From Faces to Finance: AI Measurement of Promotion Pressure and Health Costs in Public Office *

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Abstract

We study how career incentives in the public sector shape the personal costs of managing local financial and economic performance, using visible aging as a scalable proxy for stress and health deterioration. Using administrative health inspection data, we first show that the gap between individuals' apparent age and chronological age strongly predicts subsequent health outcomes. We then construct a panel of mayors and senior officials and apply computer-vision models to official photographs to estimate apparent age over time. Officials in jurisdictions facing weaker greater financial fragility and economic fundamentals age significantly faster. We further link these patterns to career incentives by showing that the effect is strongest where promotion tournaments are steeper, downside performance risk is greater, and local underperformance is more likely to translate into visible economic and financial consequences. To shed light on mechanism, we use large language models to analyze officials' speeches and government reports, extracting measures of urgency, constraint, and risk emphasis that increase when officials age faster and predict within-official changes in apparent age. Taken together, our AI-based facial and textual measures reveal that the governance of local economic and financial risk carries substantial human-capital costs, highlighting an underexplored channel through which incentive systems affect decision-makers in politically and financially consequential positions.

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1 Introduction

Government officials oversee local economies under incentive schemes that reward growth, penalize underperformance, and expose decision-makers to substantial downside risk, yet little is known about how these incentives affect officials' own human capital. In practice, local officials do not merely administer policy; they manage economically and financially consequential outcomes, including growth shortfalls, fiscal stress, firm distress, and the local transmission of financing shocks. Their incentive environment therefore embeds a familiar finance tradeoff: stronger career rewards may induce effort and risk-taking to sustain performance, while stronger accountability for downside outcomes may increase caution but also impose sustained psychological and physiological strain. Understanding whether such pressure translates into health costs (Borgschulte et al., 2025) is important because health and stress shape attention, time discounting, and risk-taking, and thus may influence how officials respond to local economic deterioration, capital-market pressure, and refinancing risk (Malmendier and Nagel, 2011, 2016). These effects matter not only for positive political economy but also for finance, since they can ultimately affect local firms (Fisman and Wang, 2015), credit allocation, and regional growth.

This paper studies the determinants of stress-related aging among Chinese government officials using a new large-scale measure of apparent age extracted from official photographs. We apply visual machine-learning methods (Hu and Ma, 2025) to estimate an individual's face age and interpret deviations of face age from chronological age as a proxy for cumulative stress-related deterioration in health capital.[1] The setting is attractive because offi-

[1]Specifically, we estimate officials' apparent age from facial images an open-source computer vision framework that provides unified access to state-of-the-art face detection and face attribute pipelines. For each image, we first detect and align the face to a standardized orientation, then apply an age-prediction model to produce an estimated age in years. A central concern is external validity across demographic groups. Many widely used facial age models are trained on datasets that under-represent Asian faces, which can induce systematic prediction error and reduce comparability across officials. To address this issue, we fine-tune the age-prediction component on a large training set of approximately one million Asian face images with known ages, using a dedicated GPU cluster for efficient training and hyperparameter search. We validate performance using held-out samples and report that the fine-tuned model reduces prediction error and, importantly, attenuates age-dependent and cohort-specific biases relative to the off-the-shelf baseline.

cials operate within relatively standardized career ladders, frequent rotations, and explicit performance evaluation systems, while variation in local economic and financial conditions generates plausibly exogenous differences in the difficulty of meeting promotion-relevant targets. We combine face-age estimates with administrative information on officials and the economic and financial characteristics of their jurisdictions to quantify how local incentive pressures map into visible aging.

To assess whether our visual machine-learning measure of apparent age captures meaningful variation in health-related human capital rather than spurious image artifacts, we validate it against objective medical records from Meinian Onehealth, one of the largest health screening providers in China. Using individual identifiers, we link annual health examination records to roughly one-fourth of the officials in our sample. We further validate the measure in a much larger independent Meinian Onehealth sample of more than one million individuals with both photographs and health inspection records. These examinations provide standardized measures of body composition, blood pressure, heart function, and a broad set of indicators capturing cardiometabolic and organ health, along with physician-assessed abnormalities and major diagnoses. In both the linked official sample and the large independent sample, individuals with higher excess face age exhibit systematically worse health profiles, particularly along cardiovascular and metabolic dimensions associated with stress and accelerated aging. Taken together, these results provide direct validation that our apparent-age measure captures economically meaningful deterioration in underlying health capital rather than spurious image artifacts.

Our first hypothesis is that officials should age faster when they govern under weaker local economic conditions. The logic is straightforward: slower growth, rising unemployment, and greater firm distress make it more difficult to meet promotion-relevant targets and increase the pressure associated with local economic management. Consistent with this prediction, we find that mayors and other key local officials serving in jurisdictions with weaker economic performance exhibit significantly higher apparent age, even after controlling

for cohort effects, time-invariant individual characteristics, and time-varying jurisdiction attributes. The pattern is broad-based across standard real-side indicators. Lower GDP growth, higher unemployment, and greater firm bankruptcy intensity are each associated with accelerated apparent aging. The estimated magnitudes are economically meaningful. A one percentage point decline in GDP growth is associated with roughly an eight-month increase in apparent age, while a one percentage point increase in the unemployment rate corresponds to about three additional months. These results are difficult to reconcile with a purely selection-based account in which weaker jurisdictions simply appoint older-looking officials, and instead point to stress exposure that accumulates while in office.

We then turn to a sharper prediction that is less obvious ex ante. If apparent aging captures the human-capital cost of governing under downside risk, then officials should respond not only to contemporaneous weakness in the real economy, but also to forward-looking financial fragility. This is what we find. In addition to the real-economy results, officials age significantly faster in jurisdictions with greater debt rollover pressure, weaker local financing conditions, and poorer SOE stock performance. These variables do not simply repackage current economic weakness. Rather, they capture exposure to refinancing risk, tighter external financing, and market-based signals of deteriorating local conditions. The fact that these finance-related measures enter strongly alongside standard economic indicators suggests that the stress cost of governance is shaped not only by realized downturns, but also by fragility in the underlying local financial environment.

The financial-fragility results are especially informative because their connection to officials' personal stress is less immediate than that of growth or unemployment. Our hypothesis is that financial vulnerability matters because it raises the visibility, persistence, and downside consequences of local underperformance. Refinancing pressure reduces officials' room to smooth shocks, weak financing conditions make adverse outcomes harder to contain, and poor market performance makes local weakness more salient to superiors, creditors, and outside investors. Consistent with this interpretation, financial variables retain explanatory

power even after controlling for broader real-economy conditions. This pattern suggests that they are not simply proxies for contemporaneous weakness. Instead, they point to a more specific mechanism: what ages officials is not only the burden of managing a weak local economy today, but also the pressure of operating under forward-looking balance-sheet risk and market discipline.

To shed light on mechanism, we complement the face-based analysis with an LLM-based text module applied to officials' speeches and government reports. The model extracts structured measures of expressed pressure, including references to economic constraints, fiscal stress, financial risk, employment pressure, and downside performance concerns, in addition to broader indicators of urgency and constraint intensity. These measures are informative because they map officials' language into economically meaningful signals of the pressure associated with managing local performance. Identification comes from within-official variation: after absorbing official fixed effects and common time effects, we test whether the same official's language becomes more risk-oriented and constraint-focused when local economic fundamentals weaken or financial stress rises. We further show that these text-based indicators predict within-official changes in apparent age. Together, these results suggest that the same adverse local conditions that worsen economic and financial performance also increase officials' perceived pressure, helping explain why such conditions are associated with faster visible aging.

Three shock-based exercises sharpen the interpretation of our baseline results by tracing how officials' visible aging responds to large adverse events that differ in their economic, financial, and accountability content. We begin with the 2015 stock market leverage crash, which provides the most finance-centered shock in our setting. Exploiting cross-sectional differences in pre-crash exposure to leveraged equity-market activity, we find that officials in more exposed jurisdictions exhibit a significantly larger increase in excess face age following the collapse. The effect is strongest in places with greater margin-financing exposure, stronger retail stock-market participation, larger local capital-market exposure, and higher

debt rollover pressure. Cheng and Milbradt (2012); Chernenko and Sunderam (2014); Sunderam (2015) show that shadow banking systems are subject to substantial rollover frictions. This insight is especially relevant in China, where a significant share of financial intermediation, including funding tied to local government fiscal activity and debt management, depends on shadow-banking-type channels. As a result, rollover risk is not merely a financial-market phenomenon, but a material source of local economic and political pressure, with direct implications for officials' promotion and demotion incentives. These patterns suggest that the apparent-aging response is not driven simply by a contemporaneous slowdown in local activity, but also by the unwind of leverage, the tightening of financing conditions, and the increased salience of market-based underperformance. In this sense, the leverage-crash evidence provides a particularly sharp test of the paper's finance channel: officials appear to age faster when local downside risk becomes financially visible and balance-sheet constraints tighten abruptly.

We next turn to the COVID-19 pandemic, which is less cleanly a finance shock but nonetheless offers useful variation in the economic and financial strain faced by local officials. Rather than interpreting COVID as a pure public-health or political shock, we focus on its association with local economic disruption and financial vulnerability. We find that officials in harder-hit jurisdictions age faster during the outbreak period, and that this effect is significantly stronger in places with greater pre-pandemic service-sector exposure, tighter fiscal space, higher debt rollover pressure, and larger local capital-market exposure. These results suggest that the aging response to COVID was most pronounced where the pandemic more severely impaired local cash flow, weakened fiscal capacity, and heightened refinancing and market pressure. Thus, although COVID is inherently a composite shock, the cross-sectional pattern points to an economics and finance channel: officials appear to age faster not only where the outbreak was more severe, but especially where that severity translated into more binding local economic and financial stress.

Finally, we examine the rollout of central government inspection teams. While inspec-

tion is naturally viewed as an accountability shock, we show that its effect is also closely linked to the economic and financial environment in which officials operate. In the baseline specification, inspection arrival is followed by a discrete rise in excess face age. More importantly, this increase is substantially larger in jurisdictions with greater LGFV rollover pressure, tighter fiscal space, weaker local financing conditions, and higher capital-market exposure. We interpret this pattern not as evidence of political scrutiny alone, but as evidence that accountability pressure becomes especially costly when local underperformance is more likely to have financially consequential and market-visible effects. In other words, the inspection results complement the other two shock designs by showing that even ostensibly non-market oversight shocks have their largest personal impact when filtered through local economic fragility and financial constraints.

These findings contribute to several literatures, and the paper's incremental contributions are threefold. First, we move beyond output measures to show that political incentives and monitoring shocks impose a direct human-capital cost on officials, captured by accelerated facial aging, introducing a new "cost of governance" object to the study of bureaucratic incentives. Second, we connect political economy to finance by showing that local macro-financial strain, including debt rollover pressure, corporate distress, and relative state-sector underperformance, is systematically associated with officials' stress-related aging, suggesting a channel through which financial conditions may affect governance capacity and ultimately firms and investors. Third, we advance the empirical toolkit by using visual machine-learning measures to proxy latent stress exposure at scale and by strengthening identification with quasi-exogenous shocks and within-official event-time designs based on repeated images.

A large literature in political economy argues that the behavior of public officials is shaped by career concerns and the incentive schemes embedded in bureaucratic personnel systems. In the Chinese setting, a central theme is that promotion and retention depend on measurable local performance, especially growth, creating "tournament-style" incentives that can discipline effort and shape policy priorities. Foundational evidence shows that leaders' promotion

and termination probabilities covary with economic performance, consistent with personnel control operating as an incentive device (Li and Zhou, 2005). Subsequent work refines how turnover is measured and emphasizes heterogeneity in promotion ladders and political constraints, but the core takeaway remains that local officials face strong, performance-linked career stakes (Jia et al., 2015; Jiang, 2018; Chen and Kung, 2019; Chen et al., 2018; Chen and Kung, 2019). Piotroski and Zhang (2014) show that IPO activities in China are shaped by government official turnovers at the provincial level. While this literature has taught us a great deal about how incentives affect growth, investment, and policy choices, it largely treats the official as a frictionless agent whose costs are limited to career outcomes. Our paper shifts the lens to the official's own human capital by quantifying a health-related cost of governing under pressure.

A second, closely related strand in finance and labor economics examines how high-powered incentives and adverse shocks affect the health of decision makers. A prominent example is work on CEOs showing that stress induced by corporate governance pressure and crisis exposure has long-run effects on visible aging and mortality, framing stress as a private cost of holding a high-stakes leadership position (Borgschulte et al., 2025). That insight is highly relevant for our setting because Chinese local officials occupy positions with similarly high responsibility, concentrated accountability, and steep career consequences. Our paper extends this "leader stress" perspective from corporate managers to public officials, and from firm-level shocks to macro-financial and political monitoring shocks, highlighting that leadership stress is not only a corporate phenomenon but also a feature of state capacity and governance.

Methodologically, our paper sits within a rapidly expanding literature that uses machine learning and nontraditional data to measure latent traits and states that are difficult to observe in administrative records (Athey and Imbens, 2019). Goldfarb and Tucker (2019) show that the digital economy can reduce costs across multiple dimensions. Our analysis suggests that the relatively low cost of machine-learning methods may achieve effects comparable to

those of more costly formal health inspections. Computer vision has become a practical tool for extracting information from images, and the broader medical and computer-vision literatures emphasize that "apparent age" estimation can be constructed at scale while still requiring careful validation and attention to image quality (Rothe et al., 2015). Parallel developments in economics and finance use AI-extracted features from faces for economic questions, underscoring both the promise and the need for robust design and interpretation (Stoker et al., 2016). Hu and Ma (2025) use machine learning analysis and show that in startup pitches, how entrepreneurs deliver their message, especially appearing more positive, warm, and passionate in video, raises the chance of getting funded, but conditional on funding, those more positively pitched startups subsequently underperform, suggesting investors can be swayed by persuasive delivery beyond fundamentals. Building on these advances, we contribute a new application that is particularly well suited to a panel setting: because we observe repeated images for the same officials and know all officials' birthdates, we can difference out time-invariant facial traits and focus on within-person changes in excess face age around shocks. We also validate the measure against canonical environmental determinants of health (Cheng et al., 2026; Tucker, 2021) and show robustness to alternative pipelines, addressing a first-order concern in image-based measurement.

The remainder of the paper proceeds as follows. We describe the institutional background and the construction and validation of the face-age measure. We then present the baseline relationship between local economic conditions and officials' apparent age, followed by a battery of robustness checks addressing selection, image quality, and alternative specifications. Finally, we turn to mechanism tests that distinguish reward-based from punishment-based pressure and discuss implications for political incentives, policy implementation, and economic outcomes.

2 Data and Methodology

2.1 Sample construction and image sources

We construct a panel of Chinese local government officials from 2014–2023 by combining administrative biographical records with a large archive of facial photographs. We focus on officials with clearly defined appointments in city- or prefecture-level leadership positions (e.g., mayors and other senior municipal leaders), although the empirical specifications generalize to broader leadership groups. For each official, we observe full name, jurisdiction, position, and exact birthdate, which allows us to compute chronological age at any point in time and to express facial aging outcomes in a comparable unit across individuals and years.

Facial images are collected from two complementary sources. First, we scrape official photographs from government portals, including municipal and provincial government websites and affiliated agencies. These sources typically provide standardized portraits and work-activity photos tied to official announcements, meetings, inspections, and personnel changes. Second, we collect press photographs taken by professional journalists and distributed through mainstream newspapers and online news outlets. Compared with official portraits, press images are less curated and provide dense temporal coverage around salient events, which is particularly useful for event-study analyses. Each photograph is linked to an official and assigned a timestamp using the publication date and, when available, the event date recorded in the surrounding text or caption.

We obtain repeated facial observations for a substantial share of officials over their tenure, often spanning multiple years. This repeated-measures structure is central to our identification strategy: it enables within-official comparisons before and after shocks (e.g., enforcement actions or economic downturns) and mitigates concerns that cross-sectional differences in appearance reflect sorting of officials into jurisdictions rather than stress exposure while in office.

2.2 Health Inspection Data

We obtain annual health examination records from one of the largest healthcare providers in China. The provider compiles a comprehensive nationwide database of health screening information, which we link to our administrative sample using individual identifiers, allowing us to match roughly one-third of government officials in our dataset. The examination records include standardized, high-frequency measures such as anthropometrics and vital signs (e.g., BMI and blood pressure), routine laboratory panels (e.g., blood and urine tests covering lipid profiles, liver and kidney function, glucose-related biomarkers, and uric acid), and common screening exams (e.g., ECG and selected imaging or ultrasound tests depending on the examination package). In addition, the records contain physician-coded diagnoses and clinically significant findings, including major chronic conditions (such as diabetes and hypertension) as well as more severe outcomes that occur less frequently in a given year (such as malignancies and serious cardiovascular conditions). These medical records provide an objective benchmark for health status that we use to corroborate and validate our AI-based apparent-age measures derived from facial images and machine-learning algorithms.

2.3 Economic, financial, and governance covariates

We merge the official-by-time image panel with jurisdiction-level measures that capture local economic conditions, financial fragility, and accountability pressure. The economic variables include standard indicators of local performance, such as GDP growth, unemployment, and firm bankruptcy intensity, which proxy for the difficulty of sustaining growth and employment in the official's jurisdiction. To capture financial vulnerability, we compile measures of debt rollover pressure, local financing conditions, and capital-market exposure, including maturing local debt, indicators of refinancing strain, and stock-market-based measures of the relative performance of firms headquartered in the jurisdiction. These variables are intended to capture forward-looking balance-sheet risk and the extent to which local underperformance becomes financially salient. We further construct event-based measures tied to three

major shocks: the 2015 stock market leverage crash, the COVID-19 pandemic, and the roll-out of central government inspection teams. For the latter two, we focus in particular on the extent to which their effects are amplified by local economic and financial exposure rather than treating them as purely political or public-health shocks. All variables are aligned at the city (or province) level and matched to the timing of each image observation.

2.4 Measuring apparent age from facial images

2.4.1 Face detection, identity verification, and age estimation

We measure apparent age using a computer-vision pipeline that produces a predicted "face age" for each image. We first detect faces and standardize alignment to reduce variation from pose and camera angle. We then apply DeepFace as well as GPT-Image to generate (i) face embeddings used for identity verification and de-duplication and (ii) predicted age for each detected face. We retain model confidence scores and facial landmark diagnostics and use them both as filters (to exclude low-quality detections) and as controls in robustness analyses.

Because image conditions can mechanically affect predicted age, we implement conservative quality screens. We exclude photographs with severe occlusion, extreme head rotation, very low resolution, or insufficient lighting. In addition, we compute and control for observable image attributes that can shift age predictions, including face size in the frame, sharpness, brightness, and contrast. We also control for source type (official website versus press) to absorb systematic differences in curation and photographic style.

2.4.2 Aggregation and construction of excess face age

Many officials appear multiple times within a short window (e.g., inspection, or crisis period). To reduce noise from any single photograph, we aggregate face-age predictions within an official-by-period cell using robust rules (e.g., median or trimmed mean). Our main outcome is either the predicted face age itself or *excess face age*, defined as predicted face age minus the

official's chronological age at the time the image was taken. Because we observe birthdates for all officials, excess face age provides a natural normalization that removes mechanical aging with time and isolates deviations that plausibly reflect cumulative stress exposure.

2.5 Empirical design

2.5.1 Baseline panel specification

We estimate how economic conditions and monitoring intensity relate to apparent aging using panel regressions that exploit within-official variation over time. The baseline specification relates excess face age for official i observed at time t to contemporaneous jurisdiction conditions and controls:

$$\text{ExcessFaceAge}_{it} = \beta X_{jt} + \gamma Z_{it} + \delta Q_{it} + \alpha_i + \lambda_t + \varepsilon_{it}, \tag{1}$$

where X_{jt} captures city/province-level economic and financial conditions in jurisdiction j at time t, Z_{it} includes career-stage controls (e.g., position indicators), Q_{it} includes image-quality controls and source-type indicators, α_i are official fixed effects, and λ_t are time fixed effects that absorb nationwide trends and common shocks. The official fixed effects ensure identification is driven by changes in an official's apparent aging over time rather than persistent differences in baseline appearance across individuals.

2.5.2 Event-study and shock designs with repeated images

We complement the baseline panel evidence with event-study and difference-in-differences designs that exploit repeated observations around major shocks. We focus on three events that help sharpen interpretation. The first is the 2015 stock market leverage crash, which provides the most direct financial shock in our setting and allows us to test whether officials age faster in jurisdictions more exposed to leverage unwinds, tighter financing conditions, and market-visible underperformance. The second is the COVID-19 pandemic, which we

analyze through its economic and financial incidence rather than as a pure public-health shock, asking whether officials in harder-hit jurisdictions age faster when local economies are more exposed to service-sector disruption, fiscal strain, rollover pressure, and capital-market stress. The third is the rollout of central government inspection teams. While inspection is naturally an accountability shock, we focus on whether its effects on apparent aging are stronger in jurisdictions with greater economic and financial vulnerability. In each case, we estimate dynamic treatment effects with leads and lags and report pre-trend tests to assess whether excess face age diverges only after the relevant shock.

2.6 Machine Learning on Apparent Age

We estimate officials' apparent age from facial images using DeepFace, an open-source computer vision framework that provides unified access to state-of-the-art face detection and face attribute pipelines. For each image, we first detect and align the face to a standardized orientation, then apply an age-prediction model to produce an estimated age in years. The key object in our analysis is *excess apparent age*, defined as the difference between predicted age and the official's chronological age at the time the photo was taken. This measure captures time-varying information in facial appearance that is plausibly related to cumulative stress exposure, health status, and lifestyle, and it has the practical advantage of being available from archival photographs even when administrative health records are unavailable.

A central concern is external validity across demographic groups. Many widely used facial age models are trained on datasets that under-represent Asian faces, which can induce systematic prediction error and reduce comparability across officials. To address this issue, we fine-tune the age-prediction component on a large training set of approximately one million Asian face images with known ages, using a dedicated GPU cluster for efficient training and hyperparameter search. We validate performance using held-out samples and find that the fine-tuned model reduces prediction error and, importantly, attenuates age-dependent and cohort-specific biases relative to the off-the-shelf baseline. In the empirical

analysis, we aggregate image-level predictions to the official-by-time level using conservative rules that prioritize higher-quality photographs and downweight extreme outliers, thereby improving signal-to-noise while maintaining transparency and replicability.

2.7 Role of large language models in metadata extraction

We complement the computer-vision pipeline with a large language model (LLM) to extract structured metadata from unstructured web pages and news articles. The LLM parses captions and surrounding text to recover names, positions, jurisdictions, and event dates, which are used to link each facial image to the correct official and time period. It also serves as a consistency-check layer that flags conflicting titles, implausible dates, and ambiguous identity references. We apply conservative matching rules and discard observations when identity or timing cannot be uniquely resolved, limiting measurement error from discretionary hand-coding.

We further use an LLM-based text module, adapted from Brynjolfsson et al. (2025), to extract structured measures of pressure from officials' speeches and government reports. The text module focuses on economically meaningful dimensions of expressed concern, including growth constraints, fiscal strain, financial risk, employment pressure, and downside performance concerns. We use these measures as mechanism evidence, asking whether the same official's language becomes more constraint-focused and risk-oriented when local economic conditions deteriorate or financial fragility increases, and whether these within-official shifts predict corresponding changes in excess apparent age. This design allows us to connect visible aging not only to reduced-form variation in local conditions, but also to changes in the language officials use when managing economic and financial stress.

We assess robustness by applying an independent vision-capable model to a subset of images and verifying that the main conclusions are not driven by a particular age estimator. Throughout, we prioritize reproducibility by fixing prompts and extraction templates, logging model outputs, and pre-specifying rules for entity resolution and data exclusion.

2.8 Summary Statistics

Figure 1 and 2 shows that there is a positive and significant relationship between apparent age and actual age, suggesting that our machine learning algorithm of facial recognization is valid. Table 1 reports summary statistics for the main sample of Chinese local officials from 2014–2023. The panel includes 589 unique officials and 4,717 official-year observations, based on 25,412 facial images. Image coverage is dense: the mean official appears in 43.1 images (P25 = 18.0; P75 = 60.0), corresponding to 5.4 images per official-year (P25 = 3; P75 = 7). Sources are diversified, with 58% of images drawn from government portals and 42% from press coverage, which mitigates concerns that results are driven by a single channel of image production.

Our primary outcome is predicted face age from the computer-vision pipeline, which averages 50.9 years with a standard deviation of 6.4. Chronological age averages 52.3 years (s.d. 6.8), implying a mean excess face age of -1.4 years (s.d. 3.1). The interquartile range of excess face age spans from -3.5 (P25) to 0.7 (P75), indicating substantial variation around chronological age. The absolute deviation is economically meaningful: absolute excess face age averages 2.5 years (s.d. 2.2), and 34% of observations exhibit positive excess face age, consistent with a nontrivial right tail in apparent aging. Officials in the sample are predominantly male (86%). Tenure in the current position averages 3.1 years (s.d. 1.9), and mayors account for 38% of official-year observations, with the remainder comprised of other senior officials.[2]

The jurisdiction-level covariates display sizable cross-sectional and time-series variation. City GDP growth averages 6.1% (s.d. 2.3; interquartile range 4.2–7.0), while log GDP averages 10.9 (s.d. 0.8). The inequality index has a mean of 0.43 (s.d. 0.08), and the unemployment rate averages 4.3% (s.d. 1.1). Measures of local labor-market distress and firm dynamics also vary meaningfully, with layoff intensity averaging 6.8 per 10k workers and

[2]Other senior officials consist mainly of municipal party secretarie. In a limited number of cases where photographs of the mayor or party secretary are unavailable, the sample may also include other clearly identifiable senior officials, such as vice mayors or deputy party secretaries.

bankruptcy filings averaging 3.1 per 10k firms. Macro-financial stress indicators show substantial dispersion: LGFV bond maturities average RMB 24 bn (s.d. 18), and maturity pressure (maturities/fiscal revenue) averages 0.32 (s.d. 0.2). Capital-market exposure is nontrivial in many jurisdictions, with an average of 18 listed firms headquartered locally and mean local market capitalization of RMB 180 bn (s.d. 220). Monitoring intensity is similarly heterogeneous: central inspections occur in 21% of jurisdiction-years, and investigated corruption cases average 12 per city/province-year.

3 Measure Validation

3.1 Direct Evidence: Actual Healthcare measure from Officials

Table 2 provides external validation that our image-based measure of excess face age captures meaningful deterioration in health-related human capital.[3] Using annual health examination records from Meinian Onehealth linked to roughly one-third of the officials in our sample, we regress a broad set of objective biomarkers and diagnosis indicators on excess face age while controlling for chronological age and including official fixed effects, year fixed effects, jurisdiction-time controls, and image-quality adjustments. The results show a consistent and clinically interpretable pattern: officials who look older than their chronological age exhibit significantly worse cardiovascular and metabolic risk profiles. A one-year increase in excess face age is associated with higher systolic and diastolic blood pressure, elevated glycemic measures, and a more adverse lipid profile (higher LDL and triglycerides and lower HDL), as well as higher uric acid. The diagnosis-level evidence points in the same direction: excess face age predicts a higher likelihood of common chronic conditions identified in routine screenings, including hypertension, pre-diabetes/diabetes, dyslipidemia, fatty liver, and hyperuricemia, and is also positively related to higher-severity health flags. Together, these findings mitigate

[3]Appendix Table A.5 provides plain-English definitions and indicates whether a higher value of each medical outcome is generally associated with better or worse health.

the concern that our facial-age estimates reflect spurious photo artifacts or time-varying image composition. Instead, the medical records indicate that excess face age loads on well-established physiological pathways through which sustained stress and accelerated aging manifest, providing direct support for our interpretation of facial aging as an economically meaningful measure of stress exposure among decision makers. This validation strengthens the paper's central mechanism: variations in the political incentive environment that we document, especially heightened monitoring and discipline risk, translate into measurable deterioration in officials' health and, by extension, their capacity to process information and bear risk while in office. More importantly, we validate that apparent age is not only an informative and validated proxy, but also a direct clinical measure of health.

We further validate the measure in a much larger independent Meinian Onehealth sample of more than one million individuals with both photographs and health examination records. In Appendix Table A.1 shows that excess face age is systematically associated with worse routine biomarkers, a higher incidence of chronic conditions and abnormal findings, and substantially higher composite health-risk indices. These patterns are especially pronounced for cardiovascular and metabolic dimensions, supporting the interpretation of excess face age as a meaningful proxy for stress-related deterioration in underlying health capital rather than visual noise.

4 Results

4.1 Economy and capital market

Table 3 relates officials' apparent aging to a set of city-year financial conditions that capture local credit risk, refinancing pressure, funding quantity, market liquidity, and equity risk pricing. Across specifications, the dependent variable is excess face age (predicted face age minus chronological age, in years). All regressions include official fixed effects and year fixed effects; the columns progressively add image-quality controls, jurisdiction controls, and

source-type controls. The results consistently point to a central role of capital markets: both market *prices* (credit spreads, equity volatility, relative returns) and market *quantities* (issuance and equity financing) covary with officials' appearance in the direction implied by heightened local financial stress.

Panel A shows that tighter local credit conditions are strongly associated with higher excess face age. Refinancing pressure, proxied by upcoming LGFV bond maturities, is positive and highly significant across all columns, with the coefficient declining from 0.061 in column (1) to 0.044 in column (4) but remaining significant at the 1% level. Importantly, the LGFV bond yield spread, a market-based price of local credit risk, also enters positively and remains statistically significant under the full set of controls, indicating that when capital markets demand higher compensation for bearing local LGFV risk, officials appear older relative to their chronological age. Local credit events intensity (defaults/extensions) is likewise positive and precisely estimated across specifications, reinforcing the interpretation that the results are not driven solely by macro aggregates, but by realized and priced stress in local credit markets.

Panel B turns to financing quantity and intermediary credit supply. Net corporate bond issuance, equity financing intensity, and bank credit growth all enter with negative coefficients, suggesting that more accommodative financing conditions are associated with lower excess face age. The coefficients on equity financing intensity and bank credit growth remain negative and statistically significant as controls are added, consistent with the view that capital-market access and local credit supply mitigate the pressure reflected in officials' appearance. The effect of net bond issuance is directionally similar and statistically weaker in the most conservative specification, which is consistent with issuance volumes being noisier at the city-year level once rich controls and fixed effects are included.

Panel C highlights market liquidity and risk appetite. Both bond and equity illiquidity measures are positively related to excess face age and remain statistically significant across columns, indicating that deterioration in trading conditions and liquidity provision

is associated with greater apparent aging. Margin financing growth enters negatively in the baseline specifications but becomes less precisely estimated with the full set of controls, consistent with leverage demand and risk appetite being an additional, but more volatile, channel at annual frequency. Finally, Panel D focuses on equity-market pricing of local risk. The SOE-minus-private return differential is negative and significant, implying that relative underperformance of the state sector is associated with higher excess face age, while local equity volatility is strongly positive and highly significant. Overall, Table 3 provides a coherent set of evidence that capital markets are an important conduit through which local financial stress is reflected in officials' apparent aging. Measures of fiscal and credit stress at the city level, captured by the intensity of upcoming municipal financing-vehicle bond maturities, predict higher face age among incumbents, suggesting that tighter rollover pressure and constrained financing capacity translate into greater psychological burden for local leaders. While maybe it is unsurprising that adverse real-economy conditions increase officials' stress, it is less obvious that financially oriented measures such as refinancing pressure, capital-market exposure, and weak financing conditions should do so as well. This distinction is important because financial vulnerability affects local officials through less direct but highly consequential channels, including rollover risk, market discipline, and the amplification of downside economic shocks.

Table 4 relates officials' apparent aging to a set of city-year macroeconomic indicators that capture local output and demand, labor-market distress, and firm distress and real activity, and shows that deteriorating local economic conditions are associated with significantly higher apparent age, consistent with stress arising from macro-financial strain and heightened career risk. The dependent variable is excess face age (predicted face age minus chronological age, in years). All regressions include official fixed effects and year fixed effects; the columns progressively add image-quality controls, jurisdiction controls, and source-type controls. Across panels, the estimates indicate that adverse local real-economy conditions are associated with higher excess face age, consistent with a broad pressure channel that

operates through deteriorating economic fundamentals. For real-economy distress: jurisdictions experiencing elevated layoffs and a higher incidence of firm bankruptcies, are associated with faster visible aging of officials, plausibly reflecting rising social stability concerns, employment mandates, and the political costs of adverse outcomes.

Panel A shows that stronger local economic performance is associated with lower excess face age. GDP growth enters with a negative and statistically significant coefficient in all specifications, with the estimate declining in magnitude from -0.614 in column (1) to -0.391 in column (4) but remaining significant after the full set of controls. The same pattern holds for industrial value-added growth and retail sales growth: both variables load negatively on excess face age, suggesting that stronger production and demand conditions coincide with a younger apparent appearance of local officials. While the retail sales coefficient becomes less precisely estimated in the most conservative specification, its point estimate remains negative, consistent with demand-side conditions moving in the same direction as overall output.

Panel B focuses on labor-market distress and provides particularly sharp evidence. Layoff intensity is positively related to excess face age and remains statistically significant across columns. Beyond layoffs, both the registered unemployment rate and the youth unemployment rate are strongly positive and precisely estimated, with youth unemployment exhibiting the largest coefficients among the labor-market measures and remaining significant throughout. Wage growth enters with a negative coefficient, consistent with stronger labor income dynamics being associated with lower excess face age. Taken together, the labor-market results suggest that deterioration in employment conditions, especially among younger workers, is closely associated with greater apparent aging of officials.

Panel C turns to firm distress and real activity. Firm bankruptcies are strongly positive and highly significant across columns, indicating that spikes in business failures coincide with higher excess face age. In contrast, measures of local dynamism and investment load negatively: new business registrations and fixed asset investment growth both enter with

negative coefficients, although their precision attenuates once the richest set of controls is included. Overall, Table 4 shows that multiple dimensions of local real-economy stress: weaker output and demand, worse labor-market outcomes, and greater firm distress are associated with higher excess face age, complementing the market-based evidence from the financial-conditions analysis.

Taken together, Tables 3 and 4 provide a coherent picture of how local stress maps into officials' apparent aging. Table 3 shows that tighter city-level financial conditions: captured by refinancing pressure, market-priced credit risk, realized credit events, reduced funding quantities, weaker liquidity, and higher equity risk are systematically associated with higher excess face age, underscoring the importance of capital markets as a conduit through which local stress is reflected in officials' appearance. Table 4 shows that adverse real-economy conditions: slower growth, weaker demand and production, deteriorating labor markets (including youth unemployment), and greater firm distress, are likewise associated with higher excess face age. Overall, the three tables jointly indicate that both capital-market signals and macroeconomic fundamentals move in tandem with officials' apparent aging in a manner consistent with a broad pressure channel, with the financial measures offering especially direct evidence through market prices, liquidity, and risk premia. Weak economic fundamentals and macro-financial stress, especially when amplified by debt rollover risk and adverse labor-market and corporate outcomes, materially increase stress exposure in office in ways that are visible in accelerated facial aging.

4.2 2015 Leverage Crash

We next examine a set of quasi-exogenous shocks that help disentangle how financial stress maps into the apparent aging of government officials. The first is the 2015 Chinese stock market leverage crash, which followed a rapid run-up in equity prices characterized by speculative trading dynamics and culminated in sharp losses and broad financial disruption (Liao et al., 2022; An et al., 2022). From mid-2014 to its June 2015 peak, the Shanghai Compos-

ite Index roughly doubled, before falling by about 30% within three weeks and triggering widespread trading suspensions and extraordinary government intervention. As one of the largest equity-market dislocations since the establishment of China's modern capital market, the episode provides a natural setting for studying how sudden financial stress translates into personal strain for local officials.[4] Table 5 examines whether the apparent-aging effect of the 2015 stock market leverage crash is stronger in jurisdictions with greater pre-crash financial exposure. In column (1), the coefficient on *Crash exposure* × *Post* is positive and statistically significant, indicating that officials in jurisdictions more exposed to the 2015 leveraged equity boom-and-bust exhibit a larger increase in excess face age following the market collapse. The estimate of 0.201 suggests that the unwind of the leverage-driven stock market expansion is associated with a meaningful deterioration in officials' facial-age residuals even after controlling for official fixed effects, jurisdiction fixed effects, year-month fixed effects, image controls, local macro controls, and province-specific trends. This baseline result is consistent with the view that large adverse financial shocks impose measurable stress on local policymakers.

Columns (2) through (5) show that this effect is substantially stronger in jurisdictions with greater ex ante sensitivity to financial-market dislocation. In column (2), the interaction between crash exposure and high margin-financing exposure is positive and statistically significant at the 1% level, indicating that the effect is amplified in jurisdictions where the pre-crash stock market boom relied more heavily on leverage. Column (3) shows a similar pattern for jurisdictions with high retail stock-market participation, suggesting that the apparent-aging response is stronger where the local economy was more exposed to household trading activity and investor sentiment tied to the equity market. Columns (4) and (5) indicate that the amplification is also economically important along broader financial fragility dimensions. The coefficient on *Crash exposure* × *Post* × *High local capital-market exposure* is 0.146 and

[4]More importantly for our purposes, the crash was not confined to asset prices alone: it tightened local financial conditions, weakened financing capacity, and increased the salience of local market underperformance.

statistically significant at the 1% level, while the corresponding interaction with high debt rollover pressure is 0.134 and significant at the 5% level. These estimates suggest that the stress effect of the 2015 crash was especially pronounced in jurisdictions where equity-market losses were more likely to spill over into financing conditions, local balance-sheet pressure, and market-visible economic deterioration.

Importantly, the coefficients on the corresponding *High exposure* × *Post* terms are small and statistically insignificant across specifications. This pattern suggests that the results are not driven by a general worsening of outcomes in more financially exposed jurisdictions after mid-2015, but rather by the interaction between the leverage-crash shock and pre-existing local exposure to financial-market risk. Overall, the evidence in Table 5 supports a finance-based interpretation of the mechanism: officials appear to age more following the 2015 market collapse precisely in jurisdictions where leverage, market participation, and refinancing vulnerability made the shock more economically consequential.

4.3 The Covid-19 Pandemic

We further sharpen identification by exploiting the COVID-19 pandemic as an unexpected, plausibly exogenous shock to local economic conditions and administrative pressure. Table 6 shows the result, which examines whether the apparent-aging effect of the COVID-19 shock is stronger in jurisdictions with greater pre-existing economic and financial vulnerability. In column (1), the coefficient on *COVID case intensity* × *Post* is positive and statistically significant, indicating that officials in harder-hit jurisdictions exhibit a larger increase in excess face age during the pandemic period. The estimate of 0.218 suggests that pandemic severity is associated with a meaningful deterioration in officials' facial-age residuals even after absorbing official fixed effects, jurisdiction fixed effects, year-month fixed effects, image controls, local health-system controls, and pre-trend controls. This baseline result is consistent with the view that the COVID-19 outbreak imposed substantial stress on local officials through the deterioration of local economic conditions.

Columns (2) through (5) show that this effect is significantly stronger in jurisdictions with greater ex ante exposure to economically and financially sensitive sectors. In column (2), the interaction between pandemic severity and high service-sector exposure is positive and significant, indicating that the aging effect is amplified in local economies that were more reliant on consumer-facing activities and therefore more vulnerable to mobility restrictions and demand disruptions. Column (3) shows a similar amplification in jurisdictions with high pre-pandemic fiscal stress, suggesting that the COVID-19 shock imposed greater strain where local governments entered the pandemic with weaker budgetary capacity. More notably, columns (4) and (5) indicate that the cross-sectional heterogeneity is particularly pronounced along financial dimensions. The coefficient on *COVID case intensity* $\times$ *Post* $\times$ *High debt rollover pressure* is 0.149 and statistically significant at the 1% level, while the corresponding interaction with high local capital-market exposure in column (5) is 0.133 and significant at the 5% level. These estimates imply that the effect of the pandemic on officials' excess face age is strongest in jurisdictions where adverse local conditions were more likely to translate into refinancing risk, balance-sheet pressure, and market-visible economic distress.

Importantly, the double-interaction terms are economically meaningful, while the corresponding *High vulnerability* $\times$ *Post* terms are small and statistically insignificant across specifications. This pattern suggests that the results are not driven by a general worsening of outcomes in more fragile jurisdictions during the post-COVID period, but rather by the interaction between pandemic severity and pre-existing economic and financial exposure. In unreported Tables, we also find that the effect is larger in places with greater exposure to service-sector activity and mobility-sensitive industries and in jurisdictions with tighter fiscal space, where stabilizing employment and firm survival is likely to be more difficult. These patterns reinforce the interpretation that the pandemic affects apparent aging primarily through local economic contraction risk and administrative strain rather than through slow-moving regional characteristics.

Overall, Table 6 suggests that the COVID-19 shock affected officials not only through

crisis-management demands, but also through local economic and financial vulnerability. Officials age more in harder-hit jurisdictions precisely where the pandemic was more likely to impair cash flow, weaken fiscal capacity, tighten refinancing conditions, and heighten capital-market pressure. In a difference-in-differences/event-study framework with jurisdiction and time fixed effects, pre-trend controls, and image controls, these patterns indicate that pandemic-driven downturn risk and financial fragility materially increased stress exposure in office, with the consequences visible in faster facial aging among mayors and other senior city officials.

4.4 Central Government Inspection Team

The central government inspection teams are a high-profile supervisory mechanism through which the Party center evaluates local and institutional compliance with political discipline, anti-corruption requirements, and major policy directives. In practice, an inspection team is dispatched to a province, ministry, state-owned enterprise, or other major public entity for a defined inspection period. During that period, the team reviews documents, interviews officials, receives complaints and tip-offs from the public and internal channels, and later delivers formal feedback identifying problems and requiring rectification. These inspections are not routine background monitoring; they are salient, concentrated episodes of scrutiny that can trigger follow-up investigations, disciplinary action, and personnel consequences. Although the inspections are political in form, their implications are often closely tied to local economic and financial conditions, because fiscal strain, debt-servicing pressure, weak growth, and failures in policy implementation become more visible and more costly when oversight intensifies. Official materials describe inspections as an important instrument for strengthening political supervision, enforcing central decisions, and improving accountability.

Table A.4 provides a chronology of central government inspection-team visits relevant to our sample period. Because these inspections are typically conducted at the province or provincial-level municipality level rather than for ordinary prefecture-level cities, we map

inspection exposure from the inspected province or municipality to the cities within that jurisdiction. The table also identifies the limited number of explicitly named city-level jurisdictions included in particular rounds, which helps clarify how the inspection timing is translated into our city-year panel.

Table 7 examines whether the apparent-aging response to the arrival of central government inspection teams is stronger in jurisdictions with greater pre-existing economic and financial vulnerability. In column (1), the coefficient on *Inspection arrival* $\times$ *Post* is positive and statistically significant, indicating that officials exhibit a larger increase in excess face age following the rollout of inspection teams. The estimate of 0.184 suggests that inspection arrival is associated with a meaningful increase in facial-age residuals even after controlling for official fixed effects, jurisdiction fixed effects, year-month fixed effects, image controls, and local macro controls. This baseline pattern is consistent with the view that inspections raise the accountability costs of local governance.

Columns (2) through (5) show that this response is substantially stronger in jurisdictions where local economic management is more financially constrained or more exposed to market discipline. In column (2), the interaction between inspection arrival and high LGFV rollover pressure is positive and statistically significant, indicating that the inspection effect is amplified where local governments face more immediate refinancing needs. Column (3) shows a similar pattern for jurisdictions with tight fiscal space, suggesting that the stress associated with inspection arrival is greater where local officials have less room to absorb economic shortfalls through public resources. Columns (4) and (5) further indicate that the effect is stronger in jurisdictions with high capital-market exposure and weak local financing conditions. The coefficient on *Inspection arrival* $\times$ *Post* $\times$ *High capital-market exposure* is 0.133 and statistically significant at the 1% level, while the corresponding interaction with weak local financing conditions is 0.121 and significant at the 5% level. These estimates suggest that inspections impose greater stress where local underperformance is more likely to be reflected in capital-market outcomes, tighter external financing, and more visible economic

deterioration.

Notably, the coefficients on the corresponding *High vulnerability* × *Post* terms are uniformly small and statistically insignificant. This pattern indicates that the results are not driven by a general worsening of outcomes in more financially fragile jurisdictions after the inspection period, but instead by the interaction between inspection arrival and pre-existing economic and financial exposure. Taken together, the evidence in Table 7 suggests that the effect of central inspections on officials' excess face age is strongest when local accountability is tied to financially consequential economic conditions. In this sense, the table supports an economics and finance interpretation of the inspection shock: inspection arrival appears to increase personal stress most in jurisdictions where weak fundamentals, refinancing pressure, and market exposure raise the cost of local underperformance.

4.5 Text-Based Evidence on Perceived Pressure and Risk Emphasis

In this subsection, we provide additional evidence consistent with a "stress and pressure" mechanism by leveraging large language models to quantify latent features of officials' communications. Table 8 shows the result. Using a corpus of officials' speeches and government reports, we construct three text-based measures, *urgency tone*, *objective constraints*, and *risk emphasis*, that capture how strongly an official frames issues as time-sensitive, constrained by external pressures, or dominated by downside risks. We then relate these measures to our apparent-aging outcome. Table 8 summarizes the results. Across specifications, higher urgency and constraint language is positively associated with excess face age, and the risk-emphasis measure exhibits a similar, though somewhat weaker, relationship. The estimated magnitudes are economically meaningful: a one-standard-deviation increase in these LLM scores corresponds to a 0.18 year increase in excess face age, suggesting that the language used in official communications systematically co-moves with the apparent-aging proxy.

Crucially, the association is not driven solely by cross-sectional differences across offi-

cials or locations. When we include official fixed effects, the coefficients remain positive and statistically significant (Table 8, columns (2)–(3)), indicating that within the same official, periods characterized by more urgent, constrained, and risk-focused language coincide with higher apparent aging. This within-official pattern helps rule out time-invariant heterogeneity, such as stable personal traits, baseline health, or persistent regional differences, as the primary explanation. Taken together, the LLM-based text evidence corroborates the mechanism that heightened perceived pressure and risk-management demands are reflected both in what officials say and in how they appear, and it complements the results based on economic stress, monitoring intensity, and shock exposures.

5 Heterogeneity

This section explores how the stress–aging relationship varies across officials and jurisdictions. The goal is twofold. First, heterogeneity tests provide additional evidence on mechanism by examining whether effects concentrate in settings where career incentives, downside risk, and monitoring are plausibly stronger. Second, they help assess external validity by clarifying which types of officials and places are most exposed to stress-induced deterioration in health-related human capital. Table 9 shows the results.

5.1 Heterogeneity by career concerns and promotion incentives

We begin by testing whether economic stress translates into larger increases in apparent age when career concerns are likely to be more salient. We proxy for promotion incentives using characteristics that steepen tournaments or increase the marginal return to measured performance, such as (i) being closer to typical promotion-age cutoffs, (ii) shorter expected time-to-retirement, and (iii) positions with clearer performance accountability (e.g., mayors relative to other senior officials). Across these splits, the association between weak economic conditions and excess face age is stronger for officials with greater promotion stakes. These

patterns are consistent with a career-concerns channel in which the stress cost of governing rises when the perceived probability of promotion (or demotion) is most sensitive to local performance.

5.2 Heterogeneity by monitoring intensity and punishment risk

Next, we examine whether the anti-corruption effects are larger in environments where scrutiny is plausibly more consequential. We interact inspection and enforcement measures with proxies for baseline monitoring intensity, such as prior enforcement activity, measures of local institutional capacity, and political visibility (e.g., provincial capital status or economically important jurisdictions). We find that the post-inspection rise in apparent age is more pronounced in high-monitoring environments and in jurisdictions where enforcement intensity is historically higher. Similarly, the continuous relationship between corruption-case intensity and excess face age is stronger where the marginal threat of punishment is likely to be higher. These patterns support a punishment-risk mechanism and suggest that inspections operate partly by elevating perceived downside risk rather than solely by changing contemporaneous workloads.

Taken together, the heterogeneity results are consistent with the paper's central mechanism. Apparent aging rises with financial fragility and economic deterioration, and this effect is amplified when officials face greater downside career risk and more intensive monitoring. In particular, financial fragility has a stronger effect on apparent age when promotion incentives are steeper and when the local enforcement environment is stronger. These patterns strengthen the interpretation that the health cost of governing is greatest precisely where incentives are strongest and the penalties for poor outcomes are most severe.

6 Robustness Checks

This section evaluates whether our findings are sensitive to measurement choices, sample construction, timing assumptions, and alternative empirical specifications. Across exercises, the qualitative conclusions remain unchanged: adverse economic conditions, heightened monitoring intensity, and pandemic-related shocks are consistently associated with higher apparent age among incumbent officials. Table A.2 shows those results.

6.1 Alternative construction of the face-age outcome

A primary concern is that the estimated effects could reflect idiosyncrasies of a particular age-estimation model rather than true variation in aging. We therefore replicate the main analyses using an alternative apparent-age measure constructed from an LLM-based pipeline (GPT-image) as a substitute for the baseline computer-vision estimator. The alternative pipeline is used solely to generate an additional predicted age measure; it does not alter sample selection or covariate definitions. Re-estimating the validation tests, the economy and capital-market specifications, the anti-corruption specifications, and the COVID shock designs yields coefficients with the same signs and similar magnitudes as in the baseline results, indicating that our conclusions are not driven by a particular computer-vision architecture.

We also verify that results are robust to alternative aggregation rules when multiple photos are observed for the same official in a given period. Using the median prediction (baseline), trimmed means, or the mean of the top-quality images (based on detection confidence and face size) produces similar estimates, suggesting that outlier photos or episodic image noise do not drive the findings. Finally, we show that the results hold when using predicted face age levels rather than excess face age; the normalization by chronological age improves interpretability but is not required for inference.

6.2 Image quality, source composition, and sample restrictions

Because photographic conditions can mechanically affect predicted age, we implement several increasingly stringent filters. First, we restrict the sample to images with high detection confidence, adequate resolution, and limited occlusion, and we confirm that estimated effects are stable. Second, we re-estimate the main specifications within source-type subsamples. When restricting the sample to government-portal images only, results remain statistically and economically meaningful, alleviating concerns that press coverage changes image composition during crises or inspections. Similarly, when restricting to press images only, results persist, suggesting that they are not driven by curated official portraits. Third, we drop images with extreme pose or lighting and include flexible controls for brightness, sharpness, and face size; the coefficients of interest remain robust, indicating that our results are not artifacts of image characteristics.

6.3 Controls, fixed effects, and clustering

We next assess sensitivity to alternative control sets and fixed-effect structures. First, we add time-varying local controls (e.g., GDP level and growth, inequality, unemployment proxies, and other fundamentals) and confirm that coefficients on the key variables remain stable. Second, we include flexible time fixed effects (year) and, where relevant, province-by-time fixed effects to absorb higher-level shocks and policy cycles; results persist. Third, we estimate specifications that include official-by-position fixed effects or restrict attention to narrower position groups (e.g., mayors only), ruling out composition effects from changes in job titles or responsibilities.

Inference could be sensitive to serial correlation and spatial correlation in shocks. We therefore report standard errors clustered at the jurisdiction level (baseline) and show robustness to alternative clustering schemes, including clustering at the province level and two-way clustering by jurisdiction and time. In all cases, statistical significance and economic magnitudes remain similar.

6.4 Selection and media coverage concerns

A remaining concern is that officials may be photographed more often during stress episodes (e.g., inspections, outbreaks), potentially altering the sample of images. We address this in two ways. First, we demonstrate that results are robust when restricting to officials with regular pre-period photo coverage and to balanced panels around events. Second, we construct placebo outcomes based on photo frequency and show that, while crises may increase photo volume, the estimated effects on apparent age persist even when controlling for the number of images per official-period and when reweighting to equalize photo counts across treated and control units. These checks reduce the likelihood that our findings are mechanically driven by changes in publicity rather than changes in apparent age.

6.5 Robustness: Alternative Definitions of Local Financial Conditions

Table A.3 examines whether the relation between officials' apparent aging and local financial conditions is sensitive to alternative measurement choices. The dependent variable is excess face age, and each row reports the coefficient on a single financial-conditions measure estimated in a separate regression using the same city-year panel. All specifications include official fixed effects, year fixed effects, and image quality controls; columns progressively add jurisdiction controls and source-type controls in the same progression as the baseline finance specification. Overall, the evidence indicates that the results are not an artifact of a particular benchmark, proxy, or scaling choice.

Panel A focuses on LGFV credit spreads constructed using alternative duration-matched benchmarks. Regardless of whether the benchmark is central government bonds, policy bank bonds[5], or the AAA corporate curve, LGFV spreads load positively on excess face age, and

[5]Note that Policy bank bond yields are not the same as CGB yields used in the main analysis before. They are usually close, but policy bank bonds generally trade at a positive spread over China government bonds (CGBs) of the same maturity because they are quasi-sovereign rather than sovereign. They are bonds issued by China's policy banks, principally the China Development Bank, the Export-Import Bank of China,

the coefficients remain economically similar across columns. In particular, the estimates are consistently positive and generally statistically significant even under the richest control set, with the AAA-curve benchmark yielding the largest and most precisely estimated coefficients. This pattern suggests that the market price of LGFV credit risk, rather than a specific benchmark selection, is what covaries with officials' apparent aging.

Panel B presents robustness to alternative liquidity measures. Using a value-weighted Amihud price-impact measure, a bid-ask spread proxy, or the share of zero-trading days among locally exposed bonds, higher illiquidity is associated with greater excess face age. The estimated coefficients are stable in magnitude as controls are added, and remain statistically significant for the Amihud and bid-ask proxies in all columns. The zero-trading-days proxy is somewhat less precisely estimated in the most conservative specification, consistent with discrete trading measures being noisier at the city-year level, but the point estimates remain positive throughout.

Panel C shows that results for credit events are robust to alternative definitions and scaling. Whether credit events are defined as defaults only, defaults plus extensions, or an amount-weighted intensity scaled by local outstanding credit, the coefficients are positive and remain statistically significant across columns. The amount-weighted measure delivers the strongest estimates, consistent with larger credit events capturing more salient stress in local credit markets.

Panel D examines financing-quantity measures using alternative issuance definitions. The coefficients on gross issuance and net issuance are negative but modest in magnitude and less precisely estimated, while the LGFV-only net issuance measure is more negative and statistically stronger in the baseline specifications. Taken together, Table A.3 supports the interpretation that the baseline findings are driven by broad movements in local credit risk, liquidity, and realized credit distress in capital markets, rather than by a particular operationalization of spreads, liquidity, default intensity, or issuance.

and the Agricultural Development Bank of China.

6.6 Placebo tests

Finally, we conduct placebo tests that shift event dates forward or backward in time and re-estimate the event-study specifications. The placebo estimates are small and statistically indistinguishable from zero, while the true event dates produce sharp increases in apparent age, providing further support that our identification is capturing the intended shocks rather than spurious time trends.

Overall, the robustness exercises show that our main conclusions are stable across alternative measurement pipelines, image-quality restrictions, timing rules, fixed effects, and inference procedures. The evidence consistently points to economically meaningful increases in apparent age following adverse economic shocks and heightened enforcement intensity, consistent with stress-induced deterioration in officials' health-related human capital.

7 Conclusion

This paper studies how local economic conditions and financial fragility shape the stress-related health costs borne by government officials. Using a new panel of Chinese local officials from 2014–2023, we construct repeated measures of apparent age from facial images collected from government portals and mainstream press coverage. Leveraging advances in computer vision, we estimate each official's face age and, using observed birthdates, translate these predictions into an interpretable measure of excess apparent aging. We validate this measure using linked medical records for a subset of officials as well as a much larger independent health-screening sample with both photographs and examination records, showing that higher excess face age is systematically associated with worse health outcomes, particularly along cardiovascular and metabolic dimensions related to stress and accelerated aging.

Our central finding is that officials age faster when they govern under weaker local conditions. Apparent aging is higher in jurisdictions with slower growth, weaker labor-market conditions, and greater firm distress. At the same time, and more strikingly, it is also

higher in jurisdictions facing greater financial fragility, including tighter refinancing conditions, greater debt rollover pressure, weaker local financing conditions, and more adverse capital-market signals. While the real-economy results are intuitive, the financial results are less obvious ex ante and therefore especially informative. They suggest that the stress cost of governance is shaped not only by contemporaneous economic weakness, but also by forward-looking balance-sheet risk, market discipline, and the greater visibility of local underperformance when financial conditions deteriorate.

The shock-based evidence reinforces this interpretation. We begin with the 2015 stock market leverage crash, the most finance-centered shock in our setting, and show that officials in more exposed jurisdictions exhibit larger increases in apparent age following the collapse, especially where leverage-sensitive market participation, capital-market exposure, and rollover pressure were greater ex ante. We then show that the COVID-19 shock also increased officials' apparent aging, particularly in jurisdictions where the pandemic translated into more severe local economic disruption and tighter financial constraints. Finally, while the rollout of central government inspection teams naturally raises monitoring intensity, its effect on apparent aging is strongest where local economic and financial fragility makes underperformance more consequential. Taken together, these results indicate that large adverse shocks matter most for officials' health when they interact with local economic weakness, financial vulnerability, and steep accountability pressure.

These findings have several implications. First, they suggest that the costs of financial fragility and economic downturns extend beyond firms, households, and investors to the public officials responsible for managing them. Second, they point to a feedback channel between local stress and governance: when refinancing pressure rises, market conditions worsen, or accountability becomes more intense, the resulting health costs may affect attention, risk-taking, and the quality of policy implementation. Third, the results imply that political incentive systems may impose meaningful human-capital costs on decision-makers precisely in the states of the world where effective governance is most needed. More broadly, our

evidence shows that the personal costs of governing are economically important and systematically related to local financial and economic conditions. Methodologically, the paper also illustrates how scalable visual and text-based AI tools can be used to measure latent stress and health-related human capital in settings where conventional data are limited, opening new possibilities for research at the intersection of finance, political economy, and organizational behavior.

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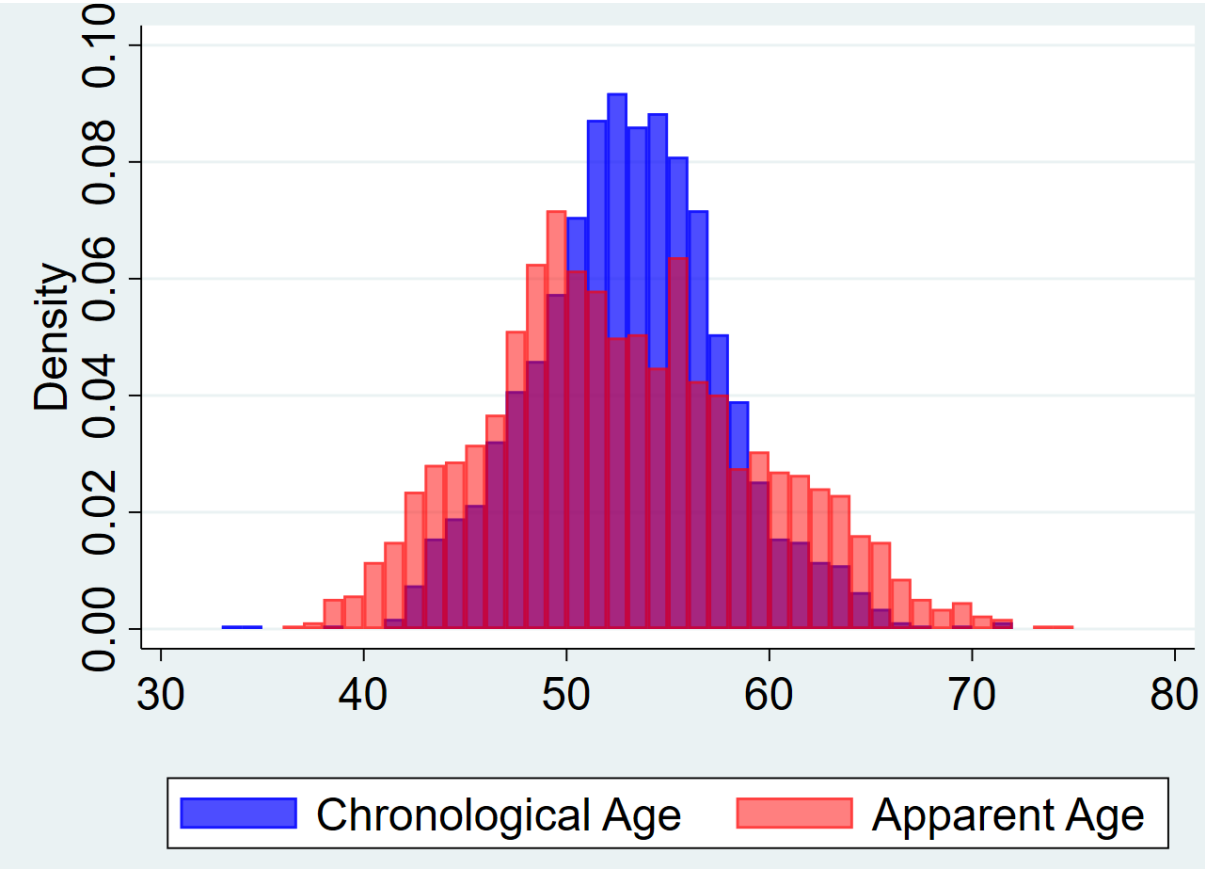
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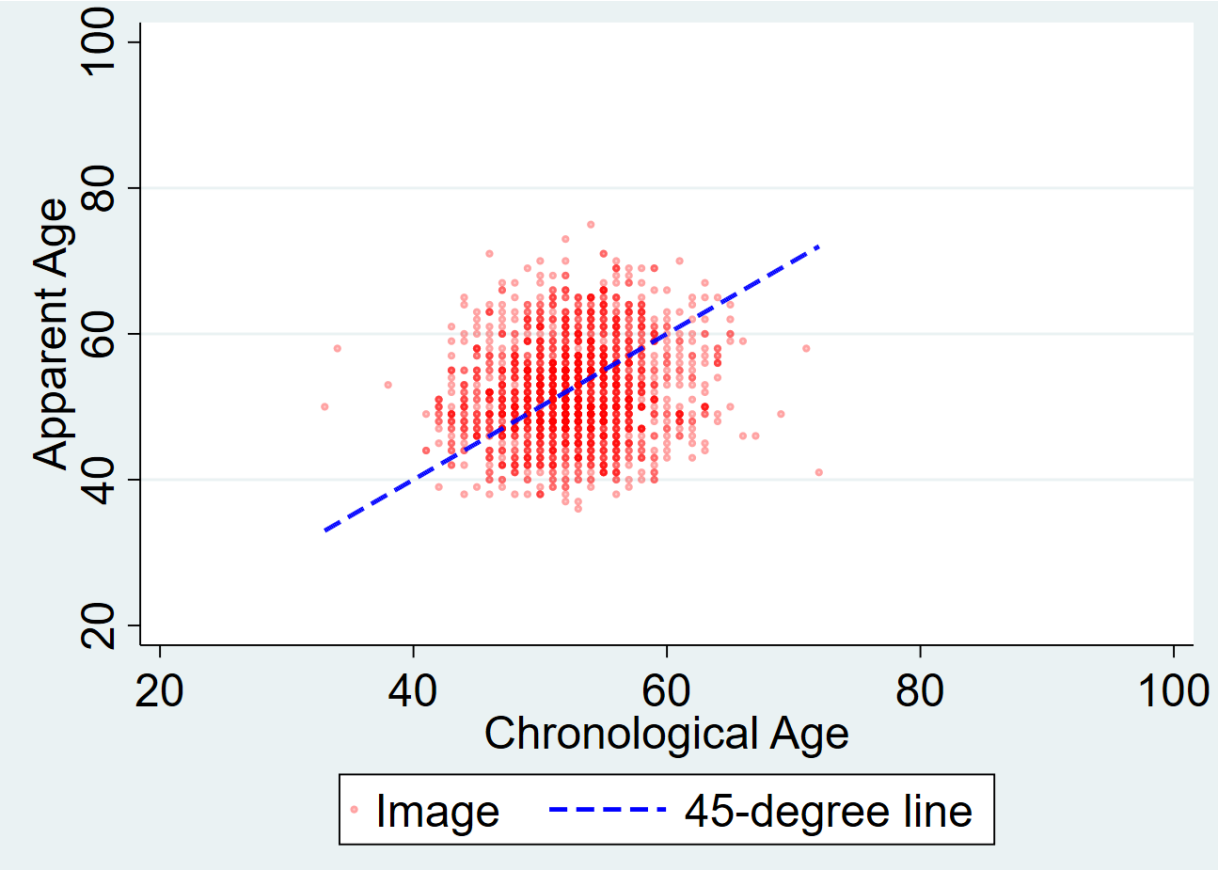
Tucker, L. A. (2021). Fruit and vegetable intake and telomere length in a random sample of 5448 u.s. adults. *Nutrients*, 13(5):1415.

Figure 1: Age verification



The figure plots the bin distribution of chronological age and apparent age.

Figure 2: Age verification



The figure shows the scatter plot of chronological age and apparent age.

Table 1: Summary Statistics

	Mean	Std. Dev.	P25	P75
Panel structure and image coverage				
Number of officials	589			
Number of official-years	4,717			
Number of images (total)	25,412			
Images per official	43.1	35.2	18.0	60.0
Images per official-year	5.4	3.2	3.0	7.0
Share of images from government portals (%)	58.0	22.0	42.0	74.0
Share of images from press coverage (%)	42.0	22.0	26.0	58.0
Outcome variables				
Predicted face age (years)	50.9	6.4	46.7	55.1
Chronological age (years)	52.3	6.8	47.8	56.9
Excess face age (face age − chronological age)	-1.4	3.1	-3.5	0.7
Absolute excess face age (years)	2.5	2.2	1.0	3.6
Indicator: Excess face age > 0	0.34	0.47	0.00	1.00
Official characteristics				
Male indicator	0.86	0.35	1.00	1.00
Years in current position	3.1	1.9	1.6	4.2
Indicator: Mayor (vs. other senior official)	0.38	0.49	0.00	1.00
Economic and distributional conditions (city/province level)				
GDP growth (% yoy)	6.1	2.3	4.2	7.0
Log GDP level	10.9	0.8	10.4	11.4
Inequality index (higher = more unequal)	0.43	0.08	0.38	0.48
Unemployment rate (%)	4.3	1.1	3.6	5.0
Layoff intensity (per 10k workers)	6.8	4.2	3.8	9.2
Firm bankruptcy filings (per 10k firms)	3.1	2.0	1.8	4.2
Macro-financial stress and capital-market exposure				
Local government financing vehicle (LGFV) bond maturities (RMB bn)	24.0	18.0	11.0	34.0
LGFV maturity pressure (maturities / fiscal revenue)	0.32	0.20	0.18	0.44
Number of listed firms headquartered locally	18.0	15.0	7.0	25.0
Total market capitalization of local listed firms (RMB bn)	180.0	220.0	55.0	240.0
SOE stock return minus private stock return (% monthly)	0.20	2.60	-1.30	1.60
Monitoring and enforcement intensity				
Indicator: Central inspection in past 12 months	0.21	0.41	0.00	0.00
Number of investigated corruption cases (city/province-year)	12.0	9.0	6.0	17.0
Validation variables (environment and nutrition proxies)				
$PM_{2.5}$ concentration ($\mu g/m^3$)	41.1	15.2	30.5	52.9
Water/environment quality index	0.63	0.12	0.55	0.72
Fruit production (tons per capita)	0.16	0.12	0.08	0.22
Vegetable production (tons per capita)	0.34	0.20	0.20	0.46

Notes: This table reports summary statistics for the main analysis sample of Chinese local officials (2014–2023). "Predicted face age" is estimated from facial images using the computer-vision pipeline described in the text. "Excess face age" equals predicted face age minus chronological age computed from observed birthdates. Jurisdiction-level covariates are matched to the image date (or event date when available) and aggregated to the official-by-period level when multiple images are observed within a period.

Table 2: Medical Validation in the Official-Linked Sample

	Panel A. Routine health measures (z-score)									
	BMI	SBP	DBP	RestHR	Glucose	Long-run sugar	Bad chol.	Good chol.	TG	Uric acid
Excess face age ($\widehat{Age}^{face} - Age$)	0.050**	0.120***	0.090***	0.060**	0.080***	0.055**	0.060**	−0.040*	0.070***	0.065***
	(0.020)	(0.030)	(0.025)	(0.024)	(0.022)	(0.023)	(0.026)	(0.021)	(0.020)	(0.019)
Chronological age	0.030***	0.080***	0.050***	0.020***	0.040***	0.035***	0.020***	−0.015***	0.010**	0.015***
	(0.006)	(0.010)	(0.009)	(0.005)	(0.007)	(0.008)	(0.007)	(0.004)	(0.005)	(0.004)
Official FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Jurisdiction-time controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Image-quality controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1172	1172	1172	1172	1172	1172	1172	1172	1172	1172
Officials	148	148	148	148	148	148	148	148	148	148
R^2	0.72	0.68	0.66	0.63	0.61	0.59	0.58	0.57	0.55	0.60

	Panel B. Diagnoses and abnormal findings (LPM)							
	Hyper-tension	Pre-diabetes	Diabetes	Dyslipi-demia	Fatty liver	Hyper-uricemia	CVD flag	Cancer dx/ suspected
Excess face age ($\widehat{Age}^{face} - Age$)	0.015***	0.012***	0.006***	0.011***	0.010***	0.011***	0.002**	0.001
	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.001)	(0.001)
Chronological age	0.008***	0.004***	0.003***	0.002***	0.001**	0.002***	0.001***	0.001***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
Official FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Jurisdiction-time controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Image-quality controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1172	1172	1172	1172	1172	1172	1172	1172
Officials	148	148	148	148	148	148	148	148
Mean dep. var.	0.26	0.18	0.07	0.23	0.17	0.14	0.03	0.01
R^2	0.41	0.33	0.28	0.36	0.30	0.32	0.19	0.12

	Panel C. Health risk summary indices			
	Cardio-metabolic index	Lipids index	Liver/kidney index	Any chronic condition
Excess face age ($\widehat{Age}^{face} - Age$)	0.095***	0.060***	0.050**	0.028***
	(0.020)	(0.018)	(0.021)	(0.006)
Chronological age	0.040***	0.018***	0.020***	0.010***
	(0.007)	(0.005)	(0.006)	(0.002)
Official FE / Year FE / Controls	Yes	Yes	Yes	Yes
Observations	1172	1172	1172	1172
Officials	148	148	148	148

Notes. This table validates excess face age in the official-linked medical sample. Panel A reports separate regressions of standardized routine health measures on excess face age and chronological age. Panel B reports linear probability models in which the dependent variable is an indicator for a diagnosis or abnormal finding recorded in the annual health examination. Panel C reports summary indices constructed from the underlying biomarkers and diagnoses. Excess face age is measured as predicted face age minus chronological age, in years. In Panels A and B, the full specification includes official fixed effects, year fixed effects, time-varying jurisdiction controls, and image-quality controls. Biomarkers are standardized to z-scores within year. In Panel B, coefficients represent percentage-point changes in diagnosis probability associated with a one-year increase in excess face age. Panel C indices are standardized averages of component z-scores or diagnosis indicators. Standard errors are clustered at the official level. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

Table 3: Local Financial Conditions: Credit Risk, Issuance, Liquidity, and Apparent Aging

	(1)	(2)	(3)	(4)
Panel A. Refinancing Pressure and Credit Risk				
LGFV bond maturities intensity (RMB bn, upcoming)	0.061***	0.055***	0.048***	0.044***
	(0.018)	(0.017)	(0.016)	(0.015)
LGFV bond yield spread (bp)	0.038**	0.035**	0.031**	0.028*
	(0.016)	(0.015)	(0.014)	(0.014)
Local credit events intensity (defaults/extensions; per 10k issuers)	0.052***	0.048***	0.043***	0.039***
	(0.015)	(0.014)	(0.013)	(0.013)
Panel B. Financing Quantity: Issuance and Net Funding				
Net corporate bond issuance (RMB bn; issuance − redemptions)	-0.019*	-0.018*	-0.016*	-0.014
	(0.010)	(0.010)	(0.009)	(0.009)
Equity financing intensity (RMB bn; IPO+SEO+convertibles)	-0.024**	-0.022**	-0.020**	-0.018*
	(0.011)	(0.010)	(0.010)	(0.010)
Bank credit growth to firms (% yoy; local)	-0.041***	-0.038***	-0.034***	-0.031***
	(0.013)	(0.012)	(0.011)	(0.011)
Panel C. Market Liquidity and Risk Appetite				
Bond market illiquidity (local, value-weighted)	0.029**	0.027**	0.024**	0.021*
	(0.013)	(0.012)	(0.011)	(0.011)
Equity market illiquidity (Amihud; local listed firms)	0.033***	0.030***	0.027***	0.024**
	(0.012)	(0.011)	(0.010)	(0.010)
Margin financing growth (% yoy; local)	-0.017*	-0.016*	-0.014	-0.013
	(0.010)	(0.009)	(0.009)	(0.009)
Panel D. Equity Pricing of Local Risk				
SOE stock return − private stock return (% annual)	-0.021**	-0.020**	-0.019**	-0.017*
	(0.010)	(0.010)	(0.009)	(0.009)
Local equity volatility (annualized; %)	0.046***	0.043***	0.039***	0.036***
	(0.014)	(0.013)	(0.013)	(0.012)
Official FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Image quality controls	No	Yes	Yes	Yes
Jurisdiction controls	No	No	Yes	Yes
Source-type controls (gov vs press)	No	No	No	Yes
Observations	4712	4712	4712	4712
Officials	589	589	589	589
R^2	0.41	0.44	0.46	0.48

Notes: The dependent variable is *excess face age* (predicted face age minus chronological age, in years). The table relates officials' apparent aging to local *financial conditions* at the city-year level. "LGFV bond maturities intensity" measures upcoming LGFV bond maturities (e.g., within the next 12 months) in the city. "LGFV bond yield spread" is the yield on locally exposed LGFV bonds minus a duration-matched benchmark (CGB or central government bonds), in basis points. "Local credit events intensity" captures local defaults/extensions/payment delays scaled by the local issuer base. "Net corporate bond issuance" is local corporate bond issuance minus redemptions. "Equity financing intensity" aggregates proceeds from IPOs, seasoned equity offerings, and convertibles for locally headquartered firms. "Bond illiquidity" are value-weighted illquidity measure as in Bao et al. (2011). "Equity illiquidity" are local value-weighted Amihud (Amihud, 2002) illiquidity measures. "Margin financing growth" proxies for local risk appetite and leverage demand. "SOE stock return − private stock return" is the annual return differential between locally headquartered SOEs and private firms. All specifications include official fixed effects and year fixed effects. "Image quality controls" include face size, sharpness, brightness, contrast, and detection confidence. "Jurisdiction controls" include time-varying local fundamentals and other controls used in the main specifications. Standard errors are clustered at the city level. Significance levels: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

Table 4: Local Macro Conditions: Real-Economy Stress and Apparent Aging

	(1)	(2)	(3)	(4)
Panel A. Output and Demand				
GDP growth (%)	-0.614***	-0.528**	-0.472**	-0.391**
	(0.203)	(0.271)	(0.228)	(0.197)
Industrial value-added growth (%)	-0.226**	-0.208**	-0.186*	-0.162*
	(0.105)	(0.099)	(0.098)	(0.096)
Retail sales growth (%)	-0.184*	-0.171*	-0.153*	-0.138
	(0.103)	(0.100)	(0.093)	(0.091)
Panel B. Labor Market Distress				
Layoff intensity (per 10k workers)	0.032**	0.030**	0.027**	0.025*
	(0.015)	(0.014)	(0.013)	(0.013)
Registered unemployment rate (%)	0.041***	0.038***	0.034***	0.031***
	(0.013)	(0.012)	(0.011)	(0.011)
Youth unemployment rate (%)	0.058***	0.054***	0.049***	0.045***
	(0.018)	(0.017)	(0.016)	(0.016)
Wage growth (avg. wage; % yoy)	-0.029**	-0.027**	-0.024**	-0.022*
	(0.013)	(0.012)	(0.011)	(0.011)
Panel C. Firm Distress and Activity				
Firm bankruptcies (per 10k firms)	0.046***	0.043***	0.039***	0.036***
	(0.014)	(0.013)	(0.013)	(0.012)
Business registrations (new firms; per 10k)	-0.018*	-0.017*	-0.015	-0.014
	(0.010)	(0.010)	(0.009)	(0.009)
Fixed asset investment growth (%)	-0.157*	-0.146*	-0.131*	-0.118
	(0.088)	(0.085)	(0.080)	(0.078)
Official FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Image quality controls	No	Yes	Yes	Yes
Jurisdiction controls	No	No	Yes	Yes
Source-type controls (gov vs press)	No	No	No	Yes
Observations	4712	4712	4712	4712
Officials	589	589	589	589
R^2	0.41	0.44	0.46	0.48

Notes: The dependent variable is *excess face age* (predicted face age minus chronological age, in years). The table relates officials' apparent aging to *local macroeconomic conditions* at the city-year level. Panel A measures output and demand. Panel B measures labor market distress. Panel C measures firm distress and real activity. *Layoff intensity* is the number of recorded layoffs per 10,000 workers in the jurisdiction-year. *Firm bankruptcies* is the number of bankruptcy cases per 10,000 registered firms in the jurisdiction-year. All specifications include official fixed effects and year fixed effects. "Image quality controls" include face size, sharpness, brightness, contrast, and detection confidence. "Jurisdiction controls" include time-varying local fundamentals and other controls used in the main specifications. Standard errors are clustered at the city level. Significance levels: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

Table 5: 2015 Stock Market Leverage Crash: Finance Channels

	(1)	(2)	(3)	(4)	(5)
Crash exposure × Post	0.201***	0.163***	0.158***	0.149***	0.145***
	(0.060)	(0.057)	(0.056)	(0.055)	(0.054)
Crash exposure × Post × High margin exposure		0.141***			
		(0.050)			
Crash exposure × Post × High retail participation			0.128**		
			(0.053)		
Crash exposure × Post × High market exposure				0.146***	
				(0.049)	
Crash exposure × Post × High rollover pressure					0.134**
					(0.055)
High margin exposure × Post		0.032			
		(0.028)			
High retail participation × Post			0.027		
			(0.030)		
High market exposure × Post				0.024	
				(0.027)	
High rollover pressure × Post					0.031
					(0.029)
Official fixed effects	Yes	Yes	Yes	Yes	Yes
Jurisdiction fixed effects	Yes	Yes	Yes	Yes	Yes
Year-month fixed effects	Yes	Yes	Yes	Yes	Yes
Image controls	Yes	Yes	Yes	Yes	Yes
Local macro controls	Yes	Yes	Yes	Yes	Yes
Province trends	Yes	Yes	Yes	Yes	Yes
Observations	1754	1754	1754	1754	1754
Adjusted R^2	0.471	0.475	0.474	0.476	0.475

Notes: This table reports estimates for the relation between the 2015 stock market leverage crash and officials' excess face age. The dependent variable is excess face age, defined as predicted face age minus chronological age. *Crash exposure* is a jurisdiction-level measure of exposure to the leveraged stock-market boom, defined as the value-weighted stock-price decline during the 2015 crash for firms headquartered in a given city. *Post* is an indicator for the post-crash period following the June–July 2015 market collapse. Columns (2)–(5) interact the baseline crash exposure measure with pre-crash measures of local financial vulnerability and market participation. *High margin exposure* indicates jurisdictions above the median in margin-balance intensity, brokerage penetration, or other leverage-sensitive trading activity prior to the crash. *High retail participation* indicates jurisdictions above the median in local stock-account penetration, trading activity, or investor participation. *High market exposure* indicates jurisdictions above the median in listed-firm market capitalization, equity issuance, or the number of locally headquartered listed firms. *High rollover pressure* indicates jurisdictions above the median in LGFV or corporate debt maturities due within one year scaled by local fiscal revenue or GDP. Standard errors are clustered at the jurisdiction level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table 6: COVID-19 Shock: Finance and Economics Channels

	(1)	(2)	(3)	(4)	(5)
COVID intensity × Post	0.218***	0.176***	0.169***	0.158***	0.151***
	(0.061)	(0.058)	(0.057)	(0.056)	(0.055)
COVID intensity × Post × High service exposure		0.124**			
		(0.051)			
COVID intensity × Post × High fiscal stress			0.137**		
			(0.058)		
COVID intensity × Post × High rollover pressure				0.149***	
				(0.054)	
COVID intensity × Post × High market exposure					0.133**
					(0.057)
High service exposure × Post		0.031			
		(0.027)			
High fiscal stress × Post			0.028		
			(0.031)		
High rollover pressure × Post				0.036	
				(0.029)	
High market exposure × Post					0.025
					(0.028)
Official fixed effects	Yes	Yes	Yes	Yes	Yes
Jurisdiction fixed effects	Yes	Yes	Yes	Yes	Yes
Year-month fixed effects	Yes	Yes	Yes	Yes	Yes
Image controls	Yes	Yes	Yes	Yes	Yes
Health-system controls	Yes	Yes	Yes	Yes	Yes
Pre-trend controls	Yes	Yes	Yes	Yes	Yes
Observations	1842	1842	1842	1842	1842
Adjusted R^2	0.472	0.476	0.477	0.478	0.477

Notes: This table reports estimates for the relation between the COVID-19 shock and officials' excess face age. The dependent variable is excess face age, defined as predicted face age minus chronological age. *COVID intensity* is a jurisdiction-level measure of local pandemic severity, and *Post* is an indicator for the outbreak period. Columns (2)–(5) interact the baseline COVID shock with pre-COVID measures of local economic and financial vulnerability. *High service exposure* indicates jurisdictions above the median share of employment or output in consumer-facing services. *High fiscal stress* indicates jurisdictions with above-median fiscal gap, land-finance dependence, or budgetary pressure prior to the pandemic. *High rollover pressure* indicates jurisdictions with above-median local government or LGFV debt maturities due within one year before COVID. *High market exposure* indicates jurisdictions above the median in listed-firm market capitalization, bond issuance, or stock-market participation. Standard errors are clustered at the jurisdiction level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table 7: Central Government Inspection: Economics and Finance Channels

	(1)	(2)	(3)	(4)	(5)
Inspection arrival × Post	0.184***	0.142**	0.136**	0.131**	0.128**
	(0.061)	(0.059)	(0.058)	(0.057)	(0.056)
Inspection arrival × Post × High LGFV rollover pressure		0.118**			
		(0.051)			
Inspection arrival × Post × Tight fiscal space			0.127**		
			(0.054)		
Inspection arrival × Post × High capital-market exposure				0.133***	
				(0.049)	
Inspection arrival × Post × Weak local financing conditions					0.121**
					(0.052)
High LGFV rollover pressure × Post		0.029			
		(0.028)			
Tight fiscal space × Post			0.034		
			(0.030)		
High capital-market exposure × Post				0.021	
				(0.027)	
Weak local financing conditions × Post					0.026
					(0.029)
Official fixed effects	Yes	Yes	Yes	Yes	Yes
Jurisdiction fixed effects	Yes	Yes	Yes	Yes	Yes
Year-month fixed effects	Yes	Yes	Yes	Yes	Yes
Image controls	Yes	Yes	Yes	Yes	Yes
Local macro controls	Yes	Yes	Yes	Yes	Yes
Province trends	No	Yes	Yes	Yes	Yes
Observations	1796	1796	1796	1796	1796
Adjusted R^2	0.468	0.472	0.473	0.474	0.473

Notes: This table reports estimates for the relation between the rollout of central government inspection teams and officials' excess face age. The dependent variable is excess face age, defined as predicted face age minus chronological age. *Inspection arrival* is an indicator for the arrival of a central inspection team in the official's jurisdiction. *Post* is an indicator for periods after inspection arrival. Columns (2)–(5) examine whether the apparent-aging response to inspection arrival is stronger in jurisdictions with greater pre-inspection economic and financial vulnerability. *High LGFV rollover pressure* indicates jurisdictions above the median in local government financing vehicle bond maturities scaled by fiscal revenue. *Tight fiscal space* indicates jurisdictions with above-median fiscal gap or land-finance dependence. *High capital-market exposure* indicates jurisdictions above the median in the number of locally headquartered listed firms or aggregate market capitalization. *Weak local financing conditions* indicates jurisdictions with above-median LGFV spreads, lower net bond issuance, or weaker local credit supply prior to inspection. Standard errors are clustered at the jurisdiction level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table 8: Mechanism Corroboration: LLM-Based Measures from Officials' Texts

	(1) Excess face age	(2) Excess face age	(3) Excess face age
Urgency tone score (LLM)	0.182***	0.141***	0.128***
	(0.051)	(0.046)	(0.044)
Objective constraint score (LLM)	0.156***	0.119***	0.103**
	(0.049)	(0.045)	(0.044)
Risk emphasis score (LLM)	0.094**	0.072*	0.065*
	(0.040)	(0.038)	(0.037)
Official FE	No	Yes	Yes
Jurisdiction FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Local economic controls	Yes	Yes	Yes
Image/source controls	Yes	Yes	Yes
Speech/report controls	No	Yes	Yes
Observations	4712	4712	4712
Officials	589	589	589
R^2	0.24	0.41	0.44

Notes: The dependent variable is *excess face age* (predicted face age minus chronological age, in years). The independent variables are LLM-based text measures constructed from officials' speeches and government reports: *urgency tone*, *objective constraints*, and *risk emphasis*. Higher values indicate greater urgency/constraint/risk emphasis in the text. Column (1) reports a baseline specification with jurisdiction and time fixed effects. Column (2) adds official fixed effects to identify within-official changes in apparent aging associated with changes in tone. Column (3) further adds speech/report controls (e.g., log text length, document type indicators, and topic fixed effects). Standard errors are clustered at the city level. Significance levels: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

Table 9: Heterogeneity: Career Concerns, Monitoring Intensity, and Local Economic/Financial Stress

	Career concerns		Monitoring intensity	
	(1) High stakes	(2) Low stakes	(3) High monitoring	(4) Low monitoring
GDP growth (yoy, %)	-0.061***	-0.018	-0.052***	-0.014
	(0.020)	(0.019)	(0.019)	(0.018)
Unemployment rate (%)	0.044***	0.017	0.039***	0.015
	(0.016)	(0.014)	(0.015)	(0.014)
Firm bankruptcies (per 10k firms)	0.051***	0.022*	0.046***	0.019
	(0.017)	(0.013)	(0.016)	(0.013)
LGFV maturities intensity (upcoming)	0.072***	0.031*	0.066***	0.027
	(0.023)	(0.018)	(0.021)	(0.019)
Weak local financing conditions	0.058***	0.021	0.053***	0.018
	(0.019)	(0.016)	(0.018)	(0.015)
SOE stock return − private stock return (% annual)	-0.029**	-0.010	-0.025**	-0.009
	(0.013)	(0.011)	(0.012)	(0.011)
Official FE	Yes	Yes	Yes	Yes
Jurisdiction FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Local economic controls	Yes	Yes	Yes	Yes
Image/source controls	Yes	Yes	Yes	Yes
Observations	4712	4712	4712	4712
Officials	589	589	589	589
R^2	0.47	0.45	0.48	0.44

Notes: The dependent variable is *excess face age* (predicted face age minus chronological age, in years). The table reports estimates from the baseline specifications estimated separately across subsamples. "High stakes" indicates officials with stronger promotion incentives, such as those closer to promotion-age cutoffs, with shorter time to retirement, or in more performance-accountable positions; "Low stakes" is the complement. "High monitoring" indicates jurisdictions with stronger baseline monitoring and accountability pressure, such as areas with greater political visibility or stronger inspection and enforcement environments; "Low monitoring" is the complement. All regressions include official, jurisdiction, and year fixed effects, along with the same local controls and image/source controls used in the baseline specifications. Standard errors are clustered at the city level. Significance levels: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

H Online Appendix

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Table A.1: Independent Medical Validation in the Large Meinian Onehealth Sample

	Panel A. Routine health measures (z-score)									
	BMI	SBP	DBP	RestHR	Glucose	Long-run sugar	Bad chol.	Good chol.	TG	Uric acid
Excess face age ($\widehat{Age}^{face} - Age$)	0.041***	0.102***	0.079***	0.051***	0.071***	0.049***	0.054***	−0.033***	0.062***	0.058***
	(0.006)	(0.008)	(0.007)	(0.006)	(0.006)	(0.006)	(0.007)	(0.005)	(0.006)	(0.005)
Chronological age	0.022***	0.061***	0.041***	0.015***	0.031***	0.028***	0.017***	−0.011***	0.009***	0.012***
	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)
Observations	1,184,520	1,184,520	1,184,520	1,171,340	1,179,860	1,145,210	1,162,480	1,162,480	1,162,480	1,176,930
R^2	0.19	0.24	0.21	0.16	0.18	0.17	0.15	0.14	0.16	0.18
	Panel B. Diagnoses and abnormal findings (LPM)									
	Hyper-tension	Pre-diabetes	Diabetes	Dyslipi-demia	Fatty liver	Hyper-uricemia	CVD flag	Cancer flag	Any abnormality	Any chronic condition
Excess face age ($\widehat{Age}^{face} - Age$)	0.011***	0.009***	0.004***	0.010***	0.008***	0.009***	0.001***	0.0004*	0.014***	0.019***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.0002)	(0.001)	(0.001)
Chronological age	0.006***	0.003***	0.002***	0.002***	0.001***	0.001***	0.001***	0.0003***	0.004***	0.007***
	(0.0004)	(0.0003)	(0.0002)	(0.0003)	(0.0003)	(0.0003)	(0.0001)	(0.0001)	(0.0003)	(0.0004)
Mean dep. var.	0.23	0.16	0.06	0.21	0.15	0.13	0.025	0.006	0.41	0.31
Observations	1,209,880	1,209,880	1,209,880	1,209,880	1,083,420	1,156,670	1,209,880	1,209,880	1,209,880	1,209,880
R^2	0.12	0.09	0.07	0.10	0.08	0.09	0.04	0.02	0.11	0.13
	Panel C. Health risk summary indices									
	Cardio-metabolic index	Lipids index	Organ-health index	Overall health-risk index						
Excess face age ($\widehat{Age}^{face} - Age$)	0.081***	0.053***	0.046***	0.072***						
	(0.006)	(0.005)	(0.006)	(0.005)						
Chronological age	0.032***	0.016***	0.018***	0.029***						
	(0.002)	(0.001)	(0.002)	(0.002)						
Observations	1,138,420	1,162,480	1,176,930	1,209,880						
R^2	0.20	0.17	0.18	0.22						

Notes. This table validates excess face age in an independent Meinian Onehealth sample of more than one million individuals with both photographs and health examination records. Panel A reports associations with standardized routine health measures. Panel B reports linear probability models for diagnoses and abnormal findings. Panel C reports summary indices. Excess face age is predicted face age minus chronological age, in years. All specifications include controls for sex, exam year fixed effects, and image-quality controls. Standard errors are clustered at the individual level. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

Table A.2: Robustness: Alternative Face-Age Measure from an LLM-Based Pipeline

	(1) Economy	(2) Finance	(3) Central inspection (DDD)	(4) 2015 leverage crash
Economic conditions				
GDP growth (%)	-0.421**			
	(0.189)			
Unemployment rate (%)	0.248***			
	(0.086)			
Firm bankruptcies (per 10k firms)	0.034***			
	(0.012)			
Layoff intensity (per 10k workers)	0.021**			
	(0.010)			
Financial fragility				
LGFV bond maturities intensity (RMB bn, upcoming)		0.051***		
		(0.016)		
Weak local financing conditions		0.067***		
		(0.021)		
Capital-market exposure		0.044**		
		(0.019)		
SOE stock return − private stock return (% monthly)		-0.018**		
		(0.008)		
Central government inspection: economics/finance amplification				
Inspection arrival × Post			0.121**	
			(0.053)	
Inspection arrival × Post × High LGFV rollover pressure			0.109**	
			(0.049)	
Inspection arrival × Post × Tight fiscal space			0.116**	
			(0.052)	
2015 stock market leverage crash				
Crash exposure × Post				0.184***
				(0.061)
Crash exposure × Post × High margin-financing exposure				0.132***
				(0.048)
Crash exposure × Post × High local capital-market exposure				0.127**
				(0.051)
Official FE	Yes	Yes	Yes	Yes
Jurisdiction FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Local economic controls	Yes	Yes	Yes	Yes
Image/source controls	Yes	Yes	Yes	Yes
Observations	4,712	4,712	4,712	4,712
Officials	589	589	589	589
R^2	0.47	0.48	0.49	0.48

Notes: This table replicates the main analyses using an alternative apparent-age outcome constructed from an LLM-based pipeline rather than the baseline computer-vision age estimator. The dependent variable is *excess face age* (LLM-based predicted face age minus chronological age, in years). Column (1) reports the association between excess face age and standard local economic conditions. Column (2) reports the association with financial fragility measures, including rollover pressure, financing conditions, and capital-market exposure. Column (3) reports a triple-difference-style inspection specification that examines whether the apparent-aging response to central government inspection is amplified in jurisdictions with greater pre-existing economic and financial vulnerability. Column (4) reports the 2015 stock market leverage crash specification, testing whether officials in jurisdictions with greater pre-crash financial exposure exhibit larger increases in excess face age after the crash. All specifications include official, jurisdiction, and year fixed effects, along with the same local controls and image/source controls used in the baseline analyses. Standard errors are clustered at the city level. Significance levels: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

Table A.3: Robustness: Alternative Definitions of Local Financial Conditions

	(1)	(2)	(3)
Panel A. LGFV Credit Spreads (Alternative Benchmarks / Transformations)			
LGFV credit spread (bp), benchmark = Policy Bank (duration-matched)	0.031**	0.029**	0.026*
	(0.014)	(0.013)	(0.013)
LGFV credit spread (bp), benchmark = AAA curve (duration-matched)	0.035**	0.033**	0.030**
	(0.015)	(0.014)	(0.014)
Panel B. Liquidity (Alternative Illiquidity Proxies)			
Bond market illiquidity (Amihud), value-weighted	0.021*	0.020*	0.018*
	(0.011)	(0.011)	(0.011)
Bond market illiquidity (bid-ask proxy)	0.027**	0.025**	0.023**
	(0.012)	(0.012)	(0.011)
Bond market illiquidity (zero-trading days share)	0.019*	0.018*	0.016
	(0.010)	(0.010)	(0.010)
Panel C. Credit Events (Alternative Default Intensity Measures)			
Credit events intensity: defaults only (per 10k issuers)	0.033**	0.031**	0.028*
	(0.014)	(0.014)	(0.014)
Credit events intensity: defaults + extensions (per 10k issuers)	0.039***	0.036***	0.033***
	(0.013)	(0.013)	(0.012)
Credit events intensity: amount-weighted (events / RMB outstanding)	0.041***	0.038***	0.035***
	(0.014)	(0.013)	(0.013)
Panel D. Issuance (Alternative Quantity Definitions)			
Bond issuance: gross issuance (RMB bn)	-0.010	-0.009	-0.008
	(0.009)	(0.009)	(0.009)
Bond issuance: net issuance (issuance − redemptions, RMB bn)	-0.014	-0.013	-0.012
	(0.009)	(0.009)	(0.009)
Bond issuance: LGFV-only net issuance (RMB bn)	-0.017*	-0.016*	-0.014
	(0.010)	(0.010)	(0.009)
Official FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Image quality controls	Yes	Yes	Yes
Jurisdiction controls	No	Yes	Yes
Source-type controls	No	No	Yes
Observations	4712	4712	4712
Officials	589	589	589
R^2	0.44	0.46	0.48

Notes: The dependent variable is *excess face age* (predicted face age minus chronological age, in years). Each row reports the coefficient on one financial-conditions measure estimated in a separate regression using the same city-year panel. All specifications include official fixed effects and year fixed effects; columns vary the control set in the same progression as the baseline finance table. *Panel A: Spreads.* "LGFV credit spread" is the yield on locally exposed LGFV bonds minus a duration-matched benchmark yield. Benchmarks include policy bank bonds, and the AAA credit curve. *Panel B: Liquidity.* "Amihud" is a value-weighted price-impact measure; "bid-ask proxy" is constructed from high-low/close-based spread proxies (or quoted bid-ask spreads when available); "zero-trading days" is the fraction of bond-days with zero volume among locally exposed bonds. *Panel C: Credit events.* These measures are constructed from local corporate and quasi-corporate credit events, rather than formal local government bond defaults, which are rare in our sample period. Specifically, we consider defaults only; defaults plus extensions or payment delays; and an amount-weighted event intensity scaled by local outstanding credit. *Panel D: Issuance.* Issuance measures include gross issuance, net issuance (issuance minus redemptions), and LGFV-only net issuance. "Image quality controls" include face size, sharpness, brightness, contrast, and detection confidence. "Jurisdiction controls" include time-varying local fundamentals and other baseline controls. Standard errors are clustered at the city level. Significance levels: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

Table A.4: Central Government Inspection Team Visits Relevant to the City/Province Sample, 2014–2023

Year	Round	Province-level jurisdictions inspected	Explicitly named city-level jurisdictions included in the inspection scope
2014	Third round	Beijing, Tianjin, Gansu, Ningxia, Shandong, Xinjiang, Hainan, Henan, Fujian, Liaoning; Xinjiang Production and Construction Corps also included	None explicitly listed in the round announcement
2014	Fourth round	Guangxi, Shanghai, Qinghai, Tibet, Zhejiang, Hebei, Shaanxi, Heilongjiang, Sichuan, Jiangsu	None explicitly listed in the round announcement
2015	Sixth–Eighth rounds	No new province-level jurisdictions in the listed rounds; inspections mainly targeted central SOEs, financial institutions, and other central entities	Not applicable
2016	Ninth round ("look-back")	Liaoning, Anhui, Shandong, Hunan	None explicitly listed in the round announcement
2017	Twelfth round ("look-back")	Inner Mongolia, Jilin, Yunnan, Shaanxi	None explicitly listed in the round announcement
2018	First round	Fujian, Henan, Sichuan, Guizhou, Liaoning, Heilongjiang, Jiangsu, Shandong, Hunan, Ningxia, Guangdong, Hainan, Hebei, Shanxi	Xiamen, Chengdu, Shenyang, Dalian, Harbin, Nanjing, Jinan, Qingdao, Guangzhou, Shenzhen

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Table A.4 continued

Year	Round	Province-level jurisdictions inspected	Explicitly named city-level jurisdictions included in the inspection scope
2018	Second round	Qinghai, Gansu, Hubei, Guangxi, Tibet, Chongqing, Shaanxi, Xinjiang, Inner Mongolia, Jilin, Anhui, Jiangxi, Yunnan	None explicitly listed in the round announcement
2019	Third–Fourth rounds	No new province-level jurisdictions in the listed rounds; inspections mainly targeted central SOEs and central/state organs	Not applicable
2020	Fifth round	No new province-level jurisdictions; inspections mainly targeted central/state organs	Not applicable
2020	Sixth round	Hubei, Guangxi, Shanghai, Zhejiang, Anhui, Jiangxi, Xinjiang, Inner Mongolia, Jilin, Yunnan, Tibet, Beijing, Tianjin, Chongqing, Shaanxi, Gansu, Qinghai; Xinjiang Production and Construction Corps also included	Wuhan, Hangzhou, Ningbo, Changchun, Xi'an
2021	Seventh–Eighth rounds	No new province-level jurisdictions in the listed rounds; inspections mainly targeted the Ministry of Education, central universities, and selected central entities	Not applicable
2022	Ninth round	No new province-level jurisdictions; inspections mainly targeted central units, including financial and other central institutions	Not applicable

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Table A.4 continued

Year	Round	Province-level jurisdictions inspected	Explicitly named city-level jurisdictions included in the inspection scope
2023	First–Second rounds	No new province-level jurisdictions; inspections mainly targeted central SOEs, financial units, and functional departments	Not applicable

Notes: This table summarizes central inspection-team visits that are relevant for mapping inspection exposure into the city/province panel used in the paper. In most rounds, the inspection unit is a province, provincial-level municipality, or major central entity rather than an ordinary prefecture-level city. Accordingly, for the city-year analysis, the standard mapping is from a city to the inspection status of its province or provincial-level municipality. A small number of deputy-provincial cities were explicitly included in the scope of some rounds and are listed separately in the final column.

Table A.5: Interpretation of Medical Validation Outcomes

Measure	Plain-English interpretation	Higher value usually indicates	Main health domain
BMI	Body mass index, a summary measure of body weight relative to height. Extremely low or high values can both be unhealthy, but in adult screening data higher BMI typically reflects excess weight.	Worse health	Body composition
SBP	Systolic blood pressure, the "top number" in a blood pressure reading.	Worse health	Cardiovascular risk
DBP	Diastolic blood pressure, the "bottom number" in a blood pressure reading.	Worse health	Cardiovascular risk
RestHR	Resting heart rate, measured when the body is at rest.	Worse health	Cardiovascular / stress
Glucose	Blood glucose level, capturing short-run blood sugar.	Worse health	Metabolic health
Long-run sugar	Longer-run blood sugar control (e.g., HbA1c), reflecting average glucose over recent months.	Worse health	Metabolic health
Bad chol.	Low-density lipoprotein cholesterol, often called "bad" cholesterol because elevated levels are linked to cardiovascular risk.	Worse health	Lipid / cardiovascular health
Good chol.	High-density lipoprotein cholesterol, often called "good" cholesterol because higher levels are generally protective.	Better health	Lipid / cardiovascular health
TG	Triglycerides, a common blood-fat measure.	Worse health	Lipid / metabolic health
Uric acid	Blood uric acid, elevated levels of which are linked to gout and other metabolic problems.	Worse health	Metabolic / kidney health
Hypertension	Indicator for high blood pressure diagnosis or abnormal finding.	Worse health	Cardiovascular risk
Pre-diabetes	Indicator for elevated blood sugar below the diabetes threshold.	Worse health	Metabolic health
Diabetes	Indicator for diabetes diagnosis or abnormal finding.	Worse health	Metabolic health
Dyslipidemia	Indicator for unhealthy blood-lipid levels.	Worse health	Lipid health
Fatty liver	Indicator for abnormal fat accumulation in the liver.	Worse health	Liver / metabolic health
Hyperuricemia	Indicator for abnormally high uric acid.	Worse health	Metabolic / kidney health
CVD flag	Indicator for a cardiovascular abnormality or elevated cardiovascular concern.	Worse health	Cardiovascular risk
Cancer dx/suspected	Indicator for diagnosed or suspected malignancy.	Worse health	Severe health condition
Cardio-metabolic index	Summary index aggregating major cardiovascular and metabolic risk measures.	Worse health	Summary risk index
Lipids index	Summary index aggregating blood-lipid risk measures.	Worse health	Summary risk index
Liver/kidney index	Summary index aggregating liver- and kidney-related risk measures.	Worse health	Summary risk index
Any chronic condition	Indicator for having at least one major chronic condition in the screening data.	Worse health	Summary risk index