Influence Activities and The Dark Sides of Decentralization: Evidence from A Chinese Newspaper

Yanhui Wu*

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Abstract

In this paper, we explore a natural experiment of organizational change from decentralization to centralization in a leading Chinese newspaper. Using a differences-in-differences approach, we find that centralization on average increases the journalists' performance, shedding light on the dark sides of decentralization. Contributions of this positive effect mainly comes from those journalists who are potentially associated with large private benefit and those who are victims of influence activities under decentralization. Our findings are consistent with recent economic theories of organization under a multi-tasking framework. The results highlight the importance of heterogeneity in organizational design.

*Economics Department and Cenre for Economic Performance, the London School of Economics, Houghton Street, London WC2A 2AE, UK. Email: Y.Wu8@lse.ac.uk; Tel:+44 (0)20-79557080; Fax: +44 (0)20-79557595. The author is very grateful to Daniel Sturm, Oriana Bandiera, Steve Pischke, Andrea Prat, Stephen Redding for their helpful suggestions and comments.

1 Introduction

Recent years have witnessed a flatter corporate structure inside firms. The so called 'knowledge-based' economy or information society drives firms to delegate power or decision rights as efficient communication and flexible response become more important. Discussion of centralization and decentralization is prevailing in newspapers and in management journals. Organizational theorists have regained interests in explaining these two old managerial practices. Despite sophistication of the theoretical models, the literature provides little evidence of consequences under the two organizational modes, in particular how individual workers respond to organizational change. There are good reasons why empirical studies of organizational change are short of supply. First of all, unlike technology, organizational modes affect a firm through workers' incentives, which are hard to observe and measure in many aspects. Secondly, restructuring of organization is always associated with changes of other managerial practices such as payment scheme, promotion policy etc. Thirdly, organization mode is somehow a part of corporate culture and may take a long time to effect. As a result, estimation of effects of organizational change requires very detailed information at the micro level. In this paper, we explore a quasi-experiment of centralization in a newspaper to address the issue of how organizational change affects individual performance through incentives.

Apart from availability of detailed data, the great advantage of investigation of a case of newspaper lies in the fact that journalism is a human capital intensive job, resulting in two consequences: 1) there may exist serious informational asymmetries between workers (journalists) and decision makers (editors); and 2) journalists perform tasks with much degree of freedom. These features lead monitoring and information transmission to the heart of management of journalism. And monitoring and information transmission are the key mechanisms underlying the organizational modes in recent economic theory of organization. (a short reference to be added). A case study

of journalism may provide a close link between empirics and theories.

The newspaper under our examination is one of the industry leaders in China. In September 2005, the newspaper undertook an organizational reform from decentralization to centralization in certain sectors. This quasi-experiment provides an opportunity to identify the effect of centralization on individual performance. We collected data and conducted interviews in late 2006 and in the Summer of 2007. The newspaper provided monthly performance measure of all journalists (reporters) in various aspects (number of published articles, total words, quantity score and quality score) from January 2003 to December 2006. We obtained detailed personal information of all employees in the newspaper from its Personnel Department. We had access to documentation of payment scheme, organizational structure, promotion policy and other managerial practices of the newspaper. We conducted numerous interviews about the organizational reform with editors, managers, sector directors and reporters. More detail about the institutional background and the data will be discussed in later sections.

By using a differences-in-differences approach, we find that centralization has a significant positive effect on individual journalist's quality performance. We decompose the average treated effect by exploring heterogeneity among the journalists in two dimensions: allocation of tasks and seniority. We find that the centralization has an especially large impact on those journalists specializing in economic news coverage (Economic Journalists for short). Interestingly we find the effects of centralization demonstrate an inverse-U shape across journalists with different seniority in terms of tenure and position in the hierarchy of the newspaper. In particular, journalists with medium seniority improve their performance substantially after the centralization reform while the effects on junior and senior journalists are insignificant or mild. The effects of centralization on other performance measure, though less pronounced, but essentially follow similar pattern.

Our findings, which might seem surprising, are consistent with some influential economic theories of organization. Aghion and Tirole (1997) formalizes

the idea that the principal may delegate decision rights in order to provide more incentives for agents to collect information, which may be more valuable than the principal's information. With delegation of power, the agent however may manipulate his information advantage to serve his own purpose. The trade-off between more initiates and loss of control depends on the preference discrepancy between the two parties. In our case of journalists, anecdote evidence suggested that Economic Journalists were more likely to receive significant amount of private benefit and thus have a target more discrepant from the newspaper's target. When the private benefit is less costly to realize (e.g. under decentralization), the Economic Journalists tend to divert efforts from their regular productive activities.

It is well known that members of organizations spend considerable time, effort and talents attempting to influence decision makers. As pointed out by Milgrom (1988) and Milgrom and Roberts (1988), organizational mode can be used as an instrument to limit access to decision making and thus result in workers' reallocation of talents between influence activities and productive activities. If we conjecture that more senior members are more likely (have lower cost) to conduct influence activities, we would expect that centralization effects in favour of more junior journalists since centralization tends to restrict influence activities. Of course, we have to take into account other effects of seniority, such as access to the firm's specific assets, learning on the job and career concerns.

Our study contributes the empirical literature of economics of organization in an unexplored aspect by exploring personnel data. (A short literature review) Moreover, this paper highlights the importance of heterogeneity in organizational design. Mere consideration of a representative agent and average effect may convey insufficient or misleading information and hinder improvement of efficiency in the organization. More realistic theory and empirical studies should take heterogeneity of agents and their interactions into account.

This paper is organized as following. In next section, we present a stylized

theoretical model under a multitasking framework, which incorporates the ideas in the Aghion and Tirole (1997) and Milgrom and Roberts (1988). Then we discuss the institutional background of the newspaper and the data in great detail in Section 3 and Section 4. In Section 5, we specify the econometric strategy: a differences-in-differences approach. Section 6 is the core part, consisting our main empirical results. Section 7 is devoted to robustness checks. We conclude in Section 8.

2 The Model

Under a multitasking framework, we develop a stylized model to illustrate the effects of different organizational modes on individual performance. A firm (the principal), which consists of a set of critical assets including intangibles, employs a group of workers (agents) to perform a series of tasks. In this model, we do not specify the principal's preferences as our main purpose is to examine the agents' response upon change of organizational modes. We assume that the firm simply adopts a piece-rate payment schemes to reward workers by their performance (measured in terms of quantity or quality) of assigned tasks. Moreover, this payment scheme is fixed at the beginning of contracting between the firm and the workers and the firm uses other methods to motivate and monitor workers. From the perspective of contract theory, such a contract may leave substantial space to improve. However, from the point of view of managerial practises, such an arrangement is not unusual. Particularly it fits the case of the newspaper we are going to investigate.

In order to single out the effects of organizational change on the workers' behaviour, we limit the principal's possible actions to a set of binary choice $O \in \{C, D\}$,with C indicating centralization and D decentralization. The key difference between these two organizational schemes is that under decentralization the agents have easier access to the firm's intangible assets (e.g. the firm specific code, culture) and to the firm's decision making process. Under centralization, with less access to the firm's decision making and pos-

sibly under more restrict monitoring, the agents are less likely to exert the influence activities. However centralization may hinder communication and learning (acquiring firm specific human capital) inside the organization and some agents may become less productive than under decentralization. For example, a newspaper's style (choice of topics, editing policy, writing style, cultural identity and possibly ideology) is important intangible assets, to which all journalists in the newspaper have access. However, it would take a long time for a junior journalist to realize value of the assets, namely to utilize the newspaper's style as input in their covering and writing activities. Under decentralization, junior journalists may get more communication and advice from experienced supervisors and editors. Centralization cuts this link off and reduce the junior journalists' productivity.

Taking the organizational form and the payment scheme as given, a worker maximizes his payoffs by allocating his talents and time among several activities. Formally a representative agent is to maximize

$\{\alpha P^O(i,t) + B^O(e) - g^O(i,t,e)\}$

where the superscript O denoting organizational form, centralization or decentralization. α is the piece-rate.[1] t indicates productive activities devoted to the measurable performance, which is directly related to his piece-rate wage. We distinguish two types of influence activities. i is influence activities affecting this performance (influence activities for short thereafter) and e is the worker's efforts to serve private benefit B (private activities for short). $g(i,t,e)$ is the cost function. As well known, results of such a typical multitasking problem will be determined by complementarities or substitutability of these activities.

In the following subsection, we will specify the representative agent multitasking framework and discuss the consequence of organizational change. Since we believe that agents with different tasks, different level of access to decision-making will differ in their allocation of talents among the various

[1] More realistically, the worker wage consists of two component, a constant base payment and the piece-rate. Without loss of generality, we normalize the constant to zero.

activities and will have distinct response to organizational change, we will introduce heterogeneity of agents into the model in subsection 2.2.

2.1 a model with homogeneous agents

For simplicity, we make an extreme assumption that under centralization, the costs of both influence activities are prohibitively high and thus no worker has tendency to influence the principal's decision. We use a simple functional form to summarize the result under centralization:

$V^C = \sup_t \{\alpha t - kt^2\} = \frac{\alpha^2}{2k}$

The worker's performance is totally determined by his productive activities which is a response of the piece-rate α and the efficiency parameter k, namely $P^C = t^C = \frac{\alpha}{2k}$ in optimum.

Under decentralization, the workers on the one hand can influence decision-making and on the other hand gain from communication and easier access to the firm's specific knowledge. The representative worker allocates his talents and time in order to maximize the following objective function:

$\max_{i,t,e} \{\alpha(1 + i - \bar{i})t + B(a)\sqrt{e} - ci - \varphi k(t + e)^2$

where t, i, e are non-negative real numbers and have the same interpretation as before. $B(a)$ is the worker's private benefit depending on assignment of tasks, a. Some tasks are associated larger amount of private benefit and others may have little private benefit. c is cost of conducting influence activities and φk is efficiency parameters indicating how costly to do productive activities and private activities. We assume $0 < \varphi \leq 1$, which implies there is efficiency gain under decentralization relative to centralization because of more communication.

In this specification, t and i are complementary, which means i is the type of influence activities having positive effect on performance and the marginal productivity increases in the worker's productive activities. Moreover, the effect of influence activities depends negatively on $\bar{i}$, the average influence activities of all the workers. In other words, the workers compete in influencing decision-making and exert negative externality on other workers. Since

we admit a representative agent, we can only focus on symmetric equilibria. Obviously, in equilibrium, the effects of influence activities on performance cancel out as all workers carry out a same level of influence activities, either zero when c is high or a positive number when c is low. The role of negative externality of influence activities will be important when we introduce heterogeneity of agents. Also notice that t and e are substitutes in our model. So the key tradeoffs of organizational mode will be diversion of productive activities and efficiency gains of communication.

Solving the model, we obtain the equilibrium level of private activities and private effects under decentralization, $t^D = \frac{\alpha}{2\varphi k} - \frac{B(a)^2}{4\alpha^2}, e^D = \frac{B(a)^2}{4\alpha^2}$,even without knowing the exact level of influence activities. Then the worker's equilibrium performance is $P^D = t^D = \frac{\alpha}{2\varphi k} - \frac{B(a)^2}{4\alpha^2}$. Comparing the result under centralization, we have

$P^C - P^D = (\frac{\alpha}{2k} - \frac{\alpha}{2\varphi k}) + \frac{B(a)^2}{4\alpha^2}$

Obviously, the term in the bracket is nonpositive since $\varphi \leq 1$ and the second term is nonnegative as $B(a) \geq 0$. When $B(a) = 0$,decentralization is superior to centralization because decentralization realizes communication gains without causing diversion of productive activities. When the private benefit is sufficiently high, the loss of diversion overwhelms the efficiency gain from decentralization and centralization will outperform decentralization. [2]

2.2 multitasking with heterogeneous agents

In a firm, a division director usually has more access to decision-making process than his or her subordinates. It is also likely that more experienced workers can affect decision-making more effectively than those less experienced as they accumulate more information and personal relationship with decision makers. In this subsection, we explore an important dimension of

[2]We discuss superiority of one organizational model only meaning the employees' measurable performance is higher. We do not mean any welfare or even efficiency analysis since we do not specify the principal's preference and do not take the agents' costs into account.

heterogeneity of the agents: seniority. Apart from the effects of exerting influence activities, seniority can also affect access to the firm's specific knowledge. For example, a senior journalist may have accumulated sufficient knowledge about the style of the newspaper and can perform tasks in an effective way while a junior journalist may work less efficiently if receiving no advice from the editors or the directors. We will investigate these two effects of seniority under the multitasking framework discussed in last subsection.

To facilitate analysis, we make two further assumptions. The first assumption is to assume $B(a) = 0$, that is the workers are allocated to tasks without private benefits. As a result, a rational worker will not conduct any private activities. This happens if the firm can monitor the workers' private activities fully or the costs of private activities are large. The second assumption is that the influence activities only take two values, $i \in \{1, 0\}$. A worker can only choose to influence or not to influence.

We introduce a parameter θ, which summaries the type of a particular agent. In our setting, we regard θ as a measure of seniority. To avoid the integer problem, we assume there is a continuum of workers, whose types are subject to a distribution function $F(\theta)$ with support $[\underline{\theta}, \overline{\theta}]$.

As in the previous subsection, we assume the costs of influence activities are high enough under centralization to prevent diversion of productive activities. What is different now is that only a fraction of workers can utilize the firm specific knowledge and they work more efficiently than other workers. Formally, under centralization, the value of a worker with type θ is

$V^C(\theta) = \sup\{\alpha t - \varphi k t^2\}$ for $\widehat{\theta} \leq \theta \leq \overline{\theta}$

and

$V^C(\theta) = \sup\{\alpha t - k t^2\}$ for $\underline{\theta} \leq \theta \leq \widehat{\theta}$

That is workers with seniority level below the threshold value $\widehat{\theta}$ will suffer from efficiency loss captured by $\varphi \in [0, 1]$ because centralization depresses communication and learning.

It is easy to show

$P^C(\theta) = t^C = \begin{cases} \frac{\alpha}{2\varphi k} & \text{if } \widehat{\theta} \leq \theta \leq \overline{\theta} \\ \frac{\alpha}{2k} & \text{if } \underline{\theta} \leq \theta \leq \widehat{\theta} \end{cases}$

In a decentralized structure, the workers can carry out influence activities, but the costs vary across θ. Under our assumptions, a worker with type θ is to

$\max_{i,t}\{\alpha(1+i-\bar{i})t+-c(\theta)i-\varphi kt^2\}$

Notice that θ only affects the costs of influence activities and we assume $c(\theta)$ is decreasing in θ. All the workers are equally efficient in productive activities. (Even those junior workers now obtain efficiency gain φ.) Their difference in performance comes from influence activities which are complements to productive activities. The equilibrium actions of influence activities can be summarized by the following Lemma.

Lemma 1 *Under decentralization, when $c(\underline{\theta})$ is sufficiently small, all the agents will choose $i=1$. When $c(\overline{\theta})$ is sufficiently large, all the agents will choose $i=0$.*

Lemma 2 *If there exists a $\widetilde{\theta}\in[\underline{\theta},\overline{\theta}]$ such that $\frac{\alpha^2+2\alpha^2F(\widetilde{\theta})}{4\varphi k}=c(\widetilde{\theta})$,then in equilibrium agents with type $\theta\in[\widetilde{\theta},\overline{\theta}]$ will choose $i=1$ and agents with type $\theta\in[\underline{\theta},\widetilde{\theta}]$ will choose $i=0$ under decentralization.*

Proof. See Appendix 1. ■

Remark 1 *The equilibrium outcomes in Lemma1 are symmetric and bring us back to the situation discussed in section 2.1. We are more interested in the asymmetric equilibrium characterized by Lemma2 and will only focus on this situation in the following discussion.*

When the equilibrium levels of influence activities are determined, it is straightforward to compare the equilibrium performance under the two organizational modes.

Proposition 1 *Suppose the condition in Lemma2 hold and $\widetilde{\theta}>\widehat{\theta}$.Then*

(P1.1) $P^C(\theta)-P^D(\theta)=\frac{\alpha[\varphi-F(\widetilde{\theta})^2]}{2\varphi k}$ if $\underline{\theta}\le\theta\le\widehat{\theta}$

(P1.2) $P^C(\theta)-P^D(\theta)=\frac{\alpha[1-F(\widetilde{\theta})^2]}{2\varphi k}>0$ if $\widehat{\theta}\le\theta\le\widetilde{\theta}$

(P1.3) $P^C(\theta)-P^D(\theta)=-\frac{\alpha[F(\widetilde{\theta})^2+2F(\widetilde{\theta})]}{2\varphi k}<0$ if $\widetilde{\theta}\le\theta\le\overline{\theta}$

Proof. See Appendix 1 ■

Remark 2 *We define junior for workers with type* $\theta \in [\underline{\theta}, \widehat{\theta}]$*, medium for* $\theta \in [\widehat{\theta}, \widetilde{\theta}]$ *and senior for* $\theta \in [\widetilde{\theta}, \overline{\theta}]$*. Then the above proposition has several economic implications. The medium workers under centralization perform better than under decentralization while the performance differential of the senior goes to the opposite direction. This is because under centralization the medium workers do not lose efficiency as they are experienced enough and they do not suffer from the negative externality of influence activities carried out by the senior workers. For the senior workers, there is no efficiency gain from change of organizational modes but under centralization they can no longer benefit from influence activities which are complements to productive activities. The effects on the junior are ambiguous, depending on the tradeoffs between efficiency gain and loss from influence activities under decentralization. Note the magnitudes of the effects of organizational change depend critically on the distribution function* $F(\theta)$ *and the threshold value* $\widetilde{\theta}$*, which summarize the total (average) influence activities within the organization.*

When the parameters are such that $\widehat{\theta} > \widetilde{\theta}$, we will obtain very different equilibrium outcomes. We leave discussions of this case in the Appendix since we find our empirical results are more consistent with Proposition1.

2.3 Heterogeneous Agents with Private Benefits

In this subsection, we relax the assumption that $B(a) = 0$ and thus allow interactions among private activities, influence activities and productive activities. To make the model as simple as possible, we assume $B(a) = B > 0$. A worker's private benefit is a fixed positive number if he is assigned to a task a. In other words, the realization of private benefit is independent of seniority. This may not be very realistic but simply our analysis substantially. We also maintain the assumption that the costs of conducting both influence activities and private activities are prohibitively high under centralization. Therefore the workers' behaviour under centralization is just the same as in

subsection 2.2. Under decentralization, a worker with type θ now has a new target:

$\max_{i,t,e}\{\alpha(1+i-\bar{i})t + B\sqrt{e} - c(\theta)i - \varphi k(t+e)^2\}$

The equilibrium results are extensions of Lemma 2 and Proposition 1.

Lemma 3 *Assume existence of interior solution for t and e and there is a value θ^* such that $\frac{\alpha^2 F(\theta^*)}{2\varphi k} - \frac{B^2}{4\alpha}\frac{1}{[1+F(\theta^*)]F(\theta^*)} = c(\theta^*)$. Then under decentralization, agents with type $\theta \in [\underline{\theta}, \theta^*]$ will choose $i = 0$ and agents with type $\theta \in [\theta^*, \overline{\theta}]$ will choose $i = 1$.*

Proposition 2 *When the conditions in Lemma3 hold and $\theta^* > \widehat{\theta}$,we have the following consequence when the organizational mode changes from decentralisation to centralization.*

(P2.1) $P^C(a,\theta) - P^D(a,\theta) = \frac{B^2}{4\alpha^2 F(\theta^*)} + \frac{\alpha[\varphi - F(\theta^*)^2]}{2\varphi k}$ if $\underline{\theta} \le \theta \le \widehat{\theta}$

(P2.2) $P^C(a,\theta) - P^D(a,\theta) = \frac{B^2}{4\alpha^2 F(\theta^*)} + \frac{\alpha[1 - F(\theta^*)^2]}{2\varphi k} > 0$ if $\widehat{\theta} \le \theta \le \theta^*$

(P2.3) $P^C(a,\theta) - P^D(a,\theta) = \frac{B^2}{4\alpha^2(1+F(\theta^*))^2} - \frac{\alpha[F(\theta^*)^2 + 2F(\theta^*)]}{2\varphi k}$ if $\theta^* \le \theta \le \overline{\theta}$

Proof. See Appendix 1. ■

Remark 3 *The results are similar to Proposition 1 except that there is an additional term associated with private benefit B,which also determines θ^*. Using the threshold values $\widehat{\theta}$ and θ^*,we define seniority of workers in the same way as before. The medium workers improve performance under centralization for sure while the effects of organizational change on the junior and the senior are ambiguous. Centralization restricts private activities, which are substitutes to productive activities and thus improves the workers' performance. Under centralization, the medium workers obtain additional gains due to reduction of influence activities under centralization, the junior suffer from efficiency loss though benefiting from reduction of influence activities and the senior workers lose because they can no longer carry out influence activities. If the size of private benefit is large, all the workers tend to outperform under centralization.*

Again there is another possibility $\theta^* < \widehat{\theta}$, which leads to different equilibrium outcomes.

The theoretical model in this section characterizes one particular mechanism governing the workers' behaviour under two common organizational modes: centralization and decentralization. We have seen that the results are sensitive to the size of private benefit, efficiency gains from communication and distribution of seniority among the workers. These are all empirical questions requiring case to case investigation.

From next section, we will conduct a case study of a Chinese newspaper to see how journalists working in this newspaper response to organizational change. Although we do not have proper measure corresponding to the parameters in the theoretical model, an organizational experiment in this newspaper still provides evidence of existence of influence activities, private activities and heterogeneous effects on workers. The evidence is consistent with the propositions we propose.

3 Institutional Backgrounds and The Natural Experiment

The newspaper under our inspection is one of the leading daily newspapers at the Provincial level in China. As all leading newspapers, it is owned by the state and members of the governance committee (board of directors) are appointed and monitored by the local Communism Party. But it has been highly commercialized and mainly funded by advertising revenue. The newspaper has high level of autonomy in managerial practices. It is allowed to freely adopt incentive schemes and organizational modes without changing the basic corporate governance.

During the time period between 2003 and 2006, the newspaper regularly had 48 broad-sheet pages during the week day (Monday to Friday) and 32 pages during the weekend (Saturday and Sunday separately). The newspaper included the front section (usually the first 4 pages) to cover important news

and editorial articles, a section consisting of economic news, politics and law, science and education and feature reports with focus on coverage of the headquarter region and a section of regional news covering regions other than the headquarter region, followed by a Business and Finance section, a Sports section, an Entertainment section and a Consumption-Guide. [3] In terms of contents, publication of political issues was under strict control while the newspaper had substantial freedom in publishing other types of news without offending the law, the ideology of the Party and social stability. Censorship or self-screening usually involved the front section.

Corresponding to the contents, the journalists worked in different divisions: economics news (covering local economic news and the Business and Finance), politics and law, science and education, sports news, feature reports, photograph, regional news, entertainment and consumption-guidance. [4] Articles written by the journalists accounted for 3/4 to 4/5 of the contents of the newspaper and the rest were provided by news agents, freelance writers and other sources.

A very special feature of the newspaper is that it adopted a piece-rate payment scheme. [5] The journalists received a fixed wage according to their education, qualification and position in the newspaper. But this fixed wage on average only accounted for one third of the journalists' total payment. A typical reporter was mainly paid according to his or her scores of quantity and quality. The quantity score was a composite measure of number of published articles and length of each article. The quality score was only assigned to high quality articles, evaluated by a committee held by senior reporters and editors who did not involve everyday news coverage and editing. The scores

[3] There was also a small supplement section related to culture, literature and others. But this section usually did not involve news coverage.

[4] In this paper, we refer as journalists to reporters who are responsible for news coverage and article writings. We call people in charge of revising articles and editing the newspaper as editorial staff.

[5] Piece-rate payment may be unusual in Western newspapers. It has been common practice for many Chinese newspapers during the last twenty-years.

were given everyday and aggregated at a monthly level which served as the basis for performance pay. The coefficients attached to quantity score and quality score respectively remained constant during the period. More details of the quantity and quality scores will be discussed in the data section.

There are two major organizational modes, centralization and decentralization, prevailing in the Chinese newspapers. The key difference is delegation of editing power, involving selection, revision and reorganization of articles. Under decentralization, the editing power is delegated to each division: the editorial staff and the reporters work together in a same division supervised and coordinated by a common director. In a centralized structure, the editorial staff work in an editing centre and monitored by the chief editors. The reporters in each division cover news and provide articles to the editing centre. The division directors can not intervene with editorial activities.

In 2002, the newspaper adopted a decentralized scheme by delegating editing power to each division except for the front section. A reporters would provide articles to the front section and to the section assigned to his or her own division. Cross provision of articles between divisions was unusual. In September 2005, the newspaper decided to centralize editing power from 5 divisions: economic news (including the Business and Finance), politics and law, science and education and feature reports and sports news. The other divisions remained decentralized.

An interesting distinction between the two modes was that under decentralization, the editing staff and the reporters in the same division sat in the same office located on the same floor while under centralization, they sat in different offices located on different floors.

There are several nice features of this experiment (or reform). First of all, the new scheme was imposed by the Board and the journalists were unlikely to influence the reform. This is why the reform is qualified as a natural experiment. Secondly the newspaper experienced a 'dull' period from 2003 to 2006. In particular, the number of pages of the newspaper was stable, there

was no substantial recruitment and no replacement of chief editors. More importantly, the payment scheme remained the same during this period. [6] These allow us to single out the effect of organizational change.

4 Data and Descriptive Statistics

We turn to details of the data. The newspaper provided documentation of monthly performance of all the reporters from January 2003 to December 2006. The performance measures include quantity score and quality score, number of articles and overall words of all articles. The panel data of performance are unbalanced since there are new recruitments and exits, and some journalists (although a small number) were reassigned from one sector to another or from reporters to editorial staff. We merge this performance data set with personnel information, which is documented at the end of each year. The personnel data contain gender, age, education, qualification, job assignment (which sector a reporter works for), working experience in the newspaper and position in the hierarchy of the newspaper for all employees in the newspaper.

We clean the data by deleting those performance observations without associated personnel information and some of the division directors who were in charge of both news coverage and editing activities and not subject to performance-pay scheme. These invalid observations occupy around 1 percentage of total observations. We exclude all observations from the sports division and photographer division. The data show that performances of the sports reporters were highly volatile since they were strongly affected by the Olympic Games in 2004, the World Cup in 2006 and some national sportive events. Exclusion of the photographers is due to two reasons. One is that the photographers were always subject to a centralized scheme. The other

[6] In contrast to this dull period, there was substantial expansion of the newspaper together with large scale of recruitment around 2000. In mid 2002, the newspaper increased the power of the performance-payment.

is that a photographer's job may be very different from that of a regular reporter. We also exclude about 300 observations which have overall score (the sum of quantity score and quality score) less than 1000. The reason is that 1000 is the minimum requirement for a reporter. Performance lower than this minimum may suggest some unusual behaviour.

We summarize the basic information in Table 1 .(All Tables are collected in the Appendix.)

The key dependent variables we are interested in are quantity score and quality score although they are internal measures provided by the newspaper. The most important reason is that what the journalists' payment respond to are exactly these two scores under the performance-pay scheme of the newspaper. The quantity score is basically a composite measure of number of articles and number of words. Correlation between quantity and number of articles is 0.86 and correlation between quantity and number of words is 0.95. Variations in the number of articles and number of words jointly explain 94 percentage variation of the quantity. The quality score reflects valuation of articles from various dimensions, which is hard to measure by outsiders. [7]

Individual characteristics may be important controls for journalists' performance. Moreover when exploring heterogeneity of the treatment effects, we construct measure of seniority, one important dimension of heterogeneity, based on some individual characteristics. So it is worthwhile explaining the individual characteristics variables in certain detail. Tenure is the journalist's working experience in the newspaper measured in terms of years. Qualification is a certificate authorized by the Chinese Journalists Association to indicate levels of journalists. We index the levels with 1 referring to assistant journalist, 2 to journalist and 3 to senior journalist. In the newspaper under our inspection, the average is 1.5, indicating that a majority of the journalists are assistant journalists and journalists. Due to complex educa-

[7] The quality of articles may be captured by their positions on the newspaper, length of articles and space of titles. This information may still not enough to capture unobservable quality such as writing skills. So we rely on the internal measure of quality score.

tion system in China, we compile an education index taking into account years of schooling, degree and quality of universities or institutes. Education level 1 means informal college education and below, 2 means 4 year college education with a Bachelor degree from non-elite universities, 3 means Bachelor degree from elite universities[8] and 4 means a Master degree or above. The average education of the journalists is around 2.5, which means most of the journalists receive four year university education and have a Bachelor degree. Position is an indicator ranking from 1 to 3, representing reporter, chief reporter and division director respectively. From the data, most active journalists are reporters and chief reporters. Only a handful of journalists are division directors.

5 Empirical Strategy

The experiment of centralization of certain sectors of the newspaper creates natural candidates of a treatment group (journalists in the Economic News, Politics and Law, Eduction and Science and Feature Reports, the four centralized sectors after September 2005) and a controlled group (the always decentralized sectors including the Regional News, Entertainment, Consumption Guide). The panel structure of the data allows us to examine the effect of centralization by using a differences-in-differences (D-i-D) methodology. The basic regression we estimate is

$$p_{it} = \alpha_t + X_{it}\beta + \gamma C_i + \delta R_t + \theta I_{it} + \epsilon_{it}$$

where i indexes individual journalists and t indexes time (every month in each year). p_{it} is then an individual journalist's performance (e.g. logarithm of quantity or logarithm of quality) over time. α_t is time (yearmonth) fixed effects, which is intended to control for aggregate fluctuations of the newspaper. X_{it} is a set of individual characteristics, including gender, age, experience, position, qualification, education etc. C_i is a dummy variable that equals one if an individual is from the treated group (the centralized

[8] Elite univerisities are the Top-20 universities ranked by a Chinese research institute.

sectors defined as before) and zero otherwise. R_t is a dummy variable that equals one if the reform has taken place. I_{it} is an intersection term of C_i and R_t, and equals one if a journalist works under centralization and after the reform. ϵ_{it} is the error term.

Our estimate of the effect of centralization is θ which, under regular assumptions of the D-i-D approach, can be expressed as

$\theta = [E(p_{it}|decentralization, after\ reform)\text{-}E(p_{it}|decentralization, before\ reform\ )]$

$-[E(p_{it}|centralization, after\ reform)\text{-}E(p_{it}|centralization, before\ reform\ )]$.

The D-i-D estimator helps to eliminate (at least to some extent) the systematic differences between the treated and the controlled and to control the changing environment in which the journalists worked before and after the reform. e.g. change of style of the newspaper, managerial practices, morale and culture inside the organization.

Despite the straightforward nature of the D-i-D estimator, we have two major concerns. A key identification assumption for D-i-D is that the treated group would behave similarly along time as the untreated group if there were no treatment. That means the systematic difference in performance between the centralized journalists and the decentralized journalists should be similar during the whole period if no reform took place. Since we have observations over a relatively long period, the validity of this assumption can be partially tested by the data. From figure 1, we observe that the quantity measure of the treated and the controlled sectors follows fairly similar patterns before the centralization reform. The pattern of the quality measure is less clear but during most of the time periods before the reform, the centralized sectors outperform the decentralized sectors in a systematic manner with a fairly stable gap.

The other main concern is that our estimate of the reform effect would be contaminated if the journalists transmit between the treated group and the controlled group after the reform. This possibility can be ruled out by the data. Only three journalists working in one group before the reform switched

to another group after the reform.

Aware of selection bias, we will also use the individual fixed effects to control the fixed differences between the treated and the untreated groups. From the data, we observe a number of exits and entries in both groups at the timing of reform although transition between the two groups is very low. More specifically, 10 people no longer worked in one of the seven sectors after the reform. 17 new journalists were recruited to work in these sectors after the reform. Now the regression we estimate becomes

$p_{it} = \alpha_i + \alpha_t + Z_{it}\beta + \gamma C_i + \delta R_t + \theta I_{it} + \epsilon_{it}$

where α_i is the individual fixed effects and Z_{it} are the time-variant individual characteristics, which are a subset of X_{it}. Of course, with both individual and time fixed effects, δ and γ are no longer identified. The drawback of the individual fixed effect regression is that it may throw away useful variation in the data, particularly when the exits and entries are indeed random.

As pointed out by Bertrand, Duflo and Mullainathan (2004), the error terms of this type of panel data are likely to be serially correlated, which invalidates the regular inference. We therefore adopt a clustering approach to remedy the bias of robust standard errors. We cluster the error terms at each individual level in the main results. We also use other clustering e.g. interaction of sector and time (month, quarter etc) as robustness check.

Our estimation of θ gives the average treatment effect of the treated (ATT) of the organizational reform from decentralization to centralization. As discussed in the theoretical part, this effect may be a complex combination of various effects, each differing across the heterogeneous population. An examination of heterogeneity of the population may provide further evidence of existence of influence activities and help distinguish different types of influence activities. Therefore we extend the above D-i-D framework to incorporate heterogeneity of treatment effects.

6 Empirical Results

In this section, we investigate empirical results of organizational change from decentralization to centralization using data of the journalists in the Chinese newspaper. Based on the differences-in-differences methodology discussed in Section 5, we find that organizational change does have substantial effects on the journalists' performance, particularly on performance measure of quality. We go further to explore heterogeneity among the journalists and find empirical results that are consistent with the theoretical model developed in Section 2. This confirms the causality of organizational change on individual performance and provides a plausible underlying mechanism.

6.1 The Average Treated Effects

Table 2 summarizes the average effects of centralization on the journalists' performance, in terms of either quantity or quality. The dependent variable in column (1)-(4) is logarithm of quantity score and the dependent variable in column (5)-(8) is logarithm of quality score. The D-I-D estimator is the coefficient of the intersection of the reform (a timing dummy) and centralization (a treatment dummy). In all the regressions, we control the time-fixed effects for each month and cluster the standard errors at the individual level. Compared to column (1) and (5), we add in the regressions in column (2) and (6) a set of individual characteristics including gender, age, squares of age, experience, squares of experience,[9] dummies of levels of each journalist's education, qualification and position. In column (3) and (7), we go further to control the fixed effects for each sector a journalist worked in. Column (4) and (8) represent results with control of individual fixed effects, which we regard as the most complete specification.

Interestingly, we do not find any significant effects of centralization on the journalists' quantity performance. However, we do find nontrivial effects of centralization on the quality performance. Centralization improves the quality performance of the journalists subject to this reform with a magnitude

[9]We add the squares of age and experience, following the standard practices in labour economics.

between 12.7 percentage and 20.6 percentage after taking away the performance differential of those journalists in the decentralized sectors before and after the reform. We notice that the effect of centralization increases from 12.7 percent to 20.6 percent when we include the individual fixed effects. This suggests existence of a negative selection effect. That is after the reform, some more able journalists (in terms of writing high-quality articles) left the centralized sectors or the newly recruited journalists were less able in writing high quality articles.

The effect of centralization on quality is consistent with predictions in the theoretical model with homogeneous agents when the effect of restriction of private activities dominates the efficiency loss under centralization. In other words, centralization limits the scope of private activities and thus directs the journalists' talents and efforts to productive activities, which have direct effects on the performance measure.

The non significant effects on quantity may be due to several reasons. One is that the overall number of articles and words is relatively stable over time. Without substantial change of number of journalists, the average quantity of each journalist may change little across time. Another possibility is that the achievement of private benefit takes the form of publication of articles. For example, a journalist has to write an article for a company to enjoy on-the-job consumption. That is private activities is not substitute but rather complement to productive activities. In this case, we may observe no effect or even negative effect of centralization on quantity.

In the homogeneous-agent model, the effects of influence activities cancel out. However, in the model with heterogeneous agents, the influence activities interact with productive activities and private activities. Therefore, it is also reasonable to interpret the coefficients of the interaction of reform and centralization in table 6.1 as the average of composite effects of centralization on the three activities. As discussed in Section 2, the effects will be always positive if the private benefit is sufficiently large. To see whether the improvement of quality performance is indeed driven by the private benefit,

we explore heterogeneity of the journalists in terms of allocation of tasks correlated with different amount of potential private benefit.

6.2 Heterogeneity in Job Assignment

It is not unusual that within an organization, some jobs are associated with large private benefit while other jobs attain little private benefit. In our case of the Chinese newspaper, we suspect that the journalists specializing in economic news (including Finance and Business) had larger private benefit than other types of journalists. Private benefit always takes forms of on-the-job consumption or shadow income that is very hard to observe. However, anecdote evidence from the Chinese media industry suggested that some economic journalists enjoyed large amount of on-the-job-consumption (which was often paid by some sponsors). For example, economic journalists had much more opportunities of free tourism abroad than other journalists. Another evidence is that disputes between economic news journalists and advertising sectors in the same media were not uncommon. The advertising sectors complained that some economic journalists wrote articles in favour of companies who were potential advertisers and thus cut down advertising revenues.

If the improvement in performance after centralization was indeed driven by restriction of private benefit, centralization should induce larger increase in performance measure in the sector associated with larger private benefit, namely the Economic News sector in our case, than other sectors. Empirical evidence summarized in Table 3 supports our conjecture.

The results are obtained by using the same empirical methods as in section 6.1. The only difference is that now we divide the treatment group into two subgroups. One is the economic journalists and the other is journalists from other centralized sectors, namely Politics and Law, Science and Education and Feature Reports. The control group remains the same. For the economic journalists, centralization induces a substantial increase (between

27.6 percent and 36.4 percent) in quality. The results are with high statistical significance. However, centralization has no significant effect on quality performance of journalists from the non-economic sectors. This is consistent with the theoretical prediction and our conjecture that economic journalists enjoyed larger private benefit.

The effect of centralization on quantity performance is also positive for the economic journalists, with smaller magnitude and with lower statistical significance (only the result in column(4) with individual fixed effects is significant). In section 6.1, we provide several reasons for the lower size of the average treated effect on quantity than on quality. The same explanations apply here as well. For non economic journalists, centralization has negative effect on their quantity performance. According to our theoretical model, the efficiency loss dominates the gain from restricting private activities as the private benefit is small. If private activities are not substitutes to productive activities in terms of quantity performance, the negative effect becomes even larger.

As in Section 6.1, the differences in the coefficient size of the D-I-D estimator between column (3) and column (4) and between (7) and (8) suggest a selection effect caused by the centralization reform. The effects go to the same negative direction for both economic journalists and non-economic journalists.

6.3 Heterogeneity in Seniority

In last section, we introduce heterogeneity in task assignments to find evidence of private activities. In order to explore the effects of influence activities on the journalists' performance, we need a measure of influence activities, which is a demanding (if not infeasible) task. Nevertheless, the theoretical model suggests that if workers differ in costs of exerting influence activities, we should observe heterogeneous effects of centralization across these people. We therefore need to construct a measure of heterogeneity related to costs of exerting influence activities. A candidate is seniority as it is plausible that

more senior employees are more likely to exert influence activities inside an organization.

We construct a measure of seniority combining tenure and position.[10] Junior journalists are defined as those regular journalists with less than five year working experience in the newspaper. Medium journalists are those regular journalists with working experience between five and ten years. Those working more than 10 years or taking a position above chief reporter are grouped as senior journalists. This classification of seniority is not arbitrary. First of all, the difference in terms of working experience corresponds to the qualification system of Chinese journalists. A journalist working less than 5 years is classified as assistant journalist by the Chinese Journalists Association. A journalist with no less than 5 year experience is qualified to take exams and obtain a certificate of being a journalist. Usually journalists with more than 10 year working experience in leading newspapers are awarded a certificate of being senior journalist. Secondly, from our interviews, we were told that a young journalist becomes mature and is able to work without much help from the directors and editors after 4-5 years. Thirdly, chief reporters and division directors were ranked higher than many of the editing staff. As a result, position is directly related to decision power under the decentralized scheme. We also construct other seniority measure as robustness check.

Although we split the treatment group into several subgroups, we uniformly use all the journalists working in the decentralized sectors as the control group. The reason is that we do not have a clear criterion of seniority for journalists in the entertainment and the consumption-guide sectors. In our interviews, views of maturity and seniority in these two sectors were very diverse. Moreover, practically we do not have enough observations for the medium group if we use the same criterion as imposed to the treated journalists.

[10]We use working experience in the newspaper as a major measure of seniority. In general seniority is a composite of experience, qualification and position. However, in this context we want to related seniority to access of decision right and firm specific knowledge. General experience indicated by qualification and age may not matter.

Both Proposition 1 and Proposition 2 in the theoretical section predict that centralization has positive effects on performance of the medium journalists, who are no longer subject to negative externality of influence activities exerted by more senior journalists and they do no lose efficiency. The empirical results in Table 4 conform to this sharp prediction. Centralization increases quality performance of the medium journalists by a magnitude between 26.0 percentage and 36.6 percentage. The corresponding coefficients in Column (5)-(10) are all highly significant. The effects on quantity measure are less clear. But after we control the individual fixed effects, the coefficient (13.4% in Column (4)) is significant.

Proposition 1 predicts that centralization will definitely reduce performance of the senior journalists. The empirical results do not support Proposition 1. The effects on quantity performance have the predicted sign but they are not statistically significant. The effects on quality measure are opposite to the prediction although the coefficient in Column (8) is not significant. However the empirical results are in favour of Proposition 2, suggesting that we should take into account the private activities which would divert the journalists' talents and efforts from productive activities and influence activities. As discussed in previous sections, the private activities may not substitute away the productive activities in quantity. As a result, the effects on quantity performance can be negative since the senior journalists can no longer benefit from influence activities under centralization.

Table 4 shows that centralization reduces the quantity performance of the junior journalists while having no significant effects on the quality measure. This is consistent with Proposition 2. Under centralization, the junior journalists suffer from efficiency loss due to less communication which dominates the gain due to absence of negative externality of the influence activities. Additionally due to restriction of private activities, centralization may improve performance of the junior if the private activities are indeed substitutes to productive activities. This additional gain may offset partially the negative effect of centralization. This helps to explain why centralization has

negative effect on quantity and has no effect on quality for the junior since we have discussed that private activities are substitutable for productive activities related to quality performance but the substitute effect for quantity performance may be weak.

To isolate (to some extent) the effect of private activities, we restrict our attention to a subsample of the treated group, which excludes economic journalists. We run the same regressions as in Table 4 and the results are summarized in Table 5. Now we observe a pattern of the heterogeneous effects of centralization fairly consistent with Proposition 1. Again centralization increases the performance of the medium journalists. Now centralization has a strong negative effect on the quantity performance of the senior while the effects on quality are small and insignificant. We offer two possible explanations for the asymmetry between the effects on quantity and on quality for the senior journalists. One is that the senior may be more effective in influencing quantity than influencing quality as the Evaluation Committee of quality operated relatively independently. Therefore restriction of influence activities has stronger effect on quantity. The other possibility is that the senior journalists in the non economic sectors may pursue certain level of private benefit, which offsets the negative effect due to loss of influence activities. For the junior journalists, we find a similar pattern as in Table 4 even when we have less concern about the confounding effect caused by existence of private benefit. As expected, the results on quantity measure are negative and stronger than in presence of private benefit since now there is little offsetting effect due to restriction of private activities. There is no strong support of Proposition 1 from the evidence of effects on quality for the non economic junior journalists. The size of the coefficients is slightly larger than their counterparts in Table 4, but they are not significant. The 'lack' of response of quality performance may be because the non economic journalists also had some private benefit under decentralization although it was not as large as that enjoyed by the economic journalists.

We also confine attention to the economic journalists and find that cen-

tralization has a significant positive effect on both the quantity and the quality performance of the medium economic journalists. We don't find significant results on quantity performance of the junior and the senior economic journalists. But we find strong effects on quality performance of the senior. The effect on quality for the junior changes substantially after we introduce the individual fixed effects. This may be because we do not have enough observation for the junior group. So we interpret our findings with caution.

In the above analysis, we decompose the average treatment effects (ATT) of centralization into three components, contributed from various groups of people with different level of seniority, which we use as a proxy of ability of exerting influence activities inside the organization. This decomposition provides another explanation of the average treated effects of centralization in Table 2, where centralization has little effect on quantity performance while having a positive effect on quality performance. The 'lack' of response of quantity is because the gain of the medium journalists cancels out the efficiency loss of the junior and the (weak) loss of the senior. Contributions to the positive effect on quality mainly come from the medium journalists in the non economic but centralized sectors and from both medium and senior economic journalists since all these journalists do not lose efficiency under centralization but the former benefit from reduction of negative externality of influence activities and the later concentrate more efforts on productive activities since centralization restricts their pursue of private benefits.

7 Robustness Check

7.1 Reverse Causality

One of the main concerns about validity of the treatment effects is reverse causality, or endogeneity of the treatment which is the centralization reform in our case. In our interviews, the editors said that they were not quite satisfied with the decentralized structure but not sure of the consequences of restructuring organization. They were hesitant for a time long enough to

undertake a 'sudden' bold reform. The journalists admitted that they knew there might be such a reform but did not know the timing before the reform took place. Most of the interviewees thought that it was unlikely that except for a handful of members of the Governance Committee, other people could affect the reform. Even with these 'facts' in mind, we still want to study in some detail the dynamic effects of the reform to address this issue. In practice, we replace the reform×treatment dummy with a set of dummies, before-1 is a dummy that equals one if an individual in the treatment group worked in the month before the reform (August 2005), before0 is a dummy for a treated journalist in the month of reform (September 2005) and after1 is a dummy for a treated journalist one month after the reform (October 2005). Similar implications apply to before-2 and after2. The regressor After3+ is a dummy that equals one for a treated journalist working after 3 months of the reform (from December 2005 and on wards). We apply this specification to all regressions reported in the above tables. We find little evidence of predetermined effects, namely the coefficients of the variables Before-2 and Before-1 are of small magnitude and statistically insignificant. We report selective results in Table 6.

The effects of the "dynamics" are consistent to our previous results. The quality measure of performance responds more to centralization than the quantity measure. The average treated effect of quality performance is positive and driven mainly by the outperforming of the economic journalists and the medium journalists. Interestingly, the response to the reform is not immediate. Most of the coefficients we discussed become significant after two periods and remain fairly stable afterwards. This may be a natural outcome of lack of quick response as it always takes time for people to realize what is going on and reallocate talents and efforts among various activities. Another explanation is that people actually respond quickly but the restructure of organization disturbed the journalists who are subject to the reform.

The only 'unusual' response is the effects of reform on the medium journalists' quality performance as shown in Column (7). The coefficient of Before-2

is sizeable and marginally significant, which might hint existence of a pre-determined effect. We extend the time period before the reform (including dummies Before-3, Before-4 as constructed before) and find no significant coefficients. And also the coefficient of Before-1 is not significant. Therefore the significance of the Before-2 coefficient in Column (7) is more likely to be by incidence. Also the medium journalists respond immediately after the reform both in terms of quality and quantity.[11] This is consistent with our previous interpretation of the effect of centralization on the medium journalists, who benefits directly from absence of negative externality of influence activities without involving adjustment of their allocation of efforts.

7.2 Clustering of Standard Errors

We also cluster the standard errors at other level. One may suspect that there may be some common unobserved factors affecting people working in the same sector. It would be ideal to cluster the standard error at the sector level. However, we only have 7 sectors and too few clusters may give rise to very imprecise estimates and misleading inference. In consequence we cluster the error terms at the sector×quarter level. The underlying idea is that journalists' performance in the same sector within one quarter may be correlated while journalists' performance across sectors and across quarters is not. This assumption is very plausible since each sector of the newspaper was run independently and cooperation between journalists across sectors was unusual. Moreover, performance of most journalists was highly subject to outside environment, which is out of control of the journalists. For example, a journalist can cover Olympic Games only when it happens. It is unlikely the outside shocks to a journalist's performance persist for a long time. All the results we reported before pass through with higher precision in most of the case. Being cautious of existence of longer persistence than one quarter, we also allow clustering at the sector level with longer period. These robustness

[11] All coefficients of After1 except for the one in Column(6) are not significant, which suggests some unusual events happening to the newspaper in October 2005.

checks do not change our results.

7.3 Other Robustness Check

From Figure 1, we observe that the journalists' performance has a mildly different trend in the year 2003 than in 2004 before the reform. One might suspect that the effects of reform may be contaminated by shocks happening in previous periods. As argued before, we do not see any substantial change such as in incentive scheme, evaluation policy etc. during this 'dull' period from the documents provided by the newspaper and interviews with the journalists. To release the concern of the contaminated effect, we use a shorter window, e.g. exclude observations before 2004. The main estimates we have discussed are reduced mildly in size but they still have the right sign and are still significant. We also extend out sample to include the sports journalists (who were also subject to the reform and became centralized after the reform) in the treatment and find an even more pronounced pattern than our previous findings.

8 Conclusions

In this paper, we explore a unique data set of performance and personnel information of each individual journalist in a leading Chinese newspaper to investigate the effects of organizational change on individual performance. As shown in the data and in the estimations, the reform of organizational mode did have impact on the journalists performance, particularly in terms of quality measure. Moreover, the magnitude and the directions of the centralization effects vary quite substantially across different groups of workers. We find that the centralization has an especially large impact on the Economic Journalists. And the journalists with medium seniority improve their performance substantially after the centralization reform while the effects on junior and senior journalists are insignificant or mild. It seems that centralization

does not have much effect on quantity performance. However, we find the average treated effect is hidden by the offsetting impacts on different groups. These results highlight the importance of heterogeneity of agents and their interactions in organizational design, which is silent in the literature.

We interpret the effects of centralization as incentive responses to restrictions or monitoring of influence activities and private activities due to organizational change, which lead to reallocation of efforts or talents. We support our view by showing the results are consistent with a simple theoretical model under the standard multitasking framework. We do not exclude other possibilities that might induce similar results. Organizational mode is by no means a simple managerial practice. To dig out the underlying mechanisms, we need direct or indirect measure of incentive change (the indirect measure may be data about influence activities and private activities), which are unfortunately unavailable.

Our research should be treated as positive rather than normative. Certain organizational mode seems to improve performance of some groups but it depresses incentives of other groups, whose contribution might be more important. Unless we have detailed information about the principal's preferences, we can not judge the efficiency of organizational mode. Another caveat is that organizational mode is always mixed with other incentive schemes. If the newspaper did not adopt a piece-rate payment scheme, the results of organizational change would be different and the mechanism might be less clear.

References: To be added.

Appendix 1: To be added.

Appendix 2: All tables and figures.

Appendix 2: All tables and figures

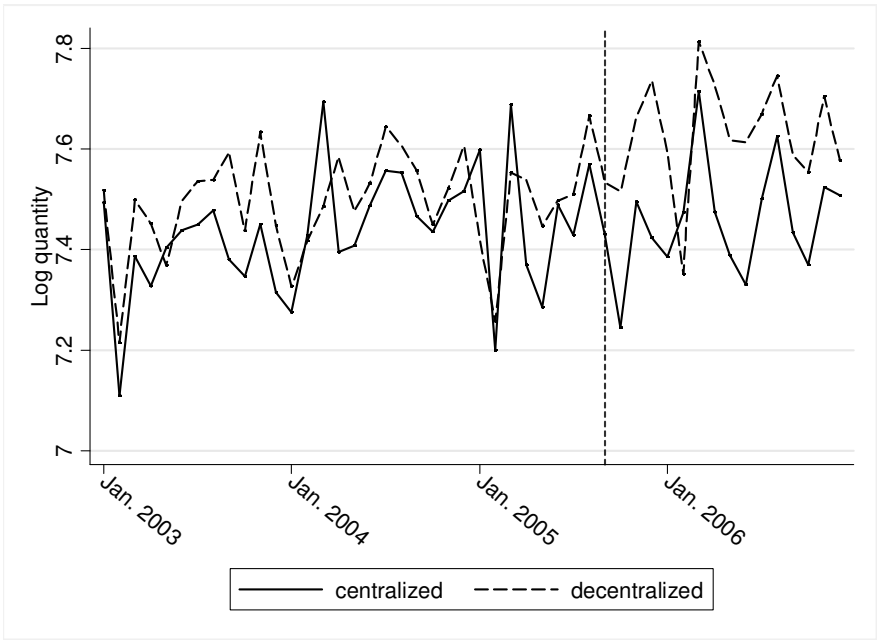
Table 1. Descriptive Statistics of Basic Variables

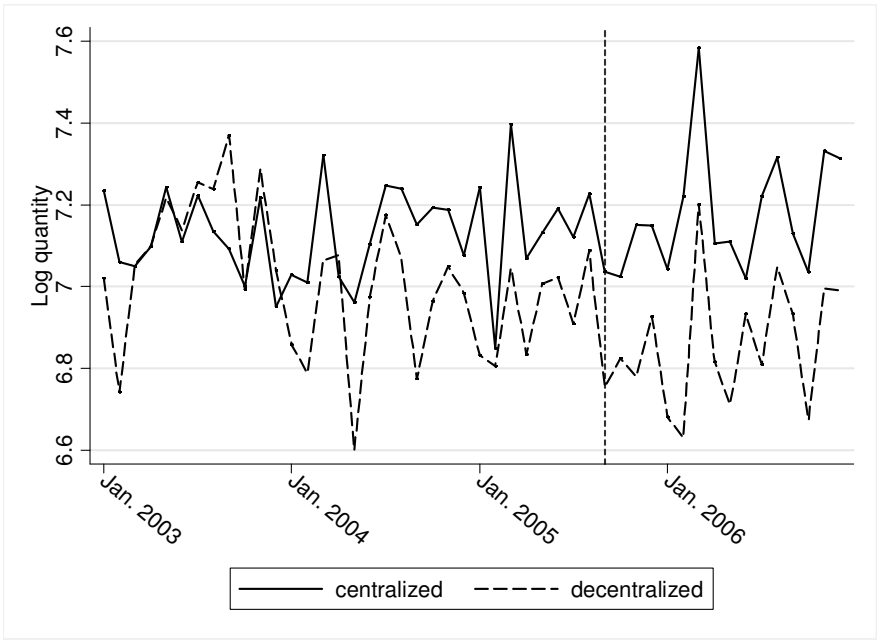
Variables	Average	Std. Deviation	Minimum	Maximum
quantity score	2056	1250	140	14850
quality score	1442	1070	0	12300
No. articles	30.1	18.8	2	184
overall words	19992	12252	984	144280

Variables\year	2003	2004	2005	2006
No. Active Reporters	121	119	147	130
Average Age	31.3	32.0	31.9	32.0
Average Tenure	6.9	7.6	7.5	7.5
Average Qualification	1.5	1.4	1.5	1.4
Average Education	2.4	2.3	2.4	2.4
Average Position	1.5	1.4	1.6	1.5
Ratio of Male to Female	.55	.57	.53	.50

Notes: 1). Overall number of observations is 5067. 2). Quantity score and quality score are internal measure of the journalists' monthly performance based on quantity (number of articles and words) and quality. 3). Active reporters are those appearing in the data more than 3 times during the year. 4). Qualification is a measure of seniority of journalists, with value 1 for Assistant Journalist, 2 for Journalist and 3 for Senior Journalist. 5). Education is an index with value 1 for informal college education and below, 2 means 4 year college education with a Bachelor degree from non-elite universities, 3 means Bachelor degree from elite universities and 4 for Masters or above. 6). Position is an indicator ranking from 1 to 3, representing Reporter, Chief Reporter and Division Director respectively.

Figure 1. Evolution of Performance over Time for The Control and The Treatment





Notes: 1). The horizontal lines in both graphs are 48 time periods (months), from January 2003 to December 2006. 2). The variables on the vertical lines are logarithm of quantity score in the upper panel and logarithm of quality score in the lower panel. 3). The vertical dash line indicates the timing of organizational change, September 2005. 4). The solid lines indicate the sectors subject to the centralization reform and the dash lines represent the decentralized sectors.

Table 2. Average Treated Effects of Centralization on Individual Performance

Independent Variables	(1) quantity	(2) quantity	(3) quantity	(4) quantity	(5) quality	(6) quality	(7) quality	(8) quality
Reform×centralization	-.109	-.111	-.081	-.019	.195	.163	.127	.206
	(.080)	(.079)	(.067)	(.067)	(.075)***	(.076)**	(.073)*	(0.080)**
centralization	-.059	-.078	---	---	.122	.127	---	---
	(.076)	(.075)			(.066)*	(.070)*		
Individual Characteristics	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector fixed effects	No	No	Yes	Yes	No	No	Yes	Yes
Individual fixed effects	No	No	No	Yes	No	No	No	Yes
#Observations	5067	5067	5067	5067	5049	5049	5049	5049
Adjusted R-squares	**0.050**	**0.110**	**0.291**	**0.534**	**0.063**	**0.093**	**0.173**	**0.377**

Notes: 1). In this differences-in-differences estimation, the treated group is journalists in the Economic News, Politics and Law, Science and Education and Feature Reports (the centralized sectors after the reform) and the control group includes journalists in the decentralized sectors (Regional News, Entertainment and Consumption Guide). 2). The dependent variable in column (1)-(4) is logarithm of quantity score and the dependent variable in column (5)-(8) is logarithm of quality score. The sample is slightly small in the quality regression since there are a few observations of zero quality measure. 3). Reform is dummy that equals one if the observation is after (in) September 2005. Centralization is a treatment dummy that equals 1 if the observation is for a journalist from the treated group. 4). Time fixed effects are controls for each month during the 48 periods. 5). Individual characteristics include gender, age, squares of age, experience, squares of experience and a set of dummies indicating each journalist's education level, qualification and position. 6). In Column (4) and (8), we include both Sector and Individual fixed effects as some journalists shift jobs across sectors. Whenever including individual fixed effects, we drop the time-invariant variables. 7). Standard errors (in parentheses) are corrected for clustering of the observations at the individual level. ***denotes the coefficient is significantly different from zero at 1%, **at 5% and * at 10% levels.

Table 3.

Heterogeneous Effects of Centralization on Journalists with Different Job Allocations

Independent Variables	(1) quantity	(2) quantity	(3) quantity	(4) quantity	(5) quality	(6) quality	(7) quality	(8) quality
Reform×econ	.090	.078	.106	.147	.358	.307	.276	.364
	(.092)	(.090)	(.082)	(.071)**	(.094)***	(.096)***	(.093)***	(.087)***
Reform×non-econ	-.266	-.268	-.220	-.165	0.071	.049	.017	.066
	(.091)***	(.089)***	(.073)***	(.077)**	(.081)	(.080)	(.077)	(.087)
Econ journalists	.047	-.040	---	---	.108	.141	---	---
	(.084)	(.084)			(.079)	(.081)*		
Non-econ journalists	-.136	-.155	---	---	.132	.117	---	---
	(.080)*	(.077)*			(.072)*	(.076)		
Individual Characteristics	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector fixed effects	No	No	Yes	Yes	No	No	Yes	Yes
Individual fixed effects	No	No	No	Yes	No	No	No	Yes
#Observations	5067	5067	5067	5067	5049	5049	5049	5049
Ajusted R-squares	0.116	0.170	0.303	0.542	0.072	0.103	0.178	0.382

Notes: 1). In this differences-in-differences estimation, we divide the treated group into two subgroups, the Economic News as one group and Non economic journalists but in the centralized sectors i.e. Politics and Law, Science and Education and Feature Reports as the other group. The control group remains the same, including journalists in the decentralized sectors (Regional News, Entertainment and Consumption Guide). 2). All the other variables are the same as in Table 2. The interactions between Reform and each treatment group identify the differences-in-differences effects. 3). As in table 2, standard errors (in parentheses) are corrected for clustering of the observations at the individual level. ***denotes the coefficient is significantly different from zero at 1%, **at 5% and * at 10% levels.

Table 4. Heterogeneous Effects of Centralization on Journalists with Different Seniority

Independent Variables	(1) quantity	(2) quantity	(3) quantity	(4) quantity	(5) quality	(6) quality	(7) quality	(8) quality
Reform×junior ×centralization	-.256 (.100)**	-.269 (.102)***	-.224 (.084)***	-.146 (.083)*	-.031 (.098)	-.024 (.099)	-.056 (.101)	.089 (.107)
Reform×medium ×centralization	-.032 (.094)	-.026 (.093)	.063 (.086)	.134 (.080)*	.284 (.094)***	.267 (.101)***	.260 (.093)***	.366 (.082)***
Reform×senior ×centralization	-.094 (.104)	-.112 (.102)	-.112 (.083)	-.108 (.088)	.274 (.095)***	.204 (.091)**	.167 (.085)**	.087 (.093)
junior×centralization	-.121 (.079)	-.311 (.076)***	---	---	.104 (.070)	.085 (.094)	---	---
medium×centralization	-.010 (.109)	-.138 (.103)	---	---	.092 (.085)	.100 (.093)	---	---
senior×centralization	-.028 (.084)	.158 (.088)*	---	---	.151 (.084)*	.176 (.085)**	---	---
Individual Characteristics	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector×seniority fixed effects	No	No	Yes	Yes	No	No	Yes	Yes
Individual fixed effects	No	No	No	Yes	No	No	No	Yes
#Observations	5067	5067	5067	5067	5049	5049	5049	5049
Adjusted R-squares	0.065	0.161	0.321	0.547	0.075	0.101	0.204	0.396

Notes: 1). In this differences-in-differences estimation, we divide the treated group into three subgroups, the Junior, Medium and Senior. Junior. Junior journalists are defined as those common reporters with less than 5 year working experience in the newspaper. Medium journalists are those common reporters with 5-10 year tenure. Those working more than 10 years or taking a position equal or above chief reporter are defined as Senior. The control group remains the same. 2).The interaction terms Reform×Seniority×Centralization identify the heterogeneous differences-in-differences effects. 3). We replace the sector fixed effects (in the previous tables) with a stronger control, interactions between sector and seniority. The other variables are the same as in previous tables. 4). Again, standard errors (in parentheses) are corrected for clustering of the observations at the individual level. ***denotes the coefficient is significantly different from zero at 1%, **at 5% and * at 10% levels.

Table 5. Heterogeneous Effects of Centralization on Journalists with Different Level of Seniority Excluding The Economic Journalists

Independent Variables	(1) quantity	(2) quantity	(3) quantity	(4) quantity	(5) quality	(6) quality	(7) quality	(8) quality
Reform×junior ×centralization	-.359 (.108)**	-.362 (.117)***	-.319 (.092)***	-.251 (.089)***	-.078 (.091)	-.053 (.094)	-.089 (.098)	-.100 (.111)
Reform×medium ×centralization	-.023 (.152)	-.012 (.152)	.066 (.113)	.189 (.086)**	.223 (.156)	.243 (.148)	.195 (.147)	.342 (.100)***
Reform×senior ×centralization	-.266 (.117)**	-.293 (.112)**	-.265 (.094)***	-.253 (.117)**	.160 (.108)	.100 (.103)	.077 (.097)	.006 (.128)
junior×centralization	-.129 (.083)	-.385 (.081)***	---	---	.158 (.0693)**	.116 (.101)	---	---
medium×centralization	-.333 (.12)***	-.495 (.111)***	---	---	.089 (.132)	-.124 (.134)	---	---
senior×centralization	-.094 (.092)	.093 (.096)	---	---	.159 (.097)	.146 (.094)	---	---
Individual Characteristics	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector×seniority fixed effects	No	No	Yes	Yes	No	No	Yes	Yes
Individual fixed effects	No	No	No	Yes	No	No	No	Yes
#Observations	3718	3718	3718	3718	3702	3702	3702	3702
Adjusted R-squares	0.098	0.237	0.351	0.540	0.072	0.108	0.222	0.387

Notes: All the variables are the same as in Table 4. The only difference is that we use a smaller sample in the each sub-treatment groups, excluding the Economic Journalists. Again, standard errors (in parentheses) are corrected for clustering of the observations at the individual level. ***denotes the coefficient is significantly different from zero at 1%, **at 5% and * at 10% levels.

Table 6. Examination of Predetermined Effects

Independent Variables	(1) Quality ATE	(2) Quantity ATE	(3) Quality economic	(4) Quantity economic	(5) Quality Non-econ	(6) Quantity Non-econ	(7) Quality Medium	(8) Quantity Medium
Before-2	.080	.029	.129	.101	.015	-.046	.340	.093
	(.098)	(.063)	(.139)	(.074)	(.106)	(.076)	(.131)*	(.118)
Before-1	-.016	-.020	.080	.028	-.111	-.085	.171	.010
	(.124)	(.078)	(.150)	(.090)	(.137)	(.090)	(.181)	(.136)
Before0	.176	-.022	.237	.120	.100	-.171	.420	.249
	(.121)	(.080)	(.140)*	(.091)	(.140)	(.092)*	(.166)**	(.100)**
After1	.075	-.110	.194	.030	-.048	-.264	.198	.051
	(.117)	(.077)	(.135)	(.083)	(.144)	(.098)***	(.157)	(.106)
After2	.188	-.013	.470	.220	-.049	-.223	.453	.197
	(.123)	(.087)	(.131)***	(.099)**	(.144)	(.097)**	(.142)***	(.115)*
After3+	.225	-.011	.415	.146	.065	-.156	.403	.137
	(.085)***	(.071)	(.096)***	(.073)*	(.098)	(.083)*	(.090)***	(.085)
Individual Characteristics	Yes	Yes	Yes	Yes	yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector fixed effects	Yes	yes	yes	yes	yes	yes	---	---
Sector×seniority fixed effects	---	---	---	---	---	---	Yes	yes
Individual fixed effects	yes	yes	yes	yes	yes	yes	Yes	Yes
#Observations	5049	5067	3220	3236	3702	3718	5049	5067
Adjusted R-squares	0.377	0.533	0.449	0.630	0.369	0.530	0.400	.546

Notes: Before-1 is a dummy that equals one if an individual in the treatment group worked in the month before the reform (August 2005), before0 is a dummy for a treated journalist in the month of reform (September 2005) and after1 is a dummy for a treated journalist one month after the reform (October 2005). Similar implications apply to before-2 and after2. The regressor After3+ is a dummy that equals one for a treated journalist working after 3 months of the reform (from December 2005 and on wards). In all the regressions, we use the

decentralized sectors as a uniform control group. In Column (1) and (2), the treatment is the overall centralized sectors and thus we are examining the average treated effects. In Column (3) and (4), the treatment is the Economic Journalists. In Column (5) and (6), the treatment is the non Economic journalists in the centralized sectors. In the last two columns, the treatment is the Medium journalists in the centralized sectors. The dependent variables in the odd columns are logarithm of quantity score and logarithm of quality score in the even columns. As in all previous regressions, standard errors (in parentheses) are corrected for clustering of the observations at the individual level. ***denotes the coefficient is significantly different from zero at 1%, **at 5% and * at 10% levels.