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How does banking expansion influence city development and synergy? — A new perspective from government debts

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ABSTRACT

This study exploits the regulatory shock of banking deregulation in China to examine how the geographical expansion of city commercial banks (CCBs) influences regional development and economic synergy. Employing a refined identification strategy, we demonstrate that bank expansion significantly promotes both local economic growth and inter-regional coordination. Specifically, we find that each new sub-branch entry leads to a 0.7 % increase in city-level development. Moreover, we identify a novel transmission mechanism whereby expanding banks support local governments through substantial subscriptions to urban investment bonds, thereby facilitating infrastructure development. Our findings illuminate the institutional linkages between banking institutions and local governments, suggesting that multi-market CCBs serve as an effective policy instrument for addressing local financial volatility and advancing coordinated regional development initiatives.

1. Introduction

The banking sector has been instrumental in driving urban development trajectories. Within China's banking system, four distinct categories of institutions operate: State-Owned Commercial Banks (SOCBs), Joint-Equity Commercial Banks (JECBs), City Commercial Banks (CCBs), and Rural Commercial Banks (RCBs). CCBs occupy a unique position within this framework, having been established with the explicit mandate to facilitate local economic development and extend financial services to small and medium-sized enterprises (SMEs) within their jurisdictions.[1] In this context, the 2006 deregulation policy specifically targeted CCBs, catalyzing a significant transformation in their operational scope. Subsequently, over the past decade, >110 of the 125 CCBs have undertaken cross-regional expansion, substantially enlarging both their asset portfolios and branch networks.

The implications of bank expansion have emerged as a significant focus of academic inquiry. At the microeconomic level, researchers have investigated the effects of expansion on various aspects of bank operations, including operational efficiency, risk management practices, and market structure dynamics. The post-deregulation period has witnessed substantial changes in credit supply patterns, which have significantly influenced corporate R&D innovation (Bertrand et al., 2007; Hsueh & Zhang, 2024), risk financing mechanisms (Cornaggia et al., 2015; Jiang et al., 2020; Krishnamurthy, 2015), and energy efficiency outcomes (Wang & Lee, 2023). In the household sector, deregulation has generated notable positive externalities, including reduced income inequality through enhanced earnings for low- and middle-income populations (Beck et al., 2010; Tewari, 2014), diminished credit constraints, and increased access to higher education as reflected in higher college enrollment rates (Sun & Yannelis, 2016).

This study advances a macroeconomic perspective by investigating the impact of CCB deregulation on urban development dynamics and regional synergies in China. Our investigation is predicated on several compelling empirical observations. First, in contrast to State-Owned Commercial Banks that maintain dominant lending positions across regions, CCBs exhibit distinctive ownership structures characterized by local state capital participation, resulting in decision-making processes that systematically align with governmental policy objectives. Second, the spatial expansion strategies of CCBs and their subsequent effects on urban development are fundamentally embedded within local political economy frameworks and development initiatives. Third, while the microeconomic implications of bank expansion have been thoroughly

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[1] More detail regarding CCB contributions can be found on the Chinese government website: https://www.gov.cn/guowuyuan/vom/2015-12/28/content_5028413.htm.

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documented in the literature, the transmission mechanisms through which such expansion shapes broader patterns of urban development warrant further theoretical and empirical investigation.

Our empirical analysis yields robust evidence of substantial effects from CCB expansion on urban development trajectories. Specifically, we document that each additional sub-branch establishment generates an average increase of 0.7 % in city-level development indicators, with heterogeneous effects particularly pronounced in regions characterized by constrained financial resources, elevated entry barriers for non-local financial institutions, and significant government expenditure levels. Furthermore, our findings demonstrate that CCB expansion significantly strengthens inter-city economic synergies, suggesting that multi-market CCBs function as crucial institutional mechanisms in facilitating coordinated regional development initiatives.

We identify a novel transmission mechanism linking bank expansion to urban development and regional synergies: the substantial expansion of Urban Investment Bond (UIB) issuance that follows the entry of non-local CCBs. Infrastructure development has served as a fundamental catalyst for urban growth in China and has contributed significantly to regional development heterogeneity (Démurger, 2001; Xiong, 2018). In this institutional framework, Urban Development Investment Companies (UDICs) function as dedicated vehicles for government-initiated infrastructure projects, meeting their capital requirements through UIB issuance. These instruments have consequently gained recognition as "quasi-government bonds" due to their implicit state backing. The magnitude of this financing channel is substantial: as of 2022, the outstanding UIB volume in China reached 60 trillion yuan, approximately double the scale of conventional local government bonds. Our analysis demonstrates that CCBs, operating under the strategic guidance of their home city governments, systematically utilize implicit guarantees and institutional connections during geographical expansion to facilitate UIB subscription and provide financing to local governments in their expanded jurisdictions.

This study extends the existing literature by identifying a novel transmission mechanism through which bank expansion shapes urban development patterns - specifically through the expansion of government debt instruments. While conventional channels such as credit allocation have been extensively documented, we illuminate how CCBs, characterized by their distinctive hybrid ownership structure integrating local state capital and market-oriented operations, catalyze urban development through their strategic positioning in the UIB market. This mechanism assumes particular significance within China's institutional context, where local governments function as primary agents of development through infrastructure investment initiatives. By establishing the causal link between CCBs' geographical expansion and the systematic growth in UIB issuance and infrastructure development, we uncover a previously unexamined nexus between financial sector evolution and urban development dynamics. Our empirical evidence on the synchronized patterns of debt growth and development across cities within CCB networks provides novel insights into the role of financial institutions in promoting regional coordination, yielding significant policy implications for regulators seeking to optimize the balance between financial innovation and sustainable urban development.

The subsequent sections of this paper are structured as follows: Section 2 establishes the institutional background and theoretical framework. Section 3 presents our data construction methodology, sample characteristics, and empirical identification strategy. Section 4 investigates the transmission channels through which CCB expansion influences development and regional synergies. Section 5 synthesizes our findings and discusses policy implications.

2. Backgrounds and facts

2.1. Banking deregulation in China

In contrast to SOCBs and JECBs, CCBs were established with the explicit mandate to promote local urban development and extend financial services to small and medium-sized enterprises (SMEs) within their jurisdictions. Initially, these institutions operated under strict geographical constraints, being prohibited from establishing branches beyond their municipal administrative boundaries or engaging in any form of cross-regional business activities.

Table 1
Policy on CCBs Cross-Regional Operations.

Period	Policy	Shock	Detail
2006–2008	"Measures for the Administration of Off-site Branches of City Commercial Banks"	Deregulation	Allow qualified CCBs to establish inter-regional (intro-province and inter-province) branches
2009–2010	"Opinions on Adjusting the Market Access Policy for Small and Medium-sized Commercial Bank Branches (Trial Implementation)"	Deregulation	Cancel quantity restrictions; Delegate approval units; Cancel the requirement for working capital
2011–2012	Criticism from senior central government officials	Regulation	Suspend the approval of applications
2013-	"Notice on Doing a Good Job in Rural Financial Services in 2013"	Regulation	Allow qualified CCBs to establish intro-province branches only

The China Banking Regulatory Commission (CBRC) implemented a significant regulatory reform in 2006, introducing measures to liberalize branch establishment restrictions for qualified CCBs. The new regulatory framework established a two-tier system of qualification criteria. For intra-provincial branch expansion, CCBs were required to satisfy multiple operational and financial thresholds: a minimum operating history of three years, total assets exceeding RMB 15 billion, fully paid-in registered capital of at least RMB 5 billion, minimum capital adequacy and core capital adequacy ratios of 8 % and 4 % respectively. Additionally, institutions needed to maintain a non-performing loan ratio below 6 % for two consecutive years and achieve specified performance metrics: asset profitability of 0.35 %, return on assets of 8 %, and per capita assets of RMB 10 million. For inter-provincial expansion, the regulatory requirements were substantially more stringent, mandating total assets of at least RMB 50 billion, registered capital exceeding RMB 10 billion, and a sustained non-performing loan ratio below 6 % for three consecutive years. These institutions were also required to meet elevated performance benchmarks: asset profitability of 0.45 %, return on assets of 10 %, and per capita assets of RMB 20 million.

This regulatory liberalization catalyzed significant cross-regional expansion initiatives among CCBs. The establishment of Shanghai Bank's Ningbo Branch in April represented a watershed moment, inaugurating a wave of inter-provincial expansion across China's banking sector. The period between 2006 and 2008 witnessed 25 CCBs successfully establishing operations beyond their home jurisdictions.

The regulatory environment underwent further liberalization in 2009 as the CBRC implemented additional measures to expand CCBs' operational scope. The revised market entry framework introduced three significant modifications: First, the elimination of quantitative branch restrictions for qualified small and medium-sized commercial banks within designated regions. Second, a streamlined administrative process that decentralized approval authority for intra-provincial branch establishments to provincial CBRC offices. Third, the removal of standardized operating capital requirements for new branches, enabling JECBs and CCBs to optimize resource allocation based on their business expansion trajectories and capital requirements. This regulatory evolution elevated cross-regional operations, particularly intra-provincial expansion, to a strategic imperative for CCBs. Consequently, by 2010, >50 % of CCBs had initiated cross-regional expansion

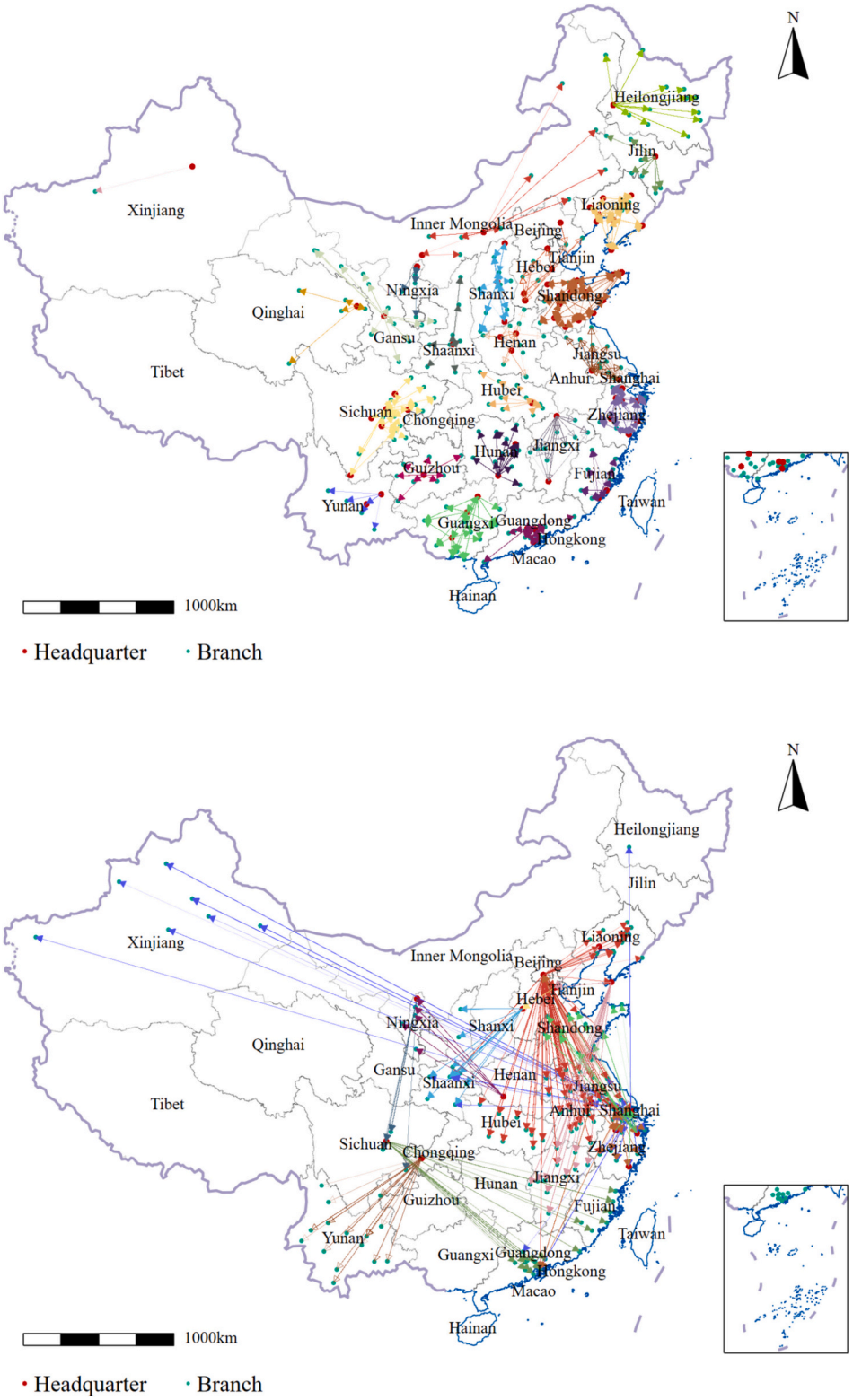

Fig. 1. Spatial expansion network of City Commercial Banks.
Note: This figure depicts the spatial distribution of CCB expansion networks through 2021. The visualization is structured in two panels: the upper panel illustrates intra-provincial expansion patterns, while the lower panel presents inter-provincial expansion dynamics, highlighting the distinctive spatial characteristics of CCB expansion across different administrative jurisdictions. Urban centers hosting CCB headquarters are denoted by red nodes, while cities containing CCB branch operations are represented by green nodes. Directional vectors connecting green nodes to red nodes indicate the flow of institutional expansion. For visual clarity, the inter-provincial panel includes only expansion networks comprising >50 branch establishments.

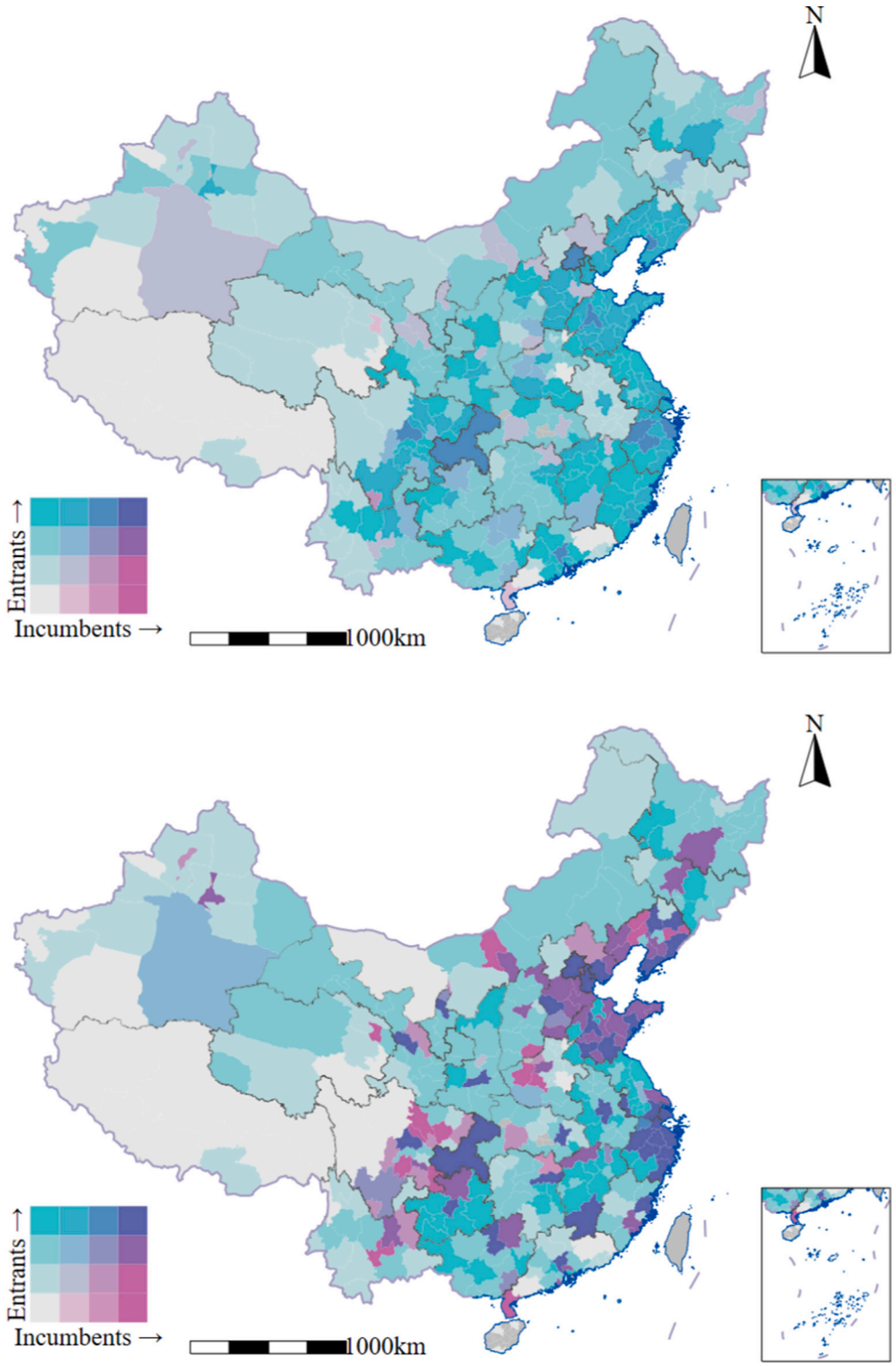

Fig. 2. Distribution of City Commercial Banks: incumbents and entrants.
Note: This figure depicts the spatial distribution of CCB market entry through 2021 at the municipal level. The visualization comprises two panels: the upper panel presents institutional-level statistics, while the lower panel illustrates operational unit distribution at the sub-branch level. The classification methodology defines institutions as incumbents when their headquarters are situated within the respective municipal jurisdiction; all other institutions are designated as entrants. For comparative visualization of incumbent and entrant concentrations across cities, the data are consolidated into a unified sample prior to classification. The sample distribution is segmented into quartiles to facilitate systematic categorization. In the institutional-level panel, bank presence is stratified into four categories: 0, 1, 2, and > 2 institutions. Similarly, in the operational unit panel, sub-branch distribution is classified into four intervals: 0, 1–17, 18–68, and > 68 establishments.

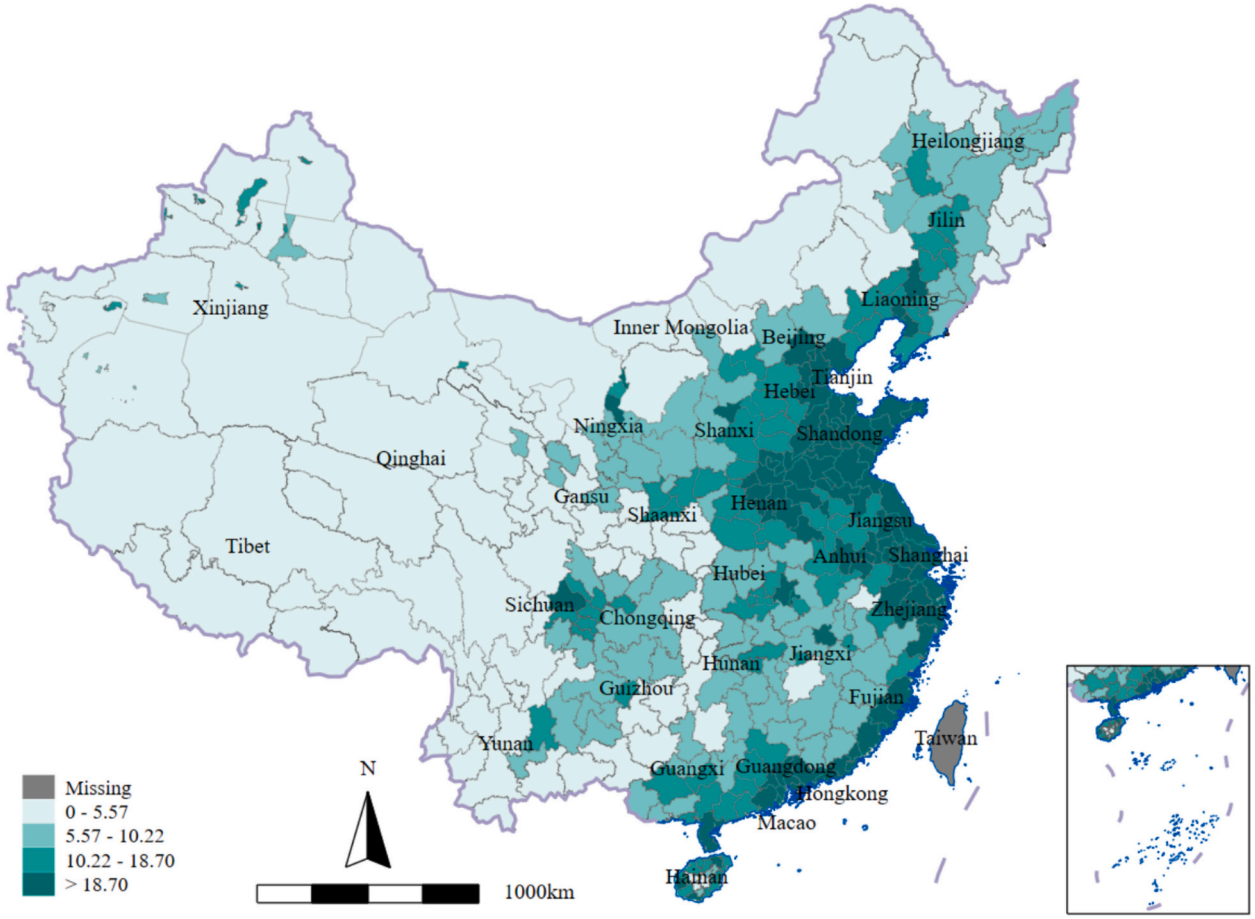

Fig. 3. Night light intensity among cities.
Note: This figure illustrates the spatial distribution of nocturnal luminosity intensity across prefecture-level administrative units in 2022. The analysis utilizes calibrated nighttime light data from Wu et al. (2021). The visualization methodology involves spatial aggregation of raster layers to compute mean luminosity values at the municipal level, followed by quartile-based categorization of the processed data for systematic visualization.

initiatives, resulting in substantial growth in both asset portfolios and branch networks.

However, the regulatory stance underwent a significant reversal in 2011 when, following concerns expressed by senior central government officials, the CBRC suspended approvals for CCB cross-regional expansion applications. The regulatory framework was further constrained in 2013 with the implementation of a comprehensive moratorium on inter-provincial branch approvals. Subsequently, CCB geographical expansion has experienced a structural deceleration, accompanied by an increased emphasis on risk management protocols. Table 1 provides a comprehensive chronology of the regulatory policies governing CCBs' geographical expansion initiatives.

2.2. Stylized facts

Figs. 1 and 2 provide a comprehensive visualization of CCB expansion patterns in the post-deregulation period. Fig. 1 delineates the spatial trajectories of CCB expansion through 2021, with directional vectors illustrating expansion flows. The figure is bifurcated to distinguish between intra-provincial and inter-provincial expansion patterns, highlighting the distinct spatial dynamics of CCB expansion within and across provincial jurisdictions. Within central and western regions, intra-provincial expansion exhibits a monocentric pattern, with CCBs headquartered in provincial capitals serving as primary nodes radiating outward to peripheral cities. In contrast, the eastern region demonstrates a polycentric expansion configuration characterized by complex network interconnections, reflecting pronounced disparities in regional financial development. The eastern coastal urban centers emerge as predominant destinations for inter-provincial expansion initiatives, while central and western cities maintain limited representation in cross-provincial networks. This asymmetric expansion pattern can be attributed to two fundamental factors: First, the geographical concentration of CCB headquarters in eastern and central regions facilitates operational expansion into proximate eastern markets. Second, the eastern region's more developed financial markets, evidenced by substantially higher deposit bases and lending volumes, generate stronger gravitational effects in attracting CCB expansion from other regions.

Market entrants constitute a dominant segment of the banking landscape, particularly in terms of institutional presence. Fig. 2 illustrates the spatial distribution of CCB market entry patterns through 2021, with a dual-panel structure: the upper panel presenting institutional-level data and the lower panel depicting operational unit distribution at the branch and sub-branch level. The visualization employs a dichromatic scheme where blue gradients indicate higher concentrations of market entrants and red gradients denote greater incumbent presence. At the institutional level, entrant representation consistently exceeds incumbent presence, primarily due to the historical pattern of single-CCB dominance in most municipal markets. This numerical superiority of entrants generally persists at the operational unit level, where entrant branch establishments substantially exceed incumbent operations across most urban centers. However, significant regional heterogeneity exists in this distribution pattern. Specific urban markets within Hebei and Shandong Provinces exhibit incumbent dominance over entrants, suggesting the presence of elevated entry

barriers. Conversely, cities in Jiangsu and Zhejiang Provinces demonstrate high concentrations of both incumbents and entrants, indicative of mature, competitive banking markets.

We present a spatially explicit visualization of the geographical distribution of calibrated nighttime luminosity data sourced from Wu et al. (2021). To optimize analytical precision and interpretability, we employ spatial aggregation techniques to transform high-resolution raster imagery into prefecture-level mean luminosity values, as illustrated in Fig. 3. The spatially averaged light intensity metrics function as quantitative indicators of regional economic development, revealing pronounced spatial heterogeneity with significant clustering of economically advanced urban centers in eastern coastal regions. Our spatial analysis identifies a modest but positive correlation between luminosity intensity and CCB market penetration, particularly evident in relatively less developed provinces including Jiangxi, Guangxi, Guizhou, and Ningxia. These spatial patterns and correlations inform our empirical identification strategy and subsequent econometric specifications.

3. Theory and hypothesis

3.1. Literature review

3.1.1. Banking deregulation

In this study, banking deregulation refers specifically to the removal of restrictions on banks' cross-regional operations. This deregulation process began with Maine's initial relaxation of entry restrictions in 1978 and culminated in the comprehensive liberalization brought about by the Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994, which removed all entry regulations. Over this period, extensive research has examined the effects of banking deregulation on both microeconomic and macroeconomic levels.

First, the effects on firms and households. Banking institutions traditionally exhibit strong geographical preferences in their lending practices, primarily serving proximate firms and households. Consequently, following deregulation, there are notable shifts in the banking industry's lending practices. In short, deregulation mitigates financial constraints for numerous local and small to medium-sized enterprises (Cornaggia et al., 2015; Hsueh & Zhang, 2024; Jiang et al., 2020), leading to a complex set of effects on corporate R&D innovation (Hsueh & Zhang, 2024), financial risk (Cornaggia et al., 2015; Jiang et al., 2020; Krishnamurthy, 2015), and energy efficiency (Wang & Lee, 2023). For households, deregulation has several notably positive outcomes, such as reducing income inequality by increasing earnings for low- and middle-income groups (Beck et al., 2010), easing credit constraints, and enhancing college enrollment rates (Sun & Yannelis, 2016).

Second, the systemic impact on the economy. As fundamental components of the financial system, banks' evolutionary changes profoundly influence broader economic dynamics. Bertrand et al. (2007) find that high-performing firms gain greater access to loans, framing bank expansion as a Schumpeterian process of creative destruction that optimizes the industrial structure. On the demand side, deregulation has several positive effects, including reducing income inequality by raising earnings for low- and middle-income groups (Tewari, 2014), alleviating credit constraints, and increasing college enrollment rates (Sun & Yannelis, 2016). Given the co-integrated relationship between inequality and growth, reducing income inequality typically supports economic development (Royuela et al., 2019). Goetz and Gozzi (2022) further demonstrate that interstate banking integration in the U.S. enhances economic co-movement between states by aligning bank lending fluctuations and facilitating the transmission of deposit shocks across state lines.

3.1.2. Local government, development and synergy

When analyzing macroeconomic growth, diverse academic perspectives and numerous influencing factors and mechanisms exist. Here, however, we focus specifically on the causes of economic growth in urban regions. While local regions operate within the national framework, the quasi-principal-agent relationship between central and local governments, along with the competitive dynamics among local governments (Xiong, 2018), necessitates a departure from traditional national-level growth analysis when examining urban growth. This approach emphasizes the unique role of local government involvement, which includes public investment and infrastructure development (Démurger, 2001; Gramlich, 1994), support for local industrial policies (Aghion et al., 2009), financial backing (Beck et al., 2005; Hernández-Cánovas & Martínez-Solano, 2010), and improvements in the institutional environment (Djankov et al., 2002).

In China, local governments play a crucial role in urban economic development, with a clear divergence in financing policy orientation between local and central governments to advance urbanization (Feng et al., 2022). Wu et al. (2016), in a study of Guangzhou, identify an interesting pattern in which hosting mega-events becomes a strategy for capital accumulation, stimulating infrastructure-led urbanization. Further, Wu et al. (2024) find that the expansion of government-funded PPPs is driven by career advancement pressures on local officials.

3.2. Theoretical framework and research hypotheses

Building on these insights, we propose a novel transmission mechanism linking CCB expansion to local government debt dynamics and infrastructure development patterns. In China's institutional framework, urban infrastructure development, excluding national railways and highways, falls primarily under the purview of Urban Development Investment Corporations (UDICs). These entities exhibit distinctive organizational characteristics that set them apart from conventional market participants. Foremost, UDICs specialize in initial urban land development and infrastructure project implementation, deriving their primary revenue from land transfer activities, which results in limited profitability (Feng et al., 2022) and necessitates substantial external financing. Additionally, UDICs operate under a distinctive ownership structure, predominantly controlled by local state-owned enterprises and functioning as operational extensions of local governments.

These institutional features position UDICs as specialized government investment and financing vehicles. While they access traditional bank lending channels, UDICs have increasingly relied on Urban Investment Bonds (UIBs), a specialized form of corporate debt instrument, to meet their financing requirements. The close institutional alignment between CCBs and local governments has resulted in CCBs emerging as the dominant subscribers to these debt instruments. Although such politically-influenced market participation may potentially distort market efficiency (Schoenherr, 2019; Sheng et al., 2011), it provides significant advantages to UDICs through enhanced financing access and reduced capital costs (Houston et al., 2014; Li et al., 2008).

This debt-driven development model has become institutionalized in China's urban growth framework, contributing to the progressive financialization of urban development processes (Feng et al., 2022; Pan et al., 2017; Wu, 2023). The mechanism through which CCB expansion facilitates debt accumulation in expanded jurisdictions warrants careful examination. CCBs, functioning as de facto financial arms of local governments, make expansion decisions that are inherently influenced by political considerations. During UIB issuance procedures, UDICs engage in a dual process of preparing requisite documentation while simultaneously cultivating relationships with potential non-local investors to ensure successful bond placement.

Our analysis suggests that during their geographical expansion, entrant CCBs systematically advance urban financialization by providing financing to their expanded jurisdictions. This operates through two primary channels: First, CCBs typically commit to substantial UIB subscriptions during pre-entry negotiations with local governments. Second, they leverage their institutional networks to attract additional investors to participate in UIB subscriptions.

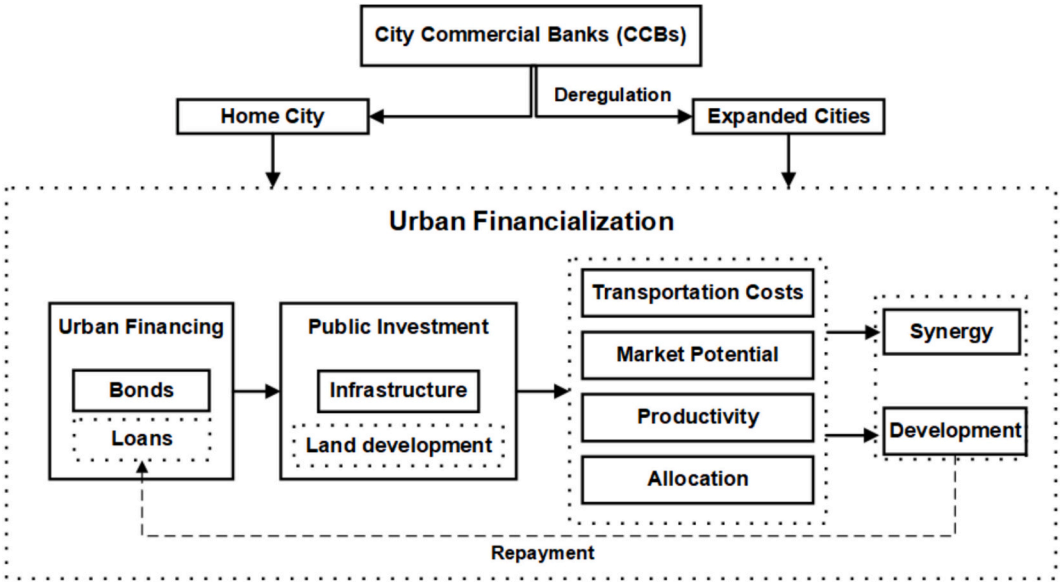

Fig. 4. The theoretical framework of bank expansion on development and synergy.

Following successful financing arrangements, UDICs deploy these resources for land development and infrastructure construction, utilizing land transfer revenues as the primary mechanism for debt servicing (Feng et al., 2022). This process exemplifies the institutionalization of urban development financialization through political connections and implicit governmental guarantees (Feng et al., 2022; Wu, 2023).

Several empirical facts lend support to our proposed mechanism. First, the geographical pattern of CCB expansion reveals a systematic development gradient: expanded jurisdictions typically exhibit lower levels of economic development relative to headquarters locations, with their local governments consequently facing more acute financing constraints. Second, the institutional framework of inter-governmental competition, structured around promotion incentives, reinforces this transmission mechanism (Li & Zhou, 2005; Xu, 2011). Within this promotion-driven governance system, local officials systematically prioritize urban development initiatives through accelerated public investment and infrastructure development programs (Xiong, 2018). Third, the secondary market tradability of UIBs, in contrast to traditional loans, provides CCBs with a strategic advantage: they can utilize UIB subscriptions as an entry mechanism into new markets while retaining the option to manage risk exposure through discounted secondary market transactions. This market structure inherently facilitates pre-issuance and issuance-phase non-market interactions, particularly in the form of strategic negotiations and bargaining arrangements.

At the inception of each development cycle, UDICs and CCBs operate as complementary institutional mechanisms, with UDICs serving as the transformative engine and CCBs functioning as the resource reservoir. Following successful financing arrangements, UDICs strategically deploy capital resources toward infrastructure development, effectively converting debt financing into productive public investment. The economic impact of public investment and infrastructure development manifests through multiple channels. Scale economies emerge through reduced transportation costs (Limao & Venables, 2001; Redding & Venables, 2004) and enhanced trade volumes and cross-regional economic linkages (Donaldson, 2018). Structural transformations occur through productivity enhancements in the private sector and improved market efficiency (Aschauer, 1989; Esfahani, & Ramírez, M. T., 2003). Additionally, infrastructure development promotes regional economic integration by expanding market accessibility in peripheral regions (Banerjee et al., 2020).

Based on this theoretical framework, we formulate our primary research hypothesis:

H1. The geographical expansion of CCB networks enhances urban development across expanded jurisdictions through accelerated public investment and infrastructure development, facilitated by increased UIB issuance.

The geographical expansion of CCBs represents a tangible manifestation of regional financial liberalization. This process facilitates efficient capital mobility (McKinnon, 1993), catalyzes the spatial reallocation of complementary factors, and ultimately contributes to reduced regional disparities and enhanced coordination in urban development patterns (Blanchard & Giavazzi, 2002). As previously established, CCB expansion generates relatively modest impacts on traditional deposit and lending markets within expanded jurisdictions; rather, their primary influence operates through politically-facilitated UIB expansion. Consequently, while Goetz and Gozzi (2022) suggest that synchronized fluctuations in bank deposits and loans might explain regional economic coordination, our analysis indicates that the fundamental driver of inter-city developmental synchronization lies in the coordinated expansion of public investment and infrastructure development initiatives.

The mechanism underlying this correlation becomes apparent when examining capital allocation patterns: CCBs and their affiliated investors, through coordinated UIB subscriptions across home and expanded jurisdictions, create an integrated capital pool accessed by multiple UDICs. The centralized coordination of UIB subscription allocations by bank headquarters facilitates synchronized patterns of public investment and infrastructure development across connected cities. This process transforms CCB geographical expansion into a mechanism for strengthening inter-city financial linkages, ultimately generating systematic networks of financial integration. While UDICs remain the primary vehicles for urban development financialization in China (Feng et al., 2022), the expanding geographical networks of CCBs function as critical accelerators of this process. Within the framework of inter-governmental strategic interactions, this systematic financial integration produces measurable synergistic development effects across connected urban centers, particularly in the short-term horizon.

Based on these insights, we formulate our second research hypothesis:

H2. The geographical expansion of CCB networks facilitates synchronized UIB growth between headquarters and expanded jurisdictions, thereby promoting coordinated development patterns within connected cities.

Finally, we present a schematic representation of the transmission mechanism in Fig. 4, which delineates the linkages between CCB expansion and its effects on urban development and regional synergies. The subsequent sections provide rigorous empirical tests of each component within this urban financialization framework, establishing their statistical significance through systematic econometric analysis.

3.3. Some considerations

Several critical methodological considerations warrant attention in framing our research inquiry. First, China's banking system exhibits a clear hierarchical structure where SOCBs maintain dominant market positions in lending and deposit-taking across all regions. Empirical evidence from Guangdong Province in 2021 illustrates this disparity: SOCBs operated 5806 sub-branches with total assets of approximately 12 trillion yuan, while CCBs maintained only 627 sub-branches with total assets of approximately 2.5 trillion yuan.[2] Given SOCBs' extensive nationwide branch network and their substantially larger lending capacity to both businesses and households, it becomes methodologically problematic to attribute urban economic development primarily to CCB expansion through credit constraint alleviation.[3]

Second, CCBs occupy a distinct position in China's banking sector due to their unique institutional structure and operational mandate. Their ownership composition integrates local state capital—predominantly from municipal governments—with enterprise and social capital investments. This hybrid structure engenders decision-making processes fundamentally different from both SOCBs, which respond primarily to national policy directives, and JECBs, which operate under market-oriented principles. The embedded political connections in CCB ownership structures systematically influence operational decisions, particularly in strategic areas such as large-scale lending and bond subscription activities aimed at promoting local economic development. This institutional arrangement contrasts sharply with SOCBs which, despite their extensive branch networks, operate independently of local government oversight through a hierarchical management structure aligned with national economic objectives.

Third, our analysis of spatial externalities focuses on recipient jurisdictions rather than headquarters locations. For illustration, when Beijing-headquartered banks establish operations in Hebei Province, we examine the developmental impacts on Hebei's urban centers. The relative scale of non-local CCB presence remains modest across jurisdictions. Our sample reveals that in 50 % of cities, entrant CCB sub-branches constitute <25 % of incumbent branch networks. Given that branch network scale serves as a proxy for credit capacity, this structural characteristic further constrains the potential impact of the credit alleviation channel.

Finally, our research addresses the fundamental challenge of linking micro-level market behavior, represented by CCB expansion decisions, to macro-level urban development outcomes. This analytical framework necessitates careful identification of transmission mechanisms sufficiently powerful to generate measurable macro-level effects. While existing literature documents improvements in firm-level operational performance through credit constraint alleviation following bank expansion, such micro-level effects alone appear insufficient to drive comprehensive urban development patterns.

[2] Data is from the website of Guangdong Province Government: http://guangzhou.pbc.gov.cn/guangzhou/129136/4264307/index.html.

[3] Another perspective that strengthens this argument is that SOCBs typically provide financial services to local state-owned enterprises (SOEs) and large private firms, whereas CCBs tend to focus on serving small and medium-sized private enterprises. It is evident that the former group forms a significant part of the local economy.

4. Empirical design and results

4.1. Data, sample and specification

Our empirical analysis employs branch-level data from CSMAR, China's premier financial database widely utilized in academic research (Chen et al., 2023; Colonnelli et al., 2024). The comprehensive dataset encompasses over 300,000 banking institutions, documenting establishment dates, geographical locations, and institutional affiliations. We integrate this data with geographical coordinates obtained through the Baidu Map API to identify provincial and municipal locations and compute geodesic distances between each institution and its headquarters. We classify institutions operating outside their headquarters' jurisdictions as non-local entities, designating them as entrant branches or sub-branches in their respective operational locations. This methodology enables the construction of various institutional metrics, including the distribution of local versus non-local branches for individual banks and the composition of incumbent versus entrant institutions across cities.

To evaluate expansion eligibility criteria, we supplement our analysis with institutional data from the China National Research Data Service (CNRDS), which provides comprehensive information on banks' capitalization, financial performance, and operational characteristics. Following data cleaning procedures that exclude observations with missing geographical identifiers, discontinued operations, or insufficient financial documentation, while maintaining granularity at the sub-branch level, our final sample comprises 291,418 sub-branches, with CCBs accounting for 38,047 of these institutions.

Our measurement of urban development and regional synergies utilizes nighttime luminosity data derived from satellite observations. These remote sensing data capture anthropogenic light emissions and serve as established indicators for monitoring spatiotemporal socio-economic dynamics. Two primary satellite platforms provide these measurements: the Defense Meteorological Satellite Program (DMSP) and the Visible Infrared Imaging Radiometer Suite (VIIRS), with temporal coverage ending in 2013 and beginning in 2012, respectively. However, technological differences between these platforms result in systematic variations in sensor characteristics, data quality metrics, temporal coverage patterns, and spatial-temporal resolution, creating methodological challenges for long-term urban development analysis. Recent methodological advances have addressed these challenges through sophisticated data harmonization techniques (Chen et al., 2021; Wu et al., 2021).

Wu et al. (2021) employ an innovative "pseudo-invariant pixel" calibration methodology for DMSP-OLS nighttime luminosity data. Their approach ensures temporal consistency between DMSP and VIIRS observations through systematic supplementation of missing VIIRS monthly observations prior to annual data synthesis. This methodology not only resolves data discontinuities but also maintains temporal coherence. The researchers generate an enhanced, continuous dataset by integrating calibrated DMSP observations with SNPP-VIIRS data transformed to DMSP-OLS specifications. Our baseline empirical analysis employs this harmonized dataset, which provides measurements at 1 km spatial resolution in units of nanowatts per centimeter squared per steradian (nW cm $-$ 2 sr $-$ 1). We validate our findings using the alternative dataset developed by Chen et al. (2021).

Our analysis incorporates comprehensive UIB issuance data obtained from the Wind database. Following the exclusion of observations with incomplete information, our dataset encompasses 41,230 UIB issuance records, documenting issuance amounts, face values, maturity structures, and coupon rates. To accommodate bond issuance approval cycles, we aggregate these data at the municipal level using rolling two-year totals for annual statistical analysis.

We complement this financial data with municipal-level infrastructure metrics extracted from the "China Urban Construction Statistical Yearbook," which provides detailed annual indicators including urban

Table 2
Descriptive statistics.

Panel A: City Level						
Variable	Obs	Mean	SD	Min	Median	Max
econ	3766	1.138	1.054	−4.693	1.183	3.127
entry	3766	15.530	23.814	0.000	4.000	122.000
lnpopulation	3766	5.817	0.718	2.898	5.876	8.136
pubfin	3766	20.585	13.971	4.262	17.283	234.876
industry	3766	0.963	0.566	0.094	0.822	5.929
fracsorc	3766	0.911	0.087	0.478	0.934	1.000
fracje	3766	0.023	0.038	0.000	0.004	0.244
competition_general	3766	0.753	0.088	0.000	0.769	0.917
competition_between	3766	0.193	0.165	0.000	0.167	0.631

Panel B: City-Pair Level						
Variable	Obs	Mean	SD	Min	Median	Max
syn	479,385	−0.268	0.249	−2.733	−0.198	−0.000
brchshare	479,385	0.074	1.183	0.000	0.000	100.000

built-up area, transportation infrastructure (roads, bridges, and streetlights), urban greenspace development, and public service facilities. To address potential endogeneity concerns, our empirical specifications incorporate various municipal economic characteristics sourced from the "China City Statistical Yearbook." Given the initiation of CCB deregulation in 2006, our sample comprises 282 urban jurisdictions (4 municipalities and 278 prefecture-level cities) over the period 2007–2021.

To examine the developmental and synergistic effects of CCB expansion, we estimate two distinct empirical specifications:

$$econ_{bt} = \beta_0 + \beta_1 entry_{bt-1} + \mathbf{X}'_{bt}\gamma + \alpha_b + \eta_t + \epsilon_{bt} \quad (1)$$

$$\mathrm{syn}_{\mathrm{bht}} = \beta_0 + \beta_1 \mathrm{brchshare}_{\mathrm{bht}-1} + \mathbf{X}'_{\mathbf{bt}}\gamma + \mathbf{X}'_{\mathbf{ht}}\theta + \alpha_{\mathrm{b}} + \alpha_{\mathrm{h}} + \eta_{\mathrm{t}} + \epsilon_{\mathrm{bht}} \quad (2)$$

Dependent Variables: $econ_{bt}$ represents the development level of city *b* in year *t*. Nighttime light data better reflect the true development level of regions and help alleviate endogeneity issues to some extent. Therefore, we measure development using fitted and calibrated nighttime light raster data. Based on city boundaries, we segment and calculate the average nighttime light intensity for each city, and then take the logarithm. We aggregate bank sub-branch-level information to the city level, creating a city pair dataset where banks headquartered in city *h* establish sub-branches in city *b*.

syn_{bht} represents the synergy between the branch city *b* and the home city *h*. We define synergy as a form of synchronized growth correlation. A straightforward approach would be to directly compute the correlation coefficient between the nighttime light intensity of two cities. However, the raw indicators may contain potential systematic shocks or time trends, which could bias the correlation coefficient. Following the methodology of Kalemli-Ozcan et al. (2013), we calculate the metric for synergy between city pairs:

$$syn_{bht} = -|\upsilon_{bt} - \upsilon_{ht}| \quad (3)$$

specifically, υ_{bt} and υ_{ht} represent the residuals of the CCBs branch cities and headquarters cities obtained by regressing the urban development variable (*econ*) of all cities on city fixed effects and year fixed effects, respectively. These residuals remove potential macroeconomic shocks, whether at the city or time level. By calculating the negative absolute difference between the two residuals, eq. (3) reflects the degree of growth synchronization: the larger the value, the smaller the difference between the residuals, indicating a higher degree of synchronization.

Independent Variables: $entry_{bt-1}$ represents the number of sub-branches of entrant CCBs in the "expanded" city. $brchshare_{bht-1}$ indicates the share of sub-branches established by CCBs from city h in city b. To account for the time lag in transmission and to alleviate endogeneity, we lag them by one period.

We control for a series of city and banking sector characteristics $\boldsymbol{X}_{bt}$. City characteristics include population, government size measured by the proportion of fiscal expenditure to local GDP, and industrial structure measured by the ratio of the output value of the service sector to the manufacture sector.

Considering that the literature finds that changes in banking market structure after deregulation have multidimensional impacts on bank operations, potentially influencing development through the credit channel (Francis et al., 2014; Hellmann et al., 2000; Petersen & Rajan, 1995), it is reasonable to assume that these factors could ultimately affect local development. Therefore, we construct and control for banking market structure indicators. These indicators include the share of sub-branches of SOCBs and RCBs within a city, as well as the share of sub-branches of JECBs. Additionally, we calculate two Herfindahl-Hirschman Indexes (HHI) to capture the intensity of banking competition in the city from different perspectives. The first is general HHI, which measures the competition each bank faces from other banks:

$$competition\_general_{bt} = 1 - \sum_{i \in \mathscr{I}_{bt}} \left(\frac{n_{it}}{\sum_{i \in \mathscr{I}_{bt}} n_{it}} \right)^2 \quad (4)$$

where $\mathscr{I}_{bt}$ represents the set of all banks in city *b* in year *t*, *i* denotes the bank in this set, and n_{it} indicates the number of sub-branches of bank *i* in city *b*. The second is the intergroup HHI, which measures the intensity of competition among different types of banks in the banking system:

$$competition\_between_{bt} = 1 - \sum_{\kappa=1}^{\kappa=4} \left(\frac{\sum_{i \in \mathscr{I}_{b\kappa t}} n_{it}}{\sum_{\kappa=1}^{\kappa=4} \sum_{i \in \mathscr{I}_{b\kappa t}} n_{it}} \right)^2 \quad (5)$$

As previously discussed, the Chinese banking system basically consists of four categories, corresponding to κ values ranging from 1 to 4: SOCEs, JECBs, CCBs, RCBs and other small and medium financial institutions. $\mathscr{I}_{b\kappa t}$ represents the set of banks belonging to category κ in city *b* in year *t*.

Our empirical strategy employs multiple fixed effects specifications to address potential endogeneity concerns. For Eq. (1), we incorporate both destination city and year fixed effects. Eq. (2) extends this framework by additionally controlling for headquarters city fixed effects. To account for unobserved time-varying heterogeneity, we further implement time-varying fixed effects for both branch and headquarters cities in our empirical specifications. Descriptive statistics for all variables are presented in Table 2.

Table 3
Bank expansion, development and synergy: OLS regressions.

Panel A: Bank Expansion and City Development				
	(1)	(2)	(3)	(4)
entry	0.009***	0.002***	0.002***	0.003***
	(0.002)	(0.001)	(0.001)	(0.001)
lnpopulation			0.416**	0.456***
			(0.166)	(0.163)
pubfin			−0.002	−0.002
			(0.002)	(0.002)
industry			−0.125***	−0.118***
			(0.034)	(0.034)
fracsorc				1.005***
				(0.378)
fracje				0.250
				(0.596)
competition_between				0.426**
				(0.170)
competition_general				−0.421**
				(0.195)
_cons	0.993***	1.104***	−1.144	−2.077*
	(0.071)	(0.010)	(0.967)	(1.061)
Year FE	N	Y	Y	Y
City FE	N	Y	Y	Y
Observations	3766	3765	3765	3765
Adjusted R2	0.044	0.968	0.970	0.970

Panel B: Bank Expansion and City Synergy				
	(1)	(2)	(3)	(4)
brchshare	0.003***	0.002***	0.002***	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)
Control	N	N	Y	N
Year FE	N	Y	Y	Y
City FE	N	Y	Y	Y
Year-City FE	N	N	N	Y
Observations	442,535	442,535	379,445	442,535
Adjusted R2	0.000	0.410	0.365	0.702

Note: This table reports the OLS estimation results for CCB expansion. Panel A presents the dependent variable as city development, while Panel B presents the dependent variable as intercity synergy. From columns (1) to (4), we sequentially add control variables and fixed effects. In Panel B, we additionally control for year-city-level interactive fixed effects to capture time-varying unobserved factors at the city level. Standard errors are clustered at the city level in Panel A and at the city-pair level in Panel B. *, **, and *** denote significance levels of 10 %, 5 %, and 1 %, respectively.

4.2. OLS results

Table 3 presents our baseline OLS estimation results. Panel A reports estimates from Eq. (1), using municipal development levels as the dependent variable. Column (1) documents a positive association between CCB market entry and urban development. Columns (2) and (3) progressively incorporate municipal-level and banking sector controls, while Column (4) adds city and year fixed effects. Panel B reports estimates from Eq. (2), examining urban synergies between city pairs. Column (1) establishes a positive relationship between CCB entry share and regional synergy. Column (2) introduces control variables for both headquarters and branch jurisdictions, while Column (3) implements multiple fixed effects specifications. The model is further augmented with time-varying city fixed effects to comprehensively account for unobserved heterogeneity at the municipal level.

While our estimates indicate statistically significant positive correlations between CCB entry and both urban development and regional synergy, these relationships exhibit potential confounding effects. The sequential introduction of control variables, particularly those capturing banking sector characteristics, substantially attenuates the entry coefficients. In the fully specified two-way fixed effects model, the coefficient reduces to 0.002, suggesting that each additional CCB branch establishment generates only a 0.2 % increase in nighttime luminosity intensity. This modest effect likely reflects negative selection bias, as CCB headquarters are predominantly located in major metropolitan areas and provincial capitals, with expansion typically directed toward less developed jurisdictions. The following section addresses these identification challenges to estimate the causal effects of CCB expansion.

4.3. Identification strategy

OLS estimates are potentially subject to selection bias arising from the non-random nature of CCB expansion decisions. Financial institutions systematically evaluate multiple location-specific factors when making branch establishment decisions, including local economic conditions, financial market development, and institutional environments. This selection process may operate in opposing directions: CCBs might target economically advanced regions with developed financial markets to exploit competitive advantages, or alternatively, pursue less developed markets to establish dominant market positions. Furthermore, unobserved political networks between jurisdictions may influence expansion patterns. As previously noted, negative selection bias could lead OLS estimates to understate the developmental impact of CCB market entry.

To address these endogeneity concerns, we employ an instrumental variables approach using exogenous factors to model expansion decisions. This methodology separates the endogenous components of location choices by generating predicted expansion patterns based on predetermined characteristics. Following Goetz et al. (2013), we utilize geographical distance and relative market size as exogenous instruments for bank expansion behavior, constructing counterfactual expansion patterns through first-stage regression analysis. The theoretical foundation for this approach rests on the observation that expansion decisions are influenced by relative rather than absolute characteristics of potential locations vis-à-vis bank headquarters.

Our implementation of this methodology incorporates two important refinements. First, we exploit the exogenous nature of geographical distance, which in a general economic context is plausibly uncorrelated with city-specific development levels. Second, we address the potential endogeneity of market size by employing relative rather than absolute measures. As specified in eq. (6), our market size ratio incorporates both origin and destination market characteristics. The modest correlation coefficient (0.3) between relative market size and destination city luminosity supports the instrument's validity. We further enhance identification by employing lagged values of relative market size, reflecting the historical information set available to banks during decision-making while minimizing contemporaneous correlation concerns.

A crucial institutional distinction exists between the Chinese and U.S. banking deregulation experiences. While U.S. bank expansion prior to the 1994 federal legislation occurred through bilateral interstate agreements or unilateral state initiatives, Chinese CCB deregulation was implemented through centralized regulatory policy. This unified framework establishes differentiated qualification criteria for cross-city and cross-provincial branch expansion. Given these institutional differences, we adapt the Goetz et al. (2013) identification strategy to align with China's regulatory context.

Our identification methodology begins with the construction of a headquarters-branch city paired dataset that employs a gravity model framework. The dependent variable measures the proportion of a bank's total sub-branches established in each destination city. Under the assumption that banks can potentially expand into any jurisdiction subject to regulatory constraints, we project expansion shares onto exogenous factors including geographical distance and relative market size between origin and destination cities. The instrument construction proceeds through three sequential steps:

Step 1: Apply regulatory qualification criteria to identify eligible CCBs in each year, specifically those meeting requirements for cross-city and cross-provincial branch establishment.

Step 2: Estimate the first-stage regression using the sample of qual-

Table 4
Zero-stage regressions of bank expansion.

	Full Sample				Sample of Qualified Banks Only			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ln(distance)	−0.003***	−1.667***	−0.493***	−0.617***	−0.004***	−1.359***	−0.798***	−0.750***
	(0.000)	(0.070)	(0.110)	(0.117)	(0.000)	(0.079)	(0.174)	(0.187)
$Ln\left(\frac{finance_b}{finance_h}\right)$	0.000***	0.398***	0.437***	0.218	0.000***	0.153***	0.127**	−0.209
	(0.000)	(0.056)	(0.064)	(0.267)	(0.000)	(0.046)	(0.050)	(0.236)
adjacent			−3.136***	−4.313***			−2.145***	−3.396***
			(0.354)	(0.294)			(0.440)	(0.443)
nonadjacent			−3.887***	−5.269***			−1.760***	−3.256***
			(0.299)	(0.363)			(0.446)	(0.474)
Year FE	N	N	N	Y	N	N	N	Y
City FE	N	N	N	Y	N	N	N	Y
Observations	503,290	503,290	503,290	503,290	362,160	362,160	362,160	362,160
R2	0.02	0.21	0.28	0.45	0.01	0.12	0.15	0.33

Note: This table presents the regression results of the projection equation for CCBs' expansion. Columns (1) to (4) follow the methodology of Goetz et al. (2013), while columns (5) to (8) apply the refined method specific to China's deregulation policy. The equation also includes administrative boundary variables to account for boundary effects and some unobservable political factors. Standard errors are clustered at the city pair level. *, **, and *** indicate significance levels of 10 %, 5 %, and 1 %, respectively.

ified institutions:

$$Share_{ibht} = \beta_1 Ln(distance_{bh}) + \beta_2 Ln\left(\frac{finance_{bt-1}}{finance_{ht-1}}\right) + \beta_3 adjacent_{bh} + \beta_4 nonadjacent_{bh} + \epsilon_{ibht} \quad (6)$$

where i represents a bank headquartered in city h, and $distance_{bh}$ denotes the straight-line distance between home city and a potential branch city. We also select the lagged relative size of financial market and administrative boundary information as exogenous factors. The variable $adjacent_{hb}$ indicates adjacency between province of home city and potential branch city, while $nonadjacent_{bh}$ indicates non-adjacency. Predicted values of $Share_{ibht}$ are subsequently extracted from the regression. For banks without expansion qualifications, set their predicted share values across all cities to 0.

Step 3: Using the total amount of sub-branches and predicted share values for each bank, aggregate at the city level and get predicted number of sub-branches from entrant CCBs, as the instrument of $entry_{bt}$ in eq. (1). Similarly, aggregate at the city pair level and compute the predicted share of expansion among cities, as the instrument of $brchshare_{bt}$ in eq. (2).

There are a few noteworthy points. First, the first-stage regression assumes uniform market potential across cities for banks headquartered in the same city, thus neglecting heterogeneity among these banks. Second, incorporating the lagged relative size of the financial market helps mitigate concerns about potential correlations with disturbances in eqs. (1) and (2). Third, $adjacent_{hb}$ and $nonadjacent_{hb}$ indicate geographic distribution based on provincial boundaries. Given China's political landscape, these variables also capture strategic interactions and competition intensity among local governments, thereby addressing omitted variable concerns. Finally, eq. (6) excludes fixed-effect parameters for simplicity, while they are included in subsequent estimations.

Table 4 presents coefficient estimates from eq. (6) using alternative estimation methodologies. Columns (1) through (4) employ the full sample without considering regulatory qualification criteria, with Column (1) reporting OLS estimates and Columns (2) through (4) presenting fractional logit specifications. Columns (5) through (8) restrict the analysis to qualified institutions meeting regulatory expansion requirements. The empirical results demonstrate systematic patterns in CCB expansion behavior: institutions exhibit a strong preference for geographical proximity to headquarters locations, with expansion patterns partially constrained by administrative boundaries. Furthermore, CCBs systematically target jurisdictions with more developed financial markets. The magnitude and significance of these effects are notably different when restricting the sample to qualified institutions. These empirical patterns align with the spatial distribution of CCB networks illustrated in Fig. 1, characterized by radial expansion patterns within provinces and concentrated development around metropolitan centers and provincial capitals in cross-provincial expansion.

Table 5
Bank expansion, development and synergy: 2SLS regressions.

Panel A: Second Stage		
	(1)	(2)
	Development	Synergy
entry	0.007**	
	(0.003)	
brchshare		0.046***
		(0.006)
Control	Y	N
Year FE	Y	Y
City FE	Y	Y
Year-City FE	N	Y
Observations	3766	479,385
Panel B: First Stage		
predicted entry	0.796***	
	(0.151)	
predicted brchshare		0.704***
		(0.091)
F statistics	27.65	59.46

Note: This table presents 2SLS regression results for eqs. (1) and (2). Panel A shows the second-stage regression results, and Panel B shows the first-stage regression results. In Panel B, we still control for variables and multi-dimensional fixed effects. The F-statistic is the Kleibergen-Paap Wald rk F statistic. Standard errors are clustered at the city level in Panel A and at the city pair level in Panel B. *, **, and *** indicate significance levels of 10 %, 5 %, and 1 %, respectively.

We employ the estimates from Column (7) to construct instrumental variables and re-estimate eqs. (1) and (2). Panel B of Table 5 reports first-stage coefficients and corresponding F-statistics, validating the instruments' relevance. After addressing endogeneity concerns, the estimated impact of CCB expansion on urban development is approximately twice the magnitude observed in OLS specifications. Specifically, each additional CCB branch establishment generates a 0.7 % increase in municipal nighttime luminosity intensity. The synergistic effects across cities similarly demonstrate enhanced magnitude. These differences from OLS estimates suggest substantial downward bias in the baseline specifications, consistent with the observed pattern of CCB headquarters concentration in provincial capitals and major metropolitan areas, with

Table 6
Robustness.

	Changing Data Source		Changing Measures				Reserving Prefecture-Level City Samples		Excluding Years of Financial Shock		Other Factors
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
entry	0.013*		0.289***		1.830**		0.007**		0.021***		0.009***
	(0.007)		(0.085)		(0.787)		(0.003)		(0.005)		(0.003)
brchshare		0.090***		1.123***		0.004***		0.037***		0.038***	
		(0.011)		(0.136)		(0.001)		(0.005)		(0.005)	
Control	Y	N	Y	N	Y	N	Y	N	Y	N	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
City FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year-City FE	N	Y	N	Y	N	Y	N	Y	N	Y	N
Observations	3765	442,535	3765	277,128	2837	277,128	3743	366,951	2959	357,780	3718
F statistics	29.91	60.75	29.91	44.37	19.00	35.16	31.64	60.23	21.85	65.20	32.18

Note: This table reports the robustness for 2SLS results of eqs. (1) and (2). Columns (1) and (2) present the results after using an alternative source of nighttime light data. Columns (3) and (4) use growth rate indicators to measure city development and synergy, while columns (5) and (6) use the proportion of entrant sub-branches relative to all CCB sub-branches in the city to measure expansion. Columns (7) to (10) report the regression results after excluding samples from specific cities and specific event shock. The F-statistic is the Kleibergen-Paap Wald rk F statistic. Standard errors in odd columns and even columns are clustered at the city level and city pair level, respectively. *, **, and *** indicate significance levels of 10 %, 5 %, and 1 %, respectively.

expansion primarily occurring within provincial boundaries.

Table 6 presents a comprehensive set of robustness tests for our main empirical findings. Our first test addresses potential measurement concerns by employing an alternative nighttime luminosity dataset from Chen et al. (2021). Second, we implement alternative specifications of our key variables: replacing logarithmic transformations with growth rates for luminosity measures (Columns 3 and 4), and substituting absolute entry counts with relative measures of CCB branch presence (Columns 5 and 6). Third, to address concerns about the concentration of financial resources in centrally-administered municipalities potentially generating outlier effects, Columns (7) and (8) report estimates excluding these jurisdictions. Finally, we account for potential confounding effects from major macroeconomic events—specifically the 2008 global financial crisis and the 2009 deregulation policy—by restricting our analysis to the post-2010 period. The results demonstrate the robustness of our findings across alternative data sources,

Table 7
Heterogeneities among cities.

Panel A: Bank Expansion and Development

	Regions		Incumbent CCBs		Financial Market		Entry Barrier		Government Spending		Fiscal Deficit	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
entry	0.022***	−0.007**	0.016***	−0.008	0.040***	−0.006	0.014***	0.002	0.017***	−0.003	0.024***	−0.002
	(0.005)	(0.003)	(0.005)	(0.008)	(0.012)	(0.005)	(0.005)	(0.003)	(0.005)	(0.003)	(0.008)	(0.003)
Control	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
City FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	2730	1036	2768	998	1879	1887	2636	1130	1879	1887	1879	1887
F statistics	19.68	19.29	28.25	2.73	18.48	5.53	26.69	17.80	19.28	9.04	15.12	9.64
Difference	0.029		0.024		0.045		0.011		0.021		0.026	
P Value	0.000		0.000		0.000		0.000		0.000		0.000	

Panel B: Bank Expansion and Synergy

	Regions		Incumbent CCBs		Financial Market		Entry Barrier		Government Spending		Fiscal Deficit	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
brchshare	0.029***	0.041***	0.030***	0.048***	0.042***	0.035***	0.373***	0.030*	0.051***	0.031***	0.064***	0.029***
	(0.006)	(0.006)	(0.005)	(0.010)	(0.012)	(0.005)	(0.131)	(0.017)	(0.008)	(0.004)	(0.009)	(0.004)
Control												
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
City FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year-City FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	309,866	132,669	320,320	122,215	189,872	191,414	425,915	15,246	189,586	191,610	189,674	191,522
F statistics	28.56	42.34	33.31	23.91	8.96	68.69	8.25	3.28	44.87	46.82	54.36	37.59
Difference	−0.012		−0.018		0.007		0.343		0.02		0.035	
P Value	0.000		0.000		0.000		0.000		0.000		0.000	

Note: This table reports heterogeneities of the impact of CCB expansion across different samples. The dependent variable is city development in Panel A and city pair synergy in Panel B. Columns (1) and (2) present the regression results for the central-western regions and the eastern regions, respectively. Columns (3) and (4) show the regression results for cities without and with Incumbent CCBs, respectively. Based on city scale of deposits and loans we classify financial market size, and columns (5) and (6) present the regression results for smaller and larger financial markets, respectively. Based on the presence of CCBs from other provinces we classify entry barriers, and columns (7) and (8) show the regression results for higher and lower entry barriers, respectively. Based on the proportion of government expenditure to city GDP we classify government spending, and columns (9) and (10) present the regression results for higher and lower government spending, respectively. Columns (11) and (12) show the regression results for higher and lower fiscal deficits, respectively. Columns (13) and (14) show the regression results for early and late years, respectively. The F-statistics is the Kleibergen-Paap Wald rk F statistic. Standard errors are clustered at the city level in Panel A and at the city pair level in Panel B. *, **, and *** indicate significance levels of 10 %, 5 %, and 1 %, respectively.

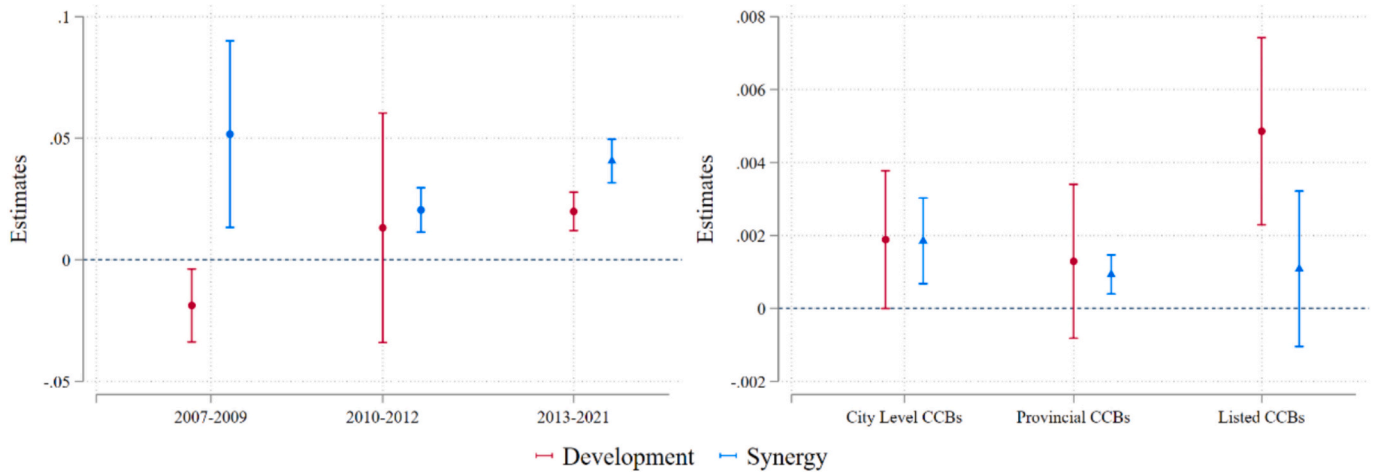

Fig. 5. Relationship between CCB entry and UIB issuance.
Note: This figure shows the coefficient estimates for the core explanatory variables (development and synergy) from two independent regression models (eq. (1) and (2)) under sub-sample regressions. The left panel uses sub-samples based on different time intervals. Reflecting the timing of various policy shocks, we divide the sample into three year windows: 2007–2009, 2010–2012, and 2013–2021, estimating the model with the 2SLS method. The right panel constructs sub-samples based on different CCB types, categorizing CCBs into city level, provincial level, and listed level. Using these classifications, we record the entry of each type of CCB in each city and employ OLS regression to mitigate potential issues with weak instruments.

measurement approaches, and sample specifications.

5. Further discussion

5.1. Facts and inference

Infrastructure development occupies a central position in China's urban growth trajectory and contributes significantly to regional development heterogeneity (Démurger, 2001; Xiong, 2018). Beyond national transportation networks, urban infrastructure development in China operates through a distinctive institutional framework where local governments maintain primary planning and implementation authority. Within this framework, local governments establish Urban Development Investment Companies (UDICs) as specialized vehicles for project financing, land development, and infrastructure construction. These entities, functioning as governmental market intermediaries, require substantial capital resources primarily accessed through bond issuance and supplemented by bank lending. Urban Investment Bonds (UIBs), issued by UDICs with local government shareholding, represent a unique debt instrument that carries implicit governmental guarantees, effectively positioning them as quasi-sovereign securities. The scale of UIB issuance has experienced exponential growth, with current outstanding urban investment debt exceeding 60 trillion yuan, substantially surpassing local government direct obligations of approximately 40 trillion yuan.

Within our theoretical framework, CCB geographical expansion influences urban development primarily through UIB market expansion and infrastructure investment acceleration. While CCBs maintain a relatively modest share of aggregate lending markets compared to SOCBs, they serve a particularly vital function in China's central and western regions. These jurisdictions typically face limited access to the diversified financial services prevalent in eastern regions, where higher levels of economic development and more sophisticated financial infrastructure have attracted concentrated presence of SOCBs, JECBs, and private financial institutions.

The constrained access to diverse financial channels in central-western regions stems from multiple institutional factors. These regions' relatively lower economic development and underdeveloped financial infrastructure reduce their attractiveness to major commercial banks and private financial institutions. Additionally, historical regulatory frameworks and operational complexities associated with cross-regional financial activities have limited the penetration of larger CCBs into these markets. As a result, CCBs have emerged as primary, and in some cases exclusive, providers of financial services addressing local needs, particularly for small and medium-sized enterprises and municipal governments facing limited external financing options. Beyond traditional banking services, CCBs serve a critical function in supporting local infrastructure development and government financing through UIB markets. This role becomes particularly vital given UDICs' reliance on multiple funding sources, including land transfer revenues, bank credit, and debt financing. In jurisdictions where conventional financing channels are constrained, CCBs facilitate local development by providing essential debt financing mechanisms, effectively addressing local government funding constraints.

The empirical patterns documented in Table 7 validate this transmission mechanism. CCB market entry generates particularly pronounced developmental effects in cities characterized by: absence of incumbent CCBs, limited financial market development, lack of cross-provincial CCB presence, and elevated levels of government fiscal expenditure and deficits. These findings suggest that CCB expansion not only addresses critical financing gaps but generates disproportionate impacts in financially constrained regions. Our analysis thus underscores the macroeconomic significance of CCB-driven debt market development as a fundamental driver of urban growth. The systematic reliance of central-western regions on CCBs illuminates these institutions' crucial role in addressing financial market incompleteness, facilitating regional development, and advancing financial inclusion across China's heterogeneous regional landscape.

We conduct additional empirical tests of our theoretical framework by analyzing heterogeneous effects of CCB expansion across regulatory regime changes and institutional characteristics. As outlined in Section 2.1, our sample period encompasses two distinct phases of regulatory liberalization (2006, 2009) and subsequent tightening (2011,2013). The period-specific estimates presented in the left panel of Fig. 5 provide strong empirical support for our theoretical predictions.

The analysis reveals temporal variation in urban development effects, with coefficient estimates shifting from negative to significantly positive following the 2013 regulatory changes, highlighting UIB-related transmission channels. This pattern aligns with broader policy developments: after the 2008 global financial crisis, China's 4 trillion RMB stimulus package established UIBs as a key local government financing mechanism, with positive effects emerging after 2009's

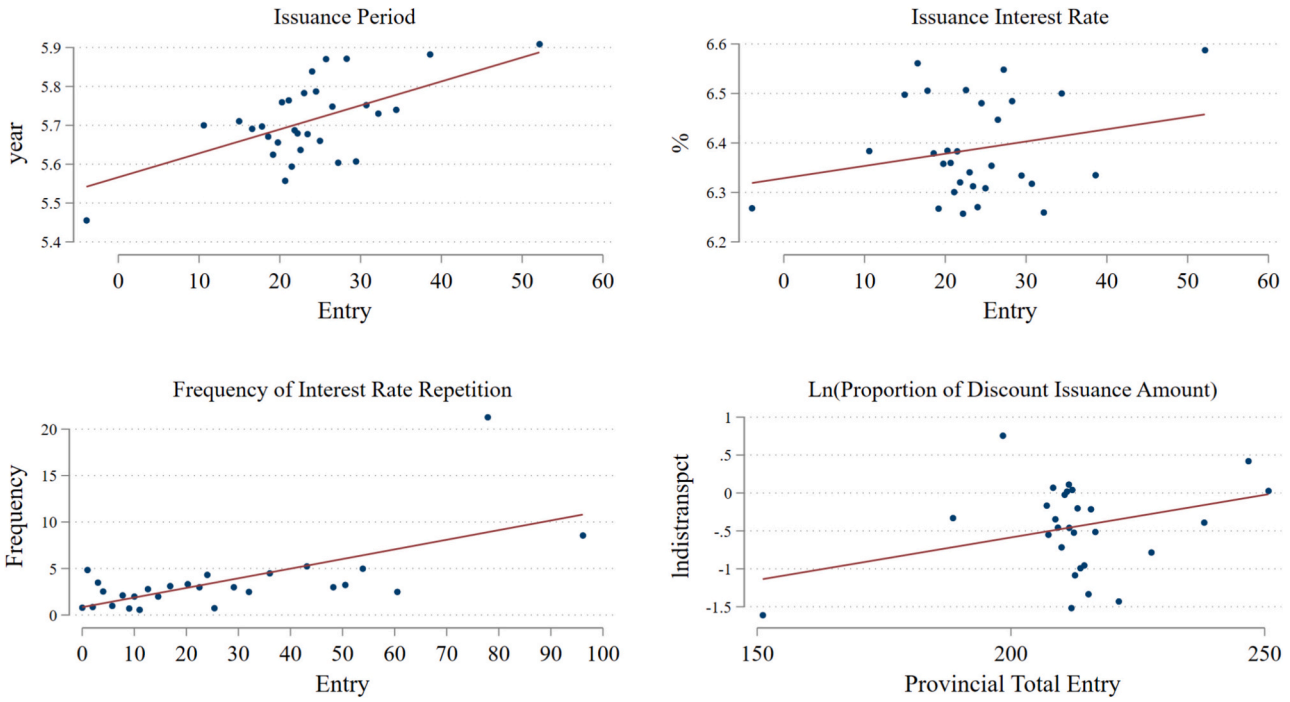

Fig. 6. Relationship between CCB entry and UIB issuance.
Note: Top two plots depict binscatter plots of the number of CCBs sub-branch and city-level UIBs issuance periods, issuance rates, respectively. We aggregate city-level UIBs issuance data over 2-year-rolling, calculating the mean of all issuance periods and interests in each city. We also account for fixed effects of cities and years during plotting. Plot in the bottom left corner illustrates a binscatter plot of the cumulative number of CCBs sub-branch entries by the end of the sample period against the frequency of coupon rate repetition. The vertical axis measures the frequency of instances that the same coupon rate for UIBs issued by the same UDIC in different years occurs 2 times or more, aggregated at the city level. Plot in the bottom right corner presents a binscatter plot of the total number of CCBs entrant sub-branches at the provincial level versus log of proportion of discounted transactions of UIBs in the secondary market. We define discounted transactions as transactions that transaction price is at least 5 % lower than the issuance face price and yields are above 6 %. We also account for fixed effects of provinces and years during plotting. These figures suggest the occurrence of non-market-oriented behaviors during the issuance of UIBs, which are closely linked with the geographic expansion of CCBs.

acceleration in UIB issuance. Policy uncertainty appears more influential than regulatory direction itself. During the 2011 regulatory suspension, point estimates remain positive but statistically insignificant, while post-2013 estimates show markedly improved precision. Similar patterns characterize urban synergy: UIB financing through CCBs and affiliated investors facilitates spatial capital allocation through cross-regional operations. However, policy uncertainty impedes inter-regional capital flows (Julio & Yook, 2016), reducing expansion's synergistic benefits.

To examine the UIB market dynamics directly, we analyze historical issuance data from 3581 UDICs nationwide. We construct city-level metrics incorporating two-year rolling aggregates of issuance volumes, maturity structures, and coupon rates to account for issuance cycles and implementation lags. The upper panels of Fig. 6 illustrate bivariate relationships between CCB market entry and both maturity structures and coupon rates. While investors typically prefer short- and medium-term instruments with stable returns, extending debt maturity represents a critical strategy for managing refinancing risk. The observed positive correlation between CCB entry and maturity length, coupled with weak pricing relationships, suggests increasing issuer market power.

Further analysis reveals systematic evidence of non-market pricing mechanisms through two channels. First, we document anomalous patterns in coupon rate clustering. Unlike sovereign debt markets characterized by minimal yield volatility, corporate bond markets typically exhibit substantial pricing variation. Under competitive market conditions, UIB coupon rates should vary across issuances and years, reflecting changing market conditions. However, we observe systematic rate convergence, suggesting coordinated pricing arrangements among issuers, underwriters, and investors. The frequency of identical coupon rates for successive issuances by individual UDICs, illustrated in the lower left panel of Fig. 6, demonstrates a positive correlation with CCB market entry, indicating increased prevalence of negotiated pricing.

Additionally, we find evidence of systematic post-issuance price discounting. While non-market pricing enables lower-quality UDICs to access debt markets, traditional adverse selection problems are mitigated by disclosure requirements and secondary market liquidity. However, when issuers face deteriorating fundamentals or systematic stress, investors frequently employ secondary market sales at discounted prices to manage exposure. Analysis of provincial-level discounted transaction data from Ratingdog[4] reveals a positive correlation between CCB entry and discounted trading volume, shown in the lower right panel. This pattern aligns with theoretical predictions: discounted secondary market sales of lower-quality instruments represent an ex-post risk management mechanism for earlier CCB expansion decisions.

5.2. *Validation tests*

Our formal empirical analysis examines the relationship between CCB market entry and UIB issuance volumes. We employ two alternative measures of municipal UIB activity: the logarithm of aggregate two-year issuance volumes and the logarithm of per capita issuance. Panel A of Table 8 presents these results, with Columns (1) through (5) utilizing aggregate measures and Columns (6) through (10) employing per capita specifications. After addressing endogenous selection in CCB expansion decisions, the estimated coefficient increases substantially from 0.021 to

[4] Source: https://www.ratingdog.cn/eChar/cityVote.

Table 8
Bank expansion and UIB issuance.

Panel A: Bank Expansion and Inflation of UIB Issuance

	UIB					UIB per person				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS	2SLS	2-Stage Poisson	2-Stage Zero-Inflated Poisson	2-Stage Zero-Inflated Negative Binomial	OLS	2SLS	2-Stage Poisson	2-Stage Zero-Inflated Poisson	2-Stage Zero-Inflated Negative Binomial
entry	0.023***	0.090***	2.091***	0.919*	1.074*	0.023***	0.090***	0.007***	0.007***	0.007***
	(0.004)	(0.018)	(0.737)	(0.503)	(0.565)	(0.004)	(0.018)	(0.002)	(0.002)	(0.002)
Control	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
City FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	3765	3765	3766	3766	3766	3765	3765	3766	3766	3766
F statistics	0.023***	0.090***	2.091***	0.919*	1.074*	0.023***	0.090***	0.007***	0.007***	0.007***

Panel B: Bank Expansion and Synergy of UIB Issuance

	UIB		UIB per person	
	(1)	(2)	(3)	(4)
	OLS	2SLS	OLS	2SLS
brchsahre	0.009***	0.116***	0.005***	0.100***
	(0.003)	(0.018)	(0.002)	(0.015)
Control	N	N	N	N
Year FE	Y	Y	Y	Y
City FE	Y	Y	Y	Y
Year-City FE	Y	Y	Y	Y
Observations	442,535	442,535	380,524	380,524
F statistics	0.009***	0.116***	0.005***	0.100***

Note: This table reports the impact of CCB entry on city level UIBs. Panel A and Panel B focus on city-level growth and city-pair synergy, respectively. In Panel A, columns (1) to (5) and columns (6) to (10) present regression results using total amount of UIB issuance and per capita measure, respectively. Columns (1) and (2) report OLS and 2SLS regression results with the logarithm of issuance amount as the dependent variable. Considering critique in Chen and Roth (2023), columns (3) to (5) report results using the original value of issuance as the dependent variable, employing two-stage Poisson regression, two-stage Zero-Inflated Poisson regression, and two-stage Zero-inflated Negative Binomial regression, with explanatory variables based on the first-stage predicted values by the instrument previously obtained. Columns (8) to (10) follow the same procedure. Standard errors are clustered at the city level in Panel A and at the city-pair level in Panel B. *, **, and *** denote significance at the 10 %, 5 %, and 1 % levels, respectively.

0.063, indicating significant positive effects on municipal UIB issuance.

Following Chen and Roth (2024), who demonstrate that log(1 + Y) transformations with extensive margins should not be interpreted as percentage effects, we implement alternative specifications. Using predicted values of CCB entry from our instrumental variables approach, we estimate two-stage Poisson, Zero-Inflated Poisson, and Zero-Inflated Negative Binomial models on untransformed issuance amounts.[5] Columns (3) through (5) and (7) through (10) report average marginal effects. The results indicate economically significant effects: each additional CCB branch establishment increases annual municipal UIB issuance by 60–130 million yuan. Per capita specifications yield consistent results, with each new branch associated with a 400,000 yuan increase in annual per capita UIB issuance.

The analysis further documents significant effects of CCB expansion on cross-city UIB issuance synergies, robust across alternative specifications. These findings carry important implications for understanding CCB expansion effects. First, CCB entry enhances public financing capacity in less developed jurisdictions through expanded UIB issuance, facilitating local development. Second, CCBs' dual role as UIB creditors in both headquarters and branch cities creates systematic debt growth coordination across regions, strengthening inter-regional development synchronization.

Finally, we examine the relationship between CCB market entry and infrastructure development across multiple dimensions. Our analysis encompasses six distinct categories of urban infrastructure: built-up area expansion, transportation networks, urban illumination, public spaces, and administrative facilities. Table 9 presents these results. Columns (1) and (2) employ alternative measures of urban development: the logarithm of built-up area and its proportion relative to total administrative jurisdiction. Columns (3) and (4) focus on transportation infrastructure, using the logarithm of road network length and the ratio of road surface area to total administrative space. Bridge and lighting infrastructure are quantified through the number of bridge structures and illumination units, respectively. Columns (7) and (8) examine public space development through city park counts and the proportion of green space coverage. Column (9) analyzes the spatial allocation of administrative and public service facilities relative to total jurisdictional area.

The empirical results provide strong evidence for the effective transmission of debt financing to physical infrastructure development. This systematic relationship between CCB expansion, government financing capacity, and infrastructure investment provides concrete empirical validation of our theoretical framework.

6. Conclusion and policy implications

Exploiting China's banking deregulation as an identification strategy, this study examines how the geographical expansion of city commercial banks (CCBs) influences regional development patterns. Through refined empirical techniques, we document that CCB market entry generates significant positive effects on local development, with each additional branch establishment associated with a 0.7 % increase in municipal development indicators. These effects are particularly pronounced in jurisdictions characterized by constrained financial resources, elevated entry barriers, and substantial government expenditure levels, while also enhancing inter-regional economic

[5] The presence of zero-issuance observations and overdispersion (sample standard deviation exceeding the mean) motivates the use of Zero-Inflated Poisson and Zero-Inflated Negative Binomial specifications rather than standard Poisson models.

Table 9
Economic significance of bank expansion.

Panel A: Bank Expansion and Infrastructure Development

	Built-up area		Road		Bridge	Light	Greenland		Service
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
entry	0.004*	0.013**	0.003	0.232**	2.149***	1.111***	1.581***	0.352	0.001
	(0.003)	(0.006)	(0.003)	(0.110)	(0.727)	(0.333)	(0.506)	(0.314)	(0.001)
Control	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
City FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	3742	3293	3742	3293	3740	3740	3293	3742	1950
F statistics	29.92	26.89	29.92	26.89	29.92	29.88	26.89	29.92	24.31

Panel B: Bank Expansion and Infrastructure Synergy

	Built-up area		Road		Bridge	Light	Greenland		Service
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
brchshare	0.005***	0.052***	0.004***	0.980***	4.154***	1.359***	4.737***	1.063***	0.002***
	(0.001)	(0.018)	(0.001)	(0.262)	(1.288)	(0.318)	(1.359)	(0.404)	(0.001)
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
City FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year-City FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	396,588	326,046	397,368	326,046	396,137	397,201	326,046	397,368	204,015
F statistics	60.20	53.09	60.21	53.09	60.20	60.21	53.09	60.21	67.26

Note: This table reports the impact of CCB entry on city infrastructure. Panel A and Panel B focus on city-level growth and city-pair synergy, respectively. Columns (1) to (9) cover six dimensions: built-up area, roads, bridges, lighting, green spaces, public administration, and public services. Columns (1) and (2) report regression results using the logarithm of area of built-up area and the percentage of built-up area relative to the total administrative area as indicators, respectively. Columns (3) and (4) report results using the logarithm of road length and the percentage of road area relative to the total administrative area as indicators, respectively. Columns (5) and (6) report results using the number of bridges and the number of streetlights as indicators, respectively. Columns (7) and (8) report results using the number of city parks and the percentage of green space relative to the total administrative area as indicators, respectively. Column (9) reports results using the percentage of land area occupied by public administration and public service facilities relative to the total administrative area as an indicator. Standard errors are clustered at the city level in Panel A and at the city-pair level in Panel B. *, **, and *** denote significance at the 10 %, 5 %, and 1 % levels, respectively.

synergies.

Our analysis departs from existing literature by examining regional development through government financing mechanisms. Local governments utilize Urban Development Investment Companies (UDICs) as specialized vehicles for infrastructure implementation, while CCBs, operating under expansion-jurisdiction governments' influence, engage in relationship-based financing through the Urban Investment Bond (UIB) market. This institutional arrangement, characterized by political connections and implicit guarantees, creates unique financing dynamics where each new CCB branch generates additional annual UIB issuance of 60–130 million RMB. As CCBs expand geographically and contribute to local debt markets, their macroeconomic impact increasingly parallels public investment, evidenced by systematic infrastructure.

Additionally, we document that CCBs function as coordinators of regional debt market development, enhancing synchronized growth across connected regions. These findings suggest that multi-market CCBs serve as effective institutional mechanisms for addressing localized financial volatility and advancing coordinated regional development initiatives.

Our findings yield important policy implications. First, while CCBs' geographical expansion positively influences urban financialization, this strategy's long-term sustainability remains uncertain. Local governments are diversifying their development approaches through region-specific industrial policies and asset renewal programs. Alternative financing instruments, such as Real Estate Investment Trusts (REITs), could complement traditional UIBs, though CCBs' role in local government financing warrants continued central government attention.

Second, CCB expansion represents a potential tool for reducing regional development disparities, supporting national initiatives including the Regional Coordinated Development and New Urbanization strategies. The observed coordination among cities within CCB networks suggests that targeted regulatory reforms—such as region-specific deregulation policies or incentives for CCB reallocation toward less-developed areas—could optimize regional capital distribution.

However, unrestricted local government debt expansion poses significant risks. The growing debt burden from public investment and infrastructure projects raises systemic financial concerns. Prudent financing policies are essential: debt levels must remain manageable through structured approaches to existing obligations, while stronger regulatory oversight of UIB issuance and utilization can ensure efficient capital allocation.

Our study has several limitations. The analysis emphasizes empirical causality without developing a comprehensive theoretical model quantifying local government behavior and financial risks. Political sensitivities prevent direct observation of CCB subscription patterns in UIB markets. Additionally, our city-level analysis may not fully capture the complexity of local government influence on regional development. Future research should examine expansion effects at more granular administrative levels and explore broader macroeconomic implications.

CRediT authorship contribution statement

Yuyuan Wen: Writing – original draft, Supervision, Project administration, Investigation, Funding acquisition, Conceptualization. **Hao Yu:** Writing – original draft, Visualization, Software, Methodology, Formal analysis, Data curation. **Zhiyuan Chen:** Writing – review & editing, Writing – original draft, Validation, Methodology, Investigation, Data curation, Conceptualization.

Declaration of competing interest

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

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Appendix A

A.1. Structural effects of deregulation and regulation policy on CCBs

We conduct additional empirical exploration to reveal structural impacts of these policy shocks. Fig. A1 illustrates the annual number of newly established CCB branches and sub-branches across regions. Three key findings emerge: first, CCBs show a marked response to the 2006 deregulation policy, particularly at the sub-branch level. Second, the effects of the 2009 deregulation policy exhibit a significant time lag, with substantial cross-regional branch and sub-branch expansions only materializing in 2010. Third, the 2013 policy does not appear to have a notable impact on sub-branch expansion.

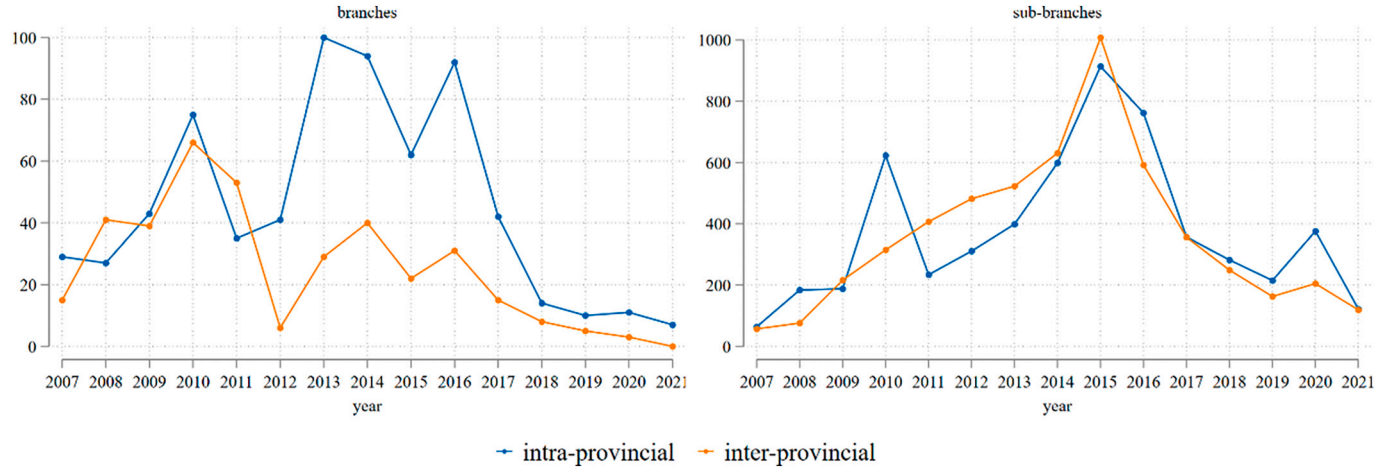

Fig. A1. Annual Number of Newly Established Cross-Regional Branches and Sub-Branches of CCBs Nationwide.
Note: This figure shows the number of non-local branches (left panel) and sub-branches (right panel) of CCBs from 2007 to 2021. Both panels distinguish between intro-provincial and inter-provincial institutions based on whether they are located in the same province as their headquarters. The blue line represents the number of intro-provincial institutions, while the orange line represents the number of inter-provincial institutions.

Further, recognizing that the expansion strategy has two dimensions—gaining access to a new market (city) and strengthening presence in already-entered markets—we use Fig. A2 to illustrate where CCB market entries experience significant changes across different policy shocks. The left panel shows the number of branches established by CCBs in cities they enter for the first time that year, while the right panel displays the number of branches added in previously entered cities. The structural effects of policy shocks become more pronounced in this view.

First, both deregulation policies significantly increase CCBs' geographical expansion in both dimensions. Second, the 2011 regulation does not seem to impact CCBs' expansion in markets they have already entered—an outcome of the 2009 policy, which delegates approval authority for new branches to local government agencies. Third, the 2013 policy has a more limited effect, primarily restricting cross-provincial initial entries. Comparing branch numbers in expanded cities (whether intra- or inter-provincial) to those in home cities reveals that, once CCBs enter a city, their subsequent expansion strategy and response to policy shocks largely mirror those seen in their home city (with differences mainly in scale).

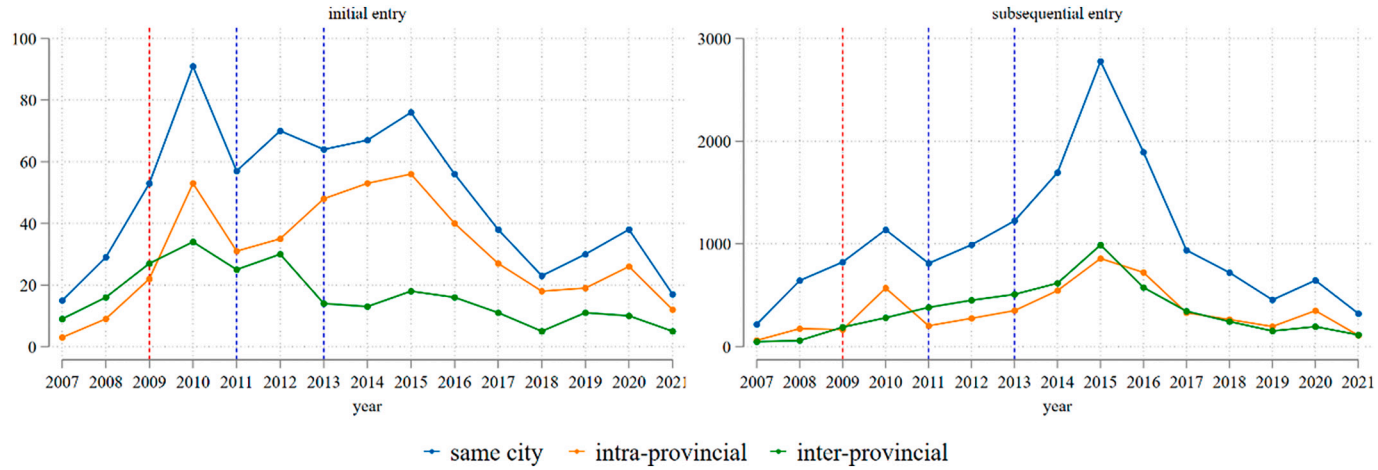

Fig. A2. Annual Number of New Sub-Branches Established by CCBs for Initial and Subsequent Market Entries Nationwide.
Note: This figure shows the annual number of newly established sub-branches from 2007 to 2021. For each CCB and city, we categorize entries based on whether the CCB is entering a city for the first time, classifying them as either initial entry (left panel) or subsequent entry (right panel). Within each panel, we differentiate the entries as same city, intro-provincial, and inter-provincial based on whether the institution is located in the same city and province as its headquarters. The blue line represents the number of same-city entries, the orange line represents intro-provincial entries, and the green line represents inter-provincial entries.

A.2. Plausibly exogenous test on IV

Completely exogenous instrumental variables are an ideal scenario, and in reality, instruments may have slight endogeneity. Therefore, we conduct conservative tests to examine the impact on regression results assuming the instrumental variables do not fully satisfy the exclusion restriction. In a simplified reduced-form regression:

$$Y = \beta X + \gamma Z + \epsilon$$

Where X is the endogenous variable and Z is the instrumental variable. γ reflects how closely the exclusion restriction is satisfied in the model. Under strict exogeneity assumptions, there is $\gamma = 0$[6] Following Conley et al. (2012), we employ two methods to relax this assumption. The first approach is "Union of Confidence Intervals with γ Support Assumption", which estimates confidence intervals for instrumental variable regression results under different degrees of deviation by setting an interval for. The second approach is "γ Local-to-Zero Approximation" , which makes assumptions about the distribution of γ and estimates confidence intervals for instrumental variable regression results under the assumed distribution. Fig. A3 illustrates the confidence intervals for the coefficient of bank entry estimated using both methods, indicating $\beta = 0.004$ (estimates in 2SLS regression)remains relatively reliable even under considerable deviations from perfect exogeneity.

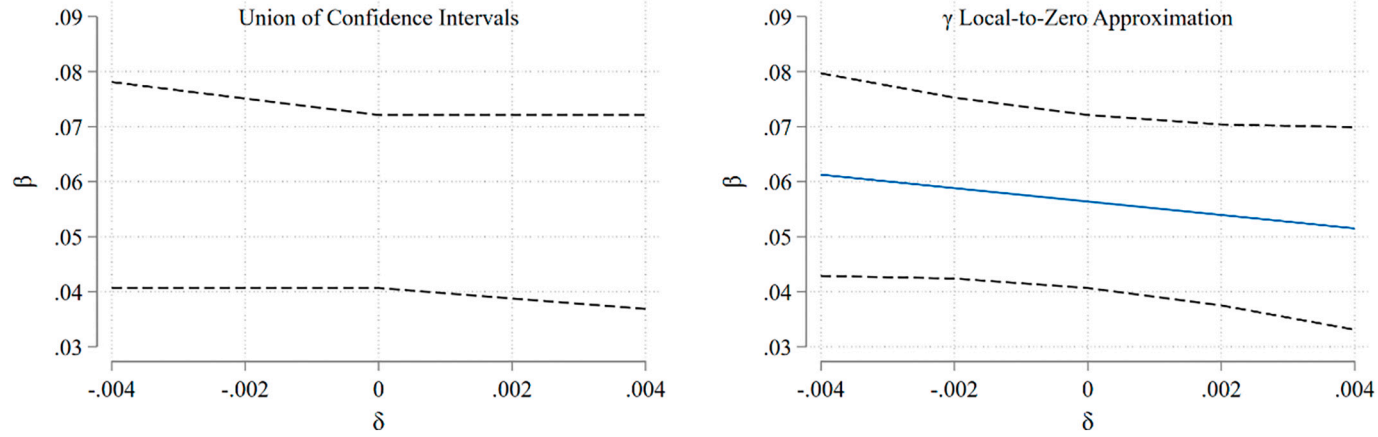

Fig. A3. Plausibly exogenous bounds varying prior assumptions.
Note: This figure displays the results of a plausibly exogenous test on the IV following Conley et al. (2012). The left panel applies the "Union of Confidence Intervals with γ Support Assumption" method, while the right panel uses the "γ Local-to-Zero Approximation" method. We run the equation $Y = \beta X + \gamma Z + \epsilon$ in our setting (using eq. (1) as an example), yielding an estimated γ value of 0.002 (although not significant). The two panels both illustrate the confidence intervals for the core explanatory variable estimates when γ fluctuates around 0.002, demonstrating the range of estimates when strict exogeneity assumptions do not hold.

Data availability

Data will be made available on request.

[6] In our regression, the estimated coefficient for γ is 0.002, although it is not statistically significant

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