patent pool containing 10 new drug patents with projected future cash flows of 1 billion RMB, securitization could achieve financing of 600–700 million RMB, far exceeding traditional credit limits.

Second, **reduced financing costs**. Digital renminbi settlement lowers cross-border exchange and compliance costs, reducing overall financing costs by 1–2 percentage points.

Third, **facilitated cross-border capital flows**. If cross-border payment settlement is conducted through stablecoins or digital renminbi, enterprises can obtain foreign investment without relying on the US dollar clearing system, reducing foreign exchange and settlement costs [**?**].

Table: Traditional Model vs. Digital Renminbi Model Comparison

Indicator	Traditional Model (Domestic/Foreign Currency + Bank Loans)	Digital Renminbi + Patent Pool Securitization Model
Financing discount rate (r)	6%	5%
Financing scale	Limited	Increased by 20–30%
Settlement cycle	T+2	T+0.5
Cross-border exchange cost	Higher	Decreased by 0.5–1 percentage points
Capital turnover efficiency	Baseline	Improved by about 20%
Compliance transparency	Bank review + foreign exchange registration	Smart contracts + on-chain audit

Table notes: Financing discount rate reduction: Due to digital renminbi compliance and payment efficiency, investor risk premium decreases. Present value increase: Discount rate reduction directly increases the present value of patent pool future cash flows. Capital efficiency improvement: T+2→T+0.5 significantly shortens settlement cycles. Cost reduction: Reduced cross-border exchange and compliance procedures save 1–2% in costs. Transparency enhancement: On-chain settlement and smart contracts reduce information asymmetry and increase investor confidence.

VI. China' s Path Selection and Policy Recommendations

Based on international comparisons, the uniqueness of China' s path mainly lies in **central bank leadership, strict licensing and approval system**,

and **digital renminbi (e-CNY) core positioning**. Meanwhile, Hong Kong' s regulatory innovation in 2024–2025 provides a "gradual sandbox" model for comparison, with differences across the three regions forming complementary references.

(1) Practical Dilemma: Insufficient SME Financing and High Regulatory Pressure

China' s small and medium-sized pharmaceutical enterprises have long faced financing constraints characterized by "high investment, low collateral." Due to the lack of fixed assets and stable cash flows, traditional bank loans cannot meet R&D investment needs, while capital market entry barriers remain high. Although patent securitization has been piloted in some regions, its limited scale and single model make it difficult to form a systematic solution, lacking scaled experience and institutional and market support. Meanwhile, China maintains strict regulation of virtual currencies and foreign stablecoins, prohibiting their circulation in the domestic financial system: the 2021 Notice issued by ten ministries clearly requires financial institutions and payment institutions not to directly or indirectly provide related services; the 2022 China Financial Stability Report reiterates that all digital currency issuance and trading must be approved by the People' s Bank of China, thereby establishing central bank-led regulatory logic. This "prohibition + approval" combination, while preventing financial risks, also compresses space for compliant financial innovation, restricting the possibility of using stablecoins for cross-border settlement and financing innovation.

(2) Legal System Obstacles: Securities Law, Intellectual Property Law, and Capital Controls

First, securities law imposes strict conditions on asset securitization, requiring underlying assets to be authentic and clearly titled, but the future value of pharmaceutical patents involves high uncertainty, making judicial determination difficult and hard to meet legal requirements.

Second, although intellectual property laws have strengthened patent protection, they lack detailed rules and supporting systems for patent pledge and securitization, resulting in insufficient mechanisms for patent evaluation and transfer.

Third, foreign exchange management regulations strictly limit capital account convertibility; using stablecoins for international settlement may touch the legal red line of non-convertible capital accounts.

Finally, the virtual currency policy adopts a "comprehensive prohibition" approach. While beneficial for risk prevention, it highly compresses policy space for compliant stablecoins or central bank digital currency applications in intellectual property financing, even in pilot environments, as it remains heavily dependent on institutional arrangements for the central bank digital renminbi.

(3) Central Bank Leadership and Licensing System: The Core Tone of China' s Regulation

China' s institutional design presents characteristics distinctly different from the US and EU: the US and EU tend toward functional regulation or unified legislation; Hong Kong adopted a gradual sandbox in 2024-2025 emphasizing "inclusion + prudence" ; while China clearly mandates unified management by the central bank with a licensing and approval system, where digital currency issuance and circulation must rely on the digital renminbi.

This path means that any "patent pool securitization + stablecoin" model implementation in China must use the digital renminbi as the sole legal anchoring tool. This is not only a regulatory compliance requirement but also a strategic choice for national monetary sovereignty and financial security.

(4) Policy Recommendations

1. **Establish a "Digital Renminbi + Patent Securitization" pilot program.** We recommend establishing pilots in the Shanghai Free Trade Zone and Guangdong-Hong Kong-Macao Greater Bay Area to explore the "digital renminbi + patent securitization" model. Using digital renminbi to replace foreign stablecoin financing and settlement mechanisms, conduct issuance and settlement of pharmaceutical patent pool securitization products through a central bank-led approval framework to reduce cross-border payment risks while accumulating experience for renminbi internationalization [**?**].
2. **Improve patent valuation and credit rating systems.** Drawing on international experience, a national-level patent evaluation platform should be established, introducing big data and artificial intelligence technologies to enhance the objectivity and transparency of patent valuation. Simultaneously, drawing on securities market credit rating systems, a tranched rating system for patent securitization products should be formed to reduce investors' risk perception costs [**?**].
3. **Draw on the EU' s functional regulation model to form a multi-layered regulatory framework.** Reference the EU' s MiCA layered regulation of Asset-Referenced Tokens (ARTs) and E-Money Tokens (EMTs) to adopt differentiated management for different types of digital financial instruments [**?**]. For central bank digital currency, strict prudential regulation can be implemented; for compliant tokens used in industrial financing, a "regulatory sandbox" model can be explored to avoid "one-size-fits-all" approaches that stifle innovation.
4. **Promote cross-border legal coordination and risk prevention.** At the international level, China should actively participate in formulating international stablecoin and digital currency regulatory standards under frameworks such as the G20 and BIS, forming regulatory mutual recog-

nition with major jurisdictions including the US, EU, and Japan. Particularly in cross-border payments, anti-money laundering, and investor protection, legal friction in cross-border patent securitization and digital currency applications should be reduced through international treaties or bilateral cooperation mechanisms [**?**]. At the regional level, explore docking mechanisms with Hong Kong' s "sandbox + approval system," achieving two-way complementarity through Greater Bay Area policy linkage: Hong Kong responsible for market-oriented experiments, mainland China responsible for compliant implementation.

(5) Summary: The Institutional Logic of China' s Characteristic Path

Comprehensively, the institutional logic of China' s path is: **Central bank leadership**: All digital currency pilots must be approved by the central bank; **Digital renminbi core**: Foreign stablecoins are completely replaced by legal digital currency; **Gradual innovation**: Conduct pilot programs first in free trade zones and the Greater Bay Area, then gradually expand; **Three-region comparison**: Hong Kong' s "inclusive prudence" → mainland China' s "prohibition + approval," forming complementarity. This framework both ensures financial security and opens compliant pathways for intellectual property financialization.

Table: Comparison of Stablecoin Regulatory Paths Between Mainland China and Hong Kong

Aspect	Mainland China	Hong Kong
Regulatory philosophy	Central bank approval system	Gradual sandbox system
Key policy documents	2021 Notice; 2022 Financial Stability Report	2024 HKMA Sandbox; 2025 Official Rules
Implementation path	Prohibit foreign stablecoins → digital renminbi as sole legal path	Inclusive experiments → prudent implementation
Institutional characteristics	Maintains financial stability, strengthens supervision	Regional flexibility, cross-border advantages

Conclusion

This paper attempts systematic research in the intersection of "patent pool securitization + stablecoins," addressing the gap in existing literature regarding the integration of intellectual property financialization and digital currency regulation. Unlike previous studies focusing mainly on the feasibility and risks of patent securitization [**?**][**?**][**?**] and stablecoin risks and regulatory frameworks [**?**][**?**], this paper proposes an entirely new institutional framework.

In terms of academic contribution, this paper constructs a logical chain of "patent pool → securitization → stablecoin settlement" based on securitization theory, intellectual property financialization, and monetary payment theory. It further proposes a cross-border financing tool that balances liquidity, transparency, and compliance through the integration of smart contracts and digital renminbi. This framework not only expands the theoretical boundaries of intellectual property finance research but also provides new analytical perspectives for the legalization of digital currency research.

In practical contributions, this paper summarizes institutional experiences from the US, EU, Japan, and Hong Kong through international comparison, and proposes a localized path compatible with China' s regulatory environment. Research shows that introducing stablecoin mechanisms can help alleviate liquidity shortages and cross-border payment obstacles in patent securitization, but in China, it must be centered on the central bank digital renminbi and gradually promoted through pilot programs. This paper is the first to propose the "stablecoin + patent pool securitization" model, providing practical institutional reference for financing small and medium-sized pharmaceutical enterprises and the digital renminbi strategy.

Additionally, this paper introduces a "time + space evolution framework" in institutional comparison and explores potential effects of cross-border capital flows through scenario simulations, demonstrating the application potential of interdisciplinary methods in legal and financial research. This attempt lays a methodological foundation for future in-depth analysis of intellectual property finance and industrial innovation using spatio-temporal models. Meanwhile, this paper forms academic intertextuality with the authors' previous research on AI governance and fintech transformation, as well as intellectual property rule of law and institutional exploration, collectively constructing an interdisciplinary research trajectory covering AI governance, fintech regulation, intellectual property financialization, and industrial innovation.

Of course, this paper also has limitations. The simulation analysis lacks empirical data support, and future research should incorporate real cases or experimental platforms. The analysis of cross-border payments and legal conflicts remains macroscopic, urgently requiring more detailed dimensions of judicial practice and international treaties. Future research can expand in areas such as cross-border legal coordination, risk prevention mechanisms, and multi-layered regulatory model design to promote academic deepening and policy innovation in this field.

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Note: Figure translations are in progress. See original paper for figures.