

Online Appendix to Media Bias in China

Bei Qin, David Stromberg, and Yanhui Wu

Part 1. Empirical Appendix: Data Description and Additional Results

A1. Sample of Newspaper Content

The newspaper content that we use is collected from WiseNews during the 1999-2010 period. WiseNews is a daily updated information service provided by Wisers Information Limited in Hong Kong. It contains content from over 600 large newspapers, magazines, and websites from the Greater China region (Mainland China, Hong Kong, Macao and Taiwan) and the United States. A total of 289 newspapers published in Mainland China are available from 1999 to date. Among these publications, 269 newspapers match the newspaper directory that we constructed, and 117 of them are general interest newspapers that we use in this paper for content analysis. The data provider states that it selects important and influential papers from large cities. Geographically, the 117 papers are published in 22 provincial capital cities, 4 municipalities under the direct control of the central government (i.e., Beijing, Shanghai, Tianjin, Chongqing), and 9 economically well-developed prefectures.

The WiseNews sample is representative of newspaper markets in large metropolitan areas. We compare it with a sample of all general-interest newspapers that are published in the 27 provincial capital cities and the 4 municipalities directly under the central government and appear in the comprehensive newspaper directory we construct. Given that the WiseNews sample does not contain any county-level papers, we exclude county-level papers from this comparison sample. Table A1 below shows the shares of newspapers by the newspaper type (Party Daily, Party Evening, and Subsidiary) and by their administrative rank (central, province, and prefecture) in the WiseNews sample and in the sample of the newspaper directory. These shares are relatively similar across these samples. Along these dimensions, the WiseNews sample represents the newspaper markets in the provincial capital cities.

Table A1. Comparison of Newspaper Composition

	WiseNews (n=117)	Newspaper directory (n=206)
Type	Percent	Percent
Party Daily	34.19	27.32
Party Evening	10.25	8.78
Subsidiary	55.56	63.90
Total	100	100
Administrative rank		
Central	4.27	3.90
Province	60.68	63.41
Prefecture	35.05	32.69
Total	100	100

A2. Search Keywords

For all the nine content categories presented in the paper, we search the relevant key words in the digital archives of the newspapers in WiseNews from 1999 to 2010.

Total number of articles: To count the total number of articles by newspaper and year, we search for a string that is used in nearly all articles. The string we search for is any digit from 0-9 or “日” (“day”) or “不” (“No”). The variables listed below except for Epoch Stories are expressed in percentage of the total articles (the ratio of the number of each category of articles to the total number of articles in a newspaper within one year multiplied by 100).

Key words relating to the Party Line

(1) **Leader Mentions** To count the number of articles mentioning political leaders, we collect the positions and names of 108 leaders in Political Bureau of the CCP Central Committee and the affiliated Commissions, leaders in State Council (central government) with rank equal to or above the Minister level, 816 provincial Governors and Party Secretaries (including vice titles), and 1187 prefectural Mayors and Party Secretaries (including vice titles) during the 1999- 2011 period. We then search for the combination of their names and positions from one year before to the last year of every leader’s official term. Finally, we record the total number of articles that mention these word strings at the newspaper-year level.

(2) **Xinhua Cites** We search for the string “新华社” (Xinhua News Agency) in WiseNews and record the total number of articles that mention it at the newspaper-year level.

(3) **Epoch Stories** We select the top 10 annual events listed by Xinhua News from 2001 to 2010 and the top 10 annual events listed by the Epoch Times from 2002 to 2010. The Epoch Times is published and circulated outside China and is regarded as the most anti-CCP newspaper. We search for key words related to these events in WiseNews and record the total number of relevant articles at the newspaper-year level. We then calculate the ratio of the number of articles covering top events listed by the Epoch Times to the total number of articles covering top events listed by either Xinhua News or the Epoch Times. The variable is defined by multiplying this ratio by 100.

Key words relating to the Mass Line

(4) **Corruption** The number of articles covering corruption is obtained by searching keywords that identify corruption cases but not corruption speeches by politicians and government officials. The strings we use include the key words "(腐败 或 贪污 或 受贿 或 金钱) and (双规 或 调查 或 审查 或 检察机关) and (免去 或 罢免 或 查处 或 惩处 或 撤消 或 撤除)." The corresponding English translation is ("(corruption or embezzle or bribed or money) and (dual-discipline – a word

specifically used by governments or CCP organs – or investigate or examine or prosecutor) and (replace or dismiss or prosecute or punish or revoke or rescind).

(5) & (6) Disaster & accident stories. We obtain disaster data from EM-DAT, an international disaster database. We select 226 disasters with more than 30 fatalities that took place in China from 1998 to 2011. The search uses keywords that identify each disaster, and the search is limited to a time window from two days before to 40 days after an event. Among these 226 disasters, we distinguish between natural disasters (97 cases) and accidents (non-natural disasters, 129 cases). Accidents include transportation accidents and industrial accidents.

Key words relating to the Bottom Line

(7) Sports The keyword strings we use are "体育比赛 or 运动会 or 足球 or 篮球 or 乒乓球 or 羽毛球 or ((游泳 or 蛙泳 or 蝶泳 or 仰泳 or 自由泳) and 比赛) or 排球 or (田径 and 比赛) or 长跑 or 短跑 or 冬泳 or 保龄球 or 网球 or 台球 or 桌球". ("sports competition or Games or football or basketball or Ping-Pong or Badminton or ((swimming or breaststroke or butterfly or backstroke or crawl) and competition) or volleyball or ('track and field' and competition) or marathon or sprint or winter swimming or bowling or tennis or billiards or table tennis").

(8) Entertainment The keyword strings we use are "电影 or 电视 or 话剧 or 戏剧 or 戏曲 or 主演 or 演员 or 歌手 or 歌星 or 影星 or 音乐剧 or 演唱会 or 演奏会 or ((流行 or 主流 or 摇滚 or 民俗 or 民族) and 音乐) or 唱片 or 歌迷会 or 影迷会". ("movie or television or drama or opera or play or starring or actor or singer or singing star or movie star or musical or concert or symphony or ((popular or mains stream or rock or folk or minority) and music) or CDs or fan club").

(9) Crime The keyword strings we use are "歹徒 or 行凶 or 凶犯 or 罪犯 or 杀人 or 强奸 or 抢劫 or 黑社会". ("scoundrel or attack or murderer or criminal or killer or rape or rob or gangster").

A3. Additional Empirical Results

A3.1 Principal Components Analysis (PCA)

Table A2. Components and Factor Loadings of PCA

Component	Eigenvalue	Proportion	Variable	Comp1	Comp2
Comp1	3.211	0.3568	Leader mentions	0.4947	0.0126
Comp2	1.421	0.1578	Xinhua Cites	0.4235	0.1013
Comp3	1.090	0.1211	Epoch Stories	-0.2557	0.3857
Comp4	0.826	0.0917	Corruption	0.2951	0.3269
Comp5	0.709	0.0788	Disasters	0.2986	0.3684
Comp6	0.682	0.0758	Accident	0.0691	0.6363
Comp7	0.481	0.0535	Sports	-0.2346	0.2926
Comp8	0.350	0.0389	Entertainment	-0.3773	0.0365
Comp9	0.230	0.0255	Crime	-0.3636	0.3261

Notes: The PCA uses the residuals from a regression of content categories on prefecture by year fixed effects. The last columns report the factor loading of each variable for the 1st and 2nd components.

A3.2 Media Bias of Individual Newspapers and by Newspaper Type

Figure A1. Density Distribution of Newspaper bias by Newspaper Type

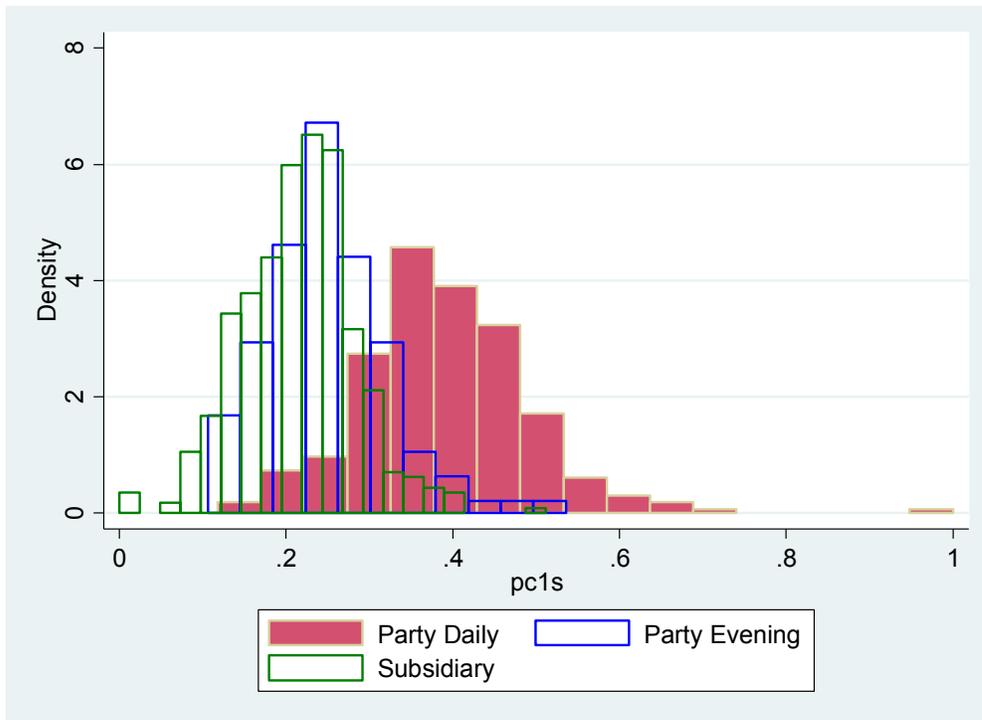


Table A3. Media Bias by Newspaper

Rank	Bias	Newspaper	Type	Rank	Province	Prefecture
1	0.593	QINGHAIDAILY	Party Daily	province	Qinghai	Xining
2	0.523	NINGXIADAILY	Party Daily	province	Ningxia	Yinchuan
3	0.520	GANSUDAILY	Party Daily	province	Gansu	Lanzhou
4	0.504	ANHUIDAILY	Party Daily	province	Anhui	Hefei
5	0.477	SHANXIDAILY	Party Daily	province	Shanxi	Taiyuan
6	0.476	YUNNANDAILY	Party Daily	province	Yunnan	Kunming
7	0.475	PEOPLESAILY	Party Daily	central	Beijing	Beijing
8	0.469	SICHUANDAILY	Party Daily	province	Sichuan	Chengdu
9	0.467	JIANGXIDAILY	Party Daily	province	Jiangxi	Nanchang
10	0.460	GUANGXIDAILY	Party Daily	province	Guangxi	Nanning
107	0.162	YANZHAOEVENINGNEWS	Subsidiary	prefecture	Hebei	Shijiazhuang
108	0.162	WUHANMORNINGPOST	Subsidiary	prefecture	Hubei	Wuhan
109	0.146	WUHANEVENINGNEWS	Subsidiary	prefecture	Hubei	Wuhan
110	0.142	MIRROR	Subsidiary	province	Beijing	Beijing
111	0.140	LIAOSHENEVENINGNEWS	Subsidiary	province	Liaoning	Shenyang
112	0.137	BEIJINGEVENINGNEWS	Subsidiary	province	Beijing	Beijing
113	0.128	THEFIRST	Subsidiary	province	Beijing	Beijing
114	0.124	YANGCHENGEVENINGNEWS	Subsidiary	province	Guangdong	Foshan
115	0.109	YOUTHXPRESS	Subsidiary	central	Beijing	Beijing
116	0.100	YANGCHENGEVENINGNEWS	Subsidiary	province	Guangdong	Dongguan
117	0.004	BEIJINGDAILYMESSENGER	Subsidiary	province	Beijing	Beijing

Data Source: Chinese newspaper directory data constructed by the authors and WiseNews.

A3.3 Robustness Check of the Effects of the 2003 Reform (Section IV.C)

Table A4. Robustness Check of the Effects of the 2003 Reform

Dependent variable: newspaper bias

VARIABLES	I	II	III	IV
Reform 2003	0.036*** (0.008)	0.031*** (0.007)	0.036*** (0.010)	
Commercial Paper *	-0.044*** (0.006)	-0.042*** (0.006)	-0.040*** (0.007)	-0.050*** (0.005)
Reform 2003 outside main sample	-0.025** (0.010)	-0.018* (0.010)	-0.024** (0.011)	
Commercial Paper * Reform 2003 outside main sample	0.026** (0.010)	0.022** (0.011)	0.022** (0.011)	0.029*** (0.010)
Observations	872	813	845	872
R-squared	0.852	0.847	0.847	0.909
Controls	Basic	Basic	Extended	Basic Newspaper and Prefecture- by-Year
Fixed Effects Commercial	Newspaper and Year 0.038	Newspaper and Year 0.013	Newspaper and Year 0.341	

Notes: Basic controls include GDP, population, industrial share of GDP, real FDI. Extended controls include the basic controls and the interaction of the reform dummy with the predicted number of county papers in 2002. Column I reproduces the baseline estimation reported in the paper. Column II reports the regression excluding two prefectures (Wuhan and Hefei). Column III includes an extended set of controls. Column IV includes prefecture-by-year fixed effects. Standard errors clustered by prefecture in parentheses. *** p<0.01, ** p<0.05, * p<0.1

A3.4 Reform Effect on the Coverage of County/Village Political Leaders (Section IV.C)

We test the possibility that after the reform, higher-level Party Dailies were mandated to report more on county-level political leaders. We find that 1.6% of the articles mention the two top political positions (Party Secretary and government chief) at the county and village levels. In comparison, 5.2% of the articles mention the equivalent positions at the prefecture, province, or national levels. Table A5 below reports the regression results, using the specification in Column 4 of Table 2 in the paper.

Table A5. Dependent variable: share of articles mentioning top positions

VARIABLES	Prefecture/Province/Nation	County/Village
Reform 2003	1.315** (0.611)	-0.070 (0.365)
Commercial Paper * Reform 2003	-1.533** (0.570)	0.111 (0.355)
Observations	283	283
R-squared	0.888	0.740
Controls	Yes	Yes
Fixed Effects	Newspaper and Year	Newspaper and Year
Commercial	0.212	0.401

Notes: Controls include GDP, population, industrial share of GDP, real FDI, the number university students, the number employees, and total government expenditure. Standard errors clustered by prefecture in parentheses. *** p<0.01, ** p<0.05, * p<0.1

A3.5 Magnitudes and Interpretation (Section IV.D)

Table A6. Effects of the 2003 Reform on Individual Content Categories

	I	II	III	IV	V	VI	VII	VIII	IX	X
Dependent Variable	Newspaper bias	Leader Mentions	Xinhua Cites	Epoch Stories	Corruption	Disasters	Accidents	Sports	Entertainment	Crime
Reform 2003	0.095*** (0.022)	8.230** (3.106)	1.042 (6.576)	-20.495** (7.634)	-0.014 (0.039)	-0.015 (0.084)	0.025 (0.037)	-0.650 (0.867)	-2.268 (1.391)	-0.016 (0.111)
Commercial Paper * Reform 2003	-0.124*** (0.017)	-9.132** (3.396)	-7.281 (5.394)	19.883** (8.142)	-0.012 (0.041)	-0.020 (0.080)	-0.025 (0.029)	0.243 (0.506)	2.575* (1.353)	0.099 (0.091)
Observations	283	283	283	283	283	283	283	283	283	283
R-squared	0.838	0.825	0.857	0.776	0.621	0.775	0.472	0.618	0.856	0.702
Commercial	-0.029	-0.902	-6.238	-0.612	-0.027	-0.034	0.001	-0.407	0.307	0.083
Commercial p-val	0.006	0.110	0.059	0.807	0.124	0.529	0.970	0.559	0.393	0.121
Mean	0.280	9.713	26.978	23.948	0.156	0.469	0.126	6.704	11.719	0.635
Std. Dev.	0.102	10.887	16.982	14.491	0.097	0.517	0.126	2.904	4.750	0.401
Commercial-Party difference	-0.156	-14.782	-17.635	1.678	-0.050	-0.107	0.013	0.484	2.808	0.410

Notes: To capture the average reform effects, the reform-variable coefficients are multiplied by 2.7, the average number of county papers in areas with positive numbers of county papers in 2002. All regressions include newspaper- and year-fixed effects, as well as our set of basic controls: GDP, population, industrial share of GDP, real FDI, number university students, number employees, total government expenditure. Standard errors clustered by prefecture in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

A3.6 Case Study of Leader Mentions (Section V.A)

One concern regarding the result that lower-level newspapers are less biased (in terms of our bias measure) than higher-level newspapers is that, in our keyword search, we focus on only several top provincial and prefectural political positions, such as Party Secretaries and Governors/Mayors, whereas for national leaders, we include a larger set of positions. This is not very likely to be an important concern because at the local level, most important Party and government functional positions are taken by the Vice Party Secretaries and Vice Governors/Mayors. To further assess this, we manually read all articles published during three randomly-selected days in six newspapers: one Party Daily and one commercial paper at each of the three administrative levels.

In particular, we choose four local newspapers from Hubei province in 2009: the Hubei Daily (province Daily), the Changjiang Daily (prefecture Daily), the Chutian Metropolis Daily (province Subsidiary), and the Wuhan Morning Post (prefecture Subsidiary). At the national level, we choose the Guangming Daily (central Daily) and the China Youth Daily (central Evening). We study the content of these two national newspapers in 2007 because the WiseNews data do not include national newspapers in 2009, and we want to avoid 2008 when the Summer Olympics was held in China. We randomly select three days of publications from the year except for holidays and weekends, when the coverage of politicians may be less than usual.

Table A7 below reports the share of articles that mention any politicians identified by our manual reading and the ratio of (1) the number of articles that mention the political leaders on the list of automatically-searched keywords to (2) the number of articles that mention any politicians identified by manual reading. As seen in the first column, compared to the prefecture newspapers, the share of articles that mention leaders is twice as high in provincial papers and four times higher in the central papers. This pattern is consistent with the result reported in the paper (Panel C of Table 1). Columns 2-4 show the ratio of the number of articles about politicians that we identify by our automatic keyword search to the number of articles that we identify by manually reading the newspaper. The differences across administrative levels are not systematic and too small to explain the average differences in the first column.

Table A7. Leader Mentions by administrative rank

	All Leaders	All Leaders	National Leaders	Local Leaders
	share of politician coverage	$\frac{\text{coverage of automatically-searched political leaders}}{\text{coverage of manually-identified politicians}}$ (%)		
Central	7.85	74.02	66.52	58.47
Provincial	4.73	67.65	55.56	72.01
Prefecture	1.85	84.86	54.84	60.00

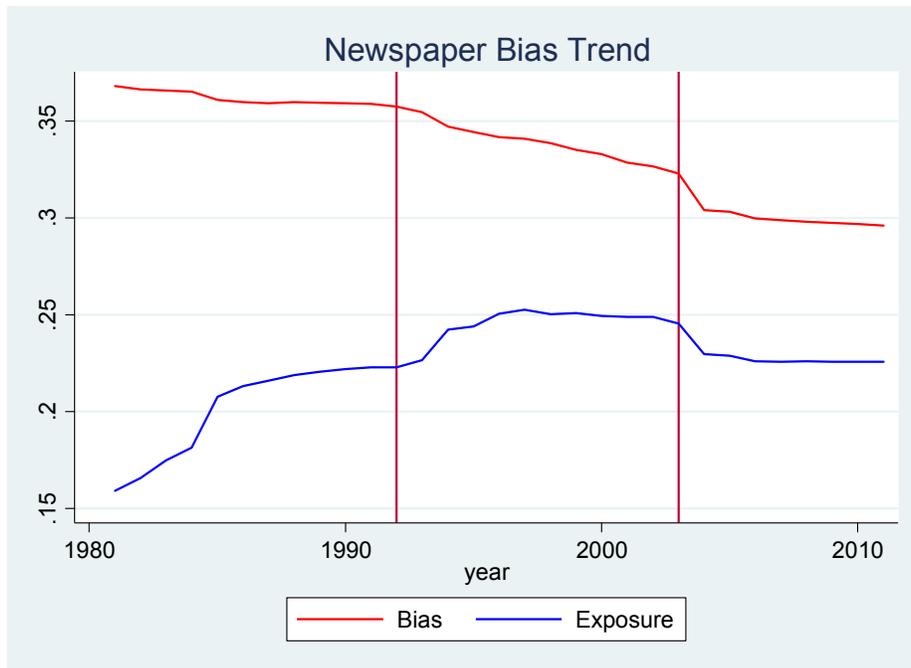
Notes: All leaders include both national and local leaders. The variable “share of politician coverage” is the share of articles that cover any of the manually-identified politicians in a newspaper. The variable “coverage of manually-identified politicians” is the number of articles that mention any politicians identified by our manual reading. The variable “coverage of automatically-searched political leaders” is the number of articles that mention any political leaders who appear in our keyword search list.

A3.7 Time Trend of Reader Exposure to Bias (Section VI)

Figure A2 below depicts both media bias and readers' exposure to bias, as implied by newspaper entry and exit from 1981 to 2011.¹ Because news content data are available only for the 1999-2010 period, we assume that the bias of newspapers is constant within the newspaper type and owners' administrative level. The red line indicates the average bias across newspapers. It demonstrates an obvious downward trend, particularly after 1990. The implied change in media bias from 1981 to 2011 is 0.08, which corresponds to a decline in the number of articles that cover political leaders from 20% in 1980 to 12.5% in 2011.

The blue line indicates our estimate of readers' average exposure to media bias. Within prefectures, this bias exposure is weighted by each newspaper's expected advertising revenue, whereas across prefectures, it is weighted by population.² The bias exposure initially increases because of the massive entry of Party papers, while it starts to decline in the late 1990s because of the influx of less-biased commercial newspapers. One implication of this trend is that, to the extent that advertising revenues subsidize the entry of highly biased newspapers, readers' exposure to media bias does not necessarily decrease with advertising revenues.

Figure A2. Trend in Newspaper Bias Implied by Entry and Exit



¹ Exit of general-interest newspapers in China was extremely rare during our sample years, except for those county-level Party Dailies that were closed in 2003.

² We calculate the weighted average based on the estimated advertising revenues rather than newspaper circulation because reliable circulation data for Chinese newspapers are not available.

Part 2. Theory Appendix to Media Bias in China

Bei Qin, David Stromberg, and Yanhui Wu

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In this appendix, we formalize the theoretical arguments presented in the paper. We focus on two questions: (1) how competition affects media owners' choice of political bias; and (2) how a politico-economic tradeoff drives the entry of commercial newspapers (as opposed to Party papers). The framework has the following three important features: (i) Consumers have heterogeneous preferences for media bias (propaganda) as opposed to non-political commercial content;¹ (ii) The ownership of newspapers is decentralized to local governments (CCPCs), which have the autonomy to distribute profits and decide the level of bias and the entry of the newspapers under their administration; and (iii) Local governments have a politico-economic dual goal – they care about exposing the audience to biased content (propaganda) and pursuing profits.

These three features match the empirical setting of Chinese newspaper. The first feature is consistent with readership survey evidence.² The last two features regarding ownership are as discussed in Section 2 of the paper, and numerous case studies regarding differences in local governments' political valuation of propaganda can be found in Zhao (1998, 2008) and Lei (2016), among others.

Features (i) and (ii) described above define a problem analogous to a product-positioning problem in the IO literature where a firm designs its product to attract consumers with different levels of willingness to pay for brands or quality. Feature (iii) implies that a Chinese local government itself has a preference for the characteristic of a product (media bias) in addition to monetary payoffs.

Regarding feature (iii), we also assume that the political valuation of media bias differs across local governments. One micro-founded explanation is that the political value created by bias exposure, such as regime stability, is a public good that can be used non-exclusively by other CCPCs in an area. Further, political effects, such as social unrest or protests, are likely to have geographic spillovers. Thus, a lower-level CCPC which internalizes these spillovers less will value the political goal of bias exposure less than a higher-level CCPC.

¹This is similar to the setup in Mullainathan and Shleifer's (2005) theory of media bias.

²In a randomized readership survey conducted by Western researchers in 2005, 36% of readers in Beijing selected Party Dailies as primary information sources for important news while others viewed commercial papers as more relevant (Stockmann 2011). In another survey conducted by the Beijing Bureau of Statistics in 2007, 53.6% of the surveyees reported that they read Beijing Evening most frequently, while 17.1% ranked Beijing Daily as their primary newspaper (Beijing Public Opinion Research Center 2007).

This is analogous to the argument in the study of federalism (e.g., Oates 1972; Inman and Rubinfeld 1997), in which local governments internalize less of the externalities of national security.

To facilitate the analysis, we make two further assumptions. First, a newspaper's profit consists of advertising revenues determined by the size of readership. This assumption is reasonable because subscription and retail prices of Chinese newspapers are fixed by regulation, and revenues from circulation only account for a small fraction of a newspaper's total revenues. Second, readers are single-homing and consume either one or no newspaper. As long as consumers are not perfect multi-homing in the sense that they consume all available papers in exactly the same way, the basic results presented below will hold as discussed later. The key factor that drives the mechanism of the model is the existence of a critical mass of readers who switch from reading a party paper to reading a commercial paper if both are available.

The analysis below consists of two parts. In the first part, we endogenize a newspaper owner's selection of bias for one or multiple newspapers. The primary purpose of this part is to discuss the underlying factors that drive the politico-economic tradeoff in producing media bias, based on which we demonstrate an empirically-relevant strategy that the Chinese government uses to mitigate the tradeoff and illustrate how competition affects it. In the second part, we endogenize the entry of both commercial and party papers whose bias levels are restricted to fixed positions. Using this simpler setup, we analyze the dynamics of market structure and the resulting media bias to which the audience in a market is exposed.

1 Product Differentiation and Competition

1.1 Model Setup

Consumers and Demand. There exists a continuum of consumers, each with a newspaper-content blisspoint, b_i , which is uniformly distributed on $[-\frac{1}{2}, \frac{1}{2}]$. On this continuum, a position closer to $\frac{1}{2}$ indicates a stronger political preference for the CCP mouthpiece content (e.g., propaganda), while a position closer to $-\frac{1}{2}$ indicates a preference for commercial content (e.g., entertainment). Consumers who prefer commercial content have an aversion to a newspaper full of reports about government officials and political slogans, while some other consumers, such as CCP cadres or employees in public sectors, dislike newspapers that publish "no serious stuff." A consumer with blisspoint b_i derives the following utility from a newspaper, n , at position b_n :

$$u(b_i, b_n) = \frac{1}{2} - |b_i - b_n|.$$

Here, the utility of consuming a newspaper depends on the match between the consumer's own preferred position and the newspaper's position, as in Mullainathan and Shleifer (2005).

Without loss of generality, let $b_n \in [0, \frac{1}{2}]$. The market demand for a monopolistic news-

paper located at b_n is

$$X(b_n) = 1 - b_n.$$

To maximize demand, this newspaper locates its position at the center and covers the entire market: $X(0) = 1$.

Newspaper Owners' Objectives. A CCPC has a politico-economic dual goal. When assessing the economic goal, we assume that a newspaper's revenue is proportional to the total value of the advertising market it faces, denoted by R , and that the profit for a newspaper at position b_n is $X(b_n)R$. When assessing the political goal, we assume that the CCPCs blisspoint is $b_n = \frac{1}{2}$. We model a newspaper's political bias, b_n , as the deviation from the profit-maximizing position, $b_n = 0$. We assume that a CCPC values the average bias of newspapers, to which readers in the market are exposed. A newspaper has no political value if it is unbiased ($b_n = 0$), however it will also have no political value if it is highly biased and has no readership.

Consider a market with N newspapers, in which a CCPC, superscripted by J , owns a set of papers N^J . Thus, $N - N^J$ is the number of newspapers owned by other CCPCs. Then, the utility of $CCPC^J$ is:

$$U^J = \underbrace{\sum_{n \in N^J} X_n(b_n) R}_{\text{revenue}} + \alpha^J \underbrace{\sum_{n \in N} X_n(b_n) b_n}_{\text{political value}}.$$

The parameter α^J measures the weight that $CCPC^J$ places on its political goals.

The second term differentiates the above utility function from a standard firm objective function. This term captures a CCPC's political valuation of media bias. In particular, $X_n(b_n) b_n$ is a measure of bias exposure, which is the product of b_n (bias level) and $X_n(b_n)$ (bias reach). Another feature of this second term is the nature of political value, which is akin to that of a public good (within the CCP). Specifically, if one newspaper of a CCPC exposes readers to biased content, all CCPCs in the market will benefit.

When we later introduce multiple levels of CCPCs, we will further assume that the political value has geographic externalities. This is because the negative effects of events that may affect regime stability, such as political unrest and protests, are likely to spill over across regions. Based on this assumption, a higher-level CCPC covers a larger area and internalizes a greater share of spillovers. Hence, it has a larger α^J .³ The purpose of this assumption of political externalities is to provide a micro-foundation for the difference in the political valuation of media bias across different levels of CCPCs.

³To see the geographic externality effect clearly, consider an example of two prefectures, A and B , within a province. A newspaper in prefecture A is located at position x_n and thus generates political value $X_n(x_n) b(x_n)$. The geographical externality means that it also generates political value in prefecture B , for instance, by a factor $\varepsilon \in (0, 1)$ of the effect in prefecture A . In this case, the provincial CCPC's value of the political effect of this newspaper is $(1 + \varepsilon)X_n(x_n) b(x_n)$ because it internalizes the externality on prefecture B .

1.2 Optimal Bias Choice of Monopolistic Owner

Monopolist with One Newspaper. To simplify notation, we drop the superscripts and denote demand X and bias b when no confusion occurs. In this case, $X = 1 - b$, and $U = XR + \alpha Xb$. The first order condition of this concave problem is

$$\frac{dU}{db} = 2\alpha \left(\frac{1}{2} - b \right) - R = 0, \quad (1)$$

which yields the following interior solution:

$$b^* = \frac{1}{2} - \frac{R}{2\alpha}, \text{ for } 0 \leq \frac{R}{\alpha} \leq 1. \quad (2)$$

From (1), when increasing the bias, the monopolist trades off a benefit from a higher level of bias against a loss of audience, which decreases both bias reach and profits. Note that there exists a tradeoff in the selection of bias even if only political effects are considered, since an increase in the level of bias reduces the reach of bias. Economic considerations adds to the cost of reducing the reach of the paper.

In view of (2), the optimal bias position (b) decreases in the size of the advertising market, R , while increasing in the CCPC's political valuation α . This implies that the political bias is lower in areas with larger advertising markets. In the presence of geographic externalities, a lower-level CCPC has a smaller α and produces less-biased newspapers. When the political valuation is sufficiently small relative to advertising revenues, the optimal position is a corner solution $b = 0$, in which case the newspaper maximizes profit, and the political bias disappears.

Monopolist with Two Newspapers. Given the demand structure, it is pointless for the monopolistic CCPC to locate its two newspapers on the same position; the two newspapers differ in their bias. We call the newspaper with a higher bias *Party paper* and the one with lower bias *Commercial paper*, and subscript them with p and c , respectively. The demand for each newspaper is, respectively,

$$X_p = \frac{1}{2} (1 - b_p - b_c), \quad (3)$$

$$X_c = \frac{1}{2} (1 + b_p - b_c). \quad (4)$$

The monopolist chooses a pair of $\{b_p, b_c\}$ to maximize

$$U = R(X_p + X_c) + \alpha(X_p b_p + X_c b_c). \quad (5)$$

The first order conditions are

$$\frac{\partial U}{\partial b_p} = \alpha \left(\frac{1}{2} - b_p \right) = 0, \quad (6)$$

$$\frac{\partial U}{\partial b_c} = \alpha \left(\frac{1}{2} - b_c \right) - R = 0. \quad (7)$$

Given that the Hessian is negatively definite, the optimal solution is:

$$b_p^* = \frac{1}{2}, \quad (8)$$

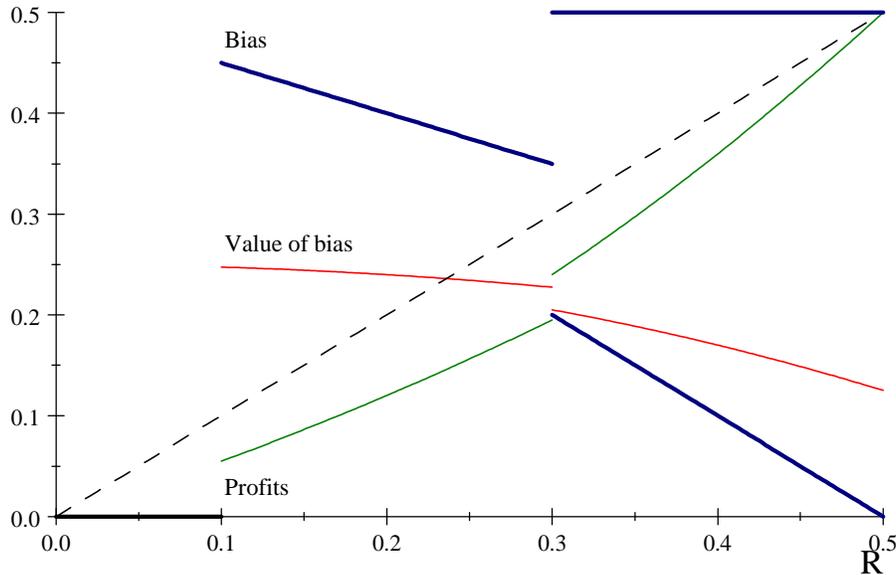
$$b_c^* = \frac{1}{2} - \frac{R}{\alpha}, \text{ for } 0 \leq \frac{R}{\alpha} \leq \frac{1}{2}. \quad (9)$$

In this solution, the bias of the Commercial paper increases in α but decreases in R , the same as in the single newspaper case. More interestingly, the Party paper is now located to the extreme bias position ($b_p^* = \frac{1}{2}$). The first order condition in Equation (6) in fact maximizes the political effects of the bias of the Party paper. The reason is that by reducing bias, the Party paper steals only audience from its sibling commercial paper, and the bias location has no effect on the CCPC's aggregate profits. Given our parametric assumptions, the Party paper optimally selects the maximum level of bias. In general, a maximum bias is not necessarily optimal even if only political effects are considered because the CCPC still needs to consider the tradeoff between the level of bias and the reach of bias.

A comparison between (2) and (9) shows that the Commercial paper is less biased than the monopolistic Party paper ($b_c^* < b^*$). The reason is that the political cost of increasing bias of the Commercial newspaper is lower in the presence of a sibling Party paper because readers of the Party paper are not exposed to the reduced bias; see (1) and (7). In this way, the existence of a commercial newspaper entirely relieves the Party paper from commercial concerns, and the existence of a Party paper reduces the commercial newspaper's political concerns.

As a result of this product differentiation strategy, the CCPC achieves a higher level of utility when it produces two newspapers rather than a single newspaper. This is analogous to the classic IO problems of market segmentation or brand differentiation in which firms charge different prices (vertical differentiation) or use different brands (horizontal differentiation) to extract more surplus from consumers with different levels of willingness to pay for quality or brands. The distinct feature of our model is that the CCPC also cares about which product (what level of media bias) that its customers consume. This political feature enhances the incentive of product differentiation because the political entity, compared to a profit-maximizing firm, is less willing to provide commercial products.

Fixed Cost and Market Entry. Suppose that c_i is the fixed cost of starting the i th paper. The CCPC will enter with a first (Party) paper when $U_p(b^*) \geq c_1$. It will enter with



the second (Commercial) paper when $U_{pc}(b_p^*, b_c^*) - U_p(b^*) \geq c_2$.⁴ The figure above shows the equilibrium. The blue lines describe newspaper bias. Initially, the advertising market is small, and a highly biased newspaper first enters the market. As the advertising market grows, this newspaper becomes less biased, following Equation (2). When the advertising market is large enough, the CCPC will launch a second paper. The two papers will then be differentiated, with one highly biased paper driven entirely by political goals, and the other substantially less-biased to target the commercial audience. When the advertising market keeps growing to a certain high level, complete differentiation will emerge: the Party paper reaches the maximum level of bias and the commercial paper becomes a profit-maximizing and unbiased paper.

1.3 Exit of Competing County Papers

One important part of our empirical investigation is to examine the effect of the reform in 2003, during which the central government closed most county-level Party papers, on the content and bias of newspapers owned by higher-level CCPCs. We amend the above model to address this issue.

Suppose that, in addition to the above two newspapers, a county-level Party paper (with subscript cp) is exogenously located at a position b_{cp} between b_p^* and b_c^* . This aligns the strong evidence that lower-level newspapers are less-biased, which is presented in the paper, and the anecdotal evidence that many county Party papers publish less propaganda content than higher-level Party papers.

Now, the (prefectural) market has three papers. The two higher-level papers (*H-Party*

⁴ $U_p(b^*) = \frac{1}{4\alpha}(R + \alpha)^2$, $U_{pc}(b_p^*, b_c^*) = \frac{1}{8\alpha}(2R + \alpha)^2$ and $U_{pc}(b_p^*, b_c^*) - U_p(b^*) = \frac{1}{8\alpha}(2R^2 - \alpha^2)$.

and *H-Commercial*) operate in the entire prefectural market while the lower-level paper (*L-Party*) operates in a county within the prefecture. Suppose that the county market occupies a share s of the entire prefecture, and that the distribution of consumer preferences in the county market is the same as in the prefectural market. Then, the demand for each of the three newspapers in this county market, respectively, is:

$$\begin{aligned}\tilde{X}_p &= \frac{1}{2}(1 - b_p - b_{pc}), \\ \tilde{X}_c &= \frac{1}{2}(1 - b_c + b_{pc}), \\ \tilde{X}_{cp} &= \frac{1}{2}(b_p - b_c).\end{aligned}$$

The demand in the prefectural market excluding the county market (a share of $1 - s$) is described previously by (3) and (4). The prefectural CCPC cares about revenues from its own newspaper but bias exposure from all newspapers because of the assumption of media bias as public goods. In the county where three newspapers compete, the prefectural CCPC's utility is:

$$\tilde{U} = R(\tilde{X}_p + \tilde{X}_c) + \alpha(\tilde{X}_p b_p + \tilde{X}_c b_c + \tilde{X}_{cp} b_{cp}),$$

whereas in the remaining part, its utility U is as described in (5). The CCPC chooses the bias locations of its two newspapers to maximize

$$s\tilde{U} + (1 - s)U.$$

The optimal solution is:

$$\begin{aligned}\tilde{b}_p^* &= b_p^* - s\frac{R}{2\alpha}, \\ \tilde{b}_c^* &= b_c^* + s\frac{R}{2\alpha}.\end{aligned}$$

From this solution, it is clear that the presence of the county Party paper reduces the prefectural CCPC's incentive to differentiate its two products. Intuitively, by reducing its bias, *H-Party* now steals audience also from *L-Party*, which increases profits. Therefore, *H-Party* starts to care about economic profits, not just bias exposure. Similarly, *H-Commercial* will move closer to *L-Party* to mitigate the business-stealing effect imposed by this competitor. Note that if $s = 0$, the bias of either *H-Party* or *H-Commercial* will be unaffected by *L-Party* at all. This implies that a finding that the exit of *L-Party* has a significant impact on the bias of both *H-Party* and *H-Commercial* will suggest that three papers are indeed competing in the same market.

We summarize the above analysis in the proposition below.

Proposition 1 (*Product differentiation*) *Consider a CCPC with a dual politico-economic goal that chooses the degree of bias of its newspapers.*

- a. When the advertising market is sufficiently large, the CCPC will run two differentiated newspapers: a highly biased Party paper targeting exclusively political goals and a low-biased Commercial paper targeting primarily economic goals.
- b. The exit of a paper owned by another CCPC that is positioned between the party and commercial papers will increase the differentiation between the two existing papers.
- c. Newspaper bias weakly decreases with the size of the advertising market and weakly increases with the political valuation of media bias.

2 Newspaper Entry and Market Dynamics

In the paper, we show that the type of newspaper (Party versus Commercial) accounts for a large variation in newspaper bias both across regions and over time. Thus, the entry decisions of newspapers are important for understanding bias exposure in China. In this section, we study the location strategy of multiple owners, each producing multiple newspapers. It is well-known that equilibria are not tractable in a continuous Hotelling model when competing locations are more than two (e.g., Lerner and Singer 1937). Thus, we discretize a newspaper's choice set of bias location to make the analysis tractable.

2.1 Model Setup

Suppose that two CCPCs compete in a market: one at a higher level, $J = H$, and one at a lower level, $J = L$. To save on notation, we will refer to $CCPC^H$ simply as H and $CCPC^L$ as L . To capture that the higher-level CCPC internalizes more of the political benefits, we assume that $\alpha^H > \alpha^L$. The two CCPCs non-cooperatively decide whether to launch a newspaper and what type of newspaper to launch. A newspaper's position is assumed to be a binary choice: $b_n \in \{0, \frac{1}{2}\}$. As before, the paper with $b_n = \frac{1}{2}$ is referred to as *Party paper*, and the other with $b_n = 0$ as *Commercial paper*. We subscript them with P and C when necessary.

Because there are only two fixed formats, we depart from the specific preference distribution on the Hotelling line and directly discuss consumer preferences in a more general way. This variant simplifies the analysis and provides a handy way to discuss alternative assumptions regarding consumer preferences. Given the fixed prices of newspapers, readers can be divided into three categories based on their preference ordering:

$$\begin{aligned}
 \textit{Party Cadres} & : \textit{Party Paper} \succ \textit{Commercial Paper} \succ \textit{No Paper} \\
 \textit{Commercial Audience} & : \textit{Commercial Paper} \succ \textit{No Paper} \succ \textit{Party Paper} \\
 \textit{Switchers} & : \textit{Commercial Paper} \succ \textit{Party Paper} \succ \textit{No Paper}.
 \end{aligned}$$

We denote the share of *Party Cadres*, *Commercial Audience*, and *Switchers* with d_p, d_c

and d_s , respectively. For an illustrative purpose, we assume that the size of these groups is $(d_p, d_s, d_c) = (\frac{1}{4}, \frac{1}{4}, \frac{1}{2})$, which can be obtained by calculating the demand for the two newspapers located at $\{0, \frac{1}{2}\}$ on the Hotelling line. This numerical assumption is made to simplify the analysis, and the basic results hold as long as $d_s > 0$. In the case that $d_s = 0$, the markets of Party papers and of Commercial papers are completely segmented. Recall that we also assume that each reader only purchases one newspaper. It is possible that some readers read both papers if available. One extreme case is perfect multi-homing (i.e., all switchers buy both papers if available), in which the demand for a Party paper is $d'_p = d_p + d_s$ and the demand for a Commercial paper is $d'_c = d_s + d_c$. Under either complete market segmentation or perfect multi-homing, the demand for each newspaper type is independent of what other newspaper types are offered. As will be discussed, these two alternative demand structures deliver different empirical implications than what we present below.

2.2 Analysis

To capture the development of the Chinese newspaper market, we model newspaper entry in response to the growth of advertising markets. The two CCPCs non-cooperatively decide (1) whether to launch a newspaper and (2) what type of newspaper to launch. The analysis proceeds sequentially: we start with a zero-newspaper situation in which we identify the first newspaper entry. Given this first newspaper, we then consider which newspaper would enter next, and so on. To simplify the analysis, we make several technical assumptions. First, after paying a fixed cost c , a CCPC chooses a newspaper type with which to enter the market. The cost of changing the newspaper format is high enough that a newspaper never relocates. Second, when determining market entry, newspapers only consider current profits without strategically deterring future entry. This assumption is reasonable because local politicians who control newspapers are subject to frequent promotion evaluation and usually have a short time horizon. Third, to avoid uninteresting cases with only commercial newspapers in the market, we assume that the valuation of political bias is above a minimum threshold: $\alpha^H > c$.

To describe the newspaper types, we use a set of letters $\{P, C, p, c\}$, where the letter indicates whether there is a Party or Commercial newspaper, and the case indicates whether the upper or lower level runs the paper. We use a sequence of these symbols to represent the sequence of newspaper entry. For example, $PpcC$ means the following entry sequence: first *H-Party*, then *L-Party*, followed by *L-Commercial*, and finally *H-Commercial*. A market structure M is similarly described. For instance, $M = Pc$ means that an *H-Party* and a *L-Commercial* coexist in the market. We use the notation U_M^J to describe the utility of CCPC J under market structure M .

Round 1: No Newspapers $\rightarrow P$. Absent any existing newspapers, $CCPC^J$ obtains

the following payoffs by launching a newspaper of type P or C , respectively:

$$\begin{aligned} U_P^J &= (d_p + d_s)(R + \alpha^J), \\ U_C^J &= (d_p + d_s + d_c)R. \end{aligned}$$

Without competing products, the $CCPC$ that launches a Party paper obtains both advertising revenues and political benefits. If launching a Commercial paper instead, it will receive greater economic benefits but no political benefits. A newspaper will enter the market when R is large enough so that U_P^J or U_C^J exceeds the fixed cost of entry, c . Furthermore, if $\alpha^J > c$, the condition $U_P^J > c$ will be satisfied at a lower value of R , and the first entrant will be a Party paper.⁵ Since we assume $\alpha^H > \alpha^L$ and $\alpha^H > c$, the higher-level $CCPC$ will enter the market first with a Party paper. Specifically, the entry condition of the first newspaper in a market is:

$$U_P^J = (d_p + d_s)(R + \alpha^J) \geq c, \quad (10)$$

which is easier to be satisfied for $CCPC^H$. Intuitively, given that the advertising market is small at the first entry, the political value created by the Party paper is higher than the additional advertising revenue created by the Commercial paper. Because the higher-level $CCPC$ internalizes more of the geographic externality, it values the political bias more and will enter the market first.

Round 2: One Incumbent H-Party Paper (P). The market now has an incumbent Party paper produced by $CCPC^H$. Since $d_s > 0$ so that the Party and Commercial newspaper markets are not perfectly segregated, a $CCPC$ faces a trade-off when introducing a new product. Given the existence of a high-level Party paper, launching a Commercial paper yields to $CCPC^H$ a payoff: $U_{PC}^H = (d_p + d_s + d_c)R + d_p\alpha^H$. The benefit is market expansion – the inclusion of the commercial audience who previously did not read any newspapers and now read the commercial paper. However, the production of the commercial paper incurs a political cost as it attracts switchers from the Party paper, which reduces the exposure of political bias. Thus, $CCPC^H$ benefits from starting a commercial paper if

$$U_{PC}^H - U_P^H = \underbrace{d_c R}_{\text{market expansion}} - \underbrace{d_s \alpha^H}_{\text{political cost}} \geq c. \quad (11)$$

In comparison, $CCPC^L$ launches a commercial paper if

$$U_{PC}^L - U_P^L = \underbrace{d_c R}_{\text{market expansion}} + \underbrace{d_s R}_{\text{business stealing}} - \underbrace{d_s \alpha^L}_{\text{political cost}} \geq c. \quad (12)$$

This condition shows that in addition to the market expansion effect, the entry of L -Commercial

⁵To see this result more clearly, let R_P be the cutoff value of R that satisfies $U_P^J(R_P) = c$ and R_C be defined by $U_C^J(R_C) = c$. Then, H will enter first with a Party paper if $R_P < R_C$. Plugging these conditions in the two equations for U_P^J and U_C^J gives the result $\alpha^J > c$.

steals business from the incumbent *H-Party* and also imposes a political cost on $CCPC^L$ because it destroys part of the political value (the public good) that was created by *H-Party*. Given that $d_s > 0$ and $\alpha^L < \alpha^H$, $CCPC^L$ has a stronger incentive to launch a Commercial paper than $CCPC^H$.

Instead of a Commercial paper, $CCPC^L$ can launch a Party paper. This decision will be made if

$$U_{Pp}^L - U_P^L = \underbrace{\frac{1}{2}(d_p + d_s)R}_{\text{business stealing}} \geq c. \quad (13)$$

Here, no market expansion effect occurs because the new newspaper type is the same as the incumbent *H-Party*. Because of the public-good characteristic of the political value generated by *H*, the entry of *L-Party* does not create additional political value for $CCPC^L$. A comparison between (12) and (13) reveals that *L* will launch a Commercial paper if the market expansion effect dominates the political cost. Formally, *L-Commercial* will enter the market earlier than *L-Party* if $\alpha^L < 8c$, that is, the political value of bias is sufficiently low for *L*.⁶

Final Rounds, Case 1: ($Pp \rightarrow Ppc \rightarrow PpcC$). In this case, there are two Party papers in the market. The incentive to introduce a Commercial paper is symmetric between *H* and *L*. The benefit for either of them to introduce a Commercial paper is

$$U_{Pp(C \text{ or } c)}^J - U_{Pp}^J = \left(d_c + \frac{1}{2}d_s\right)R - d_s\alpha^J.$$

Launching a Commercial paper by either $CCPC$ results in market expansion d_c and business stealing $\frac{1}{2}d_s$ as well as a political cost $d_s\alpha^J$. Because it has a lower valuation of the political cost, *L* will launch a Commercial paper first. Finally, *H* enters with a Commercial paper when $\frac{1}{2}(d_s + d_c)R \geq c$.

Final Rounds, Case 2: ($Pc \rightarrow PcC \rightarrow PcCp$). In the second case, *H-Party* and *L-Commercial* are in the market. Additional newspapers will only affect profits, and the profit increment resulting from launching a commercial paper is greater. Hence, *H* will launch a Commercial paper before *L* launches a Party paper. This will occur when $\frac{1}{2}(d_s + d_c)R \geq c$. Following the entry of *H-Commercial*, *L* will enter with a Party paper when $\frac{d_p}{2}R \geq c$.

2.3 Equilibrium

The following proposition characterizes the equilibrium entry pattern derived from the analysis above.

Proposition 2 (*Vertical competition and market entry*) *Consider a market with a higher-level CCPC and a lower-level CCPC. Each can produce a Party and/or a Commercial*

⁶To see this result more clearly, let R_{Pc} be the cutoff value of R that precisely makes inequality (12) binding and let R_{Pp} the cutoff value of R that makes inequality (13) binding. Then, $R_{Pc} < R_{Pp}$ implies $\alpha^L < 8c$.

paper.

- a. The first Party paper in the market will be owned by the higher-level CCPC
- b. The first Commercial paper in the market will be owned by the lower-level CCPC.
- c. Competition between CCPCs facilitates the entry of Commercial papers.
- d. There are two equilibrium newspaper entry sequences: PpC and $PcCp$, where the letter indicates whether there is a Party or Commercial paper and the case indicates whether the paper is run by the upper- or lower- level CCPC.

Point c above is worth noting. It means that the entry of the first Commercial newspaper in a market where H and L compete happens at a lower R than if either CCPC were a monopolist. This can be seen by comparing Equations (11) and (12). In Equation (11), a monopolistic CCPC trades off the market expansion effect against the political cost. In (12), because of the existence of an incumbent competing Party paper, an additional business stealing effect occurs, which induces L to introduce a Commercial paper earlier than if it had been a monopolist. Similarly, the existence of L -Commercial will spur the entry of H -Commercial, because the political cost of having a Commercial paper in the market has already been inflicted.

Proposition 2 describes why both the hierarchical structure and competition hinder the fulfillment of political goals. The hierarchical structure matters because the CCPC with the minimum political valuation in a market will be the first to enter with a Commercial paper, which steals readership from the Party paper and reduces its political impact. Competition hinders the achievement of political goals because the business stealing effect induces the early entry of Commercial papers.

In most non-capital prefectures in China, the lower-level (county) CCPC runs only Party newspapers, while the higher-level (prefecture) CCPC may also run Commercial newspapers. In this more-restricted setting, the mechanisms that drive newspaper entry can be summarized as follows.

Proposition 3 (*Politico-economic factors and market entry*) Consider a market with a higher-level and a lower-level CCPCs. Suppose that the higher-level CCPC can produce both Party and Commercial newspapers while the lower-level CCPC can produce only a Party newspaper. The political valuation of media bias

- a. facilitates the entry of H -Party.
- b. hinders the entry of H -Commercial.
- c. has no effect on the entry of L -Party.

Proof. For the same reason as before, the first paper will be a Party paper launched by H . The possible entry sequences are PCp and PpC .

Absent any existing newspaper, launching a party newspaper yields a double dividend of both political and economic benefits. The entry condition is described by inequality (10),

which is easier to satisfy when α^H is larger. Thus, the entry of the first paper, *H-Party*, is facilitated by political valuation α^H .

If *H-Commercial* enters earlier than *L-Party*, its entry decision is described by inequality (11). If *H-Commercial* enters after *L-Party*, H's decision is described by an inequality with the same terms, only adding a business stealing effect ($\frac{1}{2}d_p R$), which captures the audience it steals from *L-Party*. In both cases, the entry of the Commercial newspaper imposes a political cost ($d_s \alpha^H$), and thus the entry of *H-Commercial* is hindered by a higher political valuation α^H .

The benefits of entering with a *L-Party* are $\frac{1}{2}d_p$ if *H-Commercial* is in the market and $\frac{1}{2}(d_p + d_s)$ if it is not. The entry of *L-Party* is unaffected by political valuation α^L . This is a direct consequence of the assumption that the political value is a public good and the fact that it was already provided by the higher-level Party newspaper. ■

An empirically important point is that advertising revenues may cross-subsidize media bias. This is because larger advertising revenues allow a CCPC to subsidize the entry of highly-biased Party papers. Although the political value of a newspaper is lower than the cost of entry, an increase in advertising revenues will induce the CCPC to launch the first Party paper; see Equation (10) again. Thus, the expansion of advertising markets may fuel the growth of propaganda outlets.

3 Alternative Demand Structure

We now discuss the two alternative demand structures that we mentioned before. If markets are completely segmented between the two newspaper types ($d_s = 0$) or if there is perfect multi-homing (i.e., all readers consume both Party and commercial papers in exactly the same manner), then the *Party* paper will not lose any of its audience in the presence of commercial papers, and vice versa. In this case, the competition effect described in Proposition 1 is not expected. Furthermore, because there is neither business stealing nor political costs of launching a commercial newspaper, *H* and *L* have equal incentives to start the commercial paper. The newspaper entry sequence predicted in Proposition 2 will not hold. Neither will the result that the political valuation of media bias hinders the entry of commercial papers presented in Proposition 3.

Consider a weaker format of multi-homing: only some readers consume both types of papers or readers consume both papers but in an asymmetric way because of limited time or attention. In this case, the advertising revenue and the political effect of media bias caused by the change of Switchers will be smaller, and thus the politico-economic tradeoff will be mitigated to some extent. Formally, we can assign a discount factor $\delta < 1$ to the political and economic effects of media bias under imperfect multi-homing. Then, d_s in the model above can be replaced by δd_s . As long as $\delta \neq 0$ and $d_s \neq 0$, the conclusion that *L* has a stronger incentive to launch a Commercial paper than *H* remains true.

In sum, if the markets are completely segmented or if there is perfect multi-homing, the predictions in Propositions 1-3 will not be observed. In other words, empirical evidence consistent with Propositions 1-3 will reject these two alternative conjectures of demand structure, in favor of our theoretical arguments.

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