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Constructing the Theory of Double Hollowing in Real Estate: Coupling Mechanisms between Spatial Structure and Financial Logic

Chengwen Song[1] Fang Chen[2] and Junyu Zhu[3]*

[1] Kookmin University, 77 Jeongneung-ro, Seongbuk-gu, Seoul, Republic of Korea

[2] Department of Business Administration, Faculty of Business Administration, Asia University, 5-8 Sakai, Musashino, Tokyo 180-8629, Japan

[3] School of public policy and administration, Chongqing University, Chongqing City, China 400044

[*]Corresponding author. e-mail: 1095981080@qq.com

Abstract

This paper introduces the concept of *Double Hollowing* in the real estate sector, defined as the simultaneous occurrence and mutual reinforcement of *spatial hollowing*—the physical and functional decline of core urban areas—and *financial hollowing*—the detachment of real estate market valuation from its actual use value under financialization. Integrating spatial political economy, financialization theory, and Marx's dual value theory, the study develops a multidimensional analytical framework that explains how spatial inefficiency and financial detachment interact through value shift, capital embeddedness, institutional collusion, and risk transmission mechanisms. The proposed *Double Hollowing* framework not only advances theoretical understanding of urban and real estate disequilibrium but also offers an operational index system for empirical testing. While primarily conceptual in nature, the framework provides valuable policy implications for balancing spatial vitality restoration and financial risk management, particularly in contexts of high land fiscal dependency and speculative real estate markets.

Keywords: Double Hollowing; Spatial Hollowing; Financial Hollowing; Spatial Political Economy; Financialization; Urban Governance; Real Estate Market; Land Finance

Evidence for Practice

- Introduces the integrated concept of *Double Hollowing*, capturing the mutually reinforcing relationship between spatial inefficiency and financial detachment in real estate markets.

- Provides an operationalizable index system—the *Spatial Hollowing Index* and *Financialization Index*—enabling empirical testing and cross-city comparisons.
- Identifies four coupling mechanisms—value shift, capital embedding, institutional collusion, and risk transmission—that explain the formation and persistence of double hollowing.
- Offers a unified framework bridging spatial political economy, financialization theory, and Marx's dual value theory, overcoming disciplinary fragmentation in existing research.
- Delivers actionable policy insights for restoring urban spatial vitality and mitigating financial risks, particularly in contexts of high land fiscal dependence and speculative property markets.

This article introduces, for the first time, the concept of **"Double Hollowing"**, which refers to a dynamic process in which two forms of structural imbalance—**spatial hollowing** (the decline of spatial functions) and **financial hollowing** (the detachment of financial value from real economic functions)—occur in parallel and mutually reinforce each other through interconnected mechanisms.

In contemporary global economies, this phenomenon has become increasingly prominent. On the one hand, urban core areas have experienced functional decline, high vacancy rates, and population loss, leading to a marked decrease in spatial utilization efficiency. On the other hand, real estate prices and investment decisions have become increasingly dependent on capital operations and financial logics rather than actual use value, resulting in a severe disconnection between financial valuation and real economic function.

Existing research generally treats **"urban hollowing"** and **"real estate financialization"** as independent topics:

- Urban hollowing studies focus on the decline of physical space and function but overlook the logic of inflated prices and the generation of financial risks.
- Real estate financialization studies emphasize capital-driven price bubbles but pay insufficient attention to the causes and consequences of inefficient spatial utilization.

This disciplinary fragmentation has left us without a unified framework capable of explaining both spatial inefficiency and financial decoupling, nor an operational indicator system to capture their interaction. The case of the U.S. **Rust Belt** exemplifies this dual imbalance: industrial relocation triggered core-area decline (spatial hollowing), followed by an influx of speculative real estate investment that drove inflated prices (financial hollowing), thereby forming a mutually reinforcing cycle of spatial and financial imbalance.

Against this backdrop, this article seeks to address three core theoretical questions:

1. How can the analytical paths of spatial decline and financial detachment be integrated into a unified framework?
2. How is the negative feedback loop between space and finance formed, operated, and evolved?
3. What theoretical and policy implications does the double hollowing framework have for urban sustainability and financial stability?

Given the long industrial chain, high interlinkages, and strong volatility transmission of the real estate sector within the economic system, such structural imbalances not only directly affect the housing market but also spread to the macroeconomy through credit, fiscal, and investment channels. The collapse of the U.S. housing bubble in 2008, which triggered the global financial crisis, has already demonstrated these risks.

Currently, the coexistence of **high inflation, high debt, and low growth**—combined with geopolitical tensions, energy transitions, and supply chain restructuring—has created a vulnerable external environment for the emergence of double hollowing.

Theoretical contributions and practical value of the double hollowing framework:

- **Theoretical innovation**: For the first time, integrates spatial political economy, real estate financialization theory, and the Marxian dual character of value to reveal the interactive mechanism between spatial inefficiency and financial decoupling, thereby filling the explanatory gap created by separate research streams.
- **Conceptual innovation**: Introduces a new concept that encompasses both urban hollowing and real estate financialization while revealing their coupling mechanisms.
- **Methodological insight**: Proposes operationalizable "Spatial Hollowing Index" and "Financialization Index," providing tools for subsequent empirical testing and cross-national comparison.
- **Policy relevance**: Offers a theoretical foundation for designing policy mixes that address both spatial vitality restoration and financial risk prevention, particularly relevant for assessing the long-term impacts of land-based fiscal dependence, urban regeneration, and housing finance regulation.

This theoretical framework is particularly applicable to urban economies characterized by high dependence on land-based fiscal revenues, high degrees of real estate financialization, and the coexistence of core-area functional decline and inflated prices.

Definition, *Double Hollowing* refers to a dynamic process in which the real estate sector simultaneously experiences:

1. **Spatial Hollowing** – the decline of traditional spatial functions; and

2. **Financial Hollowing** – the progressive detachment of financial value from real economic functions;

with the two processes mutually reinforcing each other through specific mechanisms.

Spatial Hollowing, Manifested in physical and functional decline within urban core areas or specific districts, including:

- Declining livability of core areas (deterioration of living environment and public services);
- Underutilization of productive spaces (decline in utilization rates of commercial and industrial facilities);
- High vacancy rates (idle office buildings, commercial properties, and residences).

Financial Hollowing, Characterized by the dominance of financial logics over real estate valuation, with market prices largely driven by capital operations and speculative motives rather than actual use value, including:

- Prices persistently exceeding levels supported by rents or productive returns;
- Prevalence of high leverage and securitized structures, amplifying price volatility and systemic risks;
- Excessive proportion of investment-oriented housing, leading to imbalances in supply structure.

Spatial–Financial Negative Feedback Loop, The two forms of hollowing reinforce each other through the following chain: Financial speculation and capital accumulation → Development of high-end but low-efficiency projects → Declining spatial utilization efficiency → Weakening of real economic support → Heightened price volatility and financial risk → Further speculation and spatial degradation.

Table 1 These indicators directly correspond to the conceptual dimensions and can be obtained from official statistics, industry reports, or remote sensing data, providing the empirical basis for subsequent cross-regional comparative studies.

Theoretical Foundations and Analytical Framework

This study approaches the issue of double hollowing from three complementary dimensions—spatial structure, capital logic, and value composition—integrating perspectives from spatial political economy, financialization theory, and Marx's theory of the dual character of value. Together, these provide the theoretical foundation for analyzing the formation mechanisms and coupling pathways of double hollowing.

Compared with existing research, this integration both inherits the strengths of different disciplinary traditions and overcomes the limitations of single-dimensional analyses:

- Spatial political economy → reveals the institutional roots of spatial decline;

- Financialization theory → explains the market logic underlying the detachment of financial value from real economic functions;
- Dual character of value → provides analytical tools to measure the degree of deviation between the two.

Spatial Political Economy, ***Institutionally Embedded Spatial Structural Evolution：*** Spatial political economy emphasizes that urban spatial structures are not the result of natural evolution but the product of the interplay among power relations, capital operations, and institutional arrangements (Cuthbert 2005; Morton 2017). This perspective transcends traditional ecological or administrative views of the city, highlighting the role of political power, social conflict, state intervention, and capitalist modes of production in shaping spatial forms and spatial inequalities (Harvey 2013).

Empirical cases show that suburbanization and the rise of peripheral cities are often accompanied by the functional outflow and resource depletion of core areas (McLoughlin 1994). For example, U.S. tax incentives during the Reagan and George H. W. Bush administrations encouraged suburban commercial development, undermining the economic and social vitality of core areas. In Europe, the phenomenon of "national hollowing" illustrates how fiscal austerity and functional decentralization weaken public service provision in core areas, exacerbating spatial imbalances (Varvarousis et al. 2025).

Thus, spatial political economy not only reveals the institutional roots of spatial hollowing but also emphasizes that its formation is not a mere case of market failure—it is a political-economic process deeply embedded in power structures and policy choices.

Financialization Theory, ***The Shift from the "Real" to the "Virtual" in Real Estate：*** Financialization theory posits that the growing dominance of financial markets, institutions, and elites in economic activity leads asset valuation and investment decision-making to become increasingly detached from use value (Van Loon and Aalbers 2017). In the real estate sector, this shift manifests as a transition from residential and productive functions toward capital appreciation and speculative functions (Lizieri 2025).

Key manifestations include:

- Expansion of Real Estate Investment Trusts (REITs);
- Emergence of blockchain-based real estate tokenization;
- Rising price volatility driven by high leverage and securitization (Aalbers, Fernandez, and Wijburg 2020).

Critics argue that financialization shifts the focus of economic growth from productive accumulation to short-term financial returns, contributing to the decline of manufacturing and infrastructure investment, and concentrating capital

in high-yield but low-social-utility real estate assets (Adisson and Halbert 2022). This transformation not only alters the social function and valuation logic of real estate but also heightens market sensitivity to cross-asset contagion risks, increasing vulnerability to debt deflation and long-term stagnation.

Accordingly, financialization theory provides a solid logical foundation for explaining real estate financial hollowing, tracing the capital-driven "real-to-virtual" trajectory and its mechanisms of risk accumulation.

Marx's Theory of the Dual Character of Value, ***Value Deviation and Fictitious Capital：*** Marx's theory of the dual character of value distinguishes between use value (utility in meeting actual needs) and exchange value (value formed through social labor and market relations) (Hodges 1972; Morishima 1973). Under conditions of financialized capitalism, exchange value can substantially exceed use value, creating fictitious capital (Bellofiore 2018).

In the real estate market, when prices significantly exceed their residential or productive utility due to speculation and financial manipulation, the surplus constitutes fictitious capital. This value depends on market liquidity rather than productive foundations, making it fragile and prone to sharp corrections. Moreover, large-scale financialized investment often coincides with high-end property vacancies and displacement of low-income populations, exacerbating value misalignment and social inequality (Dole and Duxbury 2024).

Thus, the dual character of value provides an essential analytical tool for measuring the degree of value misalignment between spatial hollowing and financial hollowing.

Table 2 Complementarities:

- *Spatial Political Economy* × *Financialization Theory* → explains how institutions amplify capital's reshaping of space;
- *Financialization Theory* × *Dual Character of Value* → reveals the mechanisms by which prices decouple from real economic functions;
- *Spatial Political Economy* × *Dual Character of Value* → illuminates the institutional context of value misalignment and resource redistribution.

Analytical Framework, Building on these three theoretical pillars, this study constructs an analytical framework centered on double hollowing:

- Spatial structure provides the institutional and policy context;
- Capital logic captures pricing and investment behaviors driven by financialization;
- Value composition explains the disjunction and risk between price and use utility.

Together, these elements form a spatial–financial negative feedback loop, reinforcing spatial inefficiency and financial detachment, ultimately impacting both urban sustainability and financial stability.

Conceptual Definitions

Before advancing the analysis of double hollowing, it is essential to define and dissect its core concepts with precision. Clear conceptual definitions are not only the prerequisite for theoretical analysis but also the foundation for variable operationalization and empirical testing.

In this study, double hollowing refers to a process in which spatial hollowing and financial hollowing coexist under specific institutional and market conditions and mutually reinforce each other through interconnected mechanisms. This compound imbalance differs from analytical frameworks that discuss *urban hollowing* or *real estate financialization* in isolation, as it emphasizes the coupling mechanisms between the two and the systemic risks they pose to urban sustainability and financial stability.

In subsequent analyses, double hollowing is treated both as an independent theoretical concept and as two measurable subdimensions—spatial hollowing and financial hollowing. While each can occur independently, they may also form a spatial–financial negative feedback loop that amplifies economic and social risks.

To ensure logical consistency between theory and empirical work, this chapter defines the following three core concepts:

1. Double hollowing (overall definition, core features, and value misalignment);
2. Spatial hollowing (manifestations and key drivers);
3. Financial hollowing (decoupling mechanisms and fictitious capital formation).

Double Hollowing, Definition, Double hollowing refers to a dynamic process in which the real estate market experiences spatial functional decline (spatial hollowing) and financial value detachment from real economic functions (financial hollowing) simultaneously, with the two processes mutually reinforcing one another.

Core Features

- Coexistence of declining spatial utilization efficiency and inflated asset prices;
- Significant decoupling of use value from exchange value;
- Intertwining of urban vitality decline with the accumulation of financial risks.

Interaction Mechanisms

1. Financialization aggravates spatial inefficiency – Speculative capital favors high-end but low-efficiency projects, leading to underutilized properties and weakened core-area functions.
2. Spatial decline undermines financial assets – The deterioration of core areas reduces potential real estate value, increasing the risk exposure of banks and investment institutions.
3. Gentrification and displacement – High-end redevelopment raises prices and displaces low-income populations, producing "empty luxury housing" spatial patterns.
4. Amplification of systemic risk – The high coupling between real estate and the financial system means localized decline can spread into broader financial instability through credit and securitization channels.

The "Ghost City" Paradox and Value Misalignment, Under speculative investment, real estate markets may exhibit both high prices and high vacancy rates, a paradox indicative of exchange value overshadowing use value. The result is weakened social utility of assets, fragmented community structures, and intensified socioeconomic stratification.

Table 3 *Spatial Hollowing,* Definition**,** Spatial hollowing refers to the physical and functional decline of urban core areas or specific functional zones under combined economic, social, and institutional forces, manifested in underutilization of properties, rising vacancy rates, and overall loss of vitality.

Key Manifestations

- High vacancy rates (especially in commercial real estate);
- Functional weakening of core areas and emergence of "transitional zones";
- Population outmigration and decline in social diversity;
- Deterioration in public service capacity;
- Mismatch between building uses and market demand.

Typical Drivers

- Suburbanization and urban fringe expansion;
- Digitalization and remote work altering land-use demand;
- Zoning regulations and redevelopment barriers;
- Demographic changes and shifting residential preferences;
- Fiscal austerity and functional decentralization reducing public service provision.

Spiral Decline Mechanism, Inefficient spatial utilization → reduced regional attractiveness → shrinking tax base → decline in public services → population loss → further spatial decline. This mechanism is particularly evident in "downtown decay" phenomena and often creates openings for speculative capital entry.

Financial Hollowing, Definition*,* Financial hollowing refers to the detachment of real estate market value from its use value under conditions of high financialization, transforming it into an asset type primarily oriented toward capital gains and speculative returns.

Decoupling Mechanisms

1. Asset securitization (e.g., MBS, REITs, tokenization);
2. Price escalation driven by high-leverage financing and speculation;
3. Financial engineering prioritized over productive investment;
4. Value extraction and cross-border capital transfers;
5. Persistent divergence between use value and market price (fictitious capital formation).

Illusory Wealth and Systemic Risk, The wealth generated by financialization is often not backed by real economic value, making it prone to rapid erosion during market corrections, potentially triggering cascading defaults and systemic crises. This "real-to-virtual" capital allocation also weakens the long-term growth capacity of the real economy.

Theoretical Integration and Coupling Mechanisms, Placing spatial hollowing and financial hollowing within the integrated framework of spatial political economy, financialization theory, and the dual character of value enables clear identification of their interaction pathways:

Speculative capital promotes high-end, low-efficiency projects → spatial utilization efficiency declines → real economic foundations weaken → financial asset values become fragile → market risks surface and credit contracts → capital shifts further toward short-term, high-yield speculation → worsening of both spatial and financial conditions.

Theoretical Advantages

- Multidimensional explanatory power – simultaneously incorporates spatial structure, capital logic, and value composition;
- Mechanism identification – reveals the transmission chains coupling the two hollowing processes;
- Policy applicability – provides the theoretical basis for integrated spatial governance and financial regulation policy design.

A schematic diagram of the double hollowing coupling mechanism is presented in Figure 1.

Theoretical Model Structure: Coupling Pathways and Mechanisms

Building on the unified theoretical framework outlined in the preceding chapter, this study decomposes **double hollowing** into four identifiable causal pathways to reveal the dynamic coupling between **spatial hollowing** and **financial hollowing**. Each pathway reflects the interweaving of institutional arrangements, market forces, and capital logics, together forming a self-reinforcing feedback loop.

Value Shift Mechanism, ***Residential Value → Investment Value → Collateral Value****:* Definition and Logic*,* The value shift mechanism refers to the progressive transformation of real estate's primary function—from residential and productive use value, to investment value, and ultimately to collateral value as a financing instrument. This process embodies a core feature of financialization: real estate is redefined by capital logic as a tool for asset appreciation and wealth management, rather than as space serving social needs.

Causal Chain

1. Erosion of residential utility – Housing is treated as a tradable asset rather than a long-term public good;
2. Strengthening of investment attributes – Price assessments are driven by potential appreciation and capital returns;
3. Transformation into financing collateral – Real estate is used as credit collateral, with high leverage pushing prices upward;
4. Marginalization of use value – Capital returns take precedence over spatial efficiency and social utility.

Theoretical Linkage, This mechanism directly corresponds to Marx's dual character of value—exchange value progressively dominates use value, culminating in value misalignment and the creation of fictitious capital.

Capital Embedding Mechanism, Credit–Land Price–Housing Price Amplification， Definition and Logic, The capital embedding mechanism describes the positive feedback relationship between credit expansion, land price increases, and housing price escalation. In this loop, financial capital becomes deeply embedded in urban land and housing markets, fostering a debt-driven growth model.

Causal Chain

1. Credit expansion → increased household purchasing power → heightened demand;
2. Land price escalation – Local governments raise land transfer prices, passing costs onto housing prices;
3. Housing price growth → higher collateral values → further credit expansion;

4. Debt levels and asset prices rise in tandem, accumulating systemic risk.

Theoretical Linkage, This mechanism reflects the binding effect between financialization logic and spatial structures, and reveals the deep dependence of local government finance on real estate markets.

Institutional Collusion Mechanism, ***Local Fiscal Dependence × Real Estate Financialization****:* Definition and Logic, The institutional collusion mechanism refers to the alignment between local governments' fiscal reliance on land-transfer revenues and real estate developers' financialized business strategies, together forming an institutional synergy that drives double hollowing.

Causal Chain

1. Local governments depend on land sales to sustain fiscal expenditures;
2. Policy incentives (low interest rates, tax breaks, loose credit) stimulate development investment;
3. Developers leverage land assets to secure cross-regional financing, recycling funds into speculative development;
4. Financial resources concentrate in real estate, crowding out investment in manufacturing and other productive sectors.

Theoretical Linkage, This mechanism highlights the active role of the state in real estate financialization and resonates with the concept of "national hollowing" in political economy.

Risk Transmission Mechanism, ***Spatial Decline → Asset Devaluation → Financial Crisis → Urban Decline*** *:*Definition and Logic

The risk transmission mechanism traces how spatial hollowing can destabilize the financial system through asset devaluation, which in turn deepens urban decline.

Causal Chain

1. Rising vacancy rates and functional decline in core areas → reduced real estate values;
2. Asset devaluation → shrinkage of collateral values → loan defaults and financial institution losses;
3. Financial instability → credit contraction → reduced investment in the real economy;
4. Investment shortfalls exacerbate spatial decline, forming a vicious cycle.

Theoretical Linkage, This mechanism captures the risk resonance effect between spatial and financial dimensions, explaining how localized physical decline can evolve into a systemic financial crisis.

Synthesis, These four mechanisms are not isolated; they are mutually conditional and reinforcing, collectively forming the **closed-loop structure of double hollowing**:

- The value shift mechanism initiates capital's reorientation from spatial functions toward financial logics;
- The capital embedding mechanism amplifies the land–finance price linkage;
- The institutional collusion mechanism institutionalizes and normalizes market logics;
- The risk transmission mechanism feeds crises back into the spatial and financial spheres, accelerating double hollowing.

This integrated model provides an operationalizable framework for pathway identification, forming the basis for the subsequent indicator system construction and empirical validation.

Research Hypotheses

Based on the unified theoretical framework and the coupling mechanism model developed in Chapter 4, this study proposes three testable hypotheses. These hypotheses reflect predictions derived from different theoretical perspectives and correspond to the specific causal pathways of double hollowing, providing both direction and logical grounding for subsequent empirical analysis.

H1: Higher Levels of Financialization Are Associated with Greater Real Estate Hollowing

Hypothesis Statement, Controlling for other factors, an increase in a city's level of financialization will significantly raise the degree of real estate hollowing.

Theoretical Basis, Financialization theory posits that real estate has shifted from being driven by use value to being driven by exchange value. High leverage and securitization push prices persistently upward while weakening real estate's real economic functions. Under a short-term return orientation, capital tends to favor luxury housing and speculative development projects rather than the construction of housing that meets rigid demand, directly resulting in inefficient spatial utilization and rising vacancy rates.

Logical Deduction

- Financialization → Increased speculative investment → Higher vacancy rates in luxury properties;
- Financialization → Housing prices rise beyond affordability → Residential demand spills over into peripheral areas.

From this, it follows that financialization and real estate hollowing are expected to be significantly and positively correlated.

H2: Spatial Hollowing Amplifies the Asset Devaluation Risk of Financial Hollowing

Hypothesis Statement, Under conditions of financial hollowing, spatial hollowing will significantly amplify the impact of real estate asset devaluation on the financial system.

Theoretical Basis, The risk transmission mechanism suggests that spatial decline (e.g., high vacancy rates, functional imbalance) undermines real estate's cash flows and real economic foundations, making asset prices more dependent on market expectations. Once expectations reverse, price corrections will be sharper, and default risk and financial instability will increase significantly.

Logical Deduction

- Spatial hollowing → Reduced real estate cash flows → Decline in collateral value;
- Declining collateral values → Deterioration of financial institutions' balance sheets → Credit contraction → Intensified market downturn.

Thus, spatial hollowing plays an amplifying role in financial risk.

H3: Greater Local Government Dependence on Land-Based Fiscal Revenues Tightens the Coupling Between Spatial and Financial Hollowing

Hypothesis Statement, The higher the degree of local government dependence on land-transfer revenues, the stronger the coupling relationship between spatial hollowing and financial hollowing in that city.

Theoretical Basis, The institutional collusion mechanism indicates that land-based fiscal policy drives up land and housing prices, encouraging real estate firms to rely on high-leverage financing and cross-regional capital circulation. This institutional arrangement directly links spatial and financial hollowing and reinforces their interaction into a self-perpetuating loop.

Logical Deduction

- Land fiscal dependence → Land prices rise → Housing prices rise → Leverage accumulates;
- High housing prices and financialization → Increase in luxury projects, rising vacancy rates → Deepening spatial hollowing.

From this, it follows that land fiscal dependence is a key institutional nexus strengthening double hollowing.

Table 4 This table clearly presents the theoretical foundations and causal mechanisms underlying the research hypotheses, ensuring consistency between the study's theoretical model and its empirical design.

Research Methodology Recommendations

To enhance the empirical explanatory power of the coupling mechanisms underlying **double hollowing**, this study adopts a **multi-method strategy** that integrates quantitative analysis, comparative case studies, policy text analysis, and bibliometric analysis. This strategy emphasizes **cross-validation across multiple data sources** and ensures consistency between **theory, mechanism, and data**.

Variable Operationalization

- **Spatial Hollowing Index**: Weighted average of commercial vacancy rate in core areas, net population outmigration rate, and decline in infrastructure utilization.
- **Financialization Index**: Weighted average of share of real estate-related loans, loan-to-value ratio (LTV), and proportion of investment-oriented housing.

Bibliometric Analysis and Comparative Case Study

(1) Bibliometric Analysis

- **Objective**: Identify research hotspots, trends, and theoretical gaps in the literature on real estate financialization and spatial hollowing.
- **Method**: Use Web of Science and Scopus databases; apply VOSviewer and SciMAT for keyword co-occurrence analysis, co-authorship network analysis, and co-citation analysis.
- **Application**: Reveal the thematic evolution of topics such as *risk–crisis–sustainability*, thereby providing theoretical support for hypothesis formulation.

(2) Comparative Case Study

- **Objective**: Compare the manifestations of double hollowing and policy responses in different types of cities.
- **Method**: Select high-vacancy and low-vacancy cities (e.g., Silicon Valley vs. Munich) for comparative analysis based on actual market data and institutional contexts.
- **Application**: Test the variation in coupling mechanisms under different institutional and market conditions.

Quantitative Analysis， ***Cross-Validation of Spatial and Financial Indicators***

Indicator Selection

- **Spatial efficiency indicators**: Commercial vacancy rate, residential vacancy rate, net population outmigration rate.

- **Financialization risk indicators**: Loan-to-value ratio (LTV), share of real estate-related credit, debt ratio of real estate firms.

Analytical Methods

- **Panel regression**: Test the relationship between financialization levels and the degree of spatial hollowing (H1).
- **Spatial econometrics (GIS/SLM)**: Reveal the spatial transmission and clustering effects of risks (H2).
- **Interaction effects testing**: Assess the combined impact of high leverage and high vacancy rates.

Policy Text Analysis: Identifying Institutional Collusion Mechanisms, **Objective**: Reveal the active role of government and the institutional incentive structures that contribute to double hollowing.

Method:

- **Content analysis**: Systematically code policy documents related to land, credit, and taxation.
- **Stakeholder analysis**: Identify patterns of institutional cooperation among local governments, real estate developers, and financial institutions.

Application: Analyze the institutional collusion pathway of *land-based fiscal policy → real estate financialization*, thereby validating the institutional logic of H3.

Methodological Advantages, This study's methodological system offers the following advantages:

1. **Multi-source data integration** – Cross-verification of national statistics, financial regulatory data, local policy documents, and market datasets reduces the risk of bias from single-source data.
2. **Complementarity of methods** – Quantitative models test causal relationships, comparative case studies reveal contextual variation, and policy analysis identifies institutional roots.
3. **Theoretical embeddedness** – Each method corresponds to specific theoretical hypotheses, ensuring a coherent **theory–mechanism–empirical** loop.

Conclusion and Future Directions

This study develops a systematic and multidimensional analytical framework to examine the phenomenon of double hollowing in real estate, offering the first unified theoretical model to reveal the mutually reinforcing mechanisms between spatial inefficiency and financial detachment in urban economies. Through the identification of four coupling

pathways—value shift, capital embedding, institutional collusion, and risk transmission—the research provides a structured and theoretically grounded tool for understanding this complex process.

Theoretical Contributions

1. Multi-perspective integration – This study synthesizes spatial political economy, financialization theory, and Marx's dual character of value into a coherent framework, bridging the gap in existing research that has treated urban hollowing and real estate financialization as separate topics.
2. New concept formulation – It introduces the integrated concept of *double hollowing*, emphasizing the coupling and co-evolution between spatial and financial dimensions, thus enriching the theoretical repertoire of real estate and urban studies.
3. Innovative mechanism modeling – It constructs a coupling mechanism model encompassing value shift, capital embedding, institutional collusion, and risk transmission, providing an operationalizable framework for future quantitative research.

Methodological Contributions

1. Hypothesis–variable–data–method alignment – The study proposes a systematic research design that ensures logical consistency between theoretical derivation and empirical testing.
2. Multi-method strategy – By integrating quantitative analysis, comparative case studies, policy text analysis, and bibliometric methods, the approach enables complementary validation across diverse data sources and techniques.
3. Indicator system construction – It develops measurable indices for *spatial hollowing* and *financialization*, laying a data foundation for cross-city and longitudinal comparative research.

Policy Contributions, The findings offer theoretical support for integrated policy design aimed at restoring urban spatial vitality and maintaining financial system stability, particularly in:

- Reducing dependence on land-based fiscal revenues and optimizing urban fiscal structures;
- Redirecting real estate capital toward productive and socially beneficial functions;
- Reforming urban renewal and housing finance policies to prevent the cyclical amplification of spatial and financial imbalances.

Limitations, Despite its theoretical and framework innovations, this study has certain limitations:

1. Lack of empirical testing – The study primarily presents a theoretical and conceptual model without empirical validation, and its generalizability and robustness remain to be tested.
2. Data availability constraints – Some indicators (e.g., core-area vacancy rates, proportion of investment-oriented housing) are difficult to obtain consistently across cities and countries, which may affect the operational feasibility of subsequent empirical work.
3. Contextual applicability – The manifestations and mechanisms of double hollowing may vary across institutional settings and market environments, necessitating contextualized validation in different countries and regions.

Future Research Directions, In light of these limitations, future studies could extend this work in the following ways:

1. Cross-national and cross-city comparisons – Use multi-country panel data to compare the formation conditions and evolutionary pathways of double hollowing under different fiscal systems, land regimes, and planning models.
2. Micro-level behavioral mechanism analysis – Combine microdata on real estate transactions, corporate finance, and population migration to explore how the actions of developers, investors, and residents jointly drive double hollowing.
3. Policy pilot evaluations – Assess the effects of policy experiments in urban renewal, rental subsidies, and land system reforms using causal inference methods such as difference-in-differences (DID) and regression discontinuity designs (RDD).
4. System dynamics simulation – Develop a dynamic simulation model of the urban spatial–financial system to forecast long-term evolutionary trends and risk transmission patterns under different policy scenarios, providing a scenario-based tool for policy formulation.

Tables and Figures

[Table 1 Operational Indicator System]

Dimension	Core Indicators
Spatial Hollowing	Core-area commercial vacancy rate; net outmigration rate; decline in infrastructure utilization rate

Financial Hollowing	Share of real estate-related credit; loan-to-value ratio (LTV); proportion of investment-oriented housing; price-to-rent ratio

[Table 2 Theoretical Advantages of the Three Perspectives in Combination]

Theoretical Perspective	**Core Proposition**	**Contribution to Double Hollowing Analysis**
Spatial Political Economy	Urban spatial structures are shaped by power, capital, and institutions; suburbanization and fiscal strategies can trigger core-area decline	Reveals the institutional roots of spatial hollowing
Financialization Theory	Financial dominance leads to valuation and decision-making detached from use value	Explains the market logic and risk mechanisms of financial hollowing
Dual Character of Value	Separation of use value and exchange value; expansion of fictitious capital	Measures and explains the value-deviation mechanism linking the two forms of hollowing

[Table 3 Core Concepts, Definitions, and Features]

Concept	**Definition**	**Key Features / Measurement Directions**
Spatial Hollowing	Functional decline and inefficient utilization due to imbalances in urban spatial structure	Commercial vacancy rate; net population outmigration; decline in infrastructure utilization
Financial Hollowing	Asset bubble formation due to detachment of real estate's financial value from real economic functions	Price-to-rent ratio; proportion of investment-oriented housing; real estate leverage ratio
Double Hollowing	Coexistence and mutual reinforcement of spatial and financial hollowing	High-price–high-vacancy ("ghost city"); degree of use–exchange value misalignment

[Table 4 Correspondence Between Theory, Mechanism, and Hypotheses]

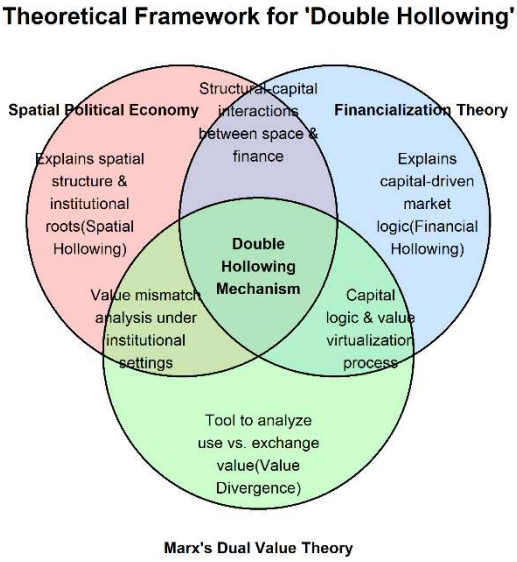
Theoretical Perspective	Mechanism Pathway	Research Hypothesis
Spatial Political Economy	Capital Embedding Mechanism	H3: Land fiscal dependence strengthens the coupling pathway of double hollowing
Financialization Theory	Risk Transmission Mechanism	H2: Spatial hollowing amplifies the asset devaluation risk of financial hollowing
Marx's Dual Value Theory	Value Shift Mechanism	H1: Higher levels of financialization are associated with greater real estate hollowing

[Table 5 Hypothesis–Variable–Data–Method Matching]

Hypothesis	Core Variables	Data Sources	Analytical Methods and Techniques
H1: Higher levels of financialization are associated with greater real estate hollowing	**Financialization Index** (share of real estate-related credit, leverage ratio); **Spatial Hollowing Index** (commercial vacancy rate, net population outmigration rate)	National Bureau of Statistics real estate data; CBIRC loan statistics; local housing authority annual reports	Panel data regression (fixed-effects / random-effects); Pearson / Spearman correlation tests
H2: Spatial hollowing amplifies the asset devaluation risk of financial hollowing	Vacancy rate change; real estate price index; non-performing loan ratio	National housing price indices from research institutes; central bank financial stability reports	Spatial lag model (SLM); error correction model (ECM)
H3: Local government dependence on land-based fiscal revenues strengthens	Share of land-transfer revenues in total fiscal revenues; proportion of	Ministry of Finance budget execution reports; Ministry of	Mediation effect analysis (structural

the coupling of double hollowing	investment-oriented real estate transactions	Natural Resources land-transfer statistics	equation modeling, SEM)

[Figure 1 Schematic Diagram of the Coupling Mechanisms of Double Hollowing]



Conflict of Interest

The authors declare no conflict of interest.

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Author Biographies

Chengwen Song PhD Student in Public Administration, Kookmin University 77 Jeongneung-ro, Seongbuk-gu, Seoul, Republic of Korea Research interests: organizational administration; market policy; related areas. (Email: wainixueer3334@gmail.com)

Fang Chen Undergraduate Student, Department of Business Administration, Faculty of Business Administration, Asia University 5-8 Sakai, Musashino, Tokyo 180-8629, Japan

Junyu Zhu holds a Master's degree and is affiliated with the School of Public Administration at Chongqing University. His primary research interests include behavioral public administration and organizational behavior. (Email: 1095981080@qq.com)