

Introduction

Motivation: Political uncertainty—the lack of confidence with which government and policy outcomes can be predicted—continues to surge to unprecedented levels.

- Prior research finds that it has substantial adverse effects on economic and political outcomes [1].
- However, with no objective measure, studies operationalize political uncertainty via electoral competition, resulting in a near exclusive focus on democracies.

At the same time that political uncertainty has surged, so too have autocracies in number and influence.

- Millions are subject to autocrats who control resources that rival those in democracies.
- Nonetheless, we know comparatively little about the effects of political uncertainty in autocracies.

Research Objective: To develop a measure of political uncertainty in autocracies.

Background: While competitive elections have no perfect parallel in autocracies, China’s leadership transitions, prior to 2018 and since reforms took hold in the 1990s, satisfy some of the same conditions.

- Term limits for president and vice president and de facto term limits due to retirement age for members of the Politburo Standing Committee guaranteed at least some leadership changeover at each transition.
- Leadership transitions were institutionalized and routinized and so occurred at regular intervals.

I take these known and predetermined periods of political uncertainty as a starting point. However, due to their lack of transparency, more work is needed to reduce measurement error.

On paper, China’s leaders are elected by the National People’s Congress shortly before they assume office. Yet, by the time “elections” take place, the outcome is a forgone conclusion for both Communist Party members and average citizens.

- At present, we know that some subset of the upper echelon of the Party selects future leaders, and when those leaders are officially announced.
- We do not know when their selections are made, nor when and with whom that information is unofficially shared.
- This is where China’s leadership transitions deviate most from competitive elections: variation in the distribution of political uncertainty during leadership transitions.

Project Overview: I exploit the Communist Party’s tight control over the news media to expose internal dynamics of China’s leadership sections and transitions. This entails identifying informative temporal and spatial patterns in Chinese news. I test a set of hypotheses about the Communists Party’s strategic use of the press prior to leadership transitions to promote preferred “candidates” and signal selections. Taken together, these analyses approximate the period when leadership selection occurs to construct a measure of political uncertainty in autocracies that accounts for its time varying distribution.

Methods

Data: ~1.5 million articles that represent every mention of the top “candidates” for the presidency, vice presidency, and Politburo Standing Committee in state-run news media between 2000-2012. Articles mechanically collected from the Hong Kong-based news media data provider WiseNews 電子剪報.

Methods: To identify informative patterns in press coverage, I employ a combination of anomaly detection methods, including:

Bayesian Detection of Abnormal Regions (BARD) in Time Series [2]:

- Bayesian procedure for difficult problem of identifying collective anomalies (segments of data, as opposed to points, that are abnormal compared to general structure of the data).
- In a multivariate setting, models a time series of dimension d and length n , $\mathbf{Y}_{1:n} = (\mathbf{Y}_1, \mathbf{Y}_2, \dots, \mathbf{Y}_n)$, where $\mathbf{Y}_i = (Y_{i,1}, Y_{i,2}, \dots, Y_{i,d})^T$ with a hidden state space $X_{1:n}$ that partitions the time interval into contiguous non-overlapping segments each of which is either “normal” or “abnormal”.
- The model assumes that data for a subset of dimensions is drawn from some known distribution D with a density function $f_D(\cdot)$, and the remaining dimensions independent realizations from a distribution P_θ with a density function $f_P(\cdot | \theta)$.

- For a normal segment, the segment marginal likelihood is,

$$P_N(t, s) = \prod_{k=1}^d \prod_{i=t}^s f_D(Y_{i,k}).$$

- For an abnormal segment, the segment marginal likelihood is

$$P_A(t, s) = pk \prod_{i=t}^s f_D(Y_{i,k} | \theta) + (1 - pk) \prod_{i=t}^s f_P(Y_{i,k}).$$

Collective and Point Anomaly Detection (CAPA) in Time Series [3]:

- Jointly estimates collective and point anomalies with epidemic changepoint models.
- Epidemic changepoints are comprised of two changepoints; a start point that deviates from the “normal” distribution and returning end point. Point anomalies estimated as epidemic changes of length 1.
- In a univariate setting, a time series $\mathbf{y}_1 \dots \mathbf{y}_n$ is said to follow a parametric epidemic changepoint model if \mathbf{y}_t has a probability density function $f(\mathbf{y}_t, \theta(t))$ and satisfies

$$\theta(t) = \begin{cases} \theta_j, & sj < t < ej \\ \theta_0, & \text{otherwise,} \end{cases}$$

- where θ_0 is the parameter of the “normal” distribution,
- Number and locations of epidemic changepoints are estimated by choosing values that minimize a penalized cost

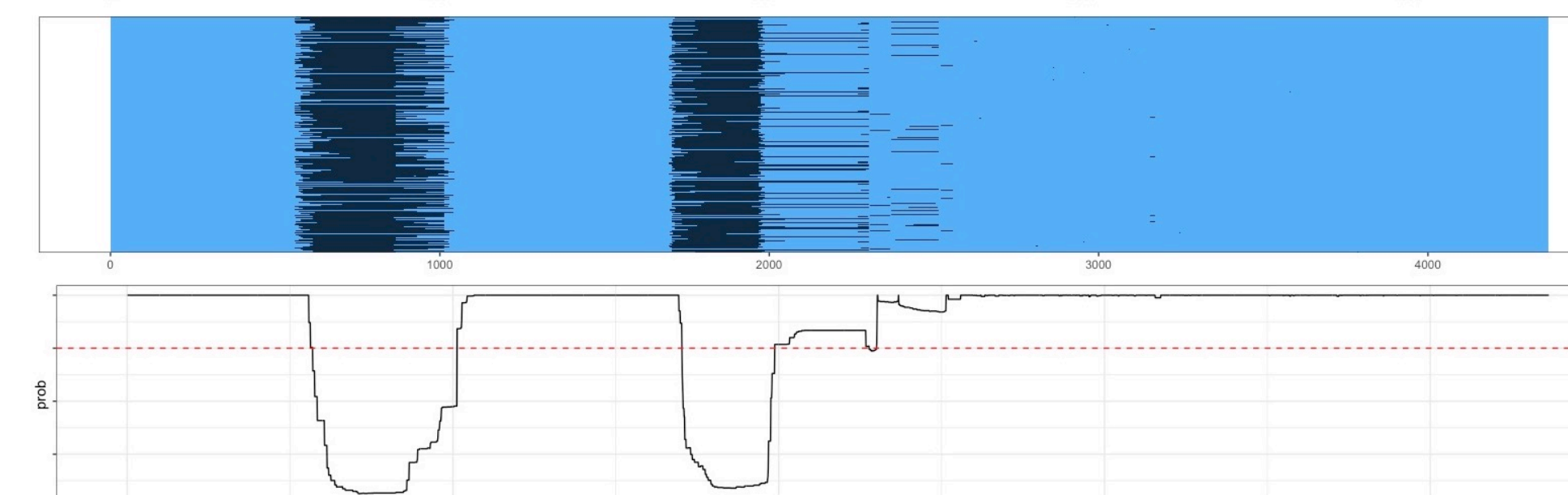
$$\sum_{t \in \cup_{i=1}^K [s_i+1, e_i]} \mathcal{C}(\mathbf{y}_t, \theta_0) + \sum_{j=1}^K \left[\min_{\theta_j} \left(\sum_{t=s_j+1}^{e_j} \mathcal{C}(\mathbf{y}_t, \theta_j) \right) \right] + \beta_C,$$

where $\mathcal{C}(\cdot)$ is a cost function, e.g., twice the negative log-likelihood, and β_C is a penalty term to prevent overfitting.

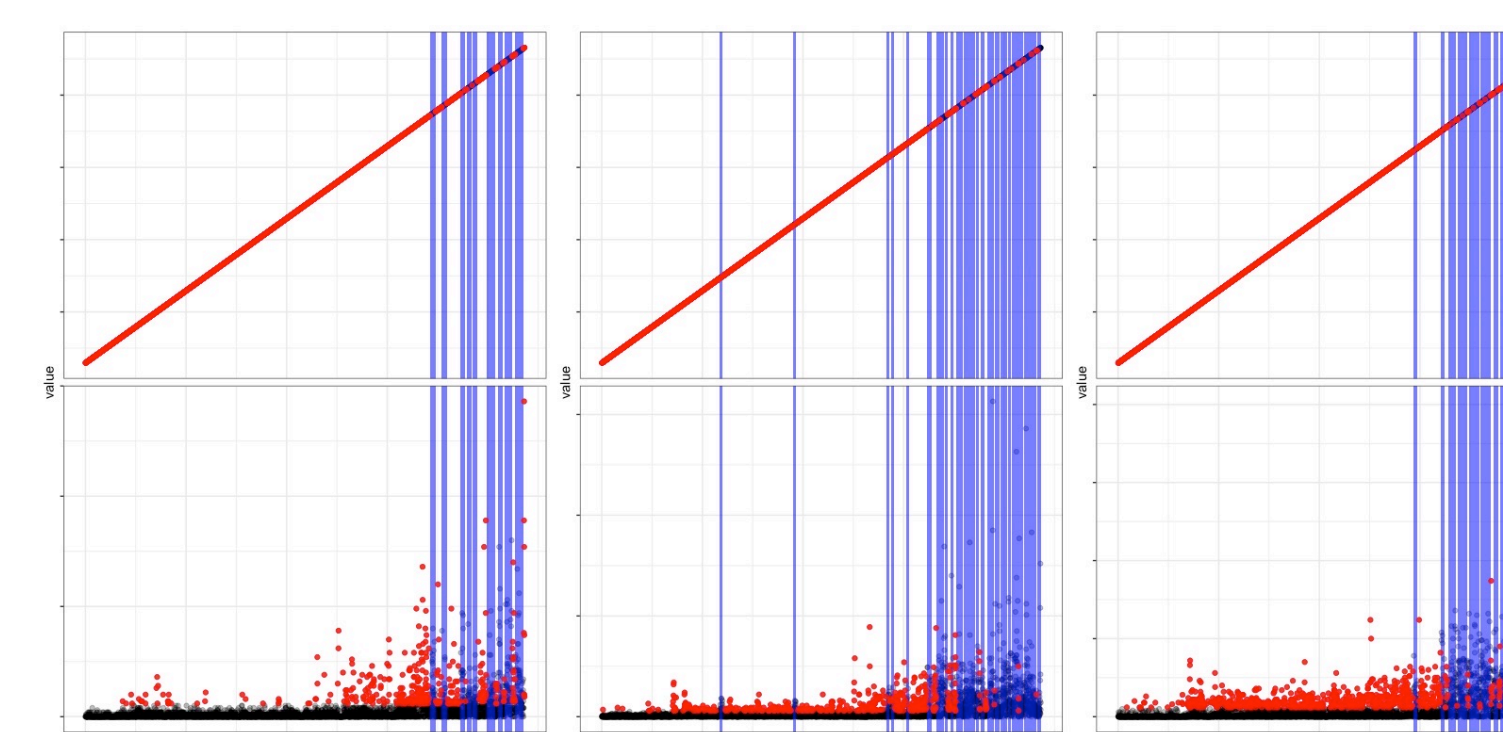
Note: Additional methods used to reduce bias from false positives and negatives, e.g., unsupervised tree-based algorithm, Isolation Forest, and a normalized composite anomaly score.

Analysis

BARD Example. Sample of 100 draws from the Posterior Distribution (top) and Marginal Likelihood (bottom) of Collective Anomalous Daily Press Coverage of Xi Jinping in National Media; Onset of “Abnormal Regions” Correspond with SARS Outbreak and First Appointment to the Politburo Standing Committee.



CAPA Example. Positive Collective (blue lines) and Point Anomalies (red dots) in Press Coverage (gray dots) of Zhang Gaoli (left), Zhang Dejiang (center), and Liu Yunshan (right) in National Media; Anomalies Cluster Around Run-up and Appointment to the Politburo Standing Committee.



CAPA Example. Last Estimated Positive Collective Anomaly in National Daily Press Coverage of Frontrunner Candidates Prior to Official Leadership Selection on November 14th, 2012.

**:= Selected to Top Spots; * := Selected to Politburo Standing Committee

Candidate	Start Point	End Point	$\Delta\text{Mean}(\text{Length})$
Xi Jinping**	November 4, 2012	November 13, 2012	7741.05
Li Keqiang**	October 28, 2012	November 13, 2012	25348.48
Yu Zhengsheng*	November 12, 2012	November 13, 2012	345.98
Liu Yunshan*	November 12, 2012	November 13, 2012	32.76
Wang Qishan*	November 8, 2012	November 10, 2012	931.71
Zhang Gaoli*	November 12, 2012	November 13, 2012	65.74
Zhang Dejiang*	November 7, 2012	November 10, 2012	622.81
Liu Yandong	October 8, 2012	October 26, 2012	1454.90
Li Yuanchao	October 17, 2012	October 26, 2012	445.89

Normalized Composite Anomaly “Score” for Provincial Daily Coverage of Frontrunner Candidates for the 18th Politburo Standing Committee; Concentration of Higher Scores for Candidates with Ties to Province Prior to Official 2012 Leadership Selection (supported by panel analyses).



Conclusion

Findings suggest that the Communist Party signals the identities of future leaders prior to their official public announcement in the press, providing evidence of when they have been selected and had their identities shared with a wider audience.

Anomalous press coverage needs to be analyzed cautiously and appears more informative retrospectively.

- Positive anomalous coverage of all frontrunner “candidates” for the Politburo Standing Committee increased throughout 2012, obscuring the identities of eventual appointees.
- Positive anomalous coverage stopped for unsuccessful candidates only weeks before the official announcement.
- The drop off in anomalous coverage is consistent with reports that those candidates’ initial selection was blocked in the final weeks of October [4] and provides evidence that the Communist Party signals decisions through the press.
- However, the narrow temporal window of the drop off, and previous high rate of anomalous coverage, suggests that such patterns are likely obscured when viewed in the aggregate.

Preliminary analyses also suggest that regional officials promote candidates with ties, with coverage converging on the selected candidates only directly prior to official selection.

- Pattern provides some indication of a “campaigning” period when political uncertainty is more uniformly distributed and the period after selections are made.
- Text analysis of coverage is required (and ongoing) to draw additional conclusions about campaigning.
- At a minimum, convergence of coverage provides further evidence of when leadership selections have been made, and shared internally.

Altogether, results suggest the proposed approach can accurately measure political uncertainty in a nondemocratic setting.

References

[1] Jens, C. E. “Political uncertainty and investment: Causal evidence from US gubernatorial elections.” *Journal of Financial Economics* 124.3 (2017).

[2] Bardwell, L. and P. Fearnhead. “Bayesian Detection of Abnormal Segments in Multiple Time Series.” *Bayesian Analysis*, *Bayesian Anal.* 12.1, (2017).

[3] Fisch, A., I. A. Eckley, and P. Fearnhead. “A linear time method for the detection of collective and point anomalies.” *Statistical Analysis and Data Mining: The ASA Data Science Journal* (2022).

[4] Lim, B. K. “Exclusive - China’s backroom powerbrokers block reform candidates: sources.” *Reuters*. Nov. 20, 2012.

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