Growth, Concentration, and Convergence of Green Credit in Chinese Commercial Banks: Evidence from a Bank-Level Panel, 2012-2023

Mingyao Sun
Supply Chain Management, Xi'an Jiaotong-Liverpool University, Suzhou, China

Abstract: Green credit is the largest channel of green finance in China and a core tool for the country's carbon peaking and carbon neutrality goals. This paper studies how green credit has developed across Chinese commercial banks from 2012 to 2023, the year range that follows the release of the Green Credit Guidelines. We build a bank-level panel of 231 banks and 815 bank-year observations from disclosed annual reports. We document three results. First, green credit grew quickly. The total green credit balance in the sample rose from 1.60 trillion yuan in 2012 to 22.58 trillion yuan in 2023, a compound annual growth rate of about 27 percent, and the share of green credit in total loans rose from 3.9 percent to 13.4 percent. Second, the market is still concentrated but is slowly broadening. The six large state-owned banks held about 85 percent of green credit in 2012 and about 79 percent in 2023, while the Herfindahl-Hirschman Index fell from about 2030 to about 1420. Third, green credit ratios across banks show beta convergence. Banks that started with low green credit ratios grew faster, with an estimated convergence speed of about 14 percent per year and a half-life near 4.6 years, while dispersion first widened and then narrowed after 2020. A positive link between bank size and green credit intensity appears in the cross-section but disappears within banks over time. The findings suggest that the green transition of Chinese banking is real and is spreading beyond the largest banks, but that large state banks remain the anchor of the system. We discuss policy steps to support smaller and inland banks.

Keywords: Green Credit; Green Finance; Commercial Banks; Market Concentration; Convergence

1. Introduction

Climate change and environmental pressure have pushed many countries to use the financial system to support a low-carbon economy. In China, the banking sector is the center of the financial system, so bank lending is the main way that capital reaches green projects. Green credit refers to loans that banks give to projects in energy saving, pollution control, clean energy, and related fields, while limiting loans to highly polluting and high-energy projects. Green credit is now the largest part of green finance in China and a key instrument for reaching the dual carbon goals of carbon peaking and carbon neutrality.

The policy that shaped this market is the Green Credit Guidelines, issued by the China Banking Regulatory Commission in February 2012. The Guidelines asked all banking institutions to build environmental and social risk management systems, to disclose their green credit business, and to direct funds toward green sectors. After 2012 the market expanded fast. According to the People's Bank of China, the balance of green loans in local and foreign currency reached 30.08 trillion yuan at the end of 2023, up 36.5 percent from the year before, which was much faster than the growth of total loans. By the end of 2024 the balance reached 36.6 trillion yuan, or 14.31 percent of all loans.

Most existing research studies green credit from two angles. One group of papers asks whether green credit helps or hurts bank performance and risk. Another group asks whether green credit reduces pollution and carbon emissions at the firm level. These questions are important, but they leave a gap. We still know little about the structure of the green credit market itself. We do not have a clear picture of how green credit is shared among banks, whether the market is becoming less concentrated, and whether banks that started late are catching up with early movers. These structural questions matter for policy, because a green transition that depends on only a few large banks is more fragile than one that is broad and shared.

This paper fills that gap. We use a bank-level panel built from disclosed annual reports, covering 231 commercial banks and 815 bank-year observations over the period 2012 to 2023. We study three structural features of the green credit market. First, we measure the growth of green credit in both absolute and relative terms. Second, we measure market concentration using the share of the six large state-owned banks, the share of the top five lenders, and the Herfindahl-Hirschman Index. Third, we test for convergence in green credit ratios, using both sigma convergence, which looks at dispersion over time, and beta convergence, which looks at whether laggards grow faster. We also test whether bank size drives green credit intensity.

The paper makes three contributions. First, it offers a clear empirical description of the structure of the green credit market, which complements the large literature on green credit effects. Second, it applies convergence analysis, a tool common in growth and regional studies, to the green credit ratio at the bank level, which to our knowledge is rare. Third, it draws simple policy lessons about how to broaden green lending beyond the largest banks. The rest of the paper is organized as follows. Section 2 reviews the policy background and the literature. Section 3 describes the data and methods. Section 4 reports the results. Section 5 discusses the findings. Section 6 concludes.

2. Policy Background and Literature Review

2.1 The Green Credit Policy Framework

China's green credit policy did not begin in 2012. In 2007, the former State Environmental Protection Administration, the People's Bank of China, and the China Banking Regulatory Commission jointly issued the Opinions on Implementing Environmental Protection Policies and Preventing Credit Risks. That document linked credit decisions to environmental compliance and asked banks to refuse new credit to projects that failed environmental review. The 2007 Opinions started the framework, but they were broad and hard to enforce.

The 2012 Green Credit Guidelines were a turning point. Unlike credit policies in many other countries, where each bank decides its own rules, the Guidelines were issued by the regulator and applied to policy banks, commercial banks, rural cooperative banks, and rural credit unions. The Guidelines required banks to identify, measure, monitor, and control environmental and social risks, to set up management systems, and to disclose green credit data. In 2014 the regulator added Green Credit Key Performance Indicators to improve monitoring and evaluation. These steps made green credit a standard part of bank reporting, which is why bank-level green credit data become richer after 2012. Our sample period of 2012 to 2023 matches this policy window.

2.2 Green Credit and Bank Outcomes

A large body of work studies the effect of green credit on banks. Several recent studies find a positive link between green credit and bank performance. A study of 42 Chinese listed banks over 2007 to 2022, published in the journal Economics in 2025, finds that green credit raises bank performance, and that the effect is stronger for non-state banks and under stronger regulation. A 2022 study in the Journal of Cleaner Production reports that return on assets and net interest margin rise with the share of green credit in total loans, and that the effect is larger where regional green development is higher. Wang and Dong (2019), in the Journal of Nanjing Audit University, find that green credit improves the operating performance of Chinese commercial banks. Pan and co-authors (2023), in Energy Exploration and Exploitation, evaluate the green credit efficiency of the top ten Chinese banks using a data envelopment analysis approach.

Not all findings agree. Some studies report that the gain is small or appears only in the short term, because green credit is a new business that is not yet mature, and because banks face pressure to protect short-term profit. Other studies stress ownership differences. State-owned banks, with more resources and stronger policy support, often show a larger green credit effect than smaller banks. This split between large state banks and the rest is a theme that our concentration analysis speaks to directly.

A related strand looks at green credit and bank risk, where the findings are mixed and again depend on bank type. Weber, Scholz, and Michalik (2010), in an early and influential paper, show that adding sustainability criteria to credit risk management can improve the prediction of borrower default, which gives a risk-based reason for green lending. Cui, Geobey, Weber, and co-authors (2018) find that higher green loan ratios are linked to lower non-

performing loan ratios for Chinese banks, so green lending need not raise risk. Zhou, Caldecott, Hoepner, and co-authors (2022) study 41 Chinese banks from 2007 to 2018 and report a more subtle pattern. The green credit policy lowered credit risk for the large state-controlled banks but raised it for city and regional banks, a gap they trace to weaker information and expertise at smaller banks. Gao and Guo (2022) treat the policy as a quasi-natural experiment and find gains in bank financial performance. Taken together, this work suggests that the effect of green credit on banks runs partly through who the bank is, which again points to the divide between large state banks and smaller banks that we study here.

2.3 Green Credit and the Real Economy

A second line of work studies how green credit affects firms and the environment. Many papers use the 2012 Guidelines as a quasi-natural experiment and apply difference-in-differences methods. One 2025 study of A-share listed firms over 2008 to 2021 finds that the green credit policy cut the carbon emissions of treated firms by about 13 to 19 percent. Other work shows that green credit limits credit to heavily polluting firms and pushes them to transform, and that the benefits can spread across regions. This literature shows that green credit is not only a financial product but also an environmental tool.

The firm-level evidence on innovation is rich but not settled. A difference-in-differences literature built on the 2012 Guidelines finds that the policy raised the green innovation output of listed firms, working mainly through easier and cheaper financing for cleaner firms and tighter credit for polluters. The effect is uneven. It tends to be stronger for state-owned enterprises, which align more closely with national goals, and weaker or even negative for some heavy polluters, where tighter credit can cut the funds available for research. Studies using firm panels from 2007 onward report that the Guidelines lifted green patent output on the whole, often by reshaping the mix of debt finance rather than by easing overall financing constraints. The common thread is that green credit redirects the supply of credit toward greener uses, with effects that depend on firm ownership and sector. These firm-level results matter for our study, because the willingness of banks to expand green credit is shaped by the demand and risk profile of the firms they serve.

2.4 Regional Disparity and Convergence in Green Finance

A third line of work measures regional gaps in green finance. Studies often use the Dagum Gini coefficient, the Theil index, kernel density estimation, and Markov chains. The general finding is that green finance is stronger in the eastern coastal provinces and weaker in the central and western inland provinces. Qin, Liu, Wang, and co-authors (2024), in Environmental Science and Pollution Research, study the green finance development level of 30 provinces and report a pattern of high in the southeast and low in the northwest, with the overall gap mainly driven by differences between regions. Pan and co-authors (2023), in Energy Exploration and Exploitation, evaluate the green credit efficiency of the largest Chinese banks and also find wide gaps across institutions.

Within this regional literature, several studies report club convergence rather than a single national path. Green finance growth in China shows an overall upward trend but a level that is still low, with the largest gaps coming from differences between regions rather than within them. Regions that start high, mostly in the east, can see their internal gaps widen, while regions that start low show some catch-up. These mixed signals at the provincial level motivate our bank-level view, which asks a sharper question: do individual banks that lag in green credit grow faster than the leaders? The convergence tools we use come from the growth literature. Barro and Sala-i-Martin (1992) set out beta and sigma convergence, and Dagum (1997) provides the Gini decomposition widely used to split regional gaps into within-region, between-region, and overlap parts. Applying these tools to the green credit ratio at the bank level is, to our knowledge, rare, and it is the main methodological contribution of this paper.

2.5 Research Gap

Three points stand out from this review. First, most studies focus on the effects of green credit, on banks, firms, or the environment, while far fewer describe the structure of the green credit market itself, such as how fast it grows, how concentrated it is, and whether it is converging. Second, convergence analysis is common at the province level but rare at the bank level, even though the bank is where green credit is actually supplied. Third, the role of bank size and bank

type in shaping green credit is often noted but seldom tested directly with both cross-bank and within-bank variation, which can give very different answers. This paper addresses these three gaps. It describes the growth, concentration, and convergence of green credit across banks over a full decade, and it separates the cross-bank and within-bank roles of bank size, which helps tell apart a scale story from a bank-type story.

3. Data and Methods

3.1 Data

The data come from the disclosed annual reports of Chinese commercial banks, collected through a commercial financial database. For each bank and year we observe two main items in yuan: the green credit balance and the total loan balance. We also observe the registered province of each bank, which is the location of its headquarters. The raw file lists many institutions, but only a part of them disclose a positive green credit balance together with a total loan balance in a given year. We keep a bank-year observation only when both items are present and positive. This gives a final panel of 231 banks and 815 bank-year observations over 2012 to 2023.

The number of banks that disclose green credit grows over the period, from 14 banks in 2012 to a peak of 172 banks in 2022. The count for 2023 is lower at 121 banks, which reflects a reporting lag at the time the data were collected, since some banks publish their green credit figures later than their main accounts. We treat the panel as unbalanced and do not force a fixed set of banks, because the entry of new banks is itself part of the story we want to tell.

The main variable of interest is the green credit ratio, defined for bank i in year t as green credit balance divided by total loan balance, expressed in percent. We use the natural log of the total loan balance as a measure of bank size. We also group banks into three regions by headquarters location, namely East, Central, and West, following the standard classification used in Chinese regional studies.

3.2 Measures of Concentration

We measure market concentration in three ways. First, we compute the share of total green credit held by the six large state-owned banks, namely ICBC, Agricultural Bank of China, China Construction Bank, Bank of China, Bank of Communications, and Postal Savings Bank of China. Second, we compute the share held by the top five lenders in each year. Third, we compute the Herfindahl-Hirschman Index (HHI), defined as the sum of squared market shares, scaled to a 0 to 10000 range. A higher HHI means more concentration. As a rough guide, an HHI above 2500 is often called highly concentrated, and a value between 1500 and 2500 is called moderately concentrated.

3.3 Convergence Tests

We test two types of convergence. Sigma convergence asks whether the spread of green credit ratios across banks falls over time. We measure spread with the coefficient of variation, which is the standard deviation divided by the mean of the green credit ratio in each year. A falling coefficient of variation means sigma convergence.

Beta convergence asks whether banks with low initial green credit ratios grow faster than banks with high initial ratios. For each bank we compute the average growth rate of its green credit ratio between its first and last observation, and we regress this growth rate on the log of the initial ratio. The model is $g_i = \alpha + \beta \ln(ri,0) + \varepsilon_i$, where g_i is the average growth rate and ri,0 is the initial ratio. A negative and significant value of β means beta convergence. We use heteroskedasticity-robust standard errors.

3.4 Bank Size and Green Credit Intensity

Finally, we ask whether larger banks have higher green credit ratios. We estimate two panel models. The first is a pooled model with year fixed effects, which captures differences across banks at a point in time. The second is a two-way fixed effects model with both bank and year fixed effects, which captures changes within a bank over time. The model is $ratio_{it} = \gamma \ln(sizei,t) + \mu_i + \lambda_t + \varepsilon_{it}$, where μ_i are bank effects and λ_t are year effects. Standard errors are clustered by bank. The two-way model with bank fixed effects is estimated on banks with at least four observations, so that within-bank variation can be identified.

4. Empirical Results

4.1 The Growth of Green Credit

Green credit grew sharply over the period. Table 1 reports the main yearly figures for the sample. The total green credit balance rose from 1.60

trillion yuan in 2012 to 22.58 trillion yuan in 2023. This is a compound annual growth rate of about 27 percent, far above the growth of total loans. Because green credit grew faster than total lending, the system green credit ratio, defined as total green credit over total loans in the sample, rose from 3.9 percent in 2012 to 13.4 percent in 2023. This figure is close to the national figure reported by the People's Bank of China, which gives a green loan share of total loans of 12.66 percent in 2023 and 14.31 percent in 2024. The closeness of the two numbers gives us confidence that the sample is representative.

Figure 1 shows the pattern. The growth was slow and steady from 2012 to about 2019, then accelerated after 2020. The faster growth after 2020 matches the timing of the dual carbon goals, which China announced in September 2020. The number of banks disclosing green credit also rose, from 14 in 2012 to 172 in 2022, which shows that green credit spread from a small group of leaders to a much wider set of banks.

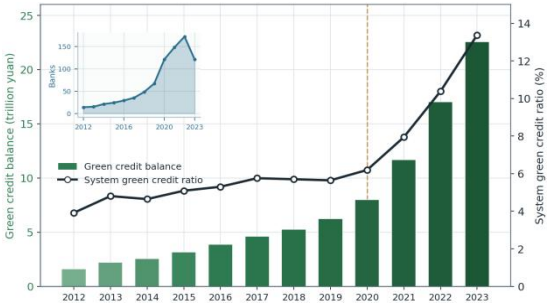

Figure 1. Green Credit Balance (Bars, Left Axis) and System Green Credit Ratio (Line, Right Axis), with the Number of Disclosing Banks in the Inset, 2012-2023.

Table 1. Green Credit in Chinese Commercial Banks, 2012-2023 (Sample).

Year	Banks	Green credit (tn yuan)	Total loans (tn yuan)	System ratio (%)	Mean ratio (%)	CV	Gini
2012	14	1.60	40.91	3.91	3.09	0.62	0.63
2013	15	2.23	46.32	4.81	3.58	0.66	0.63
2014	21	2.55	55.00	4.64	3.42	0.73	0.71
2015	24	3.15	61.83	5.09	3.45	0.77	0.75
2016	29	3.86	72.87	5.30	3.82	0.72	0.78
2017	35	4.61	80.14	5.76	4.00	0.66	0.80
2018	48	5.27	92.41	5.70	4.49	1.06	0.84
2019	67	6.24	110.50	5.64	3.77	1.12	0.87
2020	121	7.99	129.04	6.19	3.52	1.24	0.91
2021	148	11.67	147.01	7.94	4.13	1.14	0.92
2022	172	17.03	164.05	10.38	5.11	0.98	0.92
2023	121	22.58	168.78	13.38	6.30	0.87	0.91

Notes: Green credit and total loans are sample sums. System ratio is total green credit divided by total loans. Mean ratio is the unweighted mean across banks. CV is the coefficient of variation of the bank ratio. Gini is the Gini coefficient of green credit across banks. tn = trillion.

4.2Market Concentration

Green credit is still concentrated in the largest banks, but the concentration is falling slowly when we look at the leaders. Table 2 reports the main concentration measures. The six large state banks held 84.7 percent of green credit in 2012. Their share fell to 73.7 percent in 2022, then rose again to 79.3 percent in 2023. The top-five share moved in a similar way. The Herfindahl-Hirschman Index fell from about 2030 in 2012 to about 1230 in 2021, which is a clear move from high concentration toward moderate concentration, before rising to about 1420 in 2023.

A second measure tells a complementary story. The Gini coefficient of green credit across banks rose over the period, from 0.63 in 2012 to 0.91 in 2023. Figure 2 shows this through Lorenz curves. The curve for each year plots the cumulative share of green credit against the cumulative share of banks, and a curve that bows further from the 45-degree line means more inequality. The later curves bow further out, so the spread across banks widened.

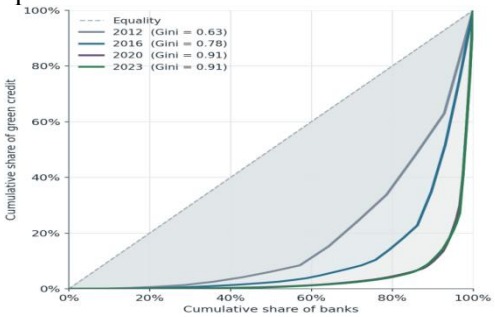

Figure 2. Lorenz Curves of Green Credit Across Banks for Selected Years, with Gini Coefficients.

The two measures are not in conflict, because they answer different questions. The falling Herfindahl index and top shares mean that the grip of the very largest banks eased, as mid-sized banks gained ground. The rising Gini means that the whole distribution became more uneven, because many small banks entered the market holding very little green credit. In other words, the leaders lost a little ground at the top, while a long tail of small entrants formed at the bottom. The net result is a market that is broader than before but still far from even.

Figure 3 shows the concentration trends among the leaders. The story is one of slow broadening, not a sudden change. The fall in concentration from 2012 to 2021 came mainly from the entry and growth of small and medium banks, such as city commercial banks and rural commercial banks. The partial rise in concentration in 2023 is most likely tied to the reporting lag noted earlier, since the large banks tend to report green credit on time while some smaller banks report later. The main message is that the six large state banks remain the anchor of the green credit market, holding about four-fifths of the total even after a decade of growth. This concentration reflects both their size and their stronger policy ties.

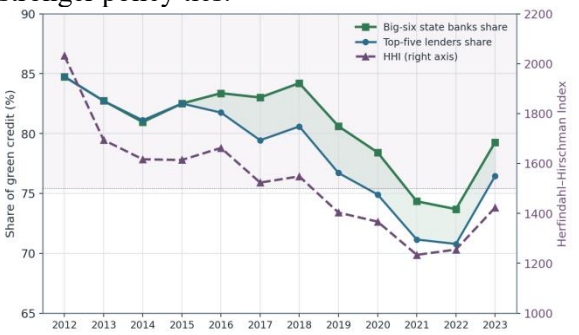

Figure 3. Share of the Six Large State-Owned Banks and the Top Five Lenders (Left Axis) and the Herfindahl-Hirschman Index (Right Axis), 2012-2023. The Shaded Band Marks the Moderate-Concentration Zone (HHI 1500 to 2500).

Table 2. Concentration of Green Credit, Selected Years.

Year	Big-six share (%)	Top-five share (%)	HHI	Gini (banks)
2012	84.7	84.7	2032	0.63
2015	82.5	82.5	1614	0.75
2018	84.2	80.6	1548	0.84
2020	78.4	74.9	1367	0.91
2021	74.3	71.1	1234	0.92
2022	73.7	70.8	1255	0.92
2023	79.3	76.4	1423	0.91

Notes: Big-six share is the share of green credit held by the six large state-owned banks. HHI is the Herfindahl-Hirschman Index on a 0 to 10000 scale. Gini is the Gini coefficient of green credit across banks.

4.3 The Regional and Headquarters Pattern

Green credit is highly concentrated in a few headquarters locations. When we group banks by the province of their headquarters, banks based in eastern provinces account for about 97 percent of green credit, while central and western provinces together account for only about 3 percent, as Table 3 shows. Beijing alone dominates the total, because the six large state banks and several joint-stock banks are headquartered there. Shanghai and Guangdong follow at a distance. The Gini coefficient of green credit across provinces is very high, near 0.92 in the later years.

Table 3. Green Credit by Headquarters Region, Selected Years.

Year	East (%)	Central (%)	West (%)	East-HQ banks	Provincial Gini
2012	100.00	0.00	0.00	14	0.70
2015	99.47	0.02	0.51	21	0.82
2018	98.32	0.79	0.89	36	0.88
2020	97.22	1.00	1.78	83	0.91
2023	97.26	1.39	1.35	78	0.92

Notes: Region is based on the bank headquarters province, not the location of lending. East, Central, and West follow the standard classification used in Chinese regional studies. Provincial Gini is the Gini coefficient of green credit across headquarters provinces.

We read this regional pattern with care. The province in our data is the registered

headquarters of the bank, not the place where the loans are actually used. A loan booked by a Beijing-headquartered bank may fund a project anywhere in the country. So the headquarters pattern reflects the institutional geography of Chinese banking, in which the largest lenders sit in a few financial centers, rather than the geography of where green projects are built. This is an important limit on any claim about regional green credit supply. Even so, the pattern is useful, because it shows how strongly the green credit market depends on a small number of head offices, which reinforces the concentration result in Section 4.2.

4.4 Convergence in Green Credit Ratios

We now ask whether banks with low green credit ratios are catching up with the leaders. The evidence points to convergence, but with a clear time pattern. We first look at sigma convergence, which asks whether the spread of green credit ratios across banks falls over time. Figure 4 shows how the whole distribution of bank green credit ratios moved year by year. The distribution shifts to the right, which is the growth we already saw, and it first spreads out and then tightens. The coefficient of variation in Table 1 tells the same story in one number. The dispersion was moderate in the early years, then rose sharply and peaked in 2020 at a value of about 1.24, then fell to about 0.87 by 2023. The rise in dispersion came when many new banks entered with very different green credit ratios. The later fall shows that the market began to even out after 2020, as latecomers raised their ratios.

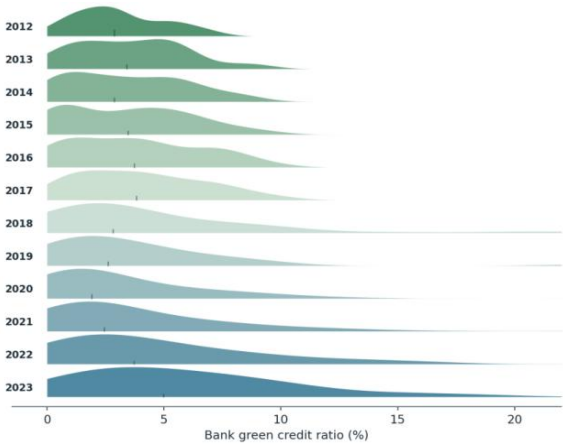

Figure 4. Distribution of Bank Green Credit Ratios by Year. Each Curve Is a Kernel Density for One Year, and the Vertical Line Marks the Median.

Beta convergence gives a stronger and clearer result. We regress each bank's average growth in its green credit ratio on the log of its initial ratio. Figure 5 shows the relationship. The estimated coefficient on the initial ratio is −0.140, with a standard error of 0.030, which is significant at the 1 percent level, based on 162 banks with a usable growth rate. The negative sign means that banks with lower initial green credit ratios grew faster. The implied convergence speed is about 14 percent per year, and the half-life, which is the time needed to close half of the gap to the long-run level, is about 4.6 years. In plain terms, banks that started behind have been closing the gap at a steady pace.

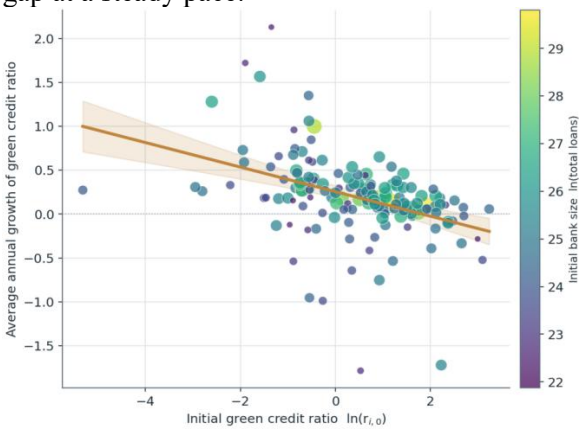

Figure 5. Beta convergence. Average annual growth of the green credit ratio against the log of the initial ratio. Bubble size and color show initial bank size.

Taken together, the two tests tell a consistent story. The market first spread out as new banks joined, which raised dispersion, and then began to tighten as latecomers grew faster than early movers. Beta convergence holds across the whole period, while sigma convergence holds only after the 2020 peak. This pattern is common in fast-growing markets, where entry first widens the spread before catch-up narrows it.

4.5 Bank Size and Green Credit Intensity

Finally, we ask whether larger banks lend a greater share of their loans to green projects. The answer depends on whether we look across banks or within banks. Table 4 reports the results. In the pooled model with year fixed effects, the coefficient on log bank size is 0.587, with a standard error of 0.176, which is significant at the 1 percent level. So in any given year, larger banks tend to have higher green credit ratios. The raw gap is large. In 2023 the six large state banks had a mean green credit ratio of 14.8 percent, against 5.9 percent for all other banks.

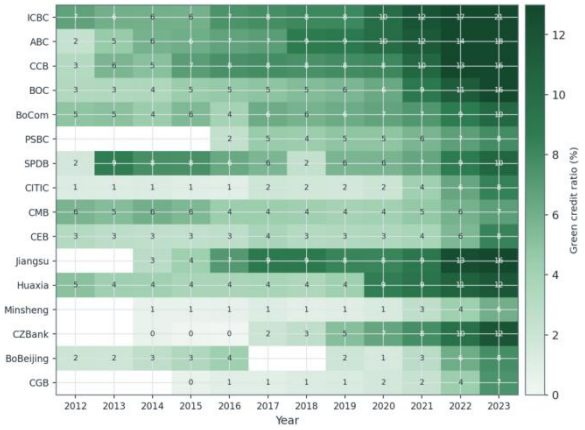

Figure 6. Green Credit Ratio of the Sixteen Largest Green Lenders in 2023, by Year. White Cells Mark Years with No Disclosure.

The picture changes once we control for bank fixed effects. In the two-way fixed effects model, which uses only the variation within each bank over time, the coefficient on log size is −1.570 with a standard error of 1.846, which is not significant. This means that when a single bank grows larger, its green credit ratio does not rise in a reliable way. The positive link in the pooled model comes from differences between banks, not from growth within a bank. Large banks do more green credit because of who they are, such as their resources, their policy ties, and their disclosure capacity, and not simply because they are big in a given year. This result supports the view that the green transition of banking is shaped by bank type and policy support more than by scale alone.

Table 4. Regression Results

	Model 1: Year FE	Model 2: Bank + Year FE	Model 3: Beta convergence
ln(bank size)	0.587***	−1.570	-
	(0.176)	(1.846)	
ln(initial ratio)	-	-	−0.140***
			(0.030)
Year fixed effects	Yes	Yes	No
Bank fixed effects	No	Yes	No
Observations	815	556	162
R-squared	0.097	0.759	0.166

Notes: The dependent variable in Models 1 and 2 is the bank green credit ratio in percent. The dependent variable in Model 3 is the average annual growth of the bank green credit ratio. Standard errors in parentheses are clustered by bank in Models 1 and 2 and are heteroskedasticity-robust in Model 3. *** denotes significance at the 1 percent level.

5. Discussion

The three findings fit together into a single picture of the green credit market. Green credit grew fast, the market slowly broadened beyond the largest banks, and laggard banks have been catching up. This is good news for the green transition, because a market that rests on many banks is more stable and more able to reach a wide set of borrowers than one that rests on a few. At the same time, the six large state banks still hold about four-fifths of green credit, so the system remains anchored by a small group. The green transition of Chinese banking is both real and uneven.

The size result adds nuance. The fact that the size effect appears across banks but not within banks suggests that policy and bank type matter more than scale. Large state banks lead in green credit not only because they are large but because they have stronger policy support, better data systems, and a clearer mandate to serve national goals. This points to a clear lever for policy. If smaller banks were given the same tools, such as shared green standards, training, and refinancing support, they might raise their green credit ratios faster, which would speed up the convergence we already observe.

Our study has limits that also point to future work. First, the province in the data is the bank headquarters, not the place of lending, so we cannot map the true geography of green credit supply. Future work could use branch-level or project-level data to study where green loans are actually used. Second, our green credit measure is the disclosed balance, and disclosure rules and definitions have changed over time, which may affect comparisons across years and banks. Third, we describe structure rather than test causal effects. A natural next step is to link these structural features to outcomes, such as bank risk, local emissions, and the cost of credit for green firms.

6. Conclusion and Policy Implications

This paper studied the structure of the green

credit market in Chinese commercial banks from 2012 to 2023, using a bank-level panel of 231 banks and 815 bank-year observations. We found three results. Green credit grew at about 27 percent per year and rose from 3.9 percent to 13.4 percent of total loans. The market is still concentrated, with the six large state banks holding about 79 percent of green credit in 2023, but concentration fell over most of the period as many smaller banks entered. Green credit ratios show beta convergence, with a speed near 14 percent per year, while dispersion widened until 2020 and then narrowed. Bank size is linked to green credit intensity across banks but not within banks.

These results suggest several policy steps. First, regulators should keep supporting the entry and growth of smaller and inland banks in green lending, since these banks drive the convergence that broadens the market. Tools could include unified green credit standards, shared environmental data systems, and targeted refinancing for green loans. Second, since green credit still leans on a few large head offices, the system would gain from a wider base, which calls for capacity building at city and rural commercial banks. Third, better and more consistent disclosure would help both research and supervision, by making green credit data comparable across banks and years. A green credit market that is large, broad, and convergent is more likely to support the dual carbon goals than one that is large but narrow. The evidence here suggests China is moving in that direction, with room to move faster.

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