

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, in which the distribution of authority alleviates incentive incompatibilities. To examine the theory, I collect monthly personnel data from about 200 journalists over three years in a Chinese newspaper, and provide evidence on their incentives and performance under two basic organizational forms — centralization and decentralization. Relying on an unexpected organizational reform from decentralizing to centralizing editorial power in some divisions of the newspaper, I find three main results: 1) centralization improves the quality of the journalists' performance, in terms of the newspaper's internal assessment and the external measures of news content; 2) centralization reduces the journalists' activities for private gain; 3) centralization decreases the editorial activities conducted by managing editors. These results are in line with the theory: a more centralized hierarchy achieves better control over workers' opportunistic behaviour, at the cost of depressing middle managers' initiative.

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

JEL Classifications: D2 J5 L2 M5

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1 Introduction

Authority, the power of a superior to select actions or decisions for her subordinates, is the core of hierarchy. Authority defines 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 supports the relevance of the internal allocation of authority to economic performance at the firm 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 interest in studying authority, we lack a rigorous empirical understanding of how its allocation affects workers' performance.

In this paper, I collect monthly personnel data from about 200 reporters from 2004 to 2006 in a leading commercial Chinese newspaper (the Newspaper hereafter) that is funded by advertising revenues. I estimate causal effects of the distribution of authority on individual performance, relying on an unexpected organizational reform from decentralizing to centralizing editorial power in some divisions of the Newspaper. In line with the view that regards authority as a device to moderate incentive incompatibilities and control opportunistic behavior, the empirical findings shed new light on a basic question 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 incentive view of authority lies in the separation of formal authority (nominal control rights) and real authority (effective control). The distribution of formal authority affects agents' performance by changing their incentives to obtain resources that permit real authority. An influential theory along this line is that of Aghion and Tirole (1997), who formalize the idea that the distribution of real authority is determined by the 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, and 2) decision bias due to interest misalignment in project selection. Centralization, under which a principal retains both the right to overrule an agent's decisions and the right to direct an agent's actions, exerts two opposite forces on an agent's incentives: an effort-directing effect due to alleviation of his action distortion and an initiative-depressing effect due to control of his decision bias. I extend the analysis to a three-layer, principal-

¹For 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).

²The incentives view of authority is discussed in Weber (1922[1968]) and Williamson (1985). For recent theoretical inquiries along this line, see Qian (1994), Aghion and Tirole (1997), Baker, Gibbons and Murphy (1999), Rajan and Zingales (1998, 2001), and Prendergast (1995, 2002), Zabojnik (2002), among many others. Mookherjee (2006) surveys the literature on organizational structure and incentives from the perspective of mechanism design. Another influential 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), Van den Steen (2010), among others.

manager-worker, hierarchy. A change of organizational structure triggers a chain of responses. 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. For example, when the worker's action distortion is more serious than his decision bias, and conversely the manager's decision bias is more serious than her action distortion, centralization outperforms decentralization in inducing the worker's initiative, at the cost of depressing the manager's.

The institutional setting of the Newspaper provides a rare opportunity to examine the theory. Making editorial decisions regarding the choice of 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 how to select and implement an investigative report, because he has more information than the editor. Therefore, the allocation of formal authority over editorial decisions affects incentives by changing the distribution of information and thus real authority among chief editors, middle managers (division directors and managing editors), and reporters. Moreover, 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 was 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, together with the adoption of different organizational forms inside the Newspaper, permits me to establish causality using a difference-in-differences estimator, whose validity is supported by the absence of a trend over a long period before the reform. Moreover, the stability of other institutional aspects such as the pay scheme, the evaluation system, and the volume of news content helps to relieve concerns about a number of potentially 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. A team of research assistants coded 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 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, who have more opportunities to obtain private benefits from companies, respond to the reform far more than those who report on public policies. 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 more likely to have misaligned interests with the Newspaper, relative to those who remain. The last two results strongly support the explanation that centralization redirects the reporters' incentives from pursuing private benefits to desirable journalistic activities.

I then examine the effects of centralization on the external measures of news content and editorial activities. Centralization significantly increases 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 authored by a reporter, declines drastically after the reform. This result verifies the effort-directing effect. Moreover, centralization reduces the number of articles originated by , or coauthored 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 theory that organizational structure affects workers' performance through the redistribution of real authority and the resulting changes in their incentives to undertake ex-ante investments (notably, information acquisition). One particular contribution is to spell out that the effects of organizational structure on agents' incentives rest on both the nature of agency problems and the 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 related to the emerging literature that combines rigorous econometric methods with personnel data to achieve a more profound understanding of internal labor markets and resource allocation mechanisms inside organizations.³ The existing studies cover a wide

³The literature is referred to as personnel economics, or sometimes as insider econometrics. Baker et al

range of topics in labor economics and organizational economics.⁴ However, the literature provides little evidence on the effects of organizational structure, and is silent on the role of authority. The current paper and my follow-up research are devoted to filling this gap. The insight from the current research can be generalized to other organizations, as the Newspaper is, to a large extent, a profit maximizer. I will discuss the issue of external validity in the conclusion section.

Additionally, my research improves the limited economic understanding of media bias. Although this paper does not 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 suggested by Herman and Chomsky (1998) in their study of journalism. 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 between potential alternative explanations. Section 7 concludes. Proofs and extended theoretical analysis, details about data collection, and additional empirical results are provided in a web appendix.⁵

2 A Theory of Authority and Incentives

This section presents a simple theory of authority in a principal-manager-worker hierarchy, to show the essential function of organizational structure, and to generate empirically testable predictions.⁶ As in Aghion and Tirole (1997), real authority (effective control) is determined by the structure of information, which in turn depends on the distribution of formal authority (nominal 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 person with formal

(1994), Lazear (2000b), Lazear and Oyer (2009), and Ichniowski and Shaw (2009) provide excellent introduction and surveys.

⁴For 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; Liberti and Mian (2009) and Hertzberg et al (2010) study communication and incentives.

⁵The appendix is available at <http://personal.lse.ac.uk/wuy9/>.

⁶For this purpose, I abstract away from a number of institutional aspects, such as performance pay, career concerns and team work, which are either stable over the sample period or can be controlled for in the empirical analysis. In the web appendix, I discuss potential interfaces between organizational structure and these aspects.

authority has two rights: 1) directing the actions of a subordinate who diverts his effort in information acquisition, and 2) overruling the decisions of a subordinate who selects a project in conflict of her interest. Second, the introduction of multiple layers in a hierarchy generates a chain of responses, highlighting the importance of relative hierarchical positions in the provision of incentives.

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) 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. A variety of projects exist, each generating 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.⁷

Information and authority. The selection of projects first of all depends on formal authority. The superior party 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 give the decision right to a manager, who then makes decisions if informed, but will delegate 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 aspect of authority requires information. A subordinate can freely allocate his effort between production activities and private activities if his superior is ignorant.

Contracts and organizational forms. In the spirit of the theory of incomplete contract à la 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 — the acquisition of information in this model. I focus on the choice between two basic organizational forms: decentralization and centralization. Under decentralization, the principal delegates formal authority to the manager, and commits not to monitor both agents' activities; under centralization, the

⁷The on-the-job benefits can be intrinsic motivation (e.g., job satisfaction from decision making), or personal benefits such as perks and potential career opportunities.

principal retains formal authority—the right of directing decisions and actions.

Timing of the game. At T_0 , 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 selects among the projects. Under centralization, the principal decides the selection of project after she has acquired and reviewed the proposal by an informed manager or the worker’s proposal passed on by an uninformed manager; alternatively, if an agent proposes no project, the principal can acquire information to direct the agent’s actions. 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 types of 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. This is the classic moral hazard due to hidden action; it has also been labelled as rent seeking or shirking in the literature of transaction costs economics (Alchian and Demsetz 1972, Williamson 1975). The second type is decision bias at T_2 , when the agents, after acquiring information, propose their preferred projects that are in conflict with the principal’s interest. This is distortion in decision making due to ex post information asymmetry, as 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 $1 - E_i$ to conduct private activities. E_i also denotes 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.⁸ 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. Alternatively, 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 an informed superior can direct her subordinate to undertake her selected projects or actions.⁹

For simplicity, all the parties are assumed to be risk neutral. As performance is not contractible, the principal pays a fixed salary s_m to the manager and s_w to the worker, regardless of which project is 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

⁸I normalize the on-the-job benefit to one, as what matters is its comparison with the private benefit that will be discussed. I also 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.

⁹Equivalently, one can think of the monitoring of private activities as protection of the assets of the organization, when the realization of private benefits diminishes resources of the organization.

and the information distribution between the two agents.

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

$$U_w^D = s_w + (1 - E_m) [E_w + (1 - E_w) b_w] - \frac{1}{2} E_w^2. \quad (2)$$

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

Centralization. Under centralization, the principal can exercise his formal authority in two ways: she either monitors an agent's proposed project, or controls the agent's pursuit of private benefit by directing his or her actions. First, if agent i has acquired information and proposed a project, the principal, after spending an effort E_p^i , is informed with probability E_p^i , and able to modify the proposed project to obtain one unit of output; with probability $1 - E_p^i$, the principal is uninformed, and will rubber stamp the proposal. Second, if agent i has conducted private activities and proposed no project, the principal can acquire information to direct the agent's actions and achieve certain value. For simplicity, I assume that centralization incurs a fixed cost F , and the principal becomes fully aware of agent i 's private activities and is able to obtain a value $\delta_i \in (0, 1)$ by directing the agent to production activities. In other words, the monitoring of private activities is perfect, and the agents can never realize their private benefits under centralization. In the web appendix, I allow continuous and imperfect monitoring of the agents' private activities under centralization; the main economic insights in the following analysis remain unchanged in this more general case.

The payoffs to the three parties are:

$$\begin{aligned} U_p^C &= -s_m - s_w + E_m [E_p^m + (1 - E_p^m) \alpha_m - \frac{1}{2} (E_p^m)^2] \\ &\quad + (1 - E_m) E_w [E_p^w + (1 - E_p^w) \alpha_w - \frac{1}{2} (E_p^w)^2] \\ &\quad - F + (1 - E_m) \delta_m + (1 - E_m) (1 - E_w) \delta_w; \\ U_m^C &= s_m + E_m (1 - E_p^m) - \frac{1}{2} E_m^2; \end{aligned} \quad (3)$$

$$U_w^C = s_w + (1 - E_m) E_w (1 - E_p^w) - \frac{1}{2} E_w^2. \quad (4)$$

Note that in the above specification, an agent obtains zero on-the-job benefit if his or her proposed project is overruled by the principal; an agent does not benefit from the principal's direction of actions. These assumptions can be relaxed easily.

2.2 Analysis

Solve the model by backward induction, and assume interior solutions throughout. Under decentralization, the first order conditions of (1) and (2) produce a pair of Nash equilibrium efforts of the manager and the worker:

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

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 with formal authority over the worker depresses the worker's initiative by a factor b_m , which indicates her ignorance due to the distraction of private benefit.

Under centralization, the principal's optimal monitoring effort is

$$E_p^i = 1 - \alpha_i.$$

The principal monitors agent i 's proposed project to counter their selection distortion, the severity of which is measured by the congruence parameter α_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:

$$E_m^C = \alpha_m; \quad E_w^C = (1 - \alpha_m)\alpha_w.$$

Note that the agents' private benefit b_i does not enter their optimal efforts, because the principal's monitoring of the agents' private activities is assumed to be perfect.

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.

Definition 1 *Agent i is distracted if $b_i > 1 - \alpha_i$: the distraction of the private benefit is large, relative to the interest misalignment in project selection; alternatively, agent i is biased if $1 - \alpha_i > b_i$: the interest misalignment in project selection is large, relative to the distraction of the private benefit.*

The relative position of each agent in the hierarchy generates another trade-off: a decline (or an increase) in the manager's initiative in turn promotes (or depresses) the worker's initiative, resulting in subtle effects on the worker's incentives.

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, as follows:*

- 1) (***Biased Manager and Distracted Worker***) *Centralization, compared to decentralization, decreases the manager's initiative, but increases the worker's initiative.*
- 2) (***Distracted Manager and Biased Worker***) *Centralization, compared to decentralization, increases the manager's initiative, but decreases the worker's initiative.*
- 3) (***Biased Manager and Biased Worker***) *Centralization, compared to decentralization, decreases the manager's initiative, but has ambiguous impact on the worker's initiative.*
- 4) (***Distracted Manager and Distracted Worker***) *Centralization, compared to decentralization, increases the manager's initiative, but has ambiguous impact on the worker's initiative.*

The impact of organizational structure on the manager's incentives simply depends on her type: biased or distracted. This result would also hold in a two-layer hierarchy. However, the impact on the worker's incentives rests on both the type of manager and the preference match between the two agents. In the first two cases of Proposition 1, the relative severity of agency problems with the manager is opposite to that with the worker. The effect of organizational structure on the worker's incentives is amplified by the effect on the manager's, and thus is unambiguous. In the last two cases, both agents have the same dominant agency problems; the effect on the worker is no longer clear-cut, because the manager's initiative substitutes the worker's.

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 The Effort-Directing Mechanism

I have discussed two aspects of control under centralization. One is control of project selection, determined by an agent's preference α_i . The other is direction of actions by restricting an agent's pursuit of the private benefit b_i . Here, I stress the latter aspect of control, as the access to private benefit, to a large extent, depends on the agent's job assignment and working environment, and is easier to test empirically.

Proposition 2 (*Heterogeneous Treatment Effect*) *Consider the effect of an organizational change from decentralization to centralization on an agent's initiative.*

- 1) *The effect on the manager's initiative increases in her access to private benefit;*

2) *The effect on the worker's initiative increases in his access to private benefit, and the increase is enhanced by the manager's access to private benefit.*

The effect on the manager only hinges on the interaction between two layers: the principal and the manager. Centralization has a larger effort-directing effect on agents who have more access to private benefit and who allocate more effort for private activities under decentralization. The second statement — the positive correlation between the effect-directing effect and the worker's access to private benefit — is true only if the principal's monitoring of the worker's private activities is sufficiently effective, which is assumed in the current model. In general, better control of the middle line does not necessarily imply better control at the bottom in a multi-layer hierarchy. For example, if the manager loses initiative under centralization, the worker will obtain greater freedom to allocate his effort; a larger private benefit may distract him further from production activities, if the monitoring of his private activities is not effective.

2.2.3 Organizational Change and Participation

A change in organizational structure also affects an agent's willingness to participate in the organization. For the manager, centralization, compared to decentralization, restricts her freedom to allocate efforts and thus decreases her utility. The effect on the worker's utility is ambiguous, because more control over the manager's power may give more power to the worker. According to Proposition 1, when the manager is biased, centralization gives the worker more freedom to allocate efforts between production activities and private activities. The worker faces a trade-off between the on-the-job benefit and the private benefit. The principal's monitoring of private activities causes a loss of private benefit under centralization. The gain of the on-the-job benefit from effort-directing is small for the one who has a strong bias in project selection, and anticipates that the principal will overrule his proposed project.

Proposition 3 (*Selection Effect*) *Consider an organizational change from decentralization to centralization, and suppose that the agents' salary is fixed.*

- 1) *The manager always becomes worse off.*
- 2) *A worker with more access to private benefit and/or lower interest alignment with the principal is more likely to leave the organization; conversely, a worker with less access to private benefit and/or higher interest alignment with the principal is more likely to participate in the organization.*

The proposition points out a selection effect triggered by an organizational change: centralization tends to hinder the participation of incumbent employees (both managers and workers) and increase turnovers, if the organization does not change its compensation policy. The organization, however, can benefit from replacing workers whose interests are misaligned with the principal's, with the ones whose interests are better aligned.

3 Institutional Background and Data

3.1 Institutional Setting

This section describes the institutional framework, drawing from numerous interviews and the internal documentation of 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 of about one million in the sample years.¹⁰ Although owned by the state, the Newspaper is fully funded by advertising and sale revenues. It operates in a highly competitive local market.¹¹ After paying a fixed fee to the state, the board of the newspaper has a large degree of freedom to distribute the residuals. A large component of the senior managers' income is tied to the Newspaper's profitability. The Newspaper enjoys high autonomy in managerial practices such as organizational strategies and pay schemes, and in editorial decisions except for reports about major political issues.

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, a General Reports section focusing on investigative reports, sudden events and miscellaneous topics, and sections on Regional and Local News, Sports, Entertainment, and Consumption-Guide.¹² 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 instructions. 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 decides the subject and selects an article for 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.

¹⁰The circulation number is a rough estimate, since Chinese newspapers may exaggerate their circulation number to attract advertising revenues.

¹¹The Newspaper competes with 5 other newspapers in the same market, and with more than 20 newspapers that are more specialized in a narrower type of journalism or geography. The Newspaper also faces increasing competition from broadcasters and the internet.

¹²The Consumption-Guide is a section on consumer products and service, for example, fashion, housing, luxury goods etc. There are two supplement sections, one on international news, in which articles are mainly provided by news agencies, and the other on culture and literature, in which articles are provided by freelance writers.

In contrast, a reporter determines the news content of an investigative report, as an editor sitting in an 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 contact with news sources. Editors are more effective in making editorial decisions regarding propaganda, regular government activities, 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.¹³ 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 the desirable information for the Newspaper. Incentives are a particular concern, because journalism 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 opportunities. The "hongbao" phenomenon that people receive money, gifts or other benefits from those who request their favors is pervasive in the Chinese media industry.¹⁴ Anecdotal evidence suggests that "hongbao" accounts for a significant proportion of their income for some reporters. Moreover, reporters may spend time and effort establishing "guanxi" (social connections in Chinese) to expand career and business opportunities. These benefits, referred to as the private benefit in the theory, detract them from production activities, and may invite them to misuse the resources of their employers. A prevalent example is that a reporter submits information in favor of interviewees. Some of this information, such as an advertising-type report, is particularly detrimental to the Newspaper, as it not only harms news content but may also crowd out advertising revenues. To realize these private benefits, a reporter has to endeavor to seek information, establish relations with potential interviewees, and persuade editors.

¹³The 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.

¹⁴In 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, birthdays, weddings etc. It has become popular to give a "hongbao" to request a favor or exchange benefits. According to the regulation of Chinese media, journalists receiving "hongbao" from interviewees is considered to be corruption. But unless the amount of money is large and verified, such misbehavior is hardly ever punished.

In contrast, an editor has far fewer opportunities to seek rents, as her scope of actions is usually limited to the office, and her information source is easy to verify. Thus the editor's agency problem mainly occurs at 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 favoritism towards certain news subjects in exchange of perks. This causes the decision bias that I have discussed in the theory.

3.1.3 Performance Pay and Evaluation

The Newspaper adopts a high-powered 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, which is 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 of the quality score is claimed to be "an accurate measure of a reporter's individual contribution", and "fair to every employee".¹⁵ It is based on well-defined rules, and I will show that I am able to imitate this internal evaluation with external measures of news content. When the published articles are authored jointly with other reporters or editors, the scores are adjusted by a sharing rule designed to distinguish between the contribution of each individual reporter.

The pay to other employees is relatively low powered. Middle managers (division directors and managing editors) receive a flat wage, together with a bonus component based on an internal assessment of the performance of the whole team in a news section. Chief editors are paid 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 coexisting 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, editorial power was formally delegated to the middle managers in a particular division (e.g. Economic and Business News). Chief editors intervened 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:

¹⁵The Evaluation Committee 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. 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.

Economic and Business, Politics and Law, Education and Health, and General Reports. Twenty-five managing editors in these divisions were reallocated to an editing center, headed by two chief editors and several associate editing directors (Panel B of Figure 1). Effectively, the chief editors retained the formal authority over editorial decisions, and closely monitored the editing process to clean up low quality or even harmful news content, such as advertising-type information. 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.¹⁶

The reform was imposed by the Board, who claimed that centralization would "enhance control", and "improve competency". However, the reform was described as "a surprise" in interviews, as "no obvious problems were perceived". Insider information suggests that the reform was triggered by the appointment of a new general chief editor in June 2005, who was a former government official and might have a tendency for centralization.¹⁷ The divisions to be reformed were supervised by the retired chief editor, whose job was taken over by the new chief editor. I will show that the data demonstrate no differentiated trends in the performance of the reporters in the reformed divisions and the unchanged divisions before the reform.

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, and there was no entry and exit of competitors. The volume of news content (the number of pages) of the Newspaper was stable throughout the period. The pay schemes and the evaluation system, in terms of both 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 by combining the Newspaper's internal personnel records and external measures of news content. The Newspaper provided personal information of all its employees, 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 were 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

¹⁶The Newspaper does not have a separate photographing section. But chief editors usually do not intervene the photographers' work. Therefore the photographing division is regarded as decentralized and will be included in the control group.

¹⁷The centralized divisions reverted to decentralization after this general chief editor stepped down in 2008, supporting the coincidence of his appointment and the organizational reform.

journalist, I specified 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 were trained to master the basic skills of content analysis in journalism. Then they coded 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 noise, I also exclude the following observations: 1) new recruits in the first three months who are not paid by performance; 2) division directors or editors who cover news occasionally; 3) regular reporters who wrote very little in some unusual situation, for instance, being ill or on holiday. All the 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 at 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 understand 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 to serve as a basis for performance pay, 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-squared 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.¹⁸ 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, and earns a quantity score of 2080, and a quality score of 1477.

3.2.4 External Measures of News Content and Editorial Activities

I classify the direct measures of news content into the following mutually exclusive categories: investigative report, feature story, special report¹⁹, advertising²⁰, 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 that they are unique or unusual in news subjects, or different in some important aspects from other newspapers' coverage of similar subjects. I use these three types of articles, particularly the first two, as proxies for a reporter's good journalistic activities and production initiative (journalistic initiative hereafter), since they require both substantial effort to collect original information and direct contact 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 articles according to their authorship, which reveals information on editorial activities. For example, an article authored by a reporter jointly 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

¹⁸ According to the interviews, on average about 20% articles submitted to the editors are rejected. Most rejections are low quality articles. 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.

¹⁹ 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.

²⁰ 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 advertisement articles assigned by the Newspaper for business clients, which are provided by the advertising department and not authored by reporters.

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 sector, private sector, and freelance writers. Usually the managing editors directly contact the freelance authors, while the reporters work with the other two types. The articles with external authors from the private sector 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 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. Panel B of Table 2 summarizes the basic statistics of the external measures. A few features 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 effort. Third, the number of articles "joint with editor" and "column by content" is small, showing that the reporters play a key role in journalistic activities and editorial decisions.

In a regression of the quality score on the external measures, the R-squared exceeds 75%, supporting their credibility as reliable measures of the reporters' initiative and effort. The main contributing factors to the quality score are investigative reports, feature stories, special reports, and propaganda articles, confirming 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 anyone'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 guidelines for such an examination.

Since accurate measures of the managing editors' performance is not available, I will mainly estimate the impact on the worker's performance. 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 underlying mechanisms, and can be interpreted in various ways. Thus 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 effort-directing effect dominates. 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 casts 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 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 journalistic 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' journalistic initiative. Empirical verification of these two hypothetical results favors 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. Even though the timing of the reform is arguably exogenous, there may be unobservable factors associated with the reform that could cause serious bias. This is of particular concern for the quality measure, which can be sensitive to explicit or implicit changes in editorial and evaluation policy. Fortunately, the remaining decentralized 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 quantity and quality scores in logarithm 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. Two features strongly support the validity of the D-I-D estimator. First, there is no 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 groups are very similar in terms of levels and co-movement pattern before the reform, suggesting that the treatment group would behave similarly as the control if there were no treatment.

One potential concern is that if the appointment of the general chief editor causes systematic editorial bias towards the treatment group after the reform, 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, is mainly largely determined by the Evaluation Committee, instead 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 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 both the treatment and control groups.

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:

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

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 exits of reporters associated with the reform. C_i is a dummy that equals one for the reformed divisions, and zero for the remaining decentralized divisions. 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 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.²¹ 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 potential time serial correlation. The main results are robust using other clustering strategies.²²

5 Main Results

This section presents the main empirical results to investigate 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 focus on the impact of centralization on the intensive margin: the change in the average performance of the same reporters before and after the reform, 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 shows that the differences in the quantity score under the two organization schemes in both the treatment and control groups are negligible, and the difference-in-differences comparison is small and statistically insignificant. These results are not surprising, given that the Newspaper's vol-

²¹The variables age and tenure are not identified due to collinearity in the regression with both individual fixed effects and time fixed effects.

²²The 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 the main results are still significant at the 10% level. The results that cluster the standard errors at the *division* \times *quarter* level are more precise than those that cluster at the individual level.

ume of content 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. 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 journalistic initiative that determines the quality of news content.

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).

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-squared 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. I replace the interaction term between the treatment dummy and the reform dummy with a set of dummy variables. "*reformstart*" is 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*" a dummy for a reporter in the treatment in August 2005 (one month before the reform), and

"October2005" a dummy for a reporter in the treatment 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 four months after 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 reform, 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 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 to private benefits varies.

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. As in other 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.²³ The reporters in these two divisions are more likely to divert their efforts to pursue private benefits. In 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.²⁴ These conjectures are supported by the distribution of the number of

²³Corruption in the education industry and the healthcare sector is frequently reported in media and widely debated in public.

²⁴The 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

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.²⁵

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, Education and Health, Politics and Law, 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 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 economically modest 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 General Reports, and most pronounced in Politics and Law, which experiences the largest exits 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 seize 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 local government, in addition to the management of internal activities. As a result, one should expect little impact of centralization in these periods, if effort directing is the mechanism underlying the reporters' response.

The Spring Festival is often in late January and sometimes in early February, and the Mid-Autumn Festival is usually in September and occasionally in early October.²⁶ Private

such misbehavior is unusual in leading Chinese newspapers, though it may be more common among reporters working for lower quality newspapers.

²⁵The 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.

²⁶The 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.

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. Table 6 reports the regressions, in which I add to the baseline estimation specified in (5) an additional interaction between `reform_treatment` and the dummy of "special months". This triple difference estimation shows that the effect of centralization on the quality score is a 16.5% reduction in the special months, benchmarked against the effect in the normal months, which is a 22% increase. The F-test cannot reject that the sum of these two coefficients equals to zero, and supports that the effect of centralization in the special months is negligible. The impact on the quantity score is insignificant in either the special or the normal months, 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 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,

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

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 stayers 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 even before the sample period, the changes in the quality residuals are more likely to reflect improvement of the

reporters' production incentives instead of their 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 the stayers' individual fixed effects 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, and thus offsets the positive effect of centralization on the stayers, causing 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 exits 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.²⁷ In 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 preferences of the exits may be less aligned with the Newspaper's interests than those of 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'

²⁷In 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.

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. To summarize, the findings in Table 7 support Proposition 3, which implies that centralization, relative to decentralization, hinders 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, centralization may improve a reporter’s initiative and performance through 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 reporters. The results presented above have indicated 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 between 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:

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

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 journalistic 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 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' journalistic initiative and their attainment of private benefits, confirming 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 jointly 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' journalistic initiative, indicates the existence of initiative substitution between the reporters and the middle managers.

Interestingly, centralization significantly increases the number of articles that reporters coauthor 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 treatment group into the four divisions as before. The trade-off between the reporters' journalistic initiative (measured by the number of investigative reports and feature stories) and their attainment of private benefits (measured by advertising articles) only appears in two divisions: Economic and Business and Education and Health, in which the 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 that 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; the depression of the managing editors' initiative does not cause 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 (biased manager and distracted worker), but in favor of Case 3 (biased manager and biased worker), 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 journalistic initiative 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), is significantly alleviated in the special months, confirming 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 could be spurious if the evaluation rules of quality, explicitly or implicitly, became relaxed, or if the editorial policies favor a particular type of report that is easier to implement after the reform. I examine this possibility by testing the stability of the correlation between the quality measure 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, evaluation may have 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' journalistic initiative increase substantially after the reform, but their quality scores do not in the absence of the 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 how to implement projects. If the organizational reform systematically affects the middle managers in these dimensions, the previous estimates are potentially biased.

Changes in the composition of the middle managers. Even though 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 the largest influence on the reporters, remain the same people. 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. However, the turnovers mostly take place among junior editors who have limited impact on the reporters, and their 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 the smallest changes in managing editors.

Implementation and coordination. When the managing editors lose their initiative to acquire information, they may divert their attention to implementing projects. For instance, a managing editor may spend more effort revising and editing a reporter's articles to improve their readability and style, which may contribute to the reporter's quality score. 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 to accumulate sufficient firm specific expertise. Therefore, I estimate the effects of centralization on the junior reporters who have working experience equal to or fewer than 3 years in the Newspaper.²⁸ Relative to the impact on the more senior, the effects of centralization on

²⁸Most interviewees agree that it takes usually 2 to 3 years to acquire the newspaper specific expertise to cover news efficiently and write well.

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 show that the reporters may learn more slowly or receive less support from the editors after the reform — a result that goes against the explanation that centralization improves implementation and coordination.

6.2.3 Intrinsic Motivation and Peer Pressure

Another possible explanation is that the organizational reform imposes greater peer pressure on the reporters. Under centralization, the reporters' articles are also reviewed by more senior editors, who may be stricter with editorial decisions and have greater influence on their promotion than the managing editors. As a result, the reporters are more willing to forego private benefits and improve their journalistic 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 cannot explain the heterogeneous 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 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 probed two fundamental questions in organizational economics: what is the source of authority? How does the distribution of authority moderate incentive incompatibility among people in a hierarchy?

The incentive view of authority is derived from the premise that authority cannot be completely contractible and fully enforceable. The role of organizational structure hinges on its impact on workers' attainment and control of the resources that generate real authority. My 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 optimize their resource allocation and compete for real authority, in response to a given distribution of formal authority.

Moreover, this research casts light on the mechanism of authority at work in a hierarchy. Authority has two aspects: 1) direction of actions and 2) direction of decisions. The former mitigates the agency problem of hidden action, and the latter mitigates the agency problem of decision bias. Therefore, the effect of the distribution of authority on agents' incentives

crucially depends on the nature of agency problems and which aspect of authority plays a larger role. 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 decision bias, at the cost of killing his or her initiative for information acquisition. Furthermore, this paper shows that the agents' relative positions in the hierarchy matter: the type of the middle manager is important to direct the impact of authority structure on the worker. Several pieces of evidence have shown that depressing the initiative of agents at a higher layer in turn promotes the initiative of those subject to their authority.

In terms of benefit and cost analysis, the adoption of the centralized organizational structure in the Chinese newspaper improves the quality of its news content, which may lead to a larger circulation and more advertising revenues. With personnel data from a single firm, the welfare analysis is limited. I am collecting data from a number of Chinese newspapers, and attempting to investigate the impact of organizational strategies on firm performance in greater detail.

The current research is based on personnel data from a specific Chinese newspaper, which certainly limits its external validity. However, the Newspaper is largely funded by advertising revenues, and its adoption of organizational strategies is, to a large extent, driven by profitability concerns. How to structure the organization of newspapers in response to market competition has been widely debated since the commercialization of Chinese media. The economic questions addressed in my paper are common in the Chinese newspaper industry, and echo the research on organizational structure in Western media, for example, the studies by DuBick (1978) and Carter (1984). Furthermore, the dialogue between the theory and the empirics in my paper suggests that the insight from the study of the Newspaper can be generalized to other organizations, in which the production involves intensive human capital and information collection, and the input from workers is hard to verify and monitor. In other settings and with different focuses, some recent research points to the same direction: the allocation of authority influences workers' incentives and decisions. For example, Argyres and Silverman (2004) provide evidence of the correlation between a firm's choice to operate a centralized or decentralized R&D structure and the type of innovation undertaken. Csaszar (2008) shows that the decision-making structure in mutual funds affects the number of their initiatives and errors in their decisions. Liberti and Mian (2009) present evidence that hierarchical distance influences the use of information in the decision making process in a multinational bank.

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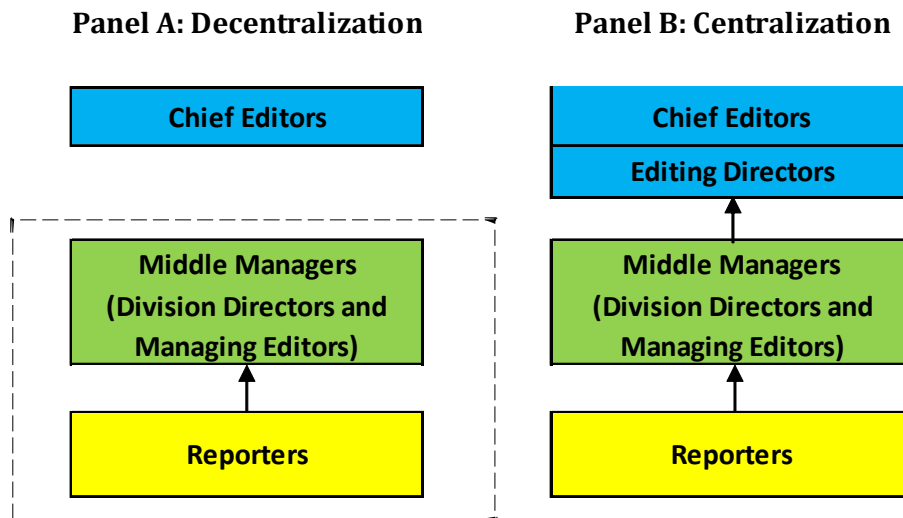
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Figure 1: Organizational Structure and Allocation of Formal Authority



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

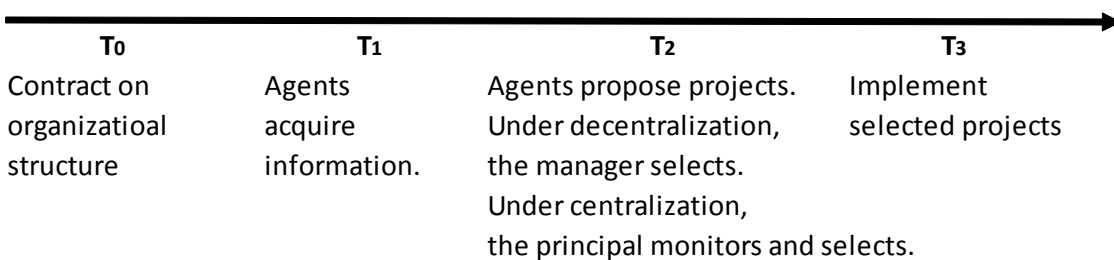
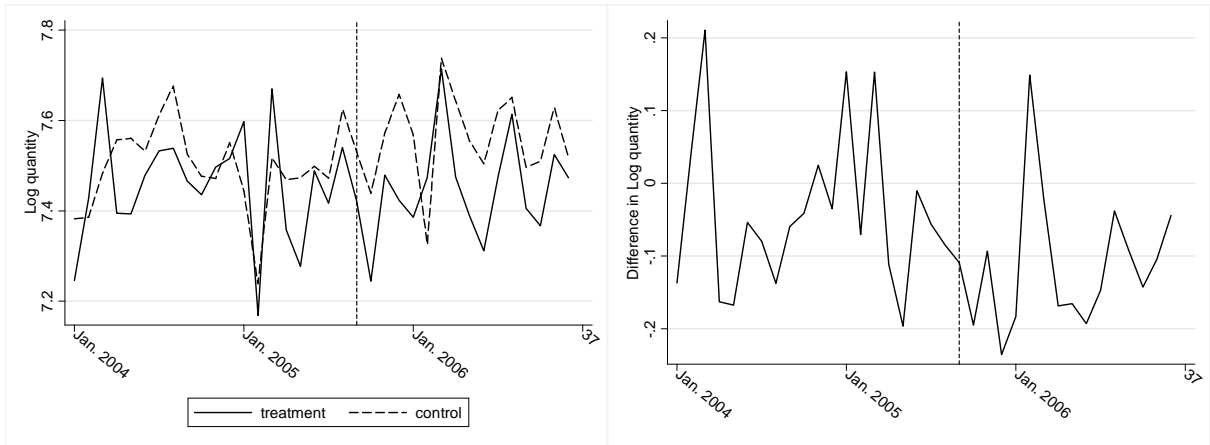
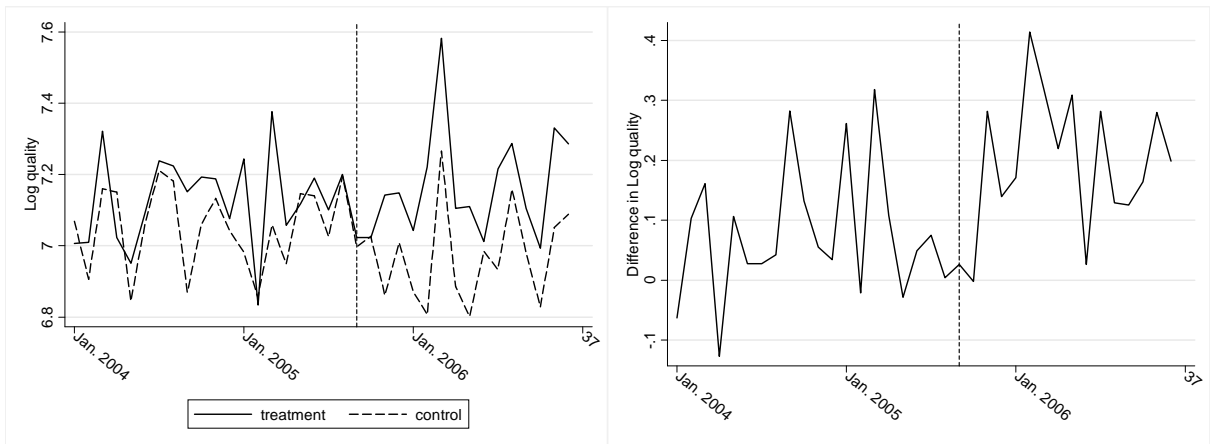


Figure 3: Comparison in Performance between Treatment and Control

Panel A: Log Quantity Score



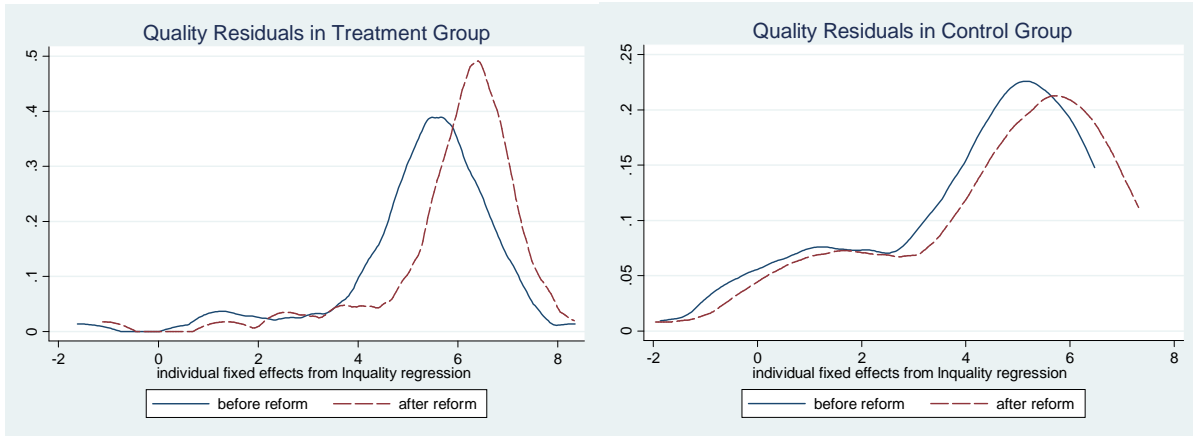
Panel B: Log Quality Score



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

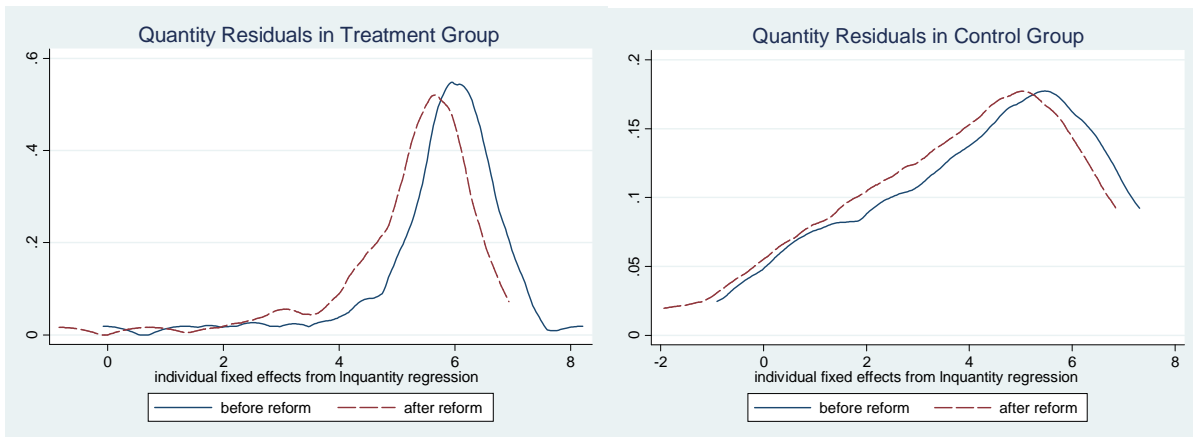
Panel A: Quality Residuals



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. Reform is the timing dummy equal to one after (including) 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. 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-squared, tenure-squared, 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
quantity 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 (0.508)	7.524 (0.549)	-0.020 (0.076)
after reform	7.513 (0.556)	7.516 (0.481)	-0.003 (0.077)
difference (after-before)	0.009 (0.047)	-0.008 (0.053)	0.017 (0.070)

Panel B: Average Log Quality Score

	treatment group	control group	difference (treatment-control)
before reform	7.199 (0.598)	7.155 (0.647)	0.044 (0.077)
after reform	7.235 (0.610)	7.040 (0.727)	0.195** (0.092)
difference (after-before)	0.036 (0.043)	-0.114* (0.062)	0.151** (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 remaining decentralized 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 (0.074)	0.052 (0.074)	0.053 (0.067)	-0.066 (0.066)	0.207*** (0.072)	0.205*** (0.073)	0.194** (0.076)	0.061 (0.070)
reform	-0.040 (0.052)				-0.152 (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-R ²	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-R ²
log quantity	0.057 (0.066)	-0.006 (0.080)	-0.017 (0.074)	-0.031 (0.078)	0.075 (0.084)	-0.053 (0.087)	0.080 (0.072)	4,461	0.543
log quality	0.013 (0.980)	-0.068 (0.110)	0.050 (0.114)	-0.023 (0.108)	0.224* (0.124)	0.103 (0.115)	0.229*** (0.082)	4,442	0.405

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, Education and Health, Politics and Law, and General Reports. The time-variant covariates include age-squared, tenure-squared, 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 reporter in the treatment group in the month of the reform (September 2005), “August2005” a dummy for a reporter in the treatment in August 2005, and “October2005” a dummy for a reporter in the treatment in October 2005. Similar definitions apply to “July2005”, “November2005” and “December2005”. “Jan-2006onwards” is a dummy 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%.

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- R ²	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. The control group is the remaining decentralized divisions. Time-variant covariates include age-squared, tenure-squared, 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

	log (quantity score)	log (quality score)
reform × treatment	0.062	0.220***
	(0.068)	(0.079)
reform × treatment × special months (January and September)	-0.058	-0.165**
	(0.054)	(0.080)
p-value of F-test on zero sum of two coefficients	0.956	0.575
Covariates include individual fixed effects, time fixed effects and the time-variant individual characteristics.		
#observations	4,466	4,447
adj-R ²	0.543	0.405

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 (1.467)	4.611 (1.452)		3.442 (0.860)	3.550 (1.815)	
after reform		5.245 (1.360)	5.120 (1.049)		4.033 (1.937)	5.082 (1.461)

Panel B: Quantity Residuals

	treatment group			control group		
	exits	stayers	entries	exits	stayers	entries
before reform	3.353 (1.129)	3.915 (0.831)		3.004 (1.166)	2.760 (1.506)	
after reform		3.357 (0.853)	3.231 (0.679)		2.248 (1.495)	3.465 (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). Reform is the timing dummy equal to one after (including) 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. 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-squared, tenure-squared, 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**

	reporters' initiative		private benefits		government influence	
	#investigative reports	#feature stories	#advertising articles	#external authors (private sector)	#propaganda	#government officials
reform	0.528*** (0.186)	0.332*** (0.127)	-0.479*** (0.139)	-0.189* (0.109)	0.021 (0.086)	0.465 (0.375)
#obs	2,446	2,446	2,446	2,446	2,446	2,446
adj-R ²	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 sector	#within division	#across divisions
reform	-0.318* (0.185)	-0.294 (0.279)	-0.065 (0.176)	0.605 (0.666)	2.180*** (0.633)	-0.569 (0.558)
#obs	2,446	2,446	2,446	2,446	2,446	2,446
adj-R ²	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*** (0.258)	0.890** (0.352)	-0.580 (0.432)	0.952 (0.676)
#feature stories	0.213 (0.208)	1.020*** (0.276)	0.175 (0.265)	0.468 (0.471)
#advertising articles	-1.050*** (0.289)	-0.206 (0.240)	0.035 (0.052)	-0.068 (0.043)
#joint with editors	0.025 (0.241)	-0.354 (0.755)	-0.777* (0.398)	-0.197 (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%.