Reaching for Guaranteed Yield: Universal-Life Insurance and the Pricing of Quasi-Sovereign Debt

Abstract

How does liability-side product deregulation reshape asset demand when financial intermediaries remain constrained by asset-side regulation? We study China's 2013–2016 universal-life (UL) insurance boom, during which product liberalization generated rapid growth in costly, surrenderable, deposit-like insurer liabilities. We construct provincial exposure by interacting insurers' pre-boom branch networks with subsequent insurer-level growth in UL liabilities. Within province-quarter cells, greater UL exposure selectively compresses spreads on rated non-AAA local-government financing vehicle (LGFV) bonds relative to non-LGFV corporate bonds. A one-standard-deviation increase in exposure implies approximately 3.7 basis points of additional spread compression. The effect is concentrated among bonds with maturities of seven years or less, is stronger in fiscally weaker provinces, and becomes more pronounced under rating-sensitive solvency regulation. These patterns are consistent with a within-rating form of reaching for yield: insurers favor securities offering additional yield relative to perceived default risk without moving further down the formal rating scale. Greater UL exposure is also associated with entry by first-time LGFV issuers. The results show how liability-side deregulation can interact with pre-existing asset-side constraints to reshape credit pricing and market access.

Keywords: universal life insurance; reaching for yield; financial intermediation; solvency regulation; LGFV bonds; quasi-sovereign debt

JEL Codes: G12, G22, G28, H74

1. Introduction

Financial regulation operates on both sides of an intermediary's balance sheet. Rules governing the products intermediaries issue shape the cost, liquidity, and effective maturity of their funding, while capital and investment rules shape which assets they can hold cheaply. Yet these two sides are often studied separately. Existing work shows how interest rates, capital requirements, and balance-sheet constraints affect insurers' portfolio choices (Ellul, Jotikasthira, and Lundblad, 2011; Koijen and Yogo, 2015, 2016). Less is known about how changes in liability-side regulation interact with these asset-side constraints. When product deregulation suddenly makes intermediary funding more expensive and withdrawal-prone, which assets absorb the resulting demand, and how does that demand affect credit pricing?

Life insurers provide a natural setting for studying this interaction. They are often viewed as patient, liability-driven institutional investors because their contractual obligations are long dated. But product design, surrender options, credited rates, and distribution channels can make the effective funding base substantially shorter, more expensive, and more liquid than that label suggests. Rapid growth in such liabilities therefore creates a constrained search for yield: insurers must deploy large volumes of funds while simultaneously managing liquidity, duration, and solvency-capital requirements. Because insurers are large participants in credit markets, this balance-sheet pressure can affect not only portfolio composition but also equilibrium asset prices.

We study this interaction using China's 2013–2016 universal-life (UL) insurance boom. A sequence of reforms liberalized life-insurance product pricing and expanded investment scope, enabling rapid growth in savings-oriented UL contracts. Many of these products combined guaranteed minimum returns and high credited rates with low early-surrender costs and broad retail accessibility. Crucially, the contracts remained liabilities on insurers' own balance sheets. Their expansion therefore generated an unusually strong demand for assets that could deliver yield without imposing excessive liquidity, duration, or regulatory-capital costs.

This portfolio problem made rated non-AAA bonds issued by local-government financing vehicles (LGFVs) particularly attractive. LGFVs are legally corporate borrowers but were widely perceived as benefiting from implicit local-government support. Under China's rating-sensitive solvency framework, capital charges on corporate bonds depended primarily on external ratings and maturity rather than on LGFV status. An LGFV bond and an industrial corporate bond with the same rating and maturity could therefore consume similar regulatory capital even though investors perceived different tail risks. This wedge between regulatory treatment and perceived government support created a capital-efficient way to reach for yield within a rating class: insurers could obtain additional yield relative to perceived default risk without moving further down the formal rating scale.

To identify the pricing effect of UL-driven funding pressure, we construct a Bartik-style measure of provincial UL exposure by interacting insurers' pre-boom branch distributions with subsequent insurer-level growth in UL liabilities. We then compare LGFV and non-LGFV corporate bonds issued within the same province-quarter. Province-by-quarter fixed effects absorb common local fiscal, credit, and macroeconomic conditions, so identification comes from whether the within-cell LGFV spread differential responds more strongly where pre-existing insurer networks generate greater exposure to UL growth.

Greater UL exposure selectively compresses the spreads of rated non-AAA LGFV bonds. A one-standard-deviation increase in exposure reduces the LGFV spread differential by approximately 3.7 basis

points relative to non-LGFV corporate bonds in the same province-quarter. We find no comparable effect among AAA bonds. The rating split is economically informative: non-AAA LGFV debt offered more scope to trade perceived government support against rating-based capital costs, whereas AAA bonds already carried the lowest corporate-bond capital charges.

Mechanism evidence maps to both sides of insurers' portfolio problem. The pricing response is concentrated among bonds with maturities of seven years or less, consistent with surrenderable UL liabilities limiting demand for the longest-duration assets. The response is also stronger in fiscally weaker provinces, where LGFV debt offered a larger yield premium while retaining perceived government support, and becomes more pronounced after C-ROSS made external ratings and maturity more consequential for solvency capital. Aggregate custody data provide complementary evidence of a sharp boom-period shift in insurance portfolios toward short-duration credit followed by a reversal after product regulation tightened. On the quantity margin, greater UL exposure is also associated with entry by first-time LGFV issuers.

This paper makes three contributions. First, it adds a liability-side channel to the literature on regulated intermediary asset demand. Existing research emphasizes how interest rates, capital requirements, and balance-sheet constraints shape insurers' portfolios. We show that product regulation can itself change the scale and economic character of intermediary liabilities, altering the shadow value of yield, liquidity, duration, and regulatory capital on the asset side. More broadly, product rules and capital rules cannot always be evaluated in isolation: their interaction jointly shapes intermediary demand and the allocation of credit.

Second, we identify a within-rating form of reaching for yield. Rather than moving mechanically toward lower-rated securities, insurers can seek additional yield within a rating class when formal capital regulation relies on external ratings that do not fully reflect perceived implicit guarantees. In our setting, non-AAA LGFV bonds combined the regulatory capital treatment of similarly rated corporate debt with an expectation of local-government support. This extends the reaching-for-yield literature by showing how implicit guarantees and rating-based regulation can jointly create a targeted, capital-efficient form of yield-seeking (Becker and Ivashina, 2015).

Third, we connect insurer balance sheets to quasi-sovereign credit supply. UL exposure affects not only relative borrowing spreads but also market access, increasing entry by first-time LGFV issuers. The results show that liability-side shocks to regulated institutional investors can propagate beyond portfolio allocation to affect both the price and availability of financing for marginal quasi-sovereign borrowers.

Taken together, the findings highlight a broader issue of regulatory coherence. Financial regulation is a system rather than a collection of independent rules: front-end product liberalization can change the funding pressures faced by intermediaries, while back-end solvency rules determine where the resulting asset demand is directed. The interaction can therefore generate credit-market consequences that would be difficult to infer from either rule in isolation.

The rest of the paper proceeds as follows. Section 2 develops the institutional setting and the rating-based capital-efficiency mechanism. Section 3 introduces the data, exposure measure, and empirical design. Section 4 reports the main pricing results and robustness checks. Section 5 examines liability-side maturity management, rating-based capital efficiency, and quantity-margin responses. Section 6 concludes.

2. Institutional Background and Underlying Mechanism

2.1 The Universal-Life Boom and the Insurer Liability Shock

At the beginning of the 2010s, Chinese insurance regulation confronted a sector that was small relative to the banking system, constrained by administratively capped pricing, and widely viewed as offering homogeneous products with weak investment performance. Regulators responded with a strategy of liberalizing product pricing and investment scope at the front end while strengthening solvency and risk controls at the back end. On the asset side, a series of investment reforms beginning in 2012 expanded the set of instruments available to insurers, including the Interim Measures on Insurance Capital Investment in Bonds (CIRC 2012, No. 58). Restrictions on corporate bonds, financial products, trusts, infrastructure, securitized assets, derivatives, delegated investment, real estate, and overseas investment were relaxed or reorganized. On the liability side, the 2013 pricing reform relaxed the long-standing ceiling on assumed interest rates for life products and subsequently extended market-oriented pricing to universal-life and participating products (CIRC 2013, No. 62), returning greater discretion over product design and pricing to market participants. The State Council's 2014 Opinions on Accelerating the Development of Modern Insurance Services further reinforced this direction by encouraging life-insurance pricing reform, product and distribution-channel innovation, and a broader institutional-investor role for insurance funds in bond and capital markets (State Council 2014, No. 29). Together, these reforms created the conditions for rapid growth in savings-oriented life insurance.1

The expansion involved the life-insurance sector broadly, although its intensity varied sharply across firms. Large incumbents participated in the UL market, while a subset of smaller and faster-growing insurers relied much more heavily on UL products as a source of balance-sheet expansion. Company-level data illustrate this heterogeneity: although large insurers generated substantial UL-related inflows in absolute terms, such inflows were considerably larger relative to traditional premium income for several rapidly expanding insurers. Universal-life funding was therefore industry-wide, but disproportionately important to the growth of a subset of firms.

The resulting Chinese version of UL differed in economically important ways from a conventional protection-oriented contract. Products were often marketed as simple savings vehicles. Some policies featured zero upfront fees, no risk-management charges, and little or no surrender penalties after a short holding period—characteristics that soon became hallmarks of UL products. Accounts carried a guaranteed minimum return, while advertised annual settlement rates could reach 7–8 percent. Products were sold through bank channels and internet platforms, typically with very low minimum purchase amounts, making them accessible to a broad base of retail savers. One widely discussed online product reportedly sold more than RMB 100 million within ten minutes during the 2013 Tmall 'Double 11' shopping festival, with a minimum premium as low as RMB 1,000 and a prominently advertised 7 percent annualized return. Collectively, these features rendered UL liabilities costly, surrenderable, and economically akin to deposit-like funding.

Unlike asset-management products in which investment risk is borne primarily by clients, UL contracts remained contractual liabilities on insurers' own balance sheets. Their expansion therefore translated directly into an asset-allocation problem: the associated funds had to be invested subject to

[1] Contemporary industry discussions framed life-insurance pricing reform as a shift from administrative rate controls toward market-oriented product pricing, supported by the expansion of insurance-fund investment channels beginning in 2012. The stated objective was to encourage product differentiation and market competition while relying on reserve and solvency regulation to constrain risk at the back end.

surrender risk, asset-liability-management requirements, and solvency-capital constraints. High credited rates raised the return required from the asset portfolio, while surrender rights created liquidity and duration-management concerns. Insurers therefore sought assets that could deliver sufficient yield without consuming excessive regulatory capital or locking the portfolio into maturities inconsistent with the liquidity of the funding base.

Regulation tightened sharply from 2016 onward. Rules issued in March 2016 restricted short- and medium-duration life products, prohibited products with maturities below one year, and imposed quantitative limits linked to capital and net assets (CIRC 2016a, No. 22). Subsequent measures broadened the definition of short-duration products, limited early survival benefits, and tied branch expansion to the composition of premium income. By 2017–2018, product-design rules and look-through asset-management regulation had substantially curtailed the model (CIRC 2017, No. 134). Universal-life growth fell abruptly, and several aggressive insurers contracted or came under regulatory intervention.

2.2 LGFV Bonds and the Implicit Guarantee

LGFVs are corporate entities that Chinese local governments use to finance infrastructure and urban development projects. Their bond liabilities are legally corporate debt. The 2014 State Council debt reform explicitly separated local-government obligations from the liabilities of financing platforms and stated that new LGFVs borrowing should not automatically be treated as government debt (State Council 2014, No. 43). Yet the economic boundary remained less clear than the legal one. LGFVs, which held public assets and performed policy functions, were often owned or controlled by local governments. Investors consequently attached value to the implicit belief that LGFV bonds enjoyed local-government backing (Ang, Bai, and Zhou 2023; Chen, He, and Liu 2020; Liu, Lyu, and Yu 2021; Ambrose, Deng, and Wu 2015).

This gap between legal form and perceived support is central to our setting. An LGFV bond could carry the same external rating as an industrial corporate bond, yet be perceived as having different tail risk and recovery prospects. At the same time, non-AAA LGFV bonds offered higher yields than the safest corporate instruments. They therefore occupied a distinctive position in the investment opportunity set: corporate in legal and regulatory classification, but quasi-sovereign in investor perception.

The UL boom also overlapped with important changes in local-government financing. LGFV bond issuance had accelerated after the 2009 stimulus, while subsequent debt reforms and the large local-government debt-swap program altered the supply and composition of local public debt during the mid-2010s (Chen, He, and Liu 2020; State Council 2014, No. 43). This concurrent evolution makes LGFV bonds an economically important setting in which to study how intermediary demand affects quasi-sovereign financing.

2.3 Rating-Based Capital Efficiency

China's first-generation solvency regime was primarily scale based and relatively insensitive to fine distinctions in bond credit quality. The China Risk-Oriented Solvency System (C-ROSS), implemented in 2016, introduced a more risk-sensitive capital framework (CIRC 2015; CIRC 2016b). Under its credit-risk minimum-capital rules, capital charges on corporate bonds increased as external ratings declined and were further adjusted for maturity (CIRC 2016c, Rule No. 8). Basic capital factors ranged from 1.5 percent for AAA-rated bonds to 13.7 percent for BBB-rated or unrated bonds.

A crucial feature of this framework was that ordinary LGFV bonds did not receive the preferential capital treatment applied to government or narrowly defined quasi-government securities. Article 7 of the

2012 bond-investment measures limited the quasi-government category to instruments approved by the State Council and carrying credit comparable to central-government debt (CIRC 2012, No. 58). Corporate bonds issued by local financing platforms generally fell outside this category. As a result, LGFV bonds were treated as corporate debt for solvency purposes, with capital charges determined primarily by their external ratings and maturities.

This treatment created what we call **rating-based capital efficiency**. An LGFV bond and an industrial corporate bond with the same external rating and maturity consumed similar regulatory capital, even though investors could perceive different tail risks because of implicit local-government support. Non-AAA LGFV bonds could therefore offer additional yield relative to perceived default risk without requiring insurers to move further down the formal rating scale. AAA bonds already carried low capital charges and offered less room for marginal compression, while similarly rated industrial bonds lacked comparable perceived government support.

This mechanism links the liability and asset sides of our setting. Costly, surrenderable UL liabilities intensified insurers' demand for yield under liquidity and duration constraints, while rating- and maturity-based solvency rules shaped which securities could supply that yield efficiently. The mechanism yields three testable predictions: the pricing response should concentrate among rated non-AAA bonds, tilt away from the longest maturities, and strengthen where the yield–guarantee wedge and the role of external ratings are larger.

3. Data and Empirical Strategy

3.1 Bond Data

The bond sample contains primary-market corporate bond offerings issued between 2012 and 2023. Bond-level issuance characteristics, pricing information, and credit ratings are obtained from CSMAR. This window captures both the expansion and subsequent unwinding of UL liabilities; observations after 2019 therefore contribute variation from the unwinding phase rather than extending the 2013–2016 boom period.

Each observation corresponds to a primary-market bond offering. We identify offerings using CSMAR’s unique security identifier (SecurityID) where available and a combination of bond code, bond name, and issuance date otherwise. Because bond codes can be reused across unrelated securities, we do not collapse observations by bond code alone. We remove duplicate offering records and trim the top and bottom one percent of credit spreads within each estimation subsample.

Bond-level credit ratings are taken from CSMAR’s issuance-time rating field (Crdrate). CSMAR provides a single rating for each security record rather than separate agency-specific ratings, so our construction does not require an additional reconciliation rule across rating agencies. Issues without a reported rating are coded as *Unknown* and excluded from the rated samples. AAA is the highest long-term rating category in China’s domestic corporate-bond rating scale.

Bond controls include the logarithm of issuance amount, maturity, and indicators for callable, putable, periodic-payment, and fixed-rate features. All pricing specifications include an LGFV indicator, rating fixed effects, and maturity-bucket fixed effects. Province is assigned using the issuer's location. LGFV status is identified using issuer classifications in the underlying databases and standard market lists. Table 1 presents descriptive statistics for the variables.

Table 1. Summary Statistics

Panel A. Full Sample						
Variable	**N**	**Mean**	**Std. Dev.**	**P25**	**Median**	**P75**
Credit spread (pp)	41,315	1.9769	1.2490	0.9667	1.6801	2.8598
UL exposure (ΔUL/TA)	41,315	0.0150	0.0184	0.0040	0.0122	0.0209
ln(Issuance amount)	41,315	1.9287	0.7093	1.6094	1.9459	2.3026
Maturity (years)	41,315	3.4503	2.5687	1.0000	3.0000	5.0000
LGFV dummy	41,315	0.5103	0.4999	0.0000	1.0000	1.0000
Fiscal pressure	41,315	0.4256	0.1675	0.2989	0.3787	0.5851
ln(GDP)	41,315	10.7769	0.7140	10.3023	10.8200	11.3278
ln(Bank loans)	41,315	11.2411	0.7696	10.7091	11.2499	11.9481
Panel B. Rated Non-AAA Sample						
Variable	**N**	**Mean**	**Std. Dev.**	**P25**	**Median**	**P75**
Credit spread (pp)	11,155	2.4998	1.1150	1.5661	2.4034	3.3313
UL exposure (ΔUL/TA)	11,155	0.0220	0.0226	0.0081	0.0162	0.0321
ln(Issuance amount)	11,155	1.9486	0.6865	1.6094	2.0794	2.3026
Maturity (years)	11,155	4.6815	2.4927	3.0000	5.0000	7.0000
LGFV dummy	11,155	0.5554	0.4969	0.0000	1.0000	1.0000
Fiscal pressure	11,155	0.4317	0.1780	0.2763	0.4384	0.5851
ln(GDP)	11,155	10.5328	0.7293	10.0680	10.5972	11.0773
ln(Bank loans)	11,155	10.8927	0.8021	10.3254	10.9230	11.4915

Notes: Credit spread is yield to maturity minus the yield on a same-maturity government bond. The sample period is 2012–2023. The primary inference sample consists of rated non-AAA bonds.

3.2 Insurance Data and Provincial UL Exposure

The insurance sample contains 48 life, health, and pension insurers with positive pre-boom branch weights. We exclude property-and-casualty insurers because their liability structures, duration profiles, and asset-allocation constraints differ materially from those of life insurers.

We construct a shift-share measure of provincial exposure to insurer-level UL expansion. For each insurer-year, the shifter is the annual change in universal-life liabilities scaled by lagged total assets. The share component is the insurer's predetermined geographic footprint, measured by the distribution of its branches across provinces as of December 31, 2012, before the UL boom. Branches include sub-branches and operating outlets. Importantly, the pre-boom branch shares are not intended to explain why some insurers subsequently expanded UL liabilities more aggressively than others. That cross-insurer variation is captured directly by the realized insurer-level shifter. Instead, the branch shares provide predetermined geographic weights that map insurer-level balance-sheet expansion into differential provincial exposure. Intuitively, two provinces are more differently exposed to the same national pattern of insurer-level UL growth when their pre-boom insurance markets were served by different sets of insurers.

Formally, let $s_{pj,2012}$ denote insurer j's share of branches located in province p at the end of 2012, and let $y(q)$ denote the calendar year containing quarter q. Let $\Delta UL_{j,y(q)} / TA_{j,y(q)-1}$ denote insurer j's annual change in UL liabilities scaled by lagged total assets. Provincial exposure is defined as

$$\text{Exposure}_{pq} = \sum_{j} s_{pj,2012} \times \frac{\Delta UL_{j,y(q)}}{TA_{j,y(q)-1}}$$

The index is high when a province had a relatively large pre-boom presence of insurers that subsequently experienced rapid UL-liability growth. Because insurer-level UL liabilities are observed annually, exposure is constant across quarters within a calendar year; positive values capture liability expansion, whereas negative values capture the subsequent unwinding. The measure should be interpreted as provincial exposure to the balance-sheet expansion of UL-growing insurers, rather than as a measure of security-level holdings or a claim that insurance funds raised in a province were mechanically invested there.

The use of branch shares as geographic exposure weights does not require the pre-boom branch network to be randomly assigned. Branch networks may reflect persistent differences in provincial market size and insurer presence. Our empirical design therefore does not compare average bond spreads across high- and low-exposure provinces. Instead, province-by-quarter fixed effects absorb all common provincial conditions, and identification comes from changes in the LGFV–non-LGFV spread differential within the same province-quarter as exposure varies.

We further validate the geographic content of the measure using independently observed insurer balance-sheet outcomes. Applying the same predetermined branch matrix to insurer-level policyholder investment funds and insurance operating revenue, we find that provincial UL exposure significantly predicts growth in both measures (Appendix Table C1). These results support interpreting the branch-weighted index as capturing the geographic incidence of insurer balance-sheet expansion rather than the determinants of insurers' decisions to expand UL business.

3.3 Empirical Specification

Our baseline specification estimates whether universal-life exposure changes the LGFV spread differential within a province-quarter cell:

$$Spread_{ipq} = \beta(Exposure_{pq} \times LGFV_i) + \alpha LGFV_i + \gamma_{pq} + \delta_r + \psi_m + X_i'\theta + \varepsilon_{ipq}$$

The dependent variable is the credit spread of bond i issued in province p and quarter q. The coefficient of interest, β, measures how the within-cell spread difference between LGFV and non-LGFV bonds varies with universal-life exposure. The specification includes an LGFV indicator, while the main effect of provincial exposure is absorbed by province-by-quarter fixed effects. These fixed effects also absorb provincial macroeconomic conditions, fiscal developments, local credit supply, and common changes in the level of bond spreads. Rating fixed effects and maturity-bucket fixed effects account for the principal pricing effects of observable credit quality and term. Bond controls include issuance amount, maturity, and indicators for callable, putable, periodic-payment, and fixed-rate features. A negative β indicates that LGFV spreads compress relative to non-LGFV corporate spreads as provincial universal-life exposure rises. Credit spreads and exposure enter in levels, so economic magnitudes are evaluated using the standard deviation of exposure in the relevant estimation sample. Standard errors are clustered by province. Because the design contains 31 provincial clusters, our primary inference uses wild cluster bootstrap p-values based on 1,999 replications.

Identification requires that, conditional on province-by-quarter fixed effects, rating, maturity, and bond characteristics, no unobserved shock correlated with universal-life exposure differentially affects LGFV and non-LGFV bond spreads within the same province-quarter. Common local macroeconomic, fiscal, and credit-supply shocks are absorbed by the province-by-quarter fixed effects. The remaining

concern is a contemporaneous shock specific to LGFV pricing that covaries with insurer exposure. Section 4 addresses this concern through alternative exposure constructions, within-rating comparisons, debt-swap controls, and timing diagnostics.

3.4 Quantity-Margin Specification

To examine whether the pricing response extends to market access, we collapse the bond-level data to a province-quarter-sector panel, with one LGFV and one non-LGFV observation in each cell. We estimate an analogous Exposure × LGFV specification with province-by-quarter and sector fixed effects. The outcomes are the number of issues, ln(1 + issuance amount), and the number of distinct issuers making their first observed bond issue in the cell.

The interaction coefficient compares the change in LGFV issuance with the change in non-LGFV issuance within the same province-quarter as universal-life exposure varies. No bond-level controls enter the collapsed regressions. Standard errors are clustered by province, and inference again relies on wild cluster bootstrap p-values based on 1,999 replications. Section 5.3 reports the results.

4. Main Results and Robustness

4.1 Baseline Estimates

Table 2 reports the pricing estimates across rating samples. Column 1 presents the primary specification for rated non-AAA bonds, the segment in which insurers faced a meaningful trade-off between yield, perceived government support, and rating-based capital costs. The coefficient on Exposure × LGFV is −1.615, indicating that greater provincial UL exposure is associated with a narrower spread differential between LGFV and non-LGFV bonds issued in the same province-quarter. Because exposure enters in levels, a one-standard-deviation increase in UL exposure—0.023 in this sample—implies approximately 3.7 basis points of additional compression in the LGFV spread differential.

The estimate reflects a selective repricing of LGFV debt rather than a general decline in provincial borrowing costs. Province-by-quarter fixed effects absorb local fiscal conditions, credit supply, and aggregate movements in bond-market pricing, while rating fixed effects, maturity-bucket fixed effects, and bond controls account for observable differences in credit quality and contract structure. The coefficient therefore captures whether LGFV bonds become cheaper relative to comparable non-LGFV corporate bonds as local exposure to UL-expanding insurers rises. The estimate is statistically significant under the paper's preferred wild-cluster-bootstrap inference, with a p-value of 0.041.

Column 2 shows no comparable spread compression among AAA bonds. The point estimate is positive and imprecise, indicating that the negative pricing response is concentrated in the non-AAA segment. This contrast is consistent with the proposed mechanism: AAA bonds already receive the lowest corporate-bond capital charge and offer less scope for insurers to obtain additional yield within the rating grid, whereas non-AAA LGFV bonds combine a larger yield premium with perceived local-government support. Columns 3 and 4 pool bonds across rating groups. The resulting estimates are close to zero, showing that the rating-specific response is obscured when securities with different capital treatment and yield–guarantee wedges are combined.

Table 2. Universal-Life Exposure and LGFV Bond Spreads

	(1) Non-AAA	(2) AAA	(3) Rated	(4) Full sample
Exposure × LGFV	-1.615**	3.503	0.068	0.223
	(0.819)	(2.178)	(0.774)	(1.111)

	(1) Non-AAA	(2) AAA	(3) Rated	(4) Full sample
Province × quarter FE	Yes	Yes	Yes	Yes
Rating FE	Yes	Yes	Yes	Yes
Term-bucket FE	Yes	Yes	Yes	Yes
Bond controls	Yes	Yes	Yes	Yes
Observations	11,155	6,523	17,678	41,315
Within R^2	0.194	0.150	0.223	0.227
Cluster p (Exposure×LGFV)	0.058	0.119	0.931	0.843
WCB p (Exposure×LGFV)	0.041	0.112	0.930	0.852

Notes: The dependent variable is the bond credit spread in percentage points. UL Exposure is the shift-share measure constructed from insurer-level changes in UL liabilities and insurers' 2012 provincial branch shares; it enters in levels and is not standardized. Bond controls include the logarithm of issuance amount, maturity, and indicators for callable, putable, periodic-payment, and fixed-rate features. All specifications include an LGFV indicator, province-by-quarter fixed effects, rating fixed effects, and term-bucket fixed effects. Standard errors, reported in parentheses, are clustered by province. Stars are based on wild-cluster-bootstrap p-values using 1,999 replications. Column 1 is the primary specification. The regressions contain 31 provincial clusters, including Tibet in specifications where bonds are observed.

4.2 Robustness Checks

Table 3 examines the stability of the rated non-AAA estimate across alternative samples, exposure constructions, and fixed-effect structures. Restricting the sample to 2013–2019 yields a coefficient of −1.727, similar in magnitude to the baseline but less precisely estimated. Reconstructing exposure using the June 2013 branch network produces a coefficient of −1.406, while excluding each insurer's contribution in its headquarters province produces −1.802.

Column 5 absorbs province-by-quarter-by-rating fixed effects, comparing LGFV and non-LGFV bonds within the same external-rating category and province-quarter. The resulting coefficient is −1.488, close to the baseline estimate. Across these exercises, the sign and economic magnitude of the coefficient remain stable.

Insurer-level contribution weights are moderately concentrated but are not dominated by a single firm. Huaxia Life accounts for 20.2 percent of total weight, while the five largest contributors account for 60.0 percent. Because the weights reflect both insurer-level UL-liability growth and predetermined geographic reach, nationwide incumbent insurers can receive substantial weight even when they were not the most aggressive UL issuers. Appendix Table B2 reports the ten largest insurer-level contribution weights.

Table 3. Robustness Panel: Rated Non-AAA Bonds

	(1) Baseline	(2) 2013–2019	(3) 2013 branch cutoff	(4) Leave-own-HQ-out	(5) P×Q×Rating FE
Exposure × LGFV	-1.615** (0.819)	-1.727* (0.970)	-1.406* (0.751)	-1.802* (0.976)	-1.488* (0.846)
Province × quarter FE	Yes	Yes	Yes	Yes	No
Province × quarter × rating FE	No	No	No	No	Yes
Rating FE	Yes	Yes	Yes	Yes	Absorbed
Term-bucket FE	Yes	Yes	Yes	Yes	Yes
Bond controls	Yes	Yes	Yes	Yes	Yes
Observations	11,155	6,264	11,155	11,155	11,155
Within R^2	0.194	0.225	0.194	0.194	0.026
Cluster p	0.058	0.085	0.071	0.075	0.089
WCB p	0.041	0.079	0.057	0.063	0.084

Notes: Each column changes one dimension relative to the baseline. Column (2) restricts issuance to 2013–2019. Column (3) uses the branch matrix as of June 30, 2013. Column (4) excludes each insurer's contribution in its headquarters province. Column (5) absorbs province-quarter-rating fixed effects via cell demeaning and retains term-bucket dummies.

4.3 Local-Government Debt-Swap Overlap

The UL boom overlapped with the local-government debt-swap program, which altered the supply and composition of LGFV-related debt beginning in 2015. We therefore augment the baseline specification with measures of provincial swap exposure interacted with LGFV status and a gradual post-2015 ramp, $\max(0, Year - 2015)$. This allows debt-swap activity to affect LGFV and non-LGFV spreads differently as the program expanded.

Table 4 reports specifications using two measures of swap exposure. Column 2 uses the provincial stock of debt potentially eligible for replacement, while column 3 uses official province-year replacement-bond issuance. The coefficient on Exposure × LGFV remains close to the baseline in both specifications. It is −1.563 when the stock measure is used and −1.435 when official replacement-bond flows are used, compared with −1.615 in the baseline. The corresponding wild-cluster-bootstrap p-values are 0.054 and 0.035. The headline pricing result is therefore robust to controls that allow the debt-swap program to differentially affect LGFV spreads as it expanded.

Table 4. Local-Government Debt-Swap Robustness (Rated Non-AAA)

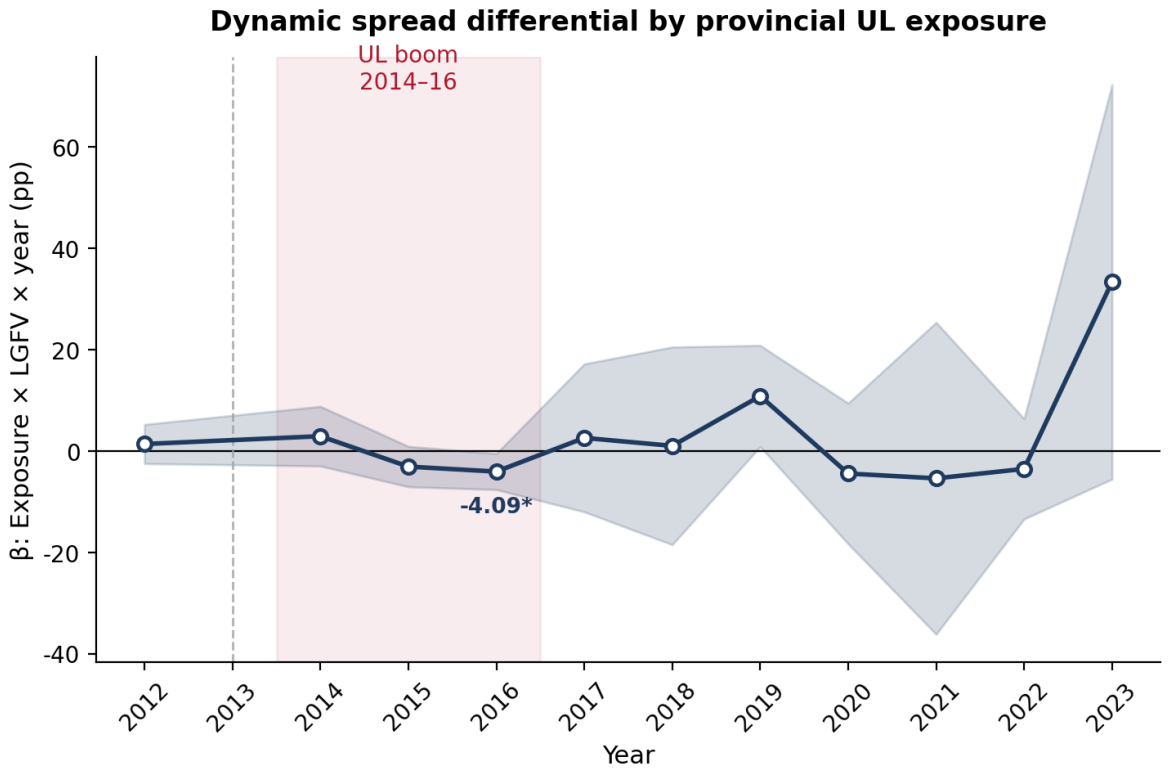
	Baseline	Stock×LGFV×ramp15	Official flow×LGFV×ramp15
Exposure × LGFV	-1.615**	-1.563*	-1.435**
	(0.819)	(0.824)	(0.694)
Province × quarter FE	Yes	Yes	Yes
Rating FE	Yes	Yes	Yes
Term-bucket FE	Yes	Yes	Yes
Bond controls	Yes	Yes	Yes
Debt-swap control	No	Stock × ramp15	Official flow × ramp15
Observations	11,155	11,155	11,155
WCB p	0.041	0.054	0.035

Notes: The dependent variable is the bond credit spread in percentage points. All columns use the rated non-AAA sample and include an LGFV indicator, province-by-quarter fixed effects, rating fixed effects, term-bucket fixed effects, and bond controls. In columns 2 and 3, the debt-swap measure is interacted with LGFV status and max(0,Year−2015). Column 2 uses a provincial stock measure of debt potentially eligible for replacement. Column 3 uses official province-year replacement-bond issuance. Standard errors, reported in parentheses, are clustered by province. Stars and reported p-values are based on wild cluster bootstrap inference using 1,999 replications.

4.4 Dynamic Pattern

Figure 1 plots the coefficients on Exposure × LGFV interacted with year indicators, relative to 2013. The estimates become most negative in 2015–2016, aligning the relative spread compression with the latter part of the UL boom, when liability growth was strongest. Because exposure is continuously measured and the boom did not begin at a common treatment date, we interpret the figure as descriptive timing evidence rather than as a conventional event-study design.

Figure 1. Dynamic Exposure × LGFV Effects



Notes: The figure reports year-specific coefficients on Exposure × LGFV, with 2013 as the omitted year. The shaded confidence band is based on province-clustered standard errors. The highlighted period corresponds to the 2014–2016 universal-life boom. Because provincial exposure is continuously measured and treatment does not begin at a common date, the figure is interpreted as descriptive timing evidence rather than as a conventional event-study design.

5. Mechanisms and Quantity Effects

5.1 Liability-Side Maturity Management

5.1.1 Bond-Maturity Heterogeneity

UL liabilities combined high credited rates with short-horizon surrender rights. Their rapid expansion therefore increased insurers' demand for yield while making the longest-duration assets relatively less attractive. If the pricing response reflects portfolio demand shaped by liability management, it should be concentrated among shorter- and intermediate-maturity bonds rather than extend uniformly across the term structure.

Table 5 splits the rated non-AAA sample by maturity at issuance. The coefficient on Exposure × LGFV is negative in both the short-maturity sample of three years or less and the medium-maturity sample of more than three and up to seven years. The estimates are −4.001 and −1.248, with wild-cluster-bootstrap p-values of 0.085 and 0.033, respectively. By contrast, the coefficient is statistically indistinguishable from zero among bonds with maturities above seven years, although this subsample contains only 383 bonds. The maturity pattern is consistent with UL-driven demand being filtered through insurers' liquidity and duration constraints. The response is concentrated among bonds with maturities of seven years or less, rather than reflecting an undifferentiated increase in demand for LGFV credit across the entire term structure.

Table 5. Maturity Heterogeneity: Rated Non-AAA Bonds

	Short (≤3y)	Medium (3–7y)	Long (>7y)
Exposure × LGFV	-4.001* (2.261)	-1.248** (0.616)	-1.929 (3.093)
Province × quarter FE	Yes	Yes	Yes
Rating FE	Yes	Yes	Yes
Term-bucket FE	Yes	Yes	Yes
Bond controls	Yes	Yes	Yes
Observations	4,110	6,662	383
Within R^2	0.254	0.141	0.483
Cluster p	0.087	0.052	0.538
WCB p	0.085	0.033	0.569

Notes: The table reports separate estimates for bonds with maturities at issuance of three years or less, more than three and up to seven years, and more than seven years. All specifications include an LGFV indicator, province-by-quarter fixed effects, rating fixed effects, term-bucket fixed effects, and bond controls. Standard errors are clustered by province. Stars and reported p-values are based on wild-cluster-bootstrap inference using 1,999 replications. The long-maturity subsample contains 383 bonds.

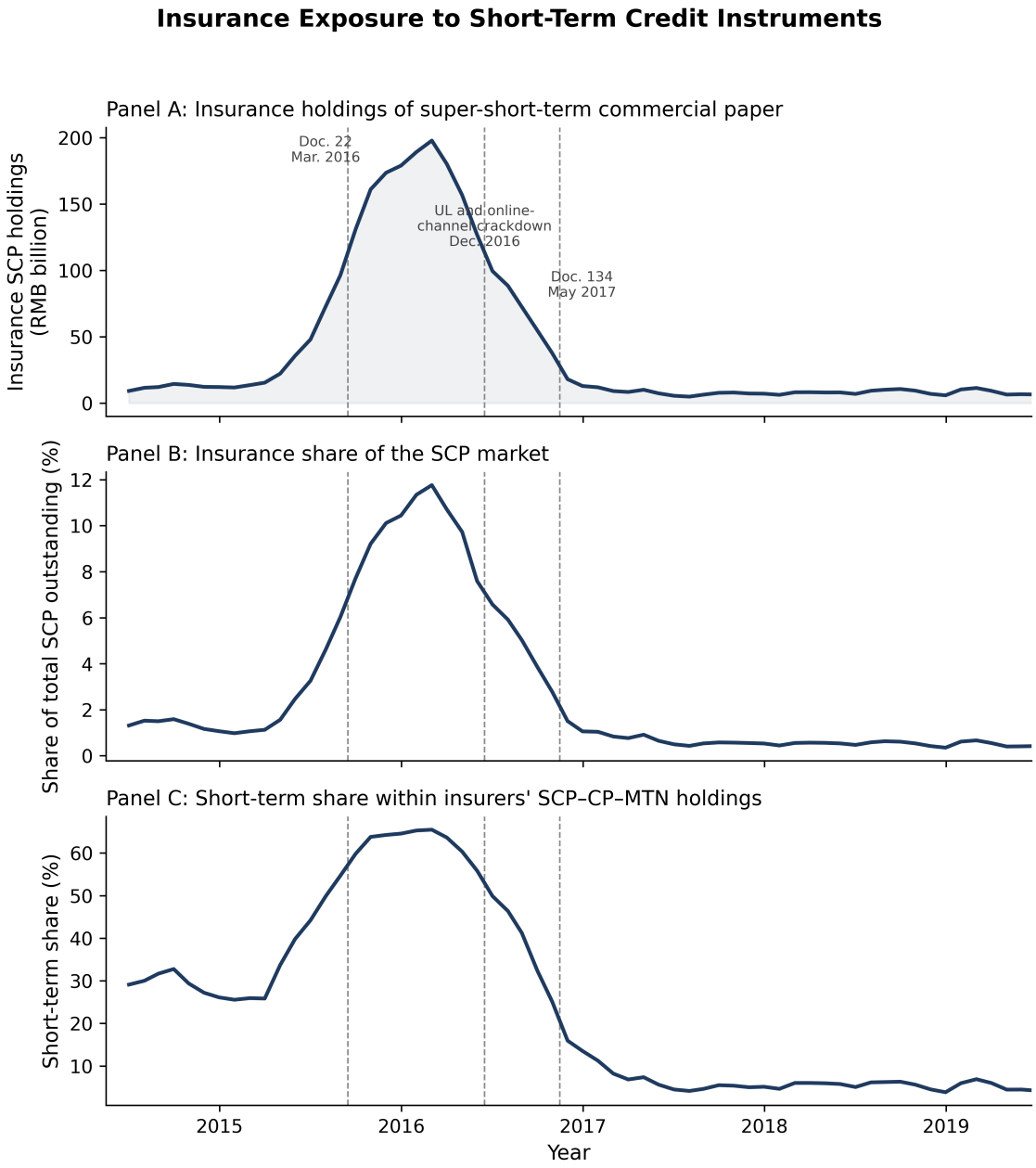
5.1.2 Aggregate Custody Evidence from the Shanghai Clearing House

Aggregate custody data from the Shanghai Clearing House provide complementary evidence on insurers' maturity allocation. Insurance institutions' holdings of super-short-term commercial paper increased from RMB 9.2 billion in December 2014 to RMB 197.9 billion in August 2016. Over the same period, insurers' share of the outstanding SCP market rose from 1.31 percent to 11.76 percent, while the share of SCP and commercial paper in their combined SCP–CP–MTN holdings increased from 29.1 percent to 65.5 percent.

The portfolio tilt reversed after universal-life regulation tightened. By December 2017, insurers' SCP holdings had fallen to RMB 5.5 billion, their share of the SCP market to 0.50 percent, and the short-term share of their SCP–CP–MTN holdings to 4.5 percent. The rise and subsequent reversal show that the UL boom coincided with a pronounced but temporary shift in insurance portfolios toward short-duration credit.

The custody data are aggregate and do not identify the issuers of the underlying securities. Their role is therefore complementary to the bond-level estimates. Table 5 shows that the relative pricing response is concentrated among bonds with maturities of seven years or less, while Figure 2 documents a parallel industry-level expansion and reversal in insurers' exposure to short-term credit instruments.

Figure 2. Insurance Institutions' Exposure to Short-Term Credit Instruments



Notes: Monthly custody holdings reported by the Shanghai Clearing House, December 2014–December 2019. Panel A reports insurance institutions' SCP holdings in RMB billions. Panel B reports insurers' share of total SCP outstanding. Panel C reports the share of SCP and CP in insurers' combined SCP–CP–MTN holdings. Vertical dashed lines mark major regulatory tightening in March 2016, December 2016, and May 2017. The series are industry-level and do not distinguish LGFV from non-LGFV issuers.

5.2 Rating-Based Capital Efficiency

The second component of the mechanism concerns the interaction between yield, perceived government support, and rating-based capital charges. If UL-expanding insurers valued LGFV bonds because they offered additional yield relative to perceived tail risk within the same regulatory rating grid, the spread response should be stronger where the yield premium on local public-sector credit is larger and where external ratings play a greater role in determining solvency capital.

5.2.1 Fiscal Pressure and the Value of the Yield–Guarantee Wedge

Panel A of Table 6 splits provinces at the median of fiscal pressure, defined as one minus the ratio of fiscal revenue to expenditure. The coefficient on Exposure × LGFV is −1.140 and statistically insignificant in low-pressure provinces. In high-pressure provinces, the coefficient is −2.157, with a wild-cluster-bootstrap p-value of 0.033. The relative spread compression is therefore concentrated in provinces where local public-sector debt initially offers a larger yield premium.

This pattern is consistent with the proposed yield–guarantee wedge. Greater fiscal pressure raises the compensation demanded on local-government-related debt, while LGFV bonds continue to carry an expectation of official support relative to similarly rated industrial bonds. UL exposure has its strongest pricing effect where this combination offers insurers more yield for a given external rating and associated capital charge.

5.2.2 Rating-Sensitive Solvency Regulation

Panel B divides the sample at the implementation of C-ROSS in 2016Q1. Under the first-generation solvency regime, the coefficient on Exposure × LGFV is −0.316 and statistically indistinguishable from zero. Under C-ROSS, the coefficient is −4.268, with a wild-cluster-bootstrap p-value of 0.010. The pricing response is therefore considerably stronger in the period when external ratings and maturity became more consequential for solvency-capital requirements.

The post-C-ROSS pattern is consistent with rating-based capital efficiency. C-ROSS did not grant LGFV bonds a special regulatory classification; rather, it made the formal rating and maturity grid more important for capital usage. Within that grid, similarly rated LGFV and industrial bonds faced comparable capital treatment, while perceived local-government support could make LGFV debt more attractive relative to its yield. The stronger post-C-ROSS estimate therefore supports the view that solvency regulation shaped which assets UL-funded insurers found most capital efficient.

Table 6. Rating-Based Capital Efficiency

Panel A. Fiscal Pressure		
	Low FP (strong)	High FP (weak)
Exposure × LGFV	-1.140 (1.128)	-2.157** (1.004)
Province × quarter FE	Yes	Yes
Rating FE	Yes	Yes
Term-bucket FE	Yes	Yes
Bond controls	Yes	Yes
Observations	5,577	5,578
Within R^2	0.178	0.233
Cluster p	0.336	0.043
WCB p	0.463	0.033
Panel B. Solvency Regime		
	Solvency I (≤2015Q4)	Solvency II (≥2016Q1)
Exposure × LGFV	-0.316 (0.875)	-4.268** (1.572)
Province × quarter FE	Yes	Yes
Rating FE	Yes	Yes
Term-bucket FE	Yes	Yes
Bond controls	Yes	Yes
Observations	3,463	7,692
Within R^2	0.274	0.192
Cluster p	0.721	0.011
WCB p	0.726	0.010

Notes: Panel A splits provinces at the full-sample median of fiscal pressure, defined as one minus fiscal revenue divided by fiscal expenditure. Panel B splits observations at the implementation of C-ROSS in 2016Q1. All specifications include an LGFV indicator, province-by-quarter fixed effects, rating fixed effects, term-bucket fixed effects, and bond controls. Standard errors are clustered by province. Stars and reported p-values are based on wild-cluster-bootstrap inference using 1,999 replications.

5.3 Market Access and Issuer Entry

Lower relative borrowing spreads may affect the extensive margin of LGFV financing by enabling marginal issuers to enter the bond market. Section 3.4 describes the province-quarter-sector specification used to examine this response, and Table 7 reports the results. Greater UL exposure is associated with more first-time LGFV issuers relative to non-LGFV entrants within the same province-quarter. The coefficient is 7.925, with a wild-cluster-bootstrap p-value of 0.007. Evaluated at a one-standard-deviation increase in exposure, the estimate corresponds to approximately 0.18 additional first-time LGFV issuers per province-quarter, relative to a mean of 1.08 new issuers in the LGFV-sector cell.

The estimates for total issue counts and issuance amounts are positive but imprecise. The quantity response is therefore concentrated at the extensive margin: UL exposure is associated with broader market access for marginal LGFV issuers rather than a clear increase in issuance scale among incumbent borrowers.

Table 7. Issuance-Margin Responses: Province×Quarter×Sector Panel (Rated Non-AAA)

	Issue count	ln(Issuance amount)	New issuers
Exposure × LGFV	17.109	4.484	7.925***
	(11.061)	(4.100)	(2.530)
Province × quarter FE	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes
Bond-level controls	No	No	No
Observations (rows)	2,436	2,436	2,436
WCB p	0.1546	0.3012	0.0065

Notes: Observations are province-quarter-sector cells, with separate LGFV and non-LGFV rows. The dependent variables are the number of bond issues, the logarithm of one plus total issuance amount, and the number of issuers making their first observed bond issue. All specifications include province-by-quarter and sector fixed effects. Standard errors are clustered by province. Stars and reported p-values are based on wild-cluster-bootstrap inference using 1,999 replications. The standard deviation of provincial UL exposure in the rated non-AAA sample is 0.023.

6. Conclusion

This paper studies how liability-side product deregulation interacts with asset-side regulation to reshape credit pricing through regulated intermediary balance sheets. China's universal-life boom expanded costly, surrenderable, and deposit-like liabilities across life insurers. Because these liabilities had to be backed by assets while insurers satisfied liquidity, duration, and solvency-capital constraints, their growth created demand not simply for high-yield securities, but for securities offering yield relative to perceived risk and regulatory capital. Rated non-AAA LGFV bonds fit this portfolio problem: they remained corporate debt for regulatory purposes while being perceived as carrying implicit local-government support.

Using insurers' pre-boom branch networks interacted with insurer-level growth in universal-life liabilities, we find that greater provincial exposure compresses the spreads of rated non-AAA LGFV bonds relative to non-LGFV corporate bonds issued in the same province-quarter. A one-standard-deviation increase in exposure is associated with approximately 3.7 basis points of additional relative spread compression. The response is concentrated among bonds with maturities at issuance of seven years or less, is stronger in fiscally weaker provinces, and becomes more pronounced under rating-sensitive solvency regulation. Aggregate custody data provide complementary evidence of a sharp boom-period

shift toward short-duration credit followed by a reversal after product regulation tightened. On the quantity margin, the same exposure measure is associated with more first-time LGFV issuers in an analogous province-quarter-sector design, while total issue counts and issuance amounts respond less clearly.

Together, the results identify a within-rating form of reaching for yield. Insurers need not move mechanically down the external-rating scale to increase portfolio yield. They can instead favor securities that carry the same formal rating-based capital treatment but offer more yield relative to perceived tail risk. In this setting, the interaction between implicit guarantees and external-rating-based capital rules transmitted product-side competition in insurance markets into both the pricing and market access of quasi-sovereign debt.

The broader implications span several dimensions. First, regulatory coherence matters. Product-side deregulation and asset-side solvency rules are not independent policy tools: the former can change the cost, liquidity, and scale of intermediary funding, while the latter shapes where the resulting asset demand is directed. Liberalizing product pricing without considering its interaction with capital regulation can therefore generate unintended credit-demand shocks. Financial regulation should be evaluated as a system in which front-end product rules, back-end capital requirements, and investment-eligibility frameworks jointly shape intermediary behavior.

Second, the expansion of the insurance sector can contribute to financial deepening. The UL boom channeled large-scale, medium-term funds into the bond market, reducing borrowing costs for LGFVs. In doing so, it partially filled a gap left by a banking-centric financial system that tends to favor short-term, collateralized lending. This suggests that insurance-sector growth, even when driven by aggressive product innovation, can help diversify the maturity structure of available funding and support the development of local capital markets—provided that the accompanying risks are managed.

Third, the asset-demand pressures unleashed by insurance expansion also underscore the importance of ecosystem coordination. When insurers rapidly accumulate liabilities, they require deep and liquid capital markets to absorb their portfolio allocations. If the supply of suitable investable assets—particularly those offering adequate yield without excessive capital charges—is insufficient, insurers may be forced into concentrated positions or riskier securities, amplifying systemic vulnerabilities. Insurance market development therefore cannot proceed in isolation; it must be accompanied by parallel efforts to broaden the capital market's capacity, improve the quality and diversity of available instruments, and strengthen the infrastructure for risk assessment and disclosure.

Our design identifies relative pricing and issuer-entry responses but does not observe security-level insurer holdings or primary-market allocations. Portfolio and transaction-level data would allow future work to trace the allocation channel more directly and to separate insurer demand from concurrent changes in bond supply.

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Appendix

Appendix A. Sample Construction and Exposure Timing

The insurer universe consists of 48 life, health, and pension insurers with positive pre-boom branch weights. Property-and-casualty insurers are excluded because their liability structure, duration profile, and asset-allocation constraints differ materially from those of life insurers. Provincial branch shares are measured as of December 31, 2012. Insurers without an operating branch network at the cutoff date receive zero pre-boom geographic weight and therefore do not contribute to the baseline exposure measure.

The primary bond sample consists of rated non-AAA corporate bond offerings issued between 2012 and 2023. Offerings are identified using CSMAR's SecurityID where available and an offering-level composite identifier otherwise. Because bond codes can be reused across unrelated securities, observations are deduplicated at the offering rather than bond-code level. Credit spreads are trimmed at the top and bottom one percent within each estimation sample, as described in Section 3.1.

Provincial UL exposure combines the predetermined 2012 branch matrix with insurer-level annual changes in universal-life liabilities scaled by lagged total assets. Because insurer balance-sheet variables are observed annually, the shifter for year y is assigned to each quarter in the same calendar year. Positive exposure values capture UL-liability expansion, while negative values capture subsequent unwinding. Exposure enters all regressions in levels and is not standardized before or after aggregation.

The June 30, 2013 branch-cutoff specification reported in Table 3 reconstructs the branch matrix using offices operating by that date while retaining the same insurer universe and rated non-AAA bond sample (N = 11,155). The leave-own-headquarters-out specification excludes each insurer's contribution to exposure in its headquarters province.

Appendix B. Additional Identification and Robustness Diagnostics

Appendix Table B1 reports supplementary exercises not displayed in the main tables. The LGFV-label permutation test evaluates whether the baseline estimate is unusually negative relative to estimates obtained after randomly reassigning LGFV status. The bank-loan-growth placebo replaces UL exposure with provincial bank-loan growth. The final rows examine whether the first-time-issuer result survives controls for official debt-swap activity.

Appendix Table B1. Additional Identification and Robustness Diagnostics

Diagnostic	Coefficient	SE	Inference	Sample
LGFV-label permutation	—	—	Permutation p = 0.0010	2,000 draws
Bank-loan growth × LGFV	−0.056	(0.401)	WCB p = 0.216	1,858 bonds
New issuers: baseline	7.925***	(2.530)	WCB p = 0.0065	2,436 cells
New issuers + Official flow × LGFV × ramp15	6.973***	(2.257)	WCB p = 0.006	2,436 cells

Notes: The LGFV-label permutation test uses 2,000 random assignments. The bank-loan-growth placebo is estimated in the available matched bond sample and includes an LGFV indicator, province-by-quarter fixed effects, rating fixed effects, term-bucket fixed effects, and bond controls. The quantity specifications use province-quarter-sector observations and include province-by-quarter and sector fixed effects, with no bond-level controls. Standard errors are clustered by province. Stars and reported p-values are based on wild-cluster-bootstrap inference using 1,999 replications, except for the permutation test.

Appendix Table B2. Insurer-Level Shifter Contribution Weights

Rank	Insurer	Contribution weight (%)	Cumulative weight (%)
1	Huaxia Life	20.18	20.18
2	Ping An Life	13.72	33.90
3	Funde Sino Life	11.61	45.51
4	Hexie Health Insurance	7.42	52.93
5	Evergrande Life	7.04	59.97
6	Sunshine Life	5.96	65.94
7	Sinatay Life	5.87	71.81
8	China Life	3.93	75.74
9	Union Life	3.55	79.29
10	CPIC Life	3.20	82.49

Notes: The table reports insurer-level contribution weights for the demeaned Exposure × LGFV regressor, following Goldsmith-Pinkham, Sorkin, and Swift (2020). The weights reflect both insurer-level variation in UL-liability growth and insurers' predetermined geographic branch distributions. Huaxia Life accounts for 20.2 percent of total contribution weight, while the five largest contributors jointly account for 60.0 percent.

Appendix C. Construct Validation and Variable Definitions

Because provincial insurer balance sheets are not directly observed, we evaluate whether the exposure index predicts the geographic incidence of insurer expansion in independently measured balance-sheet outcomes. We use the predetermined 2012 branch matrix to allocate insurer-level policyholder investment funds and insurance operating revenue across provinces.

Appendix Table C1. Construct Validation of Provincial Universal-Life Exposure

	(1) Policyholder investment funds	(2) Insurance operating revenue
UL exposure	2.43	0.62
p-value	0.012	0.019
Province FE	Yes	Yes
Year FE	Yes	Yes

Notes: The dependent variables are annual log changes in province-level outcomes constructed by allocating insurer-level variables using the predetermined 2012 branch shares. The sample covers 2012–2023 and includes province and year fixed effects. The estimates are interpreted as construct validation: they show that the shift-share index predicts the geographic incidence of balance-sheet expansion among insurers experiencing UL-liability growth. They are not interpreted as an independent first stage.

C.1 Credit Spread

The dependent variable in the pricing regressions is the credit spread at primary issuance, defined as the bond's yield to maturity minus the yield on a maturity-matched government bond. Credit spreads are expressed in percentage points.

C.2 LGFV Classification

We identify LGFV issuers using classifications in the underlying bond databases, supplemented by the market lists used in the baseline construction. The LGFV indicator varies within province-quarter cells, and the empirical design compares LGFV and non-LGFV issuers in the same provincial bond market and issuance quarter.

C.3 Provincial Universal-Life Exposure

For province p and quarter q, provincial UL exposure is defined as the predetermined branch-share-weighted sum of insurer-level annual changes in UL liabilities scaled by lagged total assets:

$$Exposure_{pq} = \Sigma_j \; s_{pj,2012} \times [\Delta UL_{j,y(q)} / TA_{j,y(q)-1}]$$

Here, the branch share is insurer j's share of branches located in province p as of December 31, 2012, and y(q) denotes the calendar year containing quarter q. The exposure measure captures the geographic incidence of insurer balance-sheet expansion rather than security-level bond holdings. It enters all regressions in levels and is not standardized. In the rated non-AAA sample, the standard deviation of exposure is 0.023. The baseline coefficient of −1.615 therefore implies that a one-standard-deviation increase in exposure is associated with approximately 3.7 basis points of additional compression in the LGFV spread differential.

C.4 Bond Controls and Fixed Effects

Bond controls include the logarithm of issuance amount, maturity at issuance, and indicators for callable, putable, periodic-payment, and fixed-rate features. Baseline pricing regressions include an LGFV indicator, province-by-quarter fixed effects, rating fixed effects, and term-bucket fixed effects. The main effect of provincial exposure is absorbed by the province-by-quarter fixed effects.

C.5 Statistical Inference

Standard errors are clustered by province. Because the regressions contain 31 provincial clusters, the paper's primary inference is based on wild-cluster-bootstrap p-values using 1,999 replications. Unless otherwise stated, statistical-significance stars in the regression tables are based on these bootstrap p-values.

C.6 Robustness Specifications

Table 3 column 2 restricts the issuance sample to 2013–2019. Column 3 reconstructs provincial exposure using the insurer branch network as of June 30, 2013. Column 4 excludes each insurer's contribution to exposure in its headquarters province. Column 5 absorbs province-by-quarter-by-rating fixed effects, so that LGFV and non-LGFV bonds are compared within the same province, quarter, and external-rating category.

Table 4 augments the baseline specification with measures of provincial local-government debt-swap exposure interacted with LGFV status and the gradual post-2015 ramp, max(0, Year − 2015). The stock specification uses a provincial measure of debt potentially eligible for replacement, while the official-flow specification uses province-year replacement-bond issuance.