ELSEVIER European Economic Review 43 (1999) 1085–1094

EUROPEAN ECONOMIC REVIEW

Economics of Transition and China's Reforms

Why is China different from Eastern Europe? Perspectives from organization theory

Yingyi Qian[a,*], Gérard Roland[b], Chenggang Xu[c]

[a] *Department of Economics, Stanford University, Stanford, CA 94305, USA*
[b] *ECARE, Université Libre de Bruxelles, Brussels, Belgium*
[c] *Department of Economics, London School of Economics, London, UK*

Abstract

We draw from recent work in organization theory to explain the differences in reform strategies between China and Eastern Europe. An experimentation approach was adopted in China whereas a big bang approach was more favored in Eastern Europe. The explanation is based on differences in the organizational structure of central planning: U-form in Eastern Europe and M-form in China. The M-form is more flexible because it makes local experiments possible, contrary to the U-form where this would give rise to major complications in coordination.

JEL classification: P3; P5

Keywords: Transition; Organizational form; Coordination; Experimentation; China

1. Introduction

Reforms in Eastern Europe and China are often contrasted as comprehensive vs. partial; rapid vs. gradual; 'big-bang' vs. experimental. Moreover, Chinese gradualism was characterized by local experimentation with reforms. Partial experiments with reforms were more scarce and mostly unsuccessful in Eastern

* Corresponding author. Tel.: 650 723 3984; fax: 650 725 5702; e-mail: yqian@leland.stanford.edu.

0014-2921/99/$ – see front matter
PII: S0014-2921(98)00116-0

Europe. Why do we observe such differences? It is often claimed that the former Soviet system was too rigid while the Chinese system was more flexible. But why are some institutions more flexible than others and how does this relate to differences in reform strategies? In this paper, we draw on our recent work in organization theory (Qian et al., 1997) to shed light on these questions.

The two former centrally planned economies of the Soviet Union and China were organized differently (Qian and Xu, 1993). The Soviet economy was organized in specialized or functional ministries (e.g., mining, machinery, textile, etc.), each controlling gigantic factories. This is known as 'branch organization' (Nove, 1980). In contrast, the Chinese economy has been organized since 1958 mainly on a geographical principle, known as 'regional organization' (Granick, 1990). The Soviet organization resembled closely the U-form organization of business firms while the Chinese organization resembled that of the M-form organization (Chandler, 1962; Williamson, 1975).

This paper focuses on the comparison of M-form and U-form organizations in coordinating changes in a team-theoretic framework.[1] Using Milgrom and Roberts' (1992) concept of 'design attributes', we analyze coordination as 'attribute matching'. In the context of business organizations, any product or service can be viewed as the result of the assembling of complementary parts: assembling of the parts of a car or of a computer; synchronizing travel, accommodation and logistics for a conference or a business meeting; assembling subroutines for a software packages; etc. Each part is characterized by its attributes: time, location, technical specifications such as size, weight and bits, etc. These complementary parts must be made to fit together. A product or a service is completed successfully only if the characteristics of each attribute of the various parts are matched successfully. For instance, the diameter of a screw must match that of a bolt; they must both meet certain standards of material resistance. They must be transported to a given location at a given time in order to be matched. Failure in the matching of attributes implies most often a drastic production failure. We assume that ex ante a program is well designed in the sense that all the attributes are matched in the blueprint. However, some of the attributes may not suit the local conditions ex post and adjusting these attributes may lead to mismatches with the attributes of other tasks, which will then require further adjustments.

We use this framework to analyze the transition where complementary reforms must be implemented. Take a simple example with two reforms: enterprise restructuring (laying off excess workers) and creation of a social safety net. The attributes of enterprise restructuring are the number and individual characteristics of the laid off workers, such as age, seniority, family composition, length of residence, sex, type of contract, current wage, history of employment, etc. The

[1] Maskin et al. (1997) analyze incentive issues in M-form and U-form organizations.

attributes of compensation from the social safety net are rules of eligibility such as length of employment, special circumstances (veteran or not), status of enterprises, rules of benefits such as size and length, types of benefits (monetary or not), technical support of computers, administration, budget, etc. If some attributes of the two tasks are not matched, laid off workers may not be compensated appropriately, so they may riot.

In our framework, a successful reform requires both a good reform blueprint and correct implementation. Thus, there is first an uncertainty about the quality of a reform blueprint. If it is flawed it can never lead to a satisfactory result, however well coordinated the implementation is. On the other hand, a good reform blueprint needs to be implemented correctly, which requires good coordination. The quality of coordination depends on the quality of the information available to decision-makers in the organization. We assume that only local managers are able to observe local information, and communication is necessary for others to use that information. However, communication is imperfect and there is a probability that the transmitted message is wrong. An M-form organization is an organization that is decomposed into more-or-less self-contained units where the attribute matching can be done locally. In contrast, a U-form organization is decomposed into specialized units which are not self-contained, and thus attribute matching cannot be carried out locally and is done by the top manager.

Our main findings can be summarized as follows.[2] A first basic tradeoff between the M-form and U-form is that the former allows for better local coordination but lacks economies of scale. Most importantly, the M-form enjoys an important flexibility advantage: it can experiment locally with reforms because the structure of self-contained units makes attribute matching achievable locally without disrupting the organization as a whole. This is not possible under the U-form due to the higher specialization of tasks. The latter result can explain why the 'big-bang' approach was followed in Eastern Europe and the former Soviet Union, which had U-form economies, whereas China followed an 'experimental' approach to reform (McMillan and Naughton, 1992; Sachs and Woo, 1997). The argument is embedded in a framework where coordination in the implementation of reforms is explicitly modeled and where different organizational forms do not have the same degree of flexibility in coordination. Our model is consistent with the view that coordination failure is an important reason for the output collapse in the former Soviet block (Roland and Verdier, 1996; Blanchard and Kremer, 1997).

[2] We present the results only in a qualitative way and refer the reader to Qian et al. (1997) for a complete analysis of the results.

2. The model

We consider an economy with two regions 'A' and 'B', and two functions, '1' and '2'. There are four tasks: $1A$, $2A$, $1B$, and $2B$, where task ir involves process i for region r. Each of the four tasks has many different attributes. A reform program is characterized by its new attributes. At the implementation stage of a reform program, unexpected contingencies appear which we call 'attribute shocks'. Attributes between tasks $1r$ and $2r$ ($r = A, B$) must be *matched* in order to implement a reform program successfully.

We consider an infinite horizon with discount factor δ. One (and only one) blueprint of the reform program is made available each period. With probability p the blueprint is a good one and with probability $1 - p$ it is bad. Blueprints available over time are stochastically independent. We assume that if a blueprint is good, it will remain good in any region in the future; however, good coordination (i.e., attribute matching) in one region cannot be 'copied' in another region because of differences in local conditions. If a blueprint tried in one region is good and coordination is successful, then the same blueprint can be used successfully elsewhere, but coordination in another region is still necessary in order to adjust to local conditions.

In each period, a manager collects information about the 'attribute shocks' and sends a message to another manager. Each message contains information about all the attributes in one task. We assume that information transmission between any two managers is imperfect so that the probability of each message being correct is λ and the probability of being wrong is $1 - \lambda$, where $0 \leq \lambda \leq 1$. We assume that the noises in information transmission are independent across tasks and over time. Based on the information received, the manager carries out his main job: attribute matching.

Consider the payoffs for unit A (payoffs for unit B are defined symmetrically). Let the status quo (without change) payoff in tasks $1A$ and $2A$ be $\frac{1}{2}$, respectively. The benefits from change are defined as follows. Suppose the program is good, then (i) with a change in task $1A$ but not in task $2A$ or vice-versa, the payoff is $(A + 1)/4$ if the attributes between $1A$ and $2A$ are matched, 0 otherwise; and (ii) with a change in both tasks $1A$ and $2A$, the payoff is $A/2$ if the attributes between $1A$ and $2A$ are matched, 0 otherwise. If the program is bad, then the payoff is always 0 when change is implemented. We assume that $pA > 1$, i.e. the expected per period benefit from change, as compared to the status quo, is positive.

We assume that all blueprints are made available for free, but for each manager there is a setup cost associated with coordinating changes. This cost can be interpreted as a training cost: to implement a reform, the managers need to be trained on how to match the attributes of the reform. Because blueprints are free and the setup costs for coordination are not, when a failure occurs in the previous period (either due to a bad program or bad coordination), the

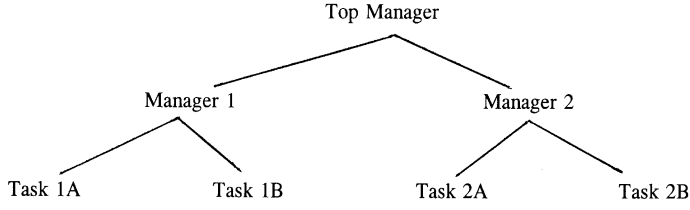

Fig. 1. A U-form organization.

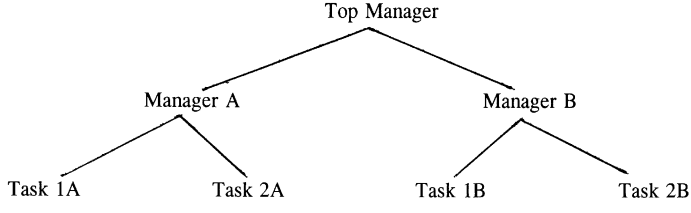

Fig. 2. An M-form organization.

organization always prefers to use a new blueprint in the next period rather than to retry the old one.

A U-form organization is set up along 'functional lines' (see Fig. 1). Two middle managers $i\,(i = 1, 2)$ are responsible for collecting information about shocks in tasks iA and iB. Because the two tasks which need attribute matching are not assigned to the same middle manager, the two middle managers have to report the information to the top manager, who, after receiving information from the two managers, matches attributes between tasks $1r$ and $2r$ $(r = A, B)$.

An M-form organization is set up along 'geographical lines' (see Fig. 2). The middle manager $r\,(r = 1, 2)$ is responsible for collecting information about shocks in tasks $1r$ and $2r$. Because the two tasks which require attribute matching are assigned to the same manager, and no attribute matching is needed between the tasks across units, the middle managers can match attributes between tasks $1r$ and $2r$ locally by themselves. The top manager provides a blueprint for change.

Under the M-form, setup costs must be incurred in each unit since attribute matching is done separately in each product unit. This leads to duplication in setup costs. For example, both managers need to be trained to coordinate the changes. In contrast, under the U-form, only the top manager matches attributes in a centralized way. Therefore, the setup cost is correspondingly smaller. For simplicity, we will assume that only one setup cost is required when only one manager coordinates.

To illustrate how our framework works, let us look at an example of enterprise reform in transition. In the U-form, the reform is organized by specialized ministries, each ministry being responsible for either enterprise restructuring or the social safety net, and the national government is responsible for matching the attributes between enterprise restructuring and the social safety net. It is possible that there will be bad coordination between layoff policies and the creation of the social safety net, leading to riots. For example, the rules for eligibility set at the national level may be completely inappropriate in some important regions which have a concentration of older workers, but the national rule for pension eligibility does not make workers close to pension age eligible for any benefits.

In the M-form, the reform is organized by regions, each regional government being responsible for matching the attributes between enterprise restructuring and the social safety net in its own region. Under this type of organization, layoff policies and the institution of social safety nets can be better coordinated within each region so that riots can be prevented.

3. M-form vs. U-form

We first compare the performances of the U-form and the M-form in the case of a 'big bang' reform where two complementary reforms 1 and 2 are implemented simultaneously in regions A and B. Under the M-form, every unit manager will be responsible for matching the attributes of the two tasks within his unit. With perfect local information, attribute matching under the M-form will be performed perfectly. If a program is good, which happens with probability p, the total payoff from the two units is $A/(1-\delta)$. If a program is bad, which happens with probability $1-p$, the current payoff is zero, and a new program will be tried in the next period. Therefore, the expected payoff of continued reform in an M-form is

$$\pi_{m2} = pA/(1-\delta) + (1-p)\delta\pi_{m2}$$

or

$$\pi_{m2} = pA/\{(1-\delta)[1-(1-p)\delta]\}.$$

On the cost side, in period 1, $2C$ is paid because two managers are involved in coordination. With probability p, the reform program is good so no more costs need to be paid afterwards. But with probability $1-p$ the program is bad, which is discovered after one period of change. Then a new program is tried in the next period. Because the managers need to be retrained for matching attributes, an additional cost of $2C$ is paid in the next period. Therefore, we should have

$$c_{m2} = 2C + \delta(1-p)c_{m2}$$

or

$$c_{m2} = 2C/[1 - (1 - p)\delta].$$

Under the U-form, the top manager is responsible for coordinating the four tasks. He thus receives four messages through noisy communication, each corresponding to one of the four tasks. When the program is bad (with probability $1 - p$), the reform fails and a new program will be tried in the next period. If the program is good (with probability p), there are three possibilities: (i) With probability λ^4, coordination is successful for both products A and B. (ii) With probability $(1 - \lambda^2)^2$, coordination fails in both A and B. This will give the same outcome as a bad program. (iii) With probability $2\lambda^2(1 - \lambda^2)$, coordination for one of the two products is successful. In this case, knowing that the program is good, the top manager will use the same program for the product in which the coordination failed and solve only the attribute matching problem in the next period. Hence, the payoff of reform under the U-form is

$$\pi_{u2} = p\{\lambda^4 A/(1 - \delta) + 2\lambda^2(1 - \lambda^2)[A/[2(1 - \delta)] + \delta\pi] + (1 - \lambda^2)^2\delta\pi_{u2}\} + (1 - p)\delta\pi_{u2},$$

where π is the expected payoff of change for one product for a good program, or

$$\pi = \lambda^2 A/[2(1 - \delta)] + (1 - \lambda^2)\delta\pi.$$

Using the above recursive formula of π, we obtain

$$\pi_{u2} = \lambda^2 pA[1 - (1 - \lambda^2)^2\delta]/\{(1 - \delta)[1 - (1 - \lambda^2)\delta] \times [1 - \delta[p(1 - \lambda^2)^2 + (1 - p)]]\}.$$

When a reform program is introduced in period 1, a setup cost C is paid (instead of $2C$ in the M-form) because only the top manager does attribute matching. With probability $1 - p$ the program is bad, which is discovered after one period. With probability $p(1 - \lambda^2)^2$ the program is good but coordination fails for both products. In both cases, a new program is tried in the next period. When the program is good and coordination is successful for at least one of the two products, the program will be known to be good. In such a case, it is reasonable (and consistent with our assumptions on costs) to assume that no new setup cost needs to be paid in the next period. Indeed, the top manager has already been trained for that program and he has been able to successfully coordinate attribute matching for one product. Under this assumption, we have

$$c_{u2} = C + \delta[p(1 - \lambda^2)^2 + (1 - p)]c_{u2}$$

or

$$c_{u2} = C/\{1 - [p(1 - \lambda^2)^2 + 1 - p]\delta\}.$$

We define the expected net payoff under the M-form and U-form, respectively,

$$M_2 = \pi_{m2} - c_{m2}$$

and

$$U_2 = \pi_{u2} - c_{u2}.$$

Comparing these two expressions, one can easily see the basic trade-off between the M-form and the U-form organizations: the M-form benefits from advantages in coordination because of better use of local information but forgoes economies of scale which give the U-form lower costs in implementing reforms. Therefore, the M-form will be more efficient than the U-form when communication quality is below a critical value, or when the setup cost is not too high.

We next compare the trade-off between a big bang approach to reforms and a gradual approach under the M-form organization. Under the gradual approach, a reform is tried first in one region and later extended to another region, conditional on the success of its implementation in the first region. If the program is a good one, the first period payoff is $(A + 1)/2$. In the second period, the same program is then used in another region with a payoff of A in each period. However, if the program is bad, the experimenting region A will get 0 payoff and the non-experimenting region B will get $\frac{1}{2}$. In this case, a new experiment in region A will take place again in the next period. Therefore, the expected payoff of the M-form with experimentation is given by

$$\pi_{m1} = p\{A/2(1-\delta) + \tfrac{1}{2} + \delta A/2(1-\delta)\} + (1-p)\{\tfrac{1}{2} + \delta\pi_{m1}\}$$

or

$$\pi_{m1} = [pA(1+\delta) + (1-\delta)]/\{2(1-\delta)[1-(1-p)\delta]\}.$$

The setup cost in the first period is C because only region A's manager does attribute matching. If the program is good, region B will use the same program in period 2 and another cost C will be paid in period 2 because region B's manager needs to match attributes according to local conditions. Region B can thus imitate region A's success but cannot copy it since local coordination is still required to introduce a successful blueprint. With probability $1 - p$, the program is bad and a new blueprint must be tried. We are then back to the situation of period 1. Hence we get

$$c_{m1} = C + \delta[pC + (1-p)c_{m1}]$$

or

$$c_{m1} = (1 + p\delta)C/[1-(1-p)\delta].$$

One can show that on the benefit side, the gradual approach always reduces the expected benefits from change as soon as reform brings a higher expected outcome than the status quo. This is due to the delay in the full implementation

of the reform blueprint. On the other hand, experimentation can save on setup costs because of the option value of early reform reversal in case of a bad blueprint (Dewatripont and Roland, 1995).

There is thus a trade-off between the 'gradual approach' ($M_1 = \pi_{m1} - c_{m1}$) and the 'big bang' approach. The former has lower expected gross benefits from change but also lower expected costs of implementation. In Qian et al. (1997) we show that if p is low enough, that is, program uncertainty is important enough, or if C is high enough, then the gradual and experimental approach dominates: $M_1 > M_2$. Indeed, in that case, the option value of early reversal after having tried a bad blueprint increases.

Let us note immediately that the U-form does not benefit from the 'gradual approach'. Indeed, the option value of early reversal will be absent since, whether one implements partial reform or full reform, the same setup costs will have to be incurred at the center. On the other hand, expected benefits cannot be higher but only lower. In fact, due to complementarities in reform, attribute matching may be an impossible task. To come back to the example of enterprise reform, it is hard to see how it is possible to implement layoffs without introducing a social safety net, while still preserving social peace.

It now remains to compare M_1 with U_2. The flexibility of the former is an advantage over the latter. One can show that when λ is close enough to 1, $U_2 > \max\{M_1, M_2\}$. This is because of the U-form's advantage in economies of scale. On the other hand, if λ is small and C is large, then M_1 will dominate both M_2 and U_2.

4. Application to China

In the following, we provide some examples from China's transition from plan to market to show the role of regional experimentation in pursuing reforms in China.

A major feature of the successfully implemented Chinese agricultural reform is its trial-and-error or experimental approach. The experiments started in some counties in 1978 when the rest of the Chinese rural areas were operating under the collective farming system. A famous experiment started in Fengyang county of Anhui province where the households in a village began to contract with the local government for delivering a fixed quota of grain in exchange for farming on a household basis. The practice was later imitated by other regions and also promoted by the central government. By 1984, almost all farm households across China had adopted this method.

Another example is that of the Special Economic Zones. In 1980, China formally established four 'Special Economic Zones', Shenzhen, Zhuhai, Shantou, and Xiamen. The M-form structure made the local governments in Special Economic Zones capable of coordinating activities across all the industries

when the rest of the economy was still under central planning. After a few years, most of the successful practices experimented with inside the Special Economic Zones were adopted nationwide.

Privatization of small- and medium-sized SOEs in China in the mid-1990s has followed a pattern similar to agricultural reform in the late 1970s. Experiments began in some counties, such as Yibin of Sichuan, Shunde of Guangdong, and Zhucheng of Shandong, around 1993. County governments have major responsibilities in coordinating all the related policies, such as changes in corporate governance, ownership structure, dealing with bad debts, etc. The successful experiments have started to be imitated by other regions.

In recent years, China's state sector began to lay off excess workers. About ten million workers were laid off by the end of 1996, and an additional 5.6 million workers were laid off in the first half of 1997. The Chinese government again took an experimental approach by delegating responsibilities to municipal governments to coordinate the layoff and reemployment of SOE workers.

References

Blanchard, O., Kremer, M., 1997. Disorganization. Quarterly Journal of Economics 112 (4), 1091–1126.

Chandler, A. Jr., 1962. Strategy and Structure. Doubleday, New York.

Dewatripont, M., Roland, G., 1995. The design of reform packages under uncertainty. American Economic Review 85 (5), 1207–1223.

Granick, D., 1990. Chinese State Enterprises: A Regional Property Rights Analysis. University of Chicago Press, Chicago, IL.

Maskin, E., Qian, Y., Xu, C., 1997. Incentives, information, and organizational form. DDP 618. Harvard Institute for International Development, Cambridge, MA.

McMillan, J., Naughton, B., 1992. How to reform a planned economy: Lessons from China. Oxford Review of Economic Policy 8, 130–143.

Milgrom, P., Roberts, J., 1992. Economics, Organization, and Management. Prentice-Hall, Englewood Cliffs, NJ.

Nove, A., 1980. The Soviet Economic System. 2nd ed., Allen&Unwin, Boston, MA.

Qian, Y., Xu, C., 1993. Why China's Economic reform differ: The M-form hierarchy and entry/expansion of the non-state sector. Economics of Transition 1 (2), 135–170.

Qian, Y., Roland, G., Xu, C., 1997. Coordinating changes in M-form and U-form organizations. Mimeo., Stanford University, ECARE and London School of Economics.

Roland, G., Verdier, T., 1996. Transition and the output fall. Mimeo., ECARE, Brussels.

Sachs, J., Woo, W.T., 1997. Understanding China's economic performance. Mimeo., Harvard University, Cambridge, MA.

Williamson, O., 1975. Markets and Hierarchies. Free Press, New York.