Authority, Incentives and Performance: Theory and Evidence from a Chinese Newspaper

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Abstract

Authority defines the formal structure of an organization, and is essential for the allocation of resources inside the firm. This paper develops a theory of authority in a multiple layer hierarchy, and provides evidence of workers' incentives and performance under two basic organizational forms — centralization and decentralization. I collect monthly personnel data of about 200 journalists over 3 years from a Chinese newspaper, and estimate the impact of an organizational reform from decentralizing to centralizing editorial decisions on their individual performance. I find that centralization improves the quality of the journalists' performance, in terms of the newspaper's internal assessment and the external measures of news content. Meanwhile, centralization reduces the journalists' attainment of private benefits, and the editorial activities conducted by managing editors. These results are in line with the theory, in which the distribution of formal authority affects workers' incentives in acquiring information to attain real authority, and a more centralized hierarchy gains from better control of workers' opportunistic behaviour, at the cost of depressing their initiative.

Key Words: Authority, Organizational Structure, Incentives, Information, Action Distortion, Decision Bias, Media Bias

JEL Classifications: D2 J5 L2 M5

1 Introduction

Authority, the power of a superior to select actions or decisions for her subordinates, is the core of hierarchy, defining the boundary of the firm (Coase 1937), the nature of an employment contract (Simon 1951), and the structure of an organization (Weber 1922[1968], Simon 1947, Arrow 1974). Recent empirical research strongly suggests the relevance of the internal allocation of authority to economic performance at the micro level, echoing the insights from the history of industrial enterprise (Chandler 1962) and from modern business strategies (Roberts 2004, Besanko et al 2010).[1] Despite the burgeoning research interest, we lack a rigorous empirical understanding of how the allocation of authority affects workers' performance.

In this paper, I collect personnel data of monthly observations from about 200 reporters in a leading commercial Chinese newspaper (the Newspaper hereafter) from 2004 to 2006. I estimate causal effects of organizational structure on individual performance, relying on an unexpected organizational reform from decentralization to centralization in some divisions of the Newspaper. In line with the view that regards authority as a device to provide incentives and control opportunistic behavior, the empirical findings shed new light on a basic inquiry about hierarchy: how does organizational structure, defined by the distribution of authority, affect workers' incentives to allocate resources and the resulting economic outcome? [2]

The essence of the incentives view of authority lies in the separation of formal authority (nominal control rights) and real authority (effective control), as the former is not fully enforceable. The allocation of formal authority affects agents' performance by changing their incentives to obtain resources that permit real authority. An influential theory along this line is advocated by Aghion and Tirole (1997), who formalize the idea that the distribution of real authority is determined by information structure, which in turn depends on the contractible arrangement of formal authority.

Based on the Aghion and Tirole framework, I build a theoretical model of authority, in which agents have dual agency problems: 1) action distortion caused by the distraction of private activities before information is acquired, and 2) selection distortion caused by decision bias after information is acquired. Centralization, under which a principal retains the right of overruling an agent's decisions and the right of directing an agent's actions, exerts two opposite forces on an agent's incentives: an effort-directing effect due to alleviation

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[1] For recent empirical studies on organizational structure and performance, see Rajan and Wulf (2006), Acemoglu et al (2007), Bloom and Van Reenen (2007), Csaszar (2008), Bloom, Sadun and Van Reenen (2009), and Guadalupe and Wulf (2010).

[2] The incentives view of authority is discussed in Weber (1922[1968]) and Williamson (1985). For recent theoretical inquiry along this line, see Qian (1994), Aghion and Tirole (1997), Baker, Gibbons and Murphy (1999), Rajan and Zingales (1998, 2001), Prendergast (1995, 2002) among many others. Mookherjee (2006) surveys the literature on organizational structure and incentives from the perspective of mechanism design. Another influencial view of hierarchy emphasizes authority as a device to coordinate behavior, beliefs and decisions among agents; recent theoretical contributions include Radner (1993), Bolton and Dewatripont (1994), van Zandt (1999), Garicano (2000), Dessein (2002), and Alonso, Dessein and Matouschek (2008) among others.

of his action distortion and an initiative-depressing effect due to control of his selection distortion. I extend the analysis to a three-layer, principal-manager-worker, hierarchy. A change of organizational structure will trigger a chain of response. More control at the top may depress the manager's initiative, which in turn promotes the initiative of her subordinate — the worker. Thus, the impact of organizational structure on the agents' incentives and performance crucially depends on two factors: 1) the nature of the agency problems, and 2) the agents' relative positions along the line of formal authority.

The institutional setting of the Newspaper provides a rare opportunity to examine the theory. Making editorial decisions regarding the choice of news subjects and the selection of articles is the key task in the production of news content. Information, the essential input, determines the execution of editorial decisions. For example, a reporter, though supervised by an editor, often decides the selection and implementation of an investigative report, in which he has more information than the editor. Therefore, the allocation of formal authority over editorial decisions affects incentives through the impact on the distribution of information and thus real authority among chief editors, middle managers (division directors and managing editors), and reporters. Moreover, journalists, in particular reporters, have substantial discretion in their actions, and are likely to divert their efforts to pursue private benefits such as a "grey income" and business opportunities, which are potentially large in the Chinese media.

With the commercialization of the Chinese media, the Newspaper experimented with a decentralized organization, in which editorial power is delegated to middle managers, in early 2000. In September 2005, the Newspaper unexpectedly centralized editorial power in four divisions: Economic and Business, Politics and Law, Education and Health, and General Reports, by creating an editing center headed by chief editors to monitor editorial decisions more closely, while leaving other divisions (Local and Regional News, Entertainment, Consumption-Guide and Photographing) decentralized. The exogeneity of the reform timing and the adoption of different organizational forms inside the Newspaper allow me to establish causality using a difference-in-differences estimator. The stability of other institutional aspects such as the pay scheme, the evaluation system, and the volume of news content helps to relieve concerns of a number of confounding factors.

The empirical analysis draws on rich personnel information and performance measures. Exploiting the internal records from the Newspaper, I match the reporters' personal characteristics to the monthly observations of their performance in both quantity and quality, which are accurately measured to serve as a basis for their pay. Moreover, I hire a team of research assistants to code the news content of all the articles written by each reporter based on publicly available archives over the sample years, to directly measure the reporters' initiative and the middle managers' editorial activities. These external measures are constructed under the close supervision of experts in content analysis and Chinese journalism, and provide a reliable data source.

I employ the difference-in-differences approach to estimate the effects of the organizational reform on the reporters' internal performance measures. Three main findings are as follows. First, centralization on average improves the quality measure of the reporters' performance by a magnitude of 20%. Second, heterogeneous treatment effects show that centralization has a larger positive effect on the performance of those reporters who have access to more private benefits. For instance, the reporters specializing in economic and business coverage respond to the reform far more than those who report government routines. Relative to the other months, the impact of centralization on the reporters' performance is much smaller in the special months of the Chinese New Year and the Mid Autumn Festival, when social norms condone rent seeking behavior. Third, the pattern of individual fixed effects suggests that the reporters who leave the Newspaper after the reform are less incentivized for the Newspaper's journalism activities, relative to those who remain. The last two results strongly support the explanation that centralization promotes the reporters' initiative by directing their efforts from pursuing private benefits to journalism activities.

I then examine the effects of centralization on the external measures of news content and editorial activities. Centralization increases significantly the number of investigative reports and feature stories, which require substantial initiative and endeavor from the reporters. Meanwhile, the attainment of private benefits, measured by the number of advertising-type articles, declines drastically after the reform. This result verifies the effort-directing effect. Moreover, centralization reduces the number of articles originated by or co-authored with managing editors, demonstrating initiative substitution between the reporters and the middle managers. Together with the previous results, the empirical findings are in line with the theory of authority and incentives that I develop.

To my knowledge, this paper is the first empirical study that examines the basic theoretical argument that organizational structure affects workers' performance through the redistribution of real authority and the resulting changes in their incentives for ex ante investments, notably information acquisition. One particular contribution is to spell out the nature of agency problems and highlight the effects of organizational structure as a consequence of strategic interactions among players at different positions in a hierarchy. This enriches the existing studies of authority and incentives, in the spirit of the subeconomy view of the firm (Holmstrom and Milgrom 1994, Holmstrom 1999).

My paper is also related to the emerging literature that combines rigorous econometric methods and personnel data to achieve a more profound understanding of internal labor market and the resource allocation mechanism inside organizations.[3] The existing studies cover a wide range of topics in labor economics and industrial organization.[4] However, the

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[3] The literature is referred to as personnel economics, or sometimes as insider econometrics. Baker et al (1994), Lazear (2000b), Lazear and Oyer (2009), and Ichniowski and Shaw (2009) provide excellent introduction and surveys.

[4] For example, Lazear (2000a), Shearer (2004) and Bandiera et al 2007) study pay contracts and productivity; Ichniowski et al (1997) and Gant et al (2002) study human resource management and firm performance; Hertzberg et al (2010) study communication and incentives.

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research of organizational structure is very limited in this literature. The current paper and my follow-up research are devoted to filling this gap.

Additionally, my research contributes to the limited economic understanding of media bias. Although not able to define and specify media bias, the significant impact of the organizational reform on the composition of news content suggests that organizational structure can be a source of persistent media bias, as pointed out by Herman and Chomsky (1998). This complements the existing explanations for media bias that focus on ownership (Djankov et al 2003, Besley and Prat 2006), and on consumer demand and market structure (George and Waldfogel 2003, Mullainathan and Shleifer 2005, Gentzkow and Shapiro 2006, 2010).

The rest of the paper is organized as follows. The next section presents a simple theoretical model of authority and incentives. Section 3 describes the institutional setting and data. Section 4 explains the empirical strategies. Section 5 presents the main empirical results. Section 6 provides further evidence that sheds light on the mechanism and discriminates potential alternative explanations. Section 7 concludes. Proofs and extended theoretical analysis, details about data collection, and additional empirical results are relegated to the web appendix.[5]

2   A Theory of Authority and Incentives

This section presents a simple theory of authority in a principal-manager-worker hierarchy. As in Aghion and Tirole (1997), real authority (the effective control) is determined by the structure of information, which in turn depends on the distribution of formal authority (the norminal control). In the presence of decision bias in selecting projects due to interest misalignment, a more centralized hierarchy restricts an agent's real authority to fulfill her own preferences, giving rise to a trade-off between better control and depressing initiative. I depart from the Aghion and Tirole model in two dimensions. First, the attainment of authority permits two rights: 1) directing actions of an agent who distorts his actions in information acquisition, and 2) overuling decisions of an agent who makes biased decisions in project selection. Second, the introduction of multiple layers in a hierarchy allows a chain of response, highlighting the importance of relative hierarchical positions in the provision of incentives.

To focus on the essential function of organizational structure, I abstract away from the role of performance pay, which is a pronounced institutional feature in the Newspaper. The main results in the model remain qualitatively true even if performance is contractible, as shown in the web appendix.

2.1   The Model

An organization owned by a principal (chief editor, she) selects one project (a news report) to implement at a time. A manager (managing editor, she) and a worker (reporter, he)

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are employed to search for projects. The hierarchy is defined by the distribution of formal authority: the principal has formal authority over the manager, who in turn has formal authority over the worker.

Projects. There exist a variety of projects, which generate different values to each party. For instance, a chief editor, a managing editor and a reporter may have a different preference ordering of the following three types of reports: an investigative report, a sensational story, and an article about a government official. The misalignment of interests can be due to different valuation of journalism, or due to non-verifiable on-the-job benefits.

Information and authority. The selection of projects first of all depends on formal authority. The party at a higher position decides which project to implement and has the right to overrule her subordinate's decision. However, being able to make proper decisions requires information about the projects. An uninformed principal will vest the decision right to a manager, who then makes decisions if informed, but will vest the decision right downwards to the worker if uninformed. The worker effectively decides which project to implement whenever he has information advantages over his supervisors. Hence, what the allocation of formal authority defines is "the right to the last word" , or the sequence of residual claimants of decision right along the hierarchy.

Authority also permits a superior to direct the actions of her subordinate within a certain "acceptance area" (Simon 1951). Again, the realization of this dimension of authority requires information. A subordinate can distort actions for his own purpose if his superior is ignorant.

Contracts and organizational forms. In the spirit of the theory of incomplete contract a là Grossman and Hart (1986) and Hart and Moore (1990), the input and output of production are assumed to be observable but non-verifiable so that the contractible organizational structure plays a central role in inducing ex ante investments — information in this model. I focus on the choice between two organizational forms: decentralization and centralization. Under decentralization, the principal delegates formal authority to the manager and commits not to monitor the agents' activities; under centralization, the principal retains formal authority and the right of monitoring.

Timing of the game. At T_o, the three parties contract on one of the two organizational alternatives and agree on the allocation of formal authority. At T_1, the manager and the worker simultaneously and independently exert efforts to acquire information on the projects. At T_2, the agents propose their projects. Under decentralization, the manager decides which project to select; under centralization, the principal selects a project after reviewing the proposal by an informed manager or the worker's proposal passed by an uninformed manager. At T_3, the selected project is implemented without further costs, output of the organization is produced, and all the benefits are realized with no uncertainty. Figure 2 depicts the timing of the game.

Agency problems. Two agency problems may arise in the production process. The first type is action distortion at T_1, when the agents divert their efforts to private activities.

The second type is selection distortion at T_2, when the agents, after acquiring information, propose their preferred projects that are in conflicts with the principal's interest. The first type is classic moral hazard due to hidden action, also labelled as rent seeking or shirking in the transaction costs economics (Alchian and Demsetz 1972, Williamson 1975). The second type is distortion in decision due to ex post information asymmetry, highlighted by Aghion and Tirole (1997).

Payoffs. Let $i \in \{m, w\}$ denote the manager or the worker. Agent i expends efforts E_i to acquire information about the projects and $1 - E_i$ on private activities. E_i also denote the probability of agent i being informed of the projects. The implementation of a project proposed by agent i delivers $\alpha_i \in (0, 1)$ to the principal, one unit of on-the-job benefit to the agent, and zero to the other agent. Thus α_i is a congruence parameter measuring the interest alignment between the principal and agent i in project selection. An agent with a higher α_i is more likely to select a project at the principal's interest. When conducting private activities, agent i obtains a non-verifiable benefit $b_i \in (0, 1)$, referred to as private benefit. The realization of b_i relies on the ignorance of agent i's superiors, because a subordinate is required to implement the project selected by an informed superior. This implies a monitoring role of an informed superior. Note that I have made two technical assumptions to simply the analysis. First, what b_i represents is the private benefit relative to the on-the-job benefit, which I have normalized to one. Second, I assume that the implementation of one agent's preferred project delivers zero on-the-job benefit to the other agent, to sharpen the conflict between the agents.

For simplicity, all the parties are assumed to be risk neutral. Due to the unavailability of contractible performance, the principal pays a fixed salary s_m to the manager and s_w to the worker, regardless of which project to be implemented. All cost functions of effort will take a quadratic form.

Decentralization. Under decentralization, the principal commits not to intervene. The selection of projects and the resulting payoffs depend on the allocation of formal authority and the information distribution between the two agents.

$$
\begin{aligned}
U_p^D &= E_m \alpha_m + (1 - E_m) E_w \alpha_w - s_m - s_w; \\
U_m^D &= s_m + E_m + (1 - E_m) b_m - \frac{1}{2} E_m^2 ; \\
U_w^D &= s_w + (1 - E_m)[E_w + (1 - E_w) b_w] - \frac{1}{2} E_w^2.
\end{aligned}
$$

(1)

(2)

With probability E_m, the manager is informed and has real authority to select her preferred project, which yields α_m to the principal, one to herself, but zero to the worker. With probability $1 - E_m$, the manager is distracted by the private benefit b_m and vests the decision right to the worker, who will, with probability E_w select his preferred project that yields α_w to the principal, one to himself, but zero to the manager, and with probability $1 - E_w$ realize the private benefit b_w.

6

Centralization. Under centralization, the principal intervenes ex post in two ways: exerts either effort E_{p1}^i to monitor agent i's proposed project or effort E_{p2}^i to control the agent's private activities. First, if agent i has acquired information and proposed a project, the principal, with probability E_{p1}^i, is informed and able to modify the proposed project to obtain one unit of output; with probability $1 - E_{p1}^i$, the principal is uninformed and will rubber stamp the proposal. Second, if agent i has conducted private activities and proposed no project, with probability E_{p2}^i, the principal is informed and will recover a value $\delta_i \in (0,1)$ by directing the agent's private activities to production activities. The parameter δ_i indicates the efficiency of the principal's monitoring of private activities. Then, the payoffs to the three parties are:

$$
\begin{aligned}
U_p^C &= E_m[E_{p1}^m + (1 - E_{p1}^m)\alpha_m - \frac{1}{2}(E_{p1}^m)^2] + (1 - E_m)[E_{p2}^m\delta_m - \frac{1}{2}(E_{p2}^m)^2] \\
&\quad + (1 - E_m)\{E_w[E_{p1}^w + (1 - E_{p1}^w)\alpha_w - \frac{1}{2}(E_{p1}^w)^2] + (1 - E_w)[E_{p2}^w\delta_w - \frac{1}{2}(E_{p2}^w)^2]\} - s_m - s_w;
\end{aligned}
$$

$$
U_m^C = s_m + E_m(1 - E_{p1}^m) + (1 - E_m)(1 - E_{p2}^m)b_m - \frac{1}{2}E_m^2 ; \tag{3}
$$

$$
U_w^C = s_w + (1 - E_m)[E_w(1 - E_{p1}^w) + (1 - E_w)(1 - E_{p2}^w)b_w] - \frac{1}{2}E_w^2. \tag{4}
$$

2.2 Analysis

The above model can be straightforwardly solved by backward induction. Assume the existence of interior solutions. Under decentralization, the first order conditions of (1) and (2) produce a pair of Nash equilibrium efforts of the manager and the worker:

$$
E_m^D = 1 - b_m; \ E_w^D = b_m(1 - b_w).
$$

Agent i' production initiative is motivated by the on-the-job benefit but diverted by the private benefit b_i. The organizational structure that endows the manager formal authority over the worker depresses the worker's initiative by a factor b_m, which indicates her ignorance.

Under centralization, the principal's optimal monitoring efforts are

$$
E_{p1}^i = 1 - \alpha_i \text{ and } E_{p2}^i = \delta_i.
$$

The monitoring of agent i's proposed project is to counter the agent's selection distortion, the extent to which is measured by the congruence parameter α_i. The control of an agent's private activities mitigates the agent's action distortion, and its effectiveness is determined by the technology parameter δ_i. Anticipating the principal's responses, the agents optimize their allocation of efforts according to (3) and (4), leading to the Subgame-Perfect-Nash

equilibrium:

$$
\begin{aligned}
E_m^C &= \alpha_m - (1 - \delta_m)b_m; \\
E_w^C &= [1 - \alpha_m + (1 - \delta_m)b_m][\alpha_w - (1 - \delta_w)b_w].
\end{aligned}
$$

2.2.1 Trade-off between Control and Initiative

An organizational change from decentralization to centralization yields two opposite effects on each agent's incentives. On the one hand, the monitoring of private activities controls the realization of an agent's private benefit, and thus directs his or her effort to production activities. On the other hand, the principal's monitoring of project selection restricts an agent's real authority to choose his or her preferred project, and thus depresses the agent's initiative. Which effect dominates depends on the relative severity of each agency problem.

Condition 1 $\delta_i b_i > 1 - \alpha_i$: *the distraction of the private benefit is more serious than the decision bias in project selection for agent i.*

Given δ_i, this condition means that agent i's main agency problem is action distortion, instead of selection distortion. The benefit from effort directing under centralization tends to outweigh the cost of depressing the agent's initiative. However, the relative position of each agent in the hierarchy generates another trade-off: a decline (or an increase) in the manager's initiative under centralization in turn promotes (or depresses) the worker's initiative, leading to more subtle results.

Proposition 1 *(Average Treatment Effect) The effect of organizational structure on the agents' incentives depends on the nature of their agency problems and their relative positions in the hierarchy.*
1) (Biased Manager and Distracted Worker) If $\delta_m b_m < 1 - \alpha_m$ and $\delta_w b_w > 1 - \alpha_w$, centralization, relative to decentralization, decreases the manager's initiative, but increases the worker's initiative.
2) (Distracted Manager and Biased Worker) If $\delta_m b_m > 1 - \alpha_m$ and $\delta_w b_w < 1 - \alpha_w$, centralization, relative to decentralization, increases the manager's initiative, but decreases worker's initiative.
3) (Biased Manager and Biased Worker) If $\delta_m b_m < 1 - \alpha_m$ and $\delta_w b_w < 1 - \alpha_w$, centralization, relative to decentralization, decreases the manager's initiative, but has ambiguous impact on the worker's initiative.
4) (Distracted Manager and Distracted Worker) If $\delta_w b_w > 1 - \alpha_w$ and $\delta_m b_m > 1 - \alpha_m$, centralization, relative to decentralization, increases the manager's initiative, but has ambiguous impact on the worker's initiative.

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The impact on the worker's incentives depends on the type of the manager and her preference match with the worker's. In the first two cases, the relative severity of agency problems with the manager is opposite to that with the worker. The impact of organizational structure on the agents' incentives is unambiguous and negatively correlated, because the two agents compete for real authority to realize their benefits. In the last two cases, both agents have the same dominant agency problems, and the impact on the worker is less clear-cut.

Proposition 1 provides guidance for optimal choice of organizational structure. For example, if it is more important to alleviate the manager's bias in project selection and encourage the worker to provide effort as in Case 1), then centralization tends to outperform decentralization. But if it is more important to encourage the manager to provide effort, and alleviate the worker's bias in project selection as in Case 2), decentralization tends to outperform centralization. More extensive analysis is relegated to the web appendix.

2.2.2 Control in a Multi-layer Hierarchy

I have discussed two aspects of control under centralization. One is control of project selection, determined by an agent's intrinsic preference α_i. The other is control of private benefit b_i, which directs an agent's effort to production activities, and, to a large extent, depends on the agent's job assignment and working environment. Here, I stress the effort directing aspect of control, as it generates an empirically testable implication that organizational structure has different impact on agents whose jobs permit them a different level of discretion and private benefit.

For the manager, the effort directing effect of centralization always increases in the size of her private benefit. However, it is not necessarily so for the worker, because better control of the middle line may cause loss of control at the bottom in a multi-layer hierarchy. For example, if the effort-directing effect on the manager is not strong enough to overcome her depressed initiative due to control of project selection, the worker will obtain greater freedom to allocate his effort. Then a larger private benefit may distract him further from production activities under centralization if the monitoring of his private activities is not effective. Only sufficiently strong monitoring of the worker's private activities can ensure better control at the bottom, regardless of the manager's response.

Proposition 2 *(Heterogeneous Treatment Effect) Consider the effect of an organizational change form decentralization to centralization on the worker's initiative.*
1) If the principal's monitoring of the worker's private activities is sufficiently effective, the effect always increases in his access to private benefit, and the increase is enhanced by the manager's access to private benefit.
2) If the principal's monitoring of the worker's private activities is not effective, the effect increases in his access of private benefit if the manager is distracted, but the effect decreases in his access of private benefit if the manager is biased.

2.2.3 Organizational Change and Participation

A change in organizational structure also affects an agent's willingness to participate in the organization. The key trade-off is between the on-the-job benefit and the private benefit. If an organization becomes more centralized, the manager faces a loss of on-the-job benefit due to the restriction of her power. Then she may divert her effort to pursue private benefits. But if the principal's monitoring of her private activities is severe, the gain will be limited, and the manager becomes worse off. The impact on the worker's utility is more complex, because of the existence of the middle layer that affects the worker's optimal allocation of efforts.

Proposition 3 *(Selection Effect) Consider an organizational change form decentralization to centralization and hold the worker's salary fixed. If the principal is sufficiently efficient in monitoring the worker's private activities, then*
1) a worker with a small private benefit and/or high interest alignment with the principal is more likely to participate in the organization;
2) a worker with a large private benefit and/or misaligned interests is more likely to leave the organization.

The result is intuitive. If the principal's monitoring of private activities is strong enough, a worker loses his private benefit under centralization. The gain from effort directing is small for the one who has strong bias in project selection and anticipates that the principal will overrule his proposed project. The proposition points out a selection effect triggered by an organizational change: centralization can replace the workers who are less aligned with the principal's interests with the ones whose interests are better aligned. The caveat is that the selection can be opposite if centralization depresses the manager's initiative, but the principal's monitoring of the worker's private activities is not effective.

3 Institutional Background and Data

3.1 Institutional Setting

This section describes the institutional framework, heavily drawing from numerous interviews and internal documentations in various Chinese newspapers. The Newspaper is an industrial leader at the provincial level in China and represents the current state of Chinese journalism. It employs more than 300 journalists (reporters and editors), and has a daily circulation about one million in the sample years.[6] Although owned by the state and run by a board under the inspection of the local Communist Party, the Newspaper is commercialized, mainly funded by advertising revenues, and enjoying high autonomy in managerial practices and in editorial decisions except for reports about major political issues.

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[6]The circulation number is estimated to take into account the possibility that Chinese newspapers over report their circulation number to attract advertising revenues.

The content of the Newspaper includes a front section that covers important news, headlines and editorial articles, an Economic and Business section, a Politics and Law section, an Education and Health section, and a General Reports section focusing on investigative reports, sudden events and miscellaneous topics, then followed by sections of Regional and Local News, Sports, Entertainment and Consumption-Guide.[7] About 80% of the news content is provided by the employed journalists, the rest by news agencies, freelance writers and other media.

3.1.1 Editorial Power and Production of News

The production of news content involves two major jobs: a reporter (he) covers news and writes reports, and an editor (she) selects and edits articles. Two alternative production procedures prevail. One is editor-oriented: an editor assigns a task to a reporter, who then implements the task according to her instruction. The other is reporter-oriented: a reporter covers news and sends his article to an editor, who then selects and edits the article. The key distinction between the two alternatives is who has real editorial power: whether an editor or a reporter effectively makes decisions on the subject of news and the selection of articles into publication.

Which procedure is used depends on the nature of tasks and the information obtained by each party. For example, the news coverage of the People's Congress is usually assigned to a reporter by an editor, as the event is anticipated and information is largely public. By contrast, a reporter determines the news content of an investigative report, as an editor sitting in office would not have the information. In general, reporters have substantial information advantages over editors in investigative reports, in-depth analysis of industries or government sectors, feature stories, and on-the-scene reports, which require task-specific expertise and/or direct contacts with news sources. Editors are more effective in making editorial decisions regarding propaganda, regular government policies, anticipated events, publicly accessible information, and columns designed in advance.

Reporters and managing editors, supervised and coordinated by division directors, are organized in divisions corresponding to the news sections except for the front section.[8] Chief editors, who supervise their subordinates and approve the final publication of news content, may also intervene in editorial decisions.

3.1.2 Incentives and Agency Problems

The quality of news content crucially depends on the information collected by the reporters and the editors. It is essential to incentivize them to collect right information for the News-

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[7]There are two supplement sections, one about international news and the other about culture and literature, which do not involve news coverage.

[8]The front section in the newspaper is the first two pages that publish news headlines, important news mostly provided by the official news agency (Xinhua), and editorial articles by staff writers who do not cover news. A limited number of articles involve news coverage by the reporters from the specialized divisions.

paper. Incentives are a particular concern, because the journalism job is human capital intensive, and the input and output of production are hard to verify. Agency problems occur when a journalist is distracted by private activities, or has misaligned interests with the Newspaper.

The agency problem with a reporter is likely to come from the diversion of production activities before an editorial decision is made. Chinese reporters have large rent-seeking potentials. The "hongbao" phenomenon that employees in public sectors receive money, gifts or other benefits from those who request their favors is pervasive in the Chinese media.[9] Anecdotal evidence suggests that "hongbao" accounts for a significant part of income for some reporters. Moreover, reporters may spend time and efforts establishing social networks to expand career and business opportunities. The private benefits attract them away from production activities, and may invite them to misuse the resources in the Newspaper. A prevalent example is that a reporter seeks and submits information in favor of interviewees, which is called "guanxi" (relation in Chinese) articles. One type of relation articles, the advertising-type report, is particularly detrimental to the Newspaper, as it not only harms news content but may also crowd out advertising revenues.

An editor has far fewer opportunities to seek rent, as her discretion of actions is usually limited to office activities, and her information source is easy to verify. Thus the editor's agency problem mainly happens in the stage of making editorial decisions, when she evaluates a report differently from the chief editors due to conflicts in their valuation of journalism or on-the-job benefits such as perks.

3.1.3 Performance Pay and Evaluation

The Newspaper adopts a high-power payment scheme for the reporters. Besides a fixed base salary accounting for about one third of his wage, a reporter receives a piece-rate type pay directly tied to his monthly performance measured by a score with two components: quantity and quality. The former is a composite measure of the numbers of published articles and words. The latter is assigned by an Evaluation Committee on a daily basis and aggregated up at a monthly level. The evaluation system is claimed to be "an accurate measure of a reporter's individual contribution", and "fair to every employee".[10] When the published

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[9]In Chinese culture, "hongbao" is a red envelope with a monetary gift that Chinese people give to their employees, children and relatives on occasions such as new year celebrations, birthday, weddings etc. It has become popular that a "hongbao" is given to request a favor or exchange benefits. According to Party policies, receiving "hongbao" from interviewees is considered as a type of journalism corruption. But unless the amount of money is large and verified, such misbehavior is hardly ever punished.

[10]The Evaluation Commitee is headed by a Chief editor and operated by 9 senior editors and reporters who are not involved with day-to-day news coverage and editing. Every day, the members of the Evaluation Committee select good articles from a list of published articles recommended by managing editors and assign a quality rank (convertable to a score) to each selected article based on a set of specified rules. A list of all the evaluated articles is posted in a public area on the next day. If the editors and reporters do not agree with the evaluation of the committee, they can apply for reevaluation by providing evidence (e.g. readers' feedback). A chief editor acts as an arbitrator to settle disputes at the end of each month. The finalized scores aggregated at a monthly level are then converted to money by computer software.

articles are authored jointly with other reporters or editors, the scores are adjusted by sharing rules designed to distinguish the contribution of each individual reporter.

The pay to other employees is low powered. Middle managers (division directors and managing editors) receive a flat wage, together with a bonus component based on internal assessment of the performance of the whole team in a news section. Chief editors are paid by a salary according to their positions in the government/Party hierarchy and a bonus depending on the profitability of the Newspaper in a financial year.

3.1.4   Organizational Reform

Centralization and decentralization, depending on the allocation of editorial power, are two basic organizational forms co-existing in the Chinese newspaper industry. From January 2002 to August 2005, the Newspaper employed a decentralized organizational structure by creating profit-center type divisions. Under this arrangement, the editorial power is formally delegated to the middle managers in a particular division (e.g. Economic and Business News). Chief editors intervene in editorial decisions only in exceptional situations (See Panel A of Figure 1). In September 2005, the Newspaper decided to centralize editorial power in four divisions: Economic and Business, Politics and Law, Education and Health, and General Reports. 25 managing editors in these divisions were reallocated to an editing center headed by 2 chief editors and several associate editing directors, who retained the formal authority over editorial decisions and closely monitored the editing process to clean out disparaging articles such as advertising articles (Panel B of Figure 1). The Sports division, however, experienced further decentralization as the sports reporters were formally allowed to make editorial decisions. The other divisions, Regional and Local News, Entertainment, Consumption Guide and Photographing remained unchanged.[11]

The reform was imposed by the Board, who claimed that centralization would "enhance control", and "improve competency". But it was described as a surprise in interviews, as "no obvious problems were perceived", and the two major competitors of the Newspaper kept the decentralization scheme. Anecdotal evidence suggests that the reform was triggered by the appointment of the general chief editor in June 2005, who was a former government official and might have a tendency for centralization. The centralized divisions reverted to decentralization after this general chief editor stepped down in 2008, supporting the coincidence of his appointment and the organizational reform. Arguably the timing of the organizational reform is exogenous to the reporters' performance. The absence of a pre-trend in the reporters' performance will be confirmed by the data. However, the selection of divisions to be reformed may be endogenous, since the four centralized divisions are considered as "hard journalism", relative to "soft journalism" in other divisions. I will show that a valid

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[11]The content of The Newspaper does not have a separate photographing section. But chief editors usually do not intervene the photographers' work under either organizational structure. Therefore the photographing division is regarded as decentralized and will be included in the control group.

difference-in-differences estimator helps to purge potential bias.

I restrict attention to the period from 2004 to 2006 despite the availability of data over a longer time, because the operating environment and the internal structure of the Newspaper were very stable during this sample period. There was no significant change in regulation and politics in Chinese newspapers. The Newspaper remained an industry leader in the local market, in which there was no entry and exit of competitors. The volume of the Newspaper remained stable throughout the period. The pay schemes and the evaluation system, in terms of the members of the Evaluation Committee and the evaluation procedure, did not change.

3.2 Data

3.2.1 Data Collection and Sample Construction

In order to measure the reporters' incentives and performance as accurately as possible, I construct a unique data set combing the Newspaper's internal personnel records and external measures of news content. The Newspaper provides personal information of all the journalists, and monthly performance measures, including the number of articles, the number of words, the quantity score and the quality score, of all the reporters. A team of Chinese research assistants are hired to classify all the articles collected from the Newspaper's on-line archives over the sample period into categories of news content. Together with an experienced journalist, I specify a set of coding rules according to the evaluation system of the Newspaper with reference to the evaluation of the Association of Chinese Journalists. The research assistants are trained to master the basic skills of doing content analysis in journalism. Then they code every article by reading its title, authorship, byline, lead paragraph and other information such as formats and pictures. The web appendix explains in detail the data collection and variable coding.

In the baseline sample, I exclude the observations of the sports reporters, because they experience a different organizational reform, and their performance is highly volatile due to exogenous shocks such as the Olympic Games and the World Cup. To reduce potential noises, I also exclude the observations that have the sum of quantity and quality scores below 1000, which is the minimum requirement for a reporter and far below the average. Observations below this level mainly come from three sources: 1) new recruits in the first three months who are not required to meet this minimum; 2) division directors or editors who cover news occasionally; 3) regular reporters in some unusual situation, for instance, being ill or on holiday. The two types of excluded observations account for about 15% of the overall observations. The main empirical results presented below are robust in the samples when these observations are included (reported in the web-appendix).

3.2.2 Personnel Information

Panel A of Table 1 summarizes the personnel information of 183 reporters in the baseline sample. Among the reporters, 60 percent are men, more than 80 percent have at least a college education, and about half are members of the Chinese Communist Party. The reporters are on average about 33 years old with an 8 year tenure in the Newspaper. Position is an indicator ranking from 1 to 3, representing reporter, chief reporter and senior reporter respectively in the hierarchy of the Newspaper. Qualification is a certificate authorized by the Association of Chinese Journalists to indicate one's expertise and experience in journalism, with 1 referring to assistant journalist, 2 to journalist and 3 to senior journalist. The average levels of position and qualification are both about 1.5. Together with the tenure information, these imply that most reporters are mature enough to know well the preferences and the evaluation system of the Newspaper and have the skills and ability to work independently.

Panel B of Table 1 reports the summary statistics of 56 managing editors (including a small number of division directors) during the sample period. The gender ratio, education level and fraction of Party members of the managing editors are fairly similar to those of the reporters. The managing editors are on average older and more experienced than the reporters. The means of their positions and qualification are about 2.2, both substantially higher than those of the reporters'.

3.2.3 Internal Measures of Quantity and Quality

I will use the internal quantity and quality scores as baseline outcome variables, because they are accurately measured for payment, and thus good proxies for the reporters' performance. Moreover, these scores are comparable across different types of journalism given the consistency of evaluation, permitting a difference-in-differences identification strategy. Simple regressions show that the variations in the number of articles and the number of words jointly explain more than 95% of the variation in the quantity score. The R-squares in the regression of the quality score on the quantity score is only about 40%, because the quality score captures the subjects of news content other than the number of articles and words. The quality score has another advantage in that it avoids the concern of article selection, as a high quality article is unlikely to be screened out.[12] Therefore, I regard the quality score as a reliable measure of the quality of news content and a reporter's production initiative. The basic information on these performance measures is summarized in Panel A of Table 2. In an average month, a reporter writes 32 articles and 18434 words, earns a quantity score of 2080, and a quality score of 1477.

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[12] According to the interviews, on average about 20% articles submited to the editors are rejected. Most rejections are lesser articles when there is a constraint of space. The rejection rate is much higher for junior reporters. A mature reporter is able to anticipate the probability of rejection, and will usually only spend substantial efforts on reports that are very likely to get published.

3.2.4 External Measures of News Content and Editorial Activities

I classify the direct measures of news content into the following exclusive categories: investigative report, feature story, special report[13], advertising[14], propaganda, government officials, on-the-scene report, sensational/entertaining report, and others. Investigative and feature reports correspond to the common sense of good journalism. Special reports indicate product differentiation from other newspapers and the diversity of news content, but editing may also play a role to specialize a report. I use these three types of articles, particularly the first two, as proxies for a reporter's journalism activities and production initiative, since they require substantial efforts to collect original information and direct contacts with news sources. Advertising articles capture the existence and extent of private benefits, and are usually regarded as bad journalism. Propaganda is the report of propaganda campaigns originated by the Party. Reports about government officials indicate the influence of governments on news content. The input information conveyed by other types of journalism such as on-the-scene and entertaining/sensational reports is less clear and will be only briefly discussed.

Parallel to the classification of news content, I also categorize an article according to its authorship, which reveals information on editorial activities. For example, an article authored by a reporter joint with a managing editor indicates that the report is originated and organized by the managing editor. Some articles directly spell out the role of a managing editor as a chief reporter. I classify these articles as "joint with editor". The articles written by reporters but assigned by managing editors to fit columns designed in advance are classified as "column by content". These two types of articles are used to approximate the managing editors' initiative. The articles that contain the names of external authors, who provide news sources to reporters and may participate in news coverage, also convey information on editorial decisions. There are three sources of external authors: government and public sectors, private sectors, and freelance writers. Usually the managing editors directly contact the freelance external authors, while the reporters work with the other two types. The articles with external authors from private sectors may also indicate a reporter's opportunities and intention to establish business relations. Finally, some articles are coauthored with other reporters either within the same division or across divisions.

One advantage of these external measures is that they are less sensitive to the explicit or implicit changes in the quality evaluation of the Newspaper. The major drawback is the incompatibility between different types of journalism. For instance, it does not make sense to compare business news with entertainment news. Therefore the constructed external measures only apply to the centralization group, in which common measures are plausible.

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[13]An article is coded as special report if it is a long article that contains key words like "special", "unique" and "first report", but not identified as an investigative report or a feature story.

[14]An article is coded as advertising if it is a promotion of products and/or image of a particular company. Most of the advertising articles are about local firms. The advertising articles are distinguished from those soft advertisements assigned by the Newspaper for business clients, which are provided by the advertising department and not authored by reporters.

Panel B of Table 2 summarizes the basic statistics of the external measures. A few remarks are worth pointing out. First, propaganda reports on average account for only about 1% of all the articles written by a reporter in a month, implying that the newspaper is not propaganda driven. Second, a reporter on average only writes 2.5 investigative and feature reports per month, as they require substantial efforts. Third, the number of articles "joint with editor" and "column by content" is small, showing that the reporters play a key role in journalism activities and editorial decisions.

In a regression of the quality score on the external measures, the R-squares is as high as more than 75%, supporting their credibility. The main contributing factors to the quality score are investigate reports, feature stories, special reports and propaganda articles, verifying the crucial role of subject selection in determining news quality. As expected, the advertising articles and articles with external authors are negatively correlated with the quality measure. Due to score sharing, the articles with internal coauthors, the "joint with editor" articles, and the "column by content" articles all reduce the quality score.

4 Empirical Strategies

4.1 From Theory to Test

If measures of the agents' private benefit are available, I can estimate the model directly, and back out the preference and technology parameters. Unfortunately, such information is usually beyond anybody's reach. I thus have to rely on indirect evidence to examine the theoretical mechanism in the model. The three theoretical propositions outlined in Section 2 provide guidance.

I will first estimate the impact on the worker's performance, which is well measured. Proposition 1 predicts a reduced-form average treatment effect of centralization on a reporter's initiative and performance. The estimation of a causal effect relies on the panel structure of the data and the identification strategy that I will discuss below. However, such an average treatment effect is mute about the theoretical mechanism, and can be interpreted in various ways. Thus, to uncover the mechanism, particularly the effort-directing effect, it is crucial to test Proposition 2 — the heterogeneous treatment effect: with controls of ability, the reporters with larger private benefits should respond more to the reform if the monitoring is indeed effective. I will exploit institutional factors such as job assignment and social norms, which reveal information on the reporters' access to private benefits, to test this prediction. Proposition 3, the selection effect, also sheds light on the effort-directing mechanism, as it is another way to demonstrate heterogeneous treatment: reporters with large private benefits or low interest alignment will respond in an extreme manner to select themselves out of their job. I will infer the selection pattern by estimating the individual fixed effects of the entries, stayers and exits. Empirical results that are jointly consistent with these three propositions are in line with the theory, lending support to the mechanism that centralization directs

17

workers' effort from private activities to production activities.

To shed further light on the basic trade-off between better control and depressing initiative, and the trade-off between the loss of the manager's initiative and the promotion of the worker's initiative, I will estimate the impact of centralization on the direct measures of news content and editorial activities. In particular, the effort directing mechanism would result in a negative relation between the effect on the measures of a reporter's journalism initiative and the effect on the measures of his private benefits. Furthermore, the initiative substitution mechanism would lead to a negative effect of centralization on the measures of the managing editors' initiative, associated with an increase in the measures of the reporters' journalism initiative. Empirical verification of these two hypothetical results is in favor of Case 1 in Proposition 1.

4.2   Identification

The organizational reform in the Newspaper creates empirical counterparts of the two organizational forms in the theory: four divisions (Economic and Business News, Politics and Law, Education and Health, and General Reports) experience an organizational change from decentralization to centralization. In other words, a centralization treatment is applied to this group of reporters. Despite that the timing of the reform is arguably exogenous, there may be unobservable factors associated with the reform that would cause serious bias. This is particularly a concern for the quality measure, which can be sensitive to explicit or implicit changes in editorial and evaluation policy. Fortunately, the unreformed divisions (Regional and Local News, Entertainment, Consumption Guide, and Photographing) can serve as a control group to mitigate potential bias. The identification, therefore, hinges on a valid difference-in-differences (D-I-D hereafter) estimator.

Figure 3 plots the average of the logarithm of the quantity and quality scores of the treatment group and that of the control group over time. The time series is fairly volatile due to seasonality and exogenous shocks in the industry. For example, the high performance in March 2005 and March 2006 is driven by the Chinese National People's Congress. But two features of the figures strongly support the validity of the D-I-D estimator. First, there does not exist a pre-trend in the performance of the treatment group before the reform, confirming that the reform is exogenous to the reporters' performance. Second, the performance of the treatment and that of the control are very similar in terms of levels and co-movement pattern before the reform, suggesting that the treated would behave similarly as the control if there were no treatment.

One potential concern is that if the reform is indeed triggered by the appointment of the general chief editor, who may have systematic bias towards the treatment group, then the D-I-D estimate will capture this bias. Several institutional features suggest that this is unlikely to be a major concern. First, the reporters' performance, in particular the quality score, are mainly affected by the managing editors and measured by the Evaluation Committee, instead

18

of chief editors. I will show that the correlation between the quality score and the external measures of news content is stable across the reform. Second, the new general chief editor is the only one replacement among nine chief editors who supervise the news sections, and his influence on news content would be limited by committee decisions. Third, a placebo test that keeps only the data before the reform shows that there is no significant performance difference before and after the appointment of the chief editor in the treatment, relative to the difference in the control.

Another concern is that the effect of the reform would be contaminated if reporters transfer between the treatment and the control after the reform. There are only 6 reporters switching between the two groups over the sample period, and the estimates from the sample that excludes these switchers are virtually the same as from the baseline sample.

4.3 Econometric Specification

The baseline D-I-D regression estimates the following panel specification:

$$Log(P_{it}) = \alpha_t + \lambda_i + \theta(C_i * R_t) + X_{it}\beta + \varepsilon_{it}, \tag{5}$$

where i indicates individual, and t indicates time at the *year* $\times$ *month* level. The dependent variable is the logarithm of a reporter's performance in terms of either the quantity score or the quality score. α_t is time fixed effects to control for aggregate fluctuations of the Newspaper. λ_i is individual fixed effects to control for unobservable individual ability and preferences, which also helps to overcome the potential selection bias due to the entries and exists of reporters associated with the reform. C_i is a dummy that equals one for the centralization treatment; R_t is a reform dummy equal to one if a reporter's performance is observed after the reform. The coefficients of both C_i and R_t are not identifiable in the presence of individual/division fixed effects and time fixed effects. $C_i * R_t$ is the interaction term between the two variables, and its coefficient θ is my main interest, which identifies the average treatment effect on the treated. X_{it} is a set of covariables including division fixed effects (some reporters switch across divisions), and time-variant individual characteristics such as age-squared, tenure-squared, position and qualification. These covariables help to control for ability, career concerns and other factors that may affect the reporters' performance.[15] ϵ_{it} is the stochastic error term, which may be correlated over time or within certain clusters in the D-I-D estimation with many periods (Bertrand, Duflo and Mullainathan 2004, Angrist and Pischke 2009). I will cluster the standard errors at the individual level to cope with the potential time serial correlation problem. The statistical significance of the main results are robust using other clustering strategies.[16]

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[15] The variables age and tenure are not identified due to collinearity in the regression with both individual fixed effects and time fixed effects.

[16] The results in the regressions that cluster the standard errors at the division level are considerably less precise because the small number of clusters (9 divisions) substantially inflates the standard errors. But

5 Main Results

This section presents the main empirical results, examining the impact of the organizational reform from decentralization to centralization on the internal measures of the reporters' quantity and quality scores. I start with an investigation of the average treatment effect, then explore the heterogenous treatment effect with regard to the reporters' access to private benefits, and finally analyze the individual fixed effects to examine the treatment on distribution and the selection pattern.

5.1 Average Treatment Effects

5.1.1 Descriptive Results

Table 3 displays the reporters' average performance before and after the reform in the treatment (centralization) group and the control (decentralization) group, and the comparison between the two groups. To relieve the concern of selection bias, I restrict the sample to a balanced panel that includes 113 reporters who are observed both before and after the reform, and do not switch between treatment and control. Consistent with Figure 3, before the reform, there are no significant differences in either the quantity score or the quality score between the treatment and the control. Panel A finds no significant differences in the quantity score under the two organization schemes in both the treatment and control groups, and the difference-in-differences comparison is small and statistically insignificant. These results are not surprising, given that the volume of the Newspaper is basically fixed and the space to accommodate more articles and words is limited.

However, the comparison of the log quality score (Panel B) suggests that the organizational reform has a strong effect on the reporters' quality performance. In particular, the quality score of the treated reporters is only slightly above that of the control before the reform, but the gap widens dramatically after the reform, amounting to a difference-in-differences comparison of 0.151 in the mean with a standard error of 0.075. It is important to recognize that the result is mainly driven by the negative impact of the reform on the performance of the control, which suggests that there may exist negative common shocks to all the reporters in the Newspaper.

The lack of response of the reporters' quantity performance rules out the potential spurious relation between the timing of the reform and the expansion of the Newspaper. Rather the organizational reform is likely to affect a reporter's journalism initiative that determines the quality of news content.

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the main results are still significant at the 10% level. The results that cluster the standard errors at the *division × quarter* level are more precise than those that cluster at the individual level.

5.1.2 Baseline Estimates

Using the D-I-D approach specified in Equation (5), I estimate the average treatment effects of the reform on the logarithm of the quantity and quality scores. The findings in Panel A of Table 4 confirm the descriptive evidence. The simplest estimation, controlling for only individual fixed effects (Column 1 and 5), shows that the average effect of centralization on the reporters' quantity score is economically small (5.4%) and statistically insignificant. But the effect on the quality score is statistically significant at the 1% level and economically large (20.7%), which amounts to a 5% increase in wages. The results hardly change after adding the time dummies (Column 2 and 6), and additional controls including division fixed effects and the time-variant personal characteristics (Column 3 and 7).

Note that the above regressions all include individual fixed effects, and the results should be interpreted as the impact of centralization on the intensive margin: the change in the average performance of the same reporters before and after the reform. When the individual fixed effects are replaced with controls for time-invariant personal characteristics such as gender, education and Party membership, together with age and tenure (Column 4 and 8), the R-squares is reduced almost half; the estimated effect on the quality score declines dramatically from 19.4% to 6.1% and becomes statistically insignificant; the effect on the quantity score becomes negative, though statistically insignificant. These results suggest a negative selection associated with the organizational reform, which I will analyze later.

5.1.3 Dynamic Effects

Panel B of Table 4 presents the dynamics of the average treatment effects. In practice, I replace the interaction term between the treatment dummy and the reform dummy with a set of dummy variable, $reformstart$ a dummy equal to one if a reporter works in the treatment group in the month of the reform (September 2005) and zero otherwise, $August2005$ being a dummy for a treated reporter in August 2005 (one month before the reform), and $October2005$ a dummy for a treated reporter in October (one month after the reform). Similar definitions apply to $July2005$, $November2005$ and $December2005$. The regressor $January2006onwards$ is a dummy that equals one for a treated reporter from January 2006 and onwards. The dynamic effects of centralization are consistent with the previous findings. The insignificant estimates of both the quantity and quality scores before the reform confirm that there is no pre-trend effect. The effects on the quantity score are always insignificant. The response of the quality score to centralization is not significant until November 2005 (two months after the reform). The effect becomes larger and more pronounced after four months of the reform. The gradually increasing effect rules out the concern that the reformer deliberately increases the quality score to reward (or compensate) the treatment group or to demonstrate the success of the organizational change as a managerial practice, in which case the response would be stronger in the short run. The lack of response in September and October of 2005 may be because these two months are among the special period, in which social norms condone rent

seeking behavior and offset the effect of the reform. I will examine this argument further in the next subsection.

5.2 Heterogenous Treatment Effects

To test the heterogenous treatment hypothesis, I estimate the effects of the organizational reform across different groups of reporters whose task assignment exposes them to different levels of private benefits, and across different periods, in which the extent of a reporter's access of private benefits vary.

5.2.1 Access to Private Benefits across Task Assignments

It is not unusual that the exposure and access to private benefits systematically vary across task assignments within an organization. Well known in the Chinese media industry, economic and financial reporters have access to large pecuniary private benefits and business opportunities, as they specialize in covering news about companies and products. Also widely recognized in transitional economies, rent seeking behavior is particularly active in the sectors that experience drastic commercialization and privatization. Education institutions, hospitals and pharmacies in China since 2000 fall into this category.[17] The reporters in these two divisions are likely to divert their efforts to pursue private benefits. By contrast, the reporters in the Politics and Law division and the General Reports division, who focus on government policies and routines, investigative reports and sudden events, have much more limited access to private benefits.[18] These conjectures are supported by the distribution of the number of advertising articles across news divisions in the sample: 1145 in Economic and Business, 72 in Education and Health, but only 28 in Politics and Law, and 11 in General Reports. A natural proxy for the extent of the reporters' access to private benefits is their allocation to divisions, which are based on task assignment.[19]

I extend the D-I-D estimation of the effects of centralization on the scores to incorporate the heterogeneous treatment across reporters in the four treated divisions: Economic and Business, Politics and Law, Education and Health, and General Reports, with the control group unchanged. Table 5 presents the results. As expected, the Economic and Business reporters improve their performance substantially, about 20% in quantity and 35% in quality after the reform. The Education and Health reporters improve their quantity score by

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[17] Corruption in the education industry and the healthcare sector is frequently reported in media and widely debated in public.

[18] The task assignment of the General reporters is fairly similar to the Politics and Law reporters, except that the former focuses more on exceptional events. It might be possible that reporters receive private benefits from governments or from interviewees who are involved in scandals. But these activities are regarded as serious journalism corruption and are risky for a reporter to undertake. Anecdotal evidence suggests that such misbehavior is unusual in leading Chinese newspapers, though it may be more common among the reporters who work in lesser newspapers.

[19] The task assignment to a reporter usually stabilizes after a two or three year tenure in the Newspaper. For most reporters, their tasks are assigned before the sample year.

more than 12% and the quality scores by more than 28%, although the effect on quantity is insignificant. On the contrary, the reporters in Politics and Law respond negatively to centralization, although the effect is not statistically significant in the presence of individual fixed effects. The effect on the General reporters' quality score is positive, but in mild magnitude and statistically insignificant; the notable decline in their quantity score may result from the increases in the quantity score of their colleagues in Economic and Business and Education and Health, whose increased publications crowd out the General reporters'. Note that the pattern of negative selection found in the average treatment effect is also present within each division except for the General Reports, and most pronounced in Politics and Law, which experiences largest exists and entries.

5.2.2 Private Benefits Condoned by Social Norms

In China, the Spring Festival (the Chinese New Year) and the Mid-Autumn Festival (also the mid financial year for companies) are two special time periods, in which Chinese people conventionally take opportunities to exchange "hongbao", establish social connections, and expand business networks. Therefore, social norms condone rent seeking behavior in these periods. Anecdotal evidence suggests that the restriction of reporters' private activities is much more relaxed than usual, and some editors may also be involved in the pursuit of private benefits. Moreover, the chief editors are usually overloaded as they are engaged in numerous external activities in the local Party and government in addition to the management of internal activities. As a result, one should expect the effect of centralization is smaller in these periods relative to other periods if effort directing is the mechanism underlying the reporters' response.

The Spring Festival is often in late January and sometimes early February, and the Mid-Autumn Festival is usually in September and occasionally in early October.[20] Private activities are likely to take place a few weeks before the festivals. Therefore I construct a "special months" dummy equal to one for January and September, and zero for all the other months. The regressions in Table 6 show that the effect of centralization in these special months is significantly different than in the other months. In particular, the effect on the quality score in the special months is 14% smaller than the effect in the other months in the treatment group, whereas such a negative effect does not appear in the control group.[21] The difference in the impact on the quantity score is negligible, suggesting that the result is more likely to be driven by the reporter's adjustment of efforts, instead of changes in the volume of the Newspaper and editorial policies during these special periods. The above results are robust if February and October are included in the "special months" to consider the lasting influence

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[20] The Spring Festivals in 2004, 2005 and 2006 are 22nd January, 9th February and 29th January respectively, and the Mid-Autumn Festivals are 28th September, 18th September and 6th October respectively.

[21] A triple difference estimation shows that the quality performance of the treated reporters in the special months is 16.6% (with a standard error 0.079) lower than in the normal months, taking into account the difference in the control group.

of social norms.

5.3   Estimates of Individual Fixed Effects

To complement the above evidence, I estimate the effects of centralization for each individual reporter using the following panel data specification,

$$Log(P_{it}) = \alpha_t + \sum_i [\lambda_i^{before} D_i(1 - R_t) + \lambda_i^{after} D_i(1 - R_t)] + X_{it}\beta + \varepsilon_{it}, \qquad (6)$$

where D_i equals one for worker i, and zero otherwise, and all the other variables are defined as in equation (5). λ_i^{before} and λ_i^{after} are estimates of the fixed effects for each individual before and after the reform respectively. I refer to the individual fixed effects from the regression of the log quantity score as quantity residuals, and the ones from the regression of the log quality score as quality residuals. Since the regressions control for variables that measure time-variant experience and expertise, these residuals, to some extent, capture the unobservable individual incentives.

5.3.1   Effect of Treatment on Distribution

To show the impact of centralization on the distribution of the reporters' response, I plot the kernel density of the estimated individual fixed effects in Figure 4, using the balanced panel that only includes those reporters who appear during the whole sample period and do not switch (66 in the treatment and 47 in the control). Panel A shows that in the treatment group, the distribution of quality residuals after the reform shift to the right of that before the reform, and the p-value of the Kolmogorov-Smirnov test for the null of equality of distributions is 0.001. However, such a pattern is not observed in the control group, in which the Kolmogorov-Smirnov test does not reject that the two distributions of quality residuals are equal. Given that the stayers are mostly experienced reporters, the changes in the quality residuals are more likely to reflect the improvement of the reporters' production incentives instead of ability. Moreover, the distribution of the quality residuals in the treatment becomes more concentrated around a higher value after the reform. This is consistent with the intuition that centralization restricts the reporters' pursuit of private benefits and thus homogenizes their incentives.

Panel B shows that the distributions of the quantity residuals before and after the reform are statistically different in the treatment group, but not so in the control group. Interestingly, in the treatment group, the distribution of the quantity residuals shifts to the left after the reform, as opposed to the change in the distribution of the quality residuals. This contrasting result suggests that a reporter's quality-enhancing efforts may substitute his quantity-enhancing efforts. Overall, the results of individual fixed effects of the stayers are in line with the previous estimates of the average treatment effects of centralization, and confirm that the organizational reform improves the reporters' production initiative.

5.3.2   Selection Pattern

As noted, the effect of centralization on the quality measure decreases from about 20% to less than 7% when the individual fixed effects are excluded, probably because of the exits and entries of reporters in both the treatment and the control. To examine the selection pattern, Table 7 compares the estimated individual fixed effects of the exits, the stayers and the entries. In Panel A, the after-before reform difference in the quality residuals of the stayers in the treatment group is significantly greater than that in the control group. However, the difference in the quality residuals of the entries and the exits in the treatment group is much smaller than that in the control group, which offsets the positive effect of centralization on the stayers and causes the negative selection in the regression results in Table 3. Panel B finds a similar pattern in the comparison of quantity residuals.

Since the individual fixed effects, particularly the quality residuals, are highly correlated before and after the reform, I compare the individual effects between the exists and the stayers before the reform to infer their differences in unobservable individual characteristics such as incentives and ability. Table 7 shows that both the quantity and quality residuals of the exits are remarkably lower than those of the stayers in the treatment group.[22] By contrast, in the control group, the average quantity residual of the exits is larger than that of the stayers before the reform, and the difference in the quality residuals is small. These results suggest that the exits may have less incentives for journalism activities than the stayers. Then, I compare the entries and the stayers after the reform. Not surprisingly, the quality residuals of the entries in the treatment group are of similar magnitude to their counterparts in the control group, because the new recruits usually rotate their task assignment in a few divisions in the two years. In the treatment group, the entries' quality residuals are very similar to the stayers', while in the control group, the entries' quality residuals are substantially larger than the stayers'. The quantity residuals also display the same pattern. These results suggest that the entries have higher interest alignment with the Newspaper than the exits. In sum, the findings in Table 7 is consistent with Proposition 3, which implies that centralization, relative to decentralization, hinds the participation of the reporters with larger private benefits and/or stronger decision bias, but facilitates the participation of the ones whose interests are more aligned with the Newspaper's preferences.

6   Mechanism

According to the theory, an improved initiative and performance of the reporters can come from two channels: the effort-directing effect through better control of the reporters' pursuit of private benefits, and the initiative substitution between the middle managers and the

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[22]In the regression of the quantity residuals on a dummy that equals one for exits and zero for stayers in the treatment group before the reform, the coefficient is -.562 with a bootstrapped standard error .291. In the similar regression of the quality residuals, the coefficient is -.544 with a bootstrapped standard error .403.

reporters. The results presented above have evidenced the effort-directing channel. This section presents evidence to strengthen this argument and examine the other channel, using the external performance measures, which capture more directly the reporters' incentives and convey information on the manager's initiative. I will also provide further evidence to discriminate a number of alternative explanations.

6.1 Effects on External Performance Measures

As the external performance measures only apply to the treatment group due to the incompatibility in measuring different journalism between the treatment and the control, I will estimate the following specification:

$$EP_{it} = \alpha_m + \gamma_y + \lambda_i + \theta R_t + X_{it}\beta + \varepsilon_{it}. \tag{7}$$

The dependent variable EP_{it} is an external measure of monthly individual performance without taking logarithm. Since a set of $year \times month$ dummies are collinear with the reform dummy, I only include the month dummies α_m to control for seasonality, and the year dummies γ_y to control for business cycles over years. λ_i is individual fixed effects, R_t the reform dummy, and X_{it} the time-variant covariables, all defined as before. The absence of a control group is less of a concern than when the dependent variables are the internal measures, because the external measures mainly capture the subjects of news content and are less sensitive to changes in evaluation. Table 8 reports the estimates.

6.1.1 Trade-off between Production Initiative and Private Benefits

Panel A of Table 8 presents the impact of the organizational reform on news content. The effects on the measures of journalism activities are positive and statistically significant. In particular, the number of investigative reports increases by .325 standard deviations, and the number of feature stories increases by .247 standard deviations, both at the 1% significance level. At the same time, the organizational reform reduces the number of the advertising articles by .411 standard deviations, and the result is statistically significant at the 1% level. Consistently, the number of articles with the external authors from private sectors, which may indicate a reporter's opportunities to attain private benefits, decreases after the reform. These findings demonstrate a substitution between the reporters' journalism initiative and their attainment of private benefits, supporting the effort directing effect.

The effects of centralization on the number of propaganda articles and the number of reports about government officials are positive, but small and statistically insignificant. These findings rule out the potential confounding factor that the Party and governments, for the purpose of ideological control, influence the Newspaper to increase these two types of articles. The effects on the other measures of news content are negligible and insignificant.

6.1.2 Initiative of Managing Editors

Panel B of Table 8 reports the estimates of the reform on the external measures of editorial decisions. Centralization reduces the number of articles "joint with editor", the most robust proxy for the initiative of the managing editors, by 0.162 standard deviations and in a statistically significant way. The effects on the number of "column by content" articles and the number of articles joint with freelance external authors, whom the managing editors contact directly, are all negative, though statistically insignificant. This evidence, together with the results in Panel A that centralization improves the reporters' journalism initiative, suggests the existence of initiative substitution between the reporters and the middle managers.

Interestingly, centralization significantly increases the number of articles that co-authored by reporters within the same division. This may be because the reporters with correlated task assignments cooperate to compensate the depressed initiative of the managing editors, or because the chief editors and/or division directors improve coordination between the reporters.

6.1.3 Heterogenous Treatment Effects

Panel C of Table 8 reports selective results from the regressions that split the treated group into the four divisions as before. The trade-off between the reporter's journalism initiative (measured by the number of investigative reports and feature stories) and private benefits (measured by advertising articles) only exists in the Economic and Business division and the Education and Health division, in which the reporters' quality score increases substantially after the reform, as shown in Table 5. The pattern is most pronounced for the Economic and Business reporters, who also experiences the largest improvement in their performance.

With regard to the effect on the managing editors' initiative, centralization reduces the number of "joint with editor" articles in Education and Health, suggesting the improvement in the reporters' production initiative under centralization is partially driven by the depression of the managing reporters' initiative, which amplifies the effort-directing effect. However, such an initiative substitution effect is muted in the Economic and Business division, possibly because the managing editors in this division may also have notable access to private benefits, and centralization directs their efforts to production initiative as well. This result is consistent with Proposition 2, which posits that the effort directing effect on the worker is reinforced by that on the manager.

The effects of centralization on the General reporters are qualitatively similar to those on the Education and Health reporters, but most estimates are statistically insignificant. Interestingly, the estimates in the Politics and Law division are contrary to those in other divisions: centralization reduces the number of investigative reports but increases the number of advertising articles, though statistically insignificant. Moreover, centralization substantially reduces the number of "joint with editor" articles authored by the Politics and Law reporters. These findings suggest that action distortion is not a major concern for the Politics

and Law journalists, and the depression of the managing editors' initiative does not promote a sufficiently large response from the reporters. The results are consistent with the previous argument that the Politics and Law reporters have much more limited access to private benefits. They are suggestive evidence against Case 1, but in favor of Case 3, in Proposition 1.

I also examine the effects on the external measures in the special months, in which social norms condone the attainment of private benefits. (Results are reported in the web-appendix.) Consistent with the previous findings, the increase in the number of articles that represent journalism activities in these special months is substantially smaller than in other months, whereas the effect on the number of advertising articles is positive. Notably, the negative effect on the number of articles initiated by the managing editors (the sum of "joint with editor" and "column by content" articles) after the reform is significantly alleviated in the special months, indicating initiative substitution between the managing editors and the reporters.

6.2 Alternative Explanations

This subsection examines a number of alternative explanations. All the related empirical results are collected in the web appendix.

6.2.1 Changes in Evaluation and Editorial Policies

The positive effects of centralization on the reporters' quality performance can be spurious if the evaluation rules of quality explicitly or implicitly become relaxed or the editorial policies change in favor of a particular type of report that is easier to implement. I examine this possibility by testing the stability of the correlation between the quality measures and the external measures of news content before and after the reform. Specifically, I regress the quality score on the measures of news content and their interactions with the reform dummy, controlling for measures of editorial decisions that affect the assignment of scores. None of the interactions between news content and the reform dummy is statistically significant. This result strongly supports the stability of the Newspaper's evaluation system over the sample period, and rules out the possibility that the increase in the quality score is caused by a relaxation in the evaluation or editorial policies. In fact, the evaluation may become tighter after the reform, as the number of the investigative, feature and propaganda reports contribute less to the quality score after the reform, though the coefficients are statistically insignificant. The tighter evaluation explains why the external measures of the reporters' journalism initiative increase substantially after the reform, but their quality scores do not in the absent of control group.

6.2.2 Contributions of Middle Managers

I have focused on the project selection function of the middle managers. But some middle managers, particularly the senior ones, may also play other roles, such as coordination and supervision of the implementation of projects. If the organizational reform systematically affects the middle managers in these dimenstion, the previous estimates are potentially biased.

Recomposition of the middle managers. Despite that the middle managers' initiative is reduced after the reform, a more able team of managing editors may improve the reporters' performance through better instruction and editing, which may not be purged from the quality score. An examination of the composition of the managing editors limits the possibility of this explanation. First, the division directors, who potentially have largest influence on the reporters, remain the same people, and a control of sector fixed effects should capture their time invariant ability. Second, there are 18 turnovers (including exits and entries) among 56 manager during the sample period, with 12 in the treatment and 6 in the control. But the turnovers mostly take place among junior editors whose personnel characteristics including education, working experience and position are fairly similar. Third, the effect of centralization is largest in the Economic and Business division, which experiences least changes in managing editors.

Implementation and coordination. The managing editors' loss of initiative for information acquisition may divert their attention to implementing projects. For instance, a managing editor may spend more efforts revising and editing a reporter's articles to improve their readability and style, which may contribute to the reporter's quality score in spite of the sharing rules. Furthermore, centralization may allow more concentrated information processing and improve the coordination between the managing editors and the reporters.

Insider insights from the Newspaper suggest that the managing editors' efforts in the reporters' performance are much more important for junior reporters who have yet accumulated sufficient firm specific expertise. Therefore, I estimate the effects of centralization on the junior reporters who have working experience equal or fewer than 3 years in the Newspaper.[23] Relative to the impact on the more senior, the effects of centralization on the junior's quantity and quality scores are significantly negative in the treatment group, whereas such differences in the control group are not obvious. Moreover the negative effect of centralization on the number of articles "joint with editors" and "column by content" is particularly strong for the junior reporters. These findings suggest that the reporters may learn more slowly or receive less support from the editors after the reform, against the explanation that centralization improves implementation and coordination.

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[23]Most interviewees agree that it takes usually 2 to 3 years to acquire the newspaper specific expertise to cover news efficiently and write well.

6.2.3 Intrinsic Motivation and Peer Pressure

Another possible explanation is that the organizational reform imposes greater peer pressure on the reporters, for under centralization the reporters' articles are now also reviewed by more senior editors, who may be stricter with editorial decisions and have greater influence on the reporters' promotion than the managing editors. As a result, the reporters are more willing to forego private benefits and improve their journalism initiative due to intrinsic motivation and/or career concerns. The previous findings provide evidence against this explanation. First, if intrinsic motivation were of first order importance, the response of the reporters in the months, in which social norms condone private benefits, would not be much less than in other months. Second, the intrinsic motivation explanation can not rationalize the heterogenous treatment effects across reporters in different divisions. Third, intrinsic motivation or career concern are likely to have a stronger effect on more junior workers, which is in conflicts with the finding that centralization indeed has negative effects on the junior's performance.

7 Conclusions

This paper has presented coherent evidence of the impact of organizational structure on workers' incentives and performance, drawing on the institutional setting combined with detailed personnel information in a Chinese newspaper. The research has supplied one piece of new evidence of the impact of organizational strategies on firm performance, and more importantly probed two fundamental questions in organizational economics: what is the source of authority? How does the distribution of authority affect workers' incentives?

The incentives view of authority is derived from the premise that authority cannot be completely contractible and fully enforceable. If it could, organizational structure, defined by the distribution of formal authority, wouldn't matter for workers' incentives. The role of organizational structure hinges on its impact on workers' attainment and control of the resources that generate real authority. This paper has contributed to our empirical understanding of this fundamental view of authority. The empirical findings are in line with the theory, in which information is the source of real authority, and agents distort their actions and/or decisions to compete for real authority and optimize their resource allocation, in response to a given distribution of formal authority.

Moreover, this research sheds light on the mechanism of authority at work in a hierarchy. First, the effect of organizational structure on workers' incentives crucially depends on the nature of agency problems: who has authority for which decisions, who controls information about which activities, and whose preferences are misaligned regarding which outcomes. A number of consistent results point to the trade-off between better control and depressing initiative: a centralized hierarchy alleviates an agent's action distortion and selection distortion, at the cost of killing his or her initiative for information acquisition. Second, the agents' relative positions in the hierarchy matter: organizational structure induces strategical

interactions between agents. Several pieces of evidence have shown that the depression of the initiative of workers at a higher layer in turn promotes the initiative of those subject to their authority.

The current research opens new avenues for further work on organization and performance. The first avenue is to go beyond personnel data. I am collecting data on a number of Chinese newspapers, and attempt to investigate the impact of organizational strategies on their market performance and news content in greater detail. Second, I will go beyond the incentives view of authority. For example, I am combining the current data set with information on the adoption of information technologies to examine the interface between communication and organizational structure, an important theme in the recent studies of organizational economics.

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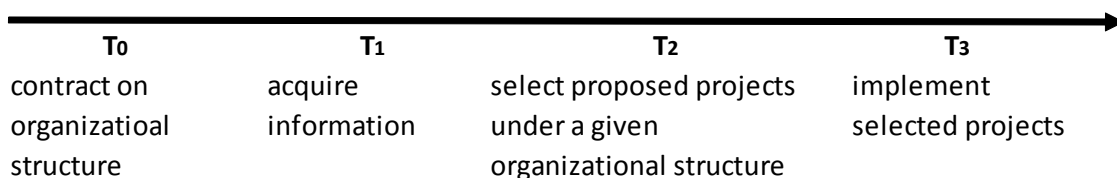
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Figure 1: Organizational Structure and Allocation of Formal Authority

Panel A: Decentralization **Panel B: Centralization**
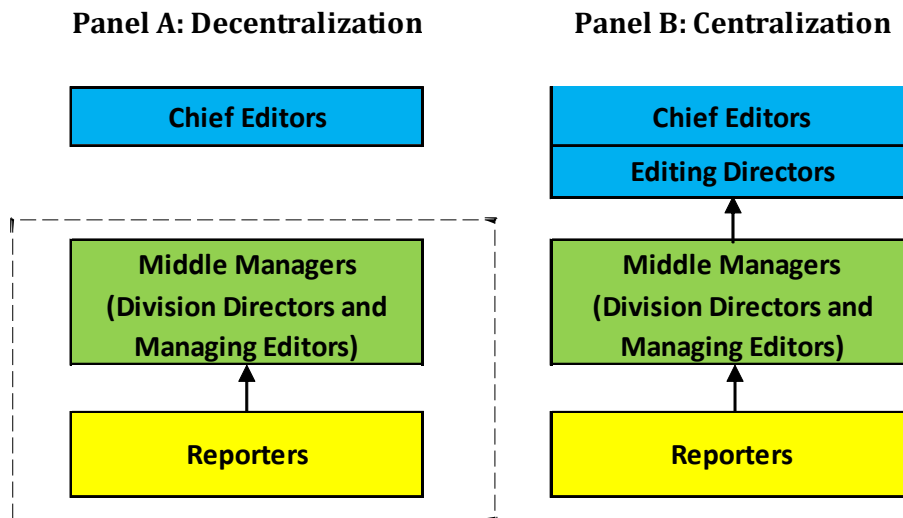
Notes: The arrow line indicates the direction of formal authority. Under decentralization, the formal authority over editorial decision is delegated to the middle managers. Each division (e.g., Economic and Business) works like an independent business unit. Under centralization, the chief editors retain formal authority, and a layer of editing directors headed by chief editors is created to monitor the editorial process more closely.

Figure 2: Timing of the Game

T_0	T_1	T_2	T_3
contract on organizatioal structure	acquire information	select proposed projects under a given organizational structure	implement selected projects

Figure 3: Comparison in Performance between Treatment and Control

Panel A: Log Quantity Score
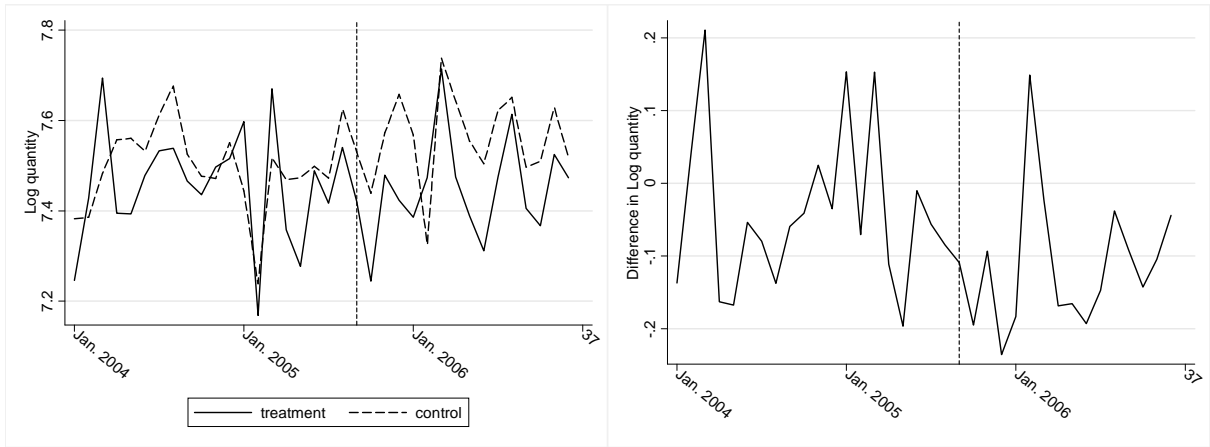
Panel B: Log Quality Score
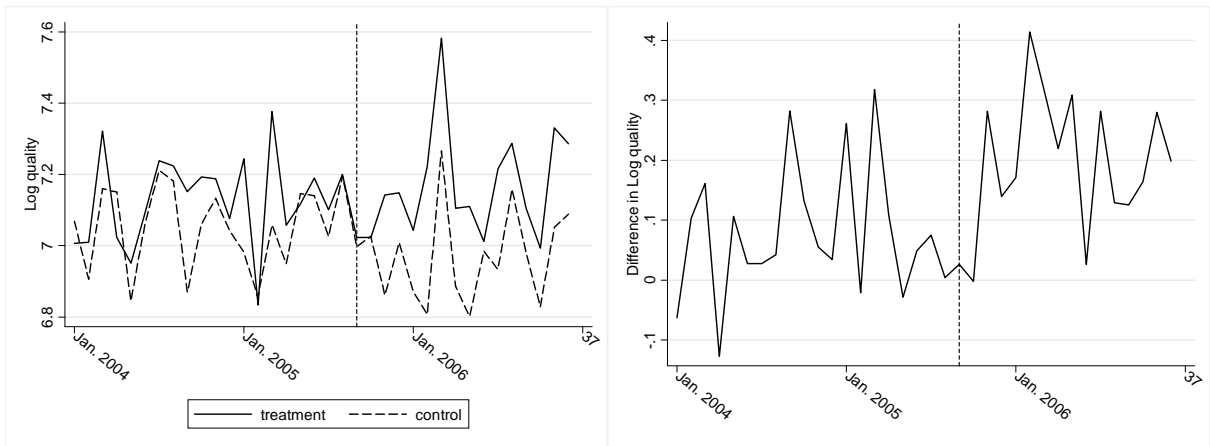
Notes: Panel A (and B) plots the average of the logarithm of the monthly quantity (and quality) score for the treatment and the control respectively from January 2004 to December 2006 (left panels) and the difference of the log quantity (quality) score between these two groups (right panels). The vertical dotted line indicates the timing of reform: September 2005. Treatment is the reporters from the divisions that experienced a centralization reform: Economic and Business, Politics and Law, Education and Health and General Reports. Control is the reporters from the divisions that remained decentralized: Regional and Local News, Entertainment, Consumption-guide and Photographing.

Figure 4: Kernel Density of Estimated Individual Fixed Effects under the Two Organizational Forms

Panel A: Quality Residuals
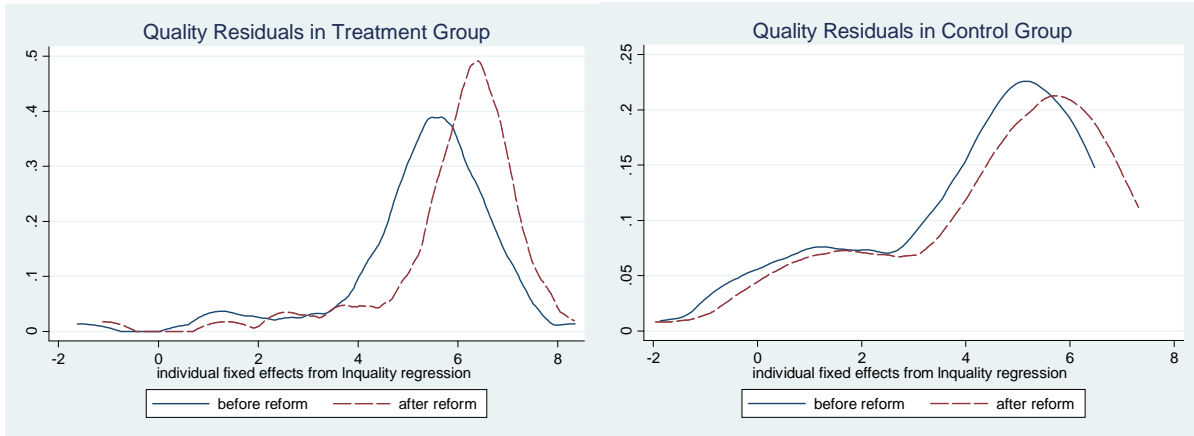
P-value of K-S Test: 0.001   *P-value of K-S Test: 0.177*

Panel B: Quantity Residuals
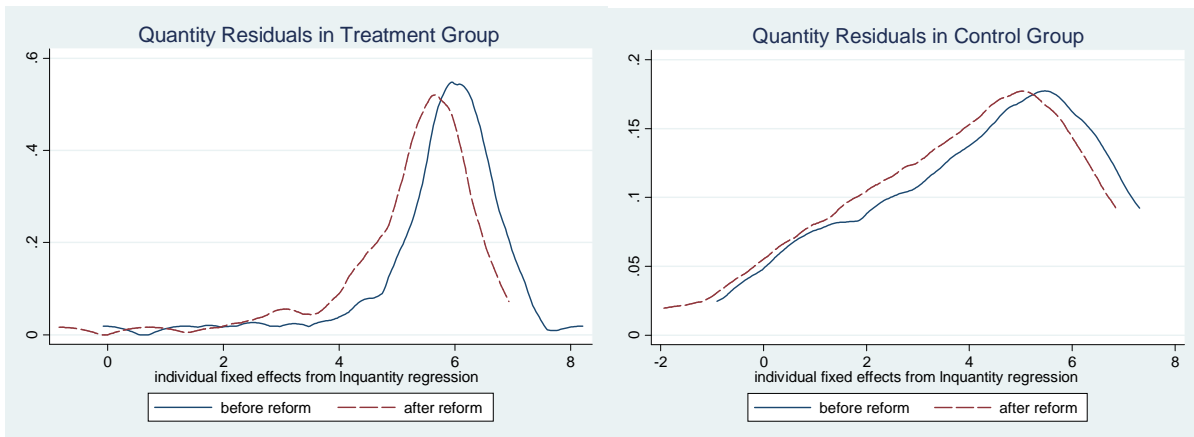
P-value of K-S Test: 0.001   *P-value of K-S Test: 0.595*

Notes: The sample used is a balanced panel, including only the reporters observed before and after the reform and excluding the 6 reporters who switch between the treatment and the control. The individual fixed effects are retrieved from running a regression of the log quantity score or the log quality score on the individual dummies and their interactions with the reform dummy, together with a bunch of controls including time dummies, division fixed effects, age-square, tenure-square, positions and qualifications as in the baseline regression. The kernel density uses the Epanechnikov kernel. The P-values of K-S test are the corrected P-values of the combined Kolmogorov–Smirnov tests of equality of distributions reported in Stata.

Table 1: Summary Statistics of Personnel Data

Panel A: Reporters

variables	gender (male)	education (college)	Party member	age	tenure	position (1-2-3)	qualification (1-2-3)
mean	0.60	0.83	0.47	32.80	8.20	1.50	1.47
min	0.00	0.00	0.00	22.00	1.00	1.00	1.00
max	1.00	1.00	1.00	57.00	27.00	3.00	3.00

Panel B: Managing Editors

variables	gender (male)	education (college)	Party member	age	tenure	position (1-2-3)	qualification (1-2-3)
mean	0.57	0.73	0.49	38.30	13.30	2.20	2.20
min	0.00	0.00	0.00	25.00	2.00	1.00	1.00
max	1.00	1.00	1.00	54.00	27.00	3.00	3.00

Notes: These tables summarize personnel information of 183 reporters and 56 managing editors in the sample from January of 2004 to December of 2006. The means of the reporters' personal characteristics are weighted by monthly observations; the means of the managing editors' personal characteristics are weighted by yearly observations. Party_member is a dummy indicating the membership of the Chinese Communist Party. Tenure is the number of years of working experience in the Newspaper. Position is an indicator ranking from 1 to 3, representing reporter, chief reporter and senior reporter respectively in the hierarchy of the Newspaper. Qualification is a certificate authorized by the Association of Chinese Journalists to indicate the expertise and experience in journalism, with 1 referring to assistant journalist, 2 to journalist and 3 to senior journalist.

Table 2: Summary Statistics of Individual Performance Measures

Panel A: Internal Measures

variables	mean	std dev	median	min	max
#articles	32.60	21.50	28.00	2.00	241.00
#words	18,434	13,223	16,188	230	144,280
quality score	2,080	1,273	1805	140	14,850
quality score	1,477	1,097	1,200	0	12,300

number of reporters: 183; number of observations: 4,461

Panel B: External Outcome Measures

variables	mean	std dev	median	min	max
measures of news content					
# investigative reports	1.42	1.62	1.00	0.00	19.00
# feature stories	1.00	1.35	1.00	0.00	11.00
# special reports	4.88	8.19	3.00	0.00	136.00
# propaganda articles	0.32	0.90	0.00	0.00	14.00
# reports on government officials	3.89	5.08	2.00	0.00	33.00
# advertising articles	0.51	1.16	0.00	0.00	11.00
# sensational/entertaining	1.14	2.60	0.00	0.00	24.00
# on-the-scene reports	0.71	1.41	0.00	0.00	10.00
measures of editorial activities					
# articles joint with editor	0.98	1.96	0.00	0.00	27.00
# articles column by content	1.27	3.01	0.00	0.00	29.00
# external author (government)	8.84	9.63	6.00	0.00	79.00
# external author (private sector)	0.53	1.82	0.00	0.00	23.00
# external author (freelance)	0.49	1.34	0.00	0.00	15.00
# coauthor (within division)	3.75	9.16	2.00	0.00	164.00
# coauthor (across division)	0.68	6.20	0.00	0.00	160.00

number of reporters: 103; number of observations: 2,446

Notes: Observations are at the individual-month level. Observations in Panel A include the reporters in all the divisions. Observations in Panel B only include the reporters in the reformed divisions, namely, Economic and Business, Politics and Law, Education and Health, and General Reports.

Table 3: Reporter Performance in Balanced Panel by Treatment and Reform

Panel A: Average Log Quantity Score

	treatment group	control group	difference (treatment-control)
before reform	7.504	7.524	-0.020
	(0.508)	(0.549)	(0.076)
after reform	7.513	7.516	-0.003
	(0.556)	(0.481)	(0.077)
difference	0.009	-0.008	0.017
(after-before)	(0.047)	(0.053)	(0.070)

Panel B: Average Log Quality Score

	treatment group	control group	difference (treatment-control)
before reform	7.199	7.155	0.044
	(0.598)	(0.647)	(0.077)
after reform	7.235	7.040	0.195**
	(0.610)	(0.727)	(0.092)
difference	0.036	-0.114*	0.151**
(after-before)	(0.043)	(0.062)	(0.075)

 Notes: The tables report the mean and standard deviations (in parentheses) of the reporters' performance in terms of the logarithm of the quantity and quality scores at the individual-month level in the constructed balanced panel, which includes only the reporters who are observed both before and after the reform and excludes 6 reporters who switch between treatment and control. Reform is the timing of the organizational change from decentralization to centralization. The treatment group is the reporters from the reformed divisions: Economic and Business, Politics and Law, Education and Health, and General Reports; the control group is the reporters from the unreformed divisions: Regional and Local News, Entertainment, Consumption-guide, and Photographing. The standard errors on the difference and the difference-in-differences are estimated from running the corresponding OLS regression, clustering the standard errors by individual. *** denotes significance at 1%, ** at 5%, and * at 10%.

Table 4: D-I-D Estimates of Average Treatment Effects of Centralization on Internal Performance Measures

Panel A: Baseline Results

	log quantity score				log quality score			
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
reform× treatment	0.054	0.052	0.053	-0.066	0.207***	0.205***	0.194**	0.061
	(0.074)	(0.074)	(0.067)	(0.066)	(0.072)	(0.073)	(0.076)	(0.070)
reform	-0.040				-0.152			
	(0.052)				(0.057)			
individual fixed effects	yes	yes	yes		yes	yes	yes	
time fixed effects		yes	yes	yes		yes	yes	yes
time-variant covariates			yes	yes			yes	yes
#observations	4,461	4,461	4,461	4,461	4,442	4,442	4,442	4,442
adj-R²	0.489	0.518	0.542	0.278	0.372	0.402	0.404	0.206

Panel B: Dynamics

	July 2005	August 2005	**Reform Start**	October 2005	November 2005	December 2005	Jan-06 onwards	#obs	adj-R²
log quantity	0.057	-0.006	-0.017	-0.031	0.075	-0.053	0.080	4,461	0.543
	(0.066)	(0.080)	(0.074)	(0.078)	(0.084)	(0.087)	(0.072)		
log quality	0.013	-0.068	0.050	-0.023	0.224*	0.103	0.229***	4,442	0.405
	(0.980)	(0.110)	(0.114)	(0.108)	(0.124)	(0.115)	(0.082)		

Notes: Reform is the timing of the organizational change from decentralization to centralization in September 2005. Treatment is a dummy for the reporters from the reformed divisions: Economic and Business, Politics and Law, Education and Health, and General Reports. The time-variant covariates include age-squares, tenure-squares, position, qualification and division fixed effects. When a regression excludes individual fixed effects (Column [4] and [8]), time-invariant personal characteristics such as gender, education and Party membership and the factors that are collinear with individual and time fixed effects such as age and tenure are now included. The regressions in Panel B are based on the D-I-D specification including individual fixed effects, time fixed effects and time-variant personal characteristics, with the reform×treatment dummy replaced by a series of interactions between the timing dummies and the treatment dummy. In particular, "Reformstart" is a dummy for a treated reporter in the month of the reform (September 2005), "August2005" a dummy for a treated reporter in August 2005, and "October2005" a dummy for a treated reporter in October 2005. Similar definitions apply to "July2005", "November2005" and "December2005". "Jan-2006onwards" is a dummy that equals one for a treated reporter working from January 2006 and onwards. Standard errors (in parentheses) are clustered by individual. ***denotes significance at 1%, **at 5% and * at 10% levels.

Table 5: D-I-D Estimates of Heterogeneous Treatment Effects of Centralization on Internal Performance Measures across Task Assignment

	log quantity score				log quality score			
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
reform×	0.191***	0.192***	0.191***	0.120	0.350***	0.349***	0.345***	0.218**
Economic and Busines	(0.069)	(0.069)	(0.069)	(0.081)	(0.081)	(0.081)	(0.083)	(0.089)
reform×	0.142	0.139	0.120	0.005	0.293**	0.290**	0.278**	0.171
Education and Health	(0.121)	(0.122)	(0.125)	(0.117)	(0.129)	(0.129)	(0.134)	(0.118)
reform×	-0.062	-0.065	-0.031	-0.224**	-0.082	-0.087	-0.088	-0.277**
Politics and Law	(0.107)	(0.107)	(0.102)	(0.098)	(0.082)	(0.083)	(0.091)	(0.117)
reform×	-0.299**	-0.307**	-0.322**	-0.316***	0.056	0.062	0.038	0.086
General Reports	(0.140)	(0.140)	(0.134)	(0.085)	(0.120)	(0.120)	(0.122)	(0.082)
individual fixed effect	yes	yes	yes		yes	yes	yes	
time fixed effects		yes	yes	yes		yes	yes	yes
time-variant covariates			yes	yes			yes	yes
#observations	4,461	4,461	4,461	4,461	4,442	4,442	4,442	4,442
adj- R²	0.515	0.545	0.552	0.293	0.380	0.410	0.411	0.218

Notes: The reported independent variables are interaction terms between division dummies and the reform dummy. Time-variant covariates include age-squares, tenure-squares, position, qualification and division fixed effects. When a regression excludes individual fixed effects (Column 4 and 8), time-invariant personal characteristics such as gender, education and Party membership and the factors that are collinear with individual and time fixed effects such as age and tenure are now included. Standard errors (in parentheses) are clustered by individual. ***denotes significance at 1%, **at 5% and * at 10%.

Table 6: Impact of Social Norms on the Effects of Centralization

	treatment group		control group	
	log quantity score	log quality score	log quantity score	log quality score
reform × special_months	-0.023	-0.140**	0.043	0.048
(January, September)	(0.036)	(0.055)	(0.041)	(0.059)
reform	-0.008	0.004	0.008	-0.102
	(0.053)	(0.061)	(0.059)	(0.082)
Covariates include individual fixed effects, month fixed effects and the time-variant individual characteristics.				
#observations	2,482	2,479	1,984	1,968
adj-R²	0.484	0.332	0.608	0.457

Notes: Reform is the timing of the organizational change from decentralization to centralization in September 2005. Special_months is a dummy for January and September, in which social norms condone rent seeking behavior. The standard errors (in parentheses) are clustered by individual. ***denotes significance at 1%, **at 5% and * at 10%.

Table 7: Comparison of Individual Fixed Effects: Exits, Stayers and Entries

Panel A: Quality Residuals

	treatment group			control group		
	exits	stayers	entries	exits	stayers	entries
before reform	4.067	4.611		3.442	3.550	
	(1.467)	(1.452)		(0.860)	(1.815)	
after reform		5.245	5.120		4.033	5.082
		(1.360)	(1.049)		(1.937)	(1.461)

Panel B: Quantity Residuals

	treatment group			control group		
	exits	stayers	entries	exits	stayers	entries
before reform	3.353	3.915		3.004	2.760	
	(1.129)	(0.831)		(1.166)	(1.506)	
after reform		3.357	3.231		2.248	3.465
		(0.853)	(0.679)		(1.495)	(1.480)

Notes: In the statistics of all the variables, the first line reports the mean values, and the second line reports the standard errors (in parentheses). The "quantity residuals" are individual fixed effects retrieved by running a regression of the log quantity score on the individual dummies and their interactions with the reform dummy, together with a bunch of controls including time dummies, division fixed effects, age-square, tenure-square, positions and qualifications in the unbalanced panel as in the baseline regression. The "quality residuals" are retrieved from a similar regression with the log quality score, instead of the log quantity score, as the dependent variable. In the regressions, the standard errors are clustered by individual. The stayers exclude 6 reporters who switch between the treatment and the control. The results are qualitatively similar when these observations are included.

Table 8: Effects of Centralization on News Content and Editorial Activities

Panel A: News Content

	journalism activities		private benefits		government influence	
	#investigative reports	#feature stories	#advertising articles	#external authors (private sectors)	#propaganda	#government officials
reform	0.528***	0.332***	-0.479***	-0.189*	0.021	0.465
	(0.186)	(0.127)	(0.139)	(0.109)	(0.086)	(0.375)
#obs	2,446	2,446	2,446	2,446	2,446	2,446
adj-R²	0.224	0.238	0.535	0.707	0.191	0.655

Panel B: Editorial Activities

	initiative of managing editors		external authors		internal co-authors	
	#joint with editors	#column by content	#freelance writers	#public sectors	#within division	#across divisions
reform	-0.318*	-0.294	-0.065	0.605	2.180***	-0.569
	(0.185)	(0.279)	(0.176)	(0.666)	(0.633)	(0.558)
#obs	2,446	2,446	2,446	2,446	2,446	2,446
adj-R²	0.145	0.637	0.283	0.640	0.252	0.037

Panel C: Heterogenous Treatment Effects by Task Assignment

	Economic and Business	Education and Health	Politics and Law	General Reports
#investigative reports	0.847***	0.890**	-0.580	0.952
	(0.258)	(0.352)	(0.432)	(0.676)
#feature stories	0.213	1.020***	0.175	0.468
	(0.208)	(0.276)	(0.265)	(0.471)
#advertising articles	-1.050***	-0.206	0.035	-0.068
	(0.289)	(0.240)	(0.052)	(0.043)
#joint with editors	0.025	-0.354	-0.777*	-0.197
	(0.241)	(0.755)	(0.398)	(0.220)
#observations	1,019	345	628	454

Notes: All the regressions include individual fixed effects, time (month and year separately) fixed effects, time-variant individual characteristics defined as before. The standard errors (in parentheses) are clustered by individual. ***denotes significance at 1%, **at 5% and * at 10%.