Innovation and Fiscal Decentralization in Transitional Economies

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Abstract

In this paper, I build a theoretical model of the innovation decision in transitional economies. Innovation often erodes the economic interests of certain interest groups. To block innovation, an interest group can choose to overthrow the central ruler who adopts innovation policy, or to bribe the local leader who implements the innovation policy. Therefore, for the central ruler, innovation has two major costs. One derives from the overthrow effect imposed by the interest group, and the other derives from tax revenue share as an incentive for the local leader to implement the innovation policy. The central ruler tends to innovation when the interest group has relatively small political power; the economic rents erosion for the interest group is relatively small; there is a relatively large improvement of production under innovation; and the beginning technology level is relatively high. In a politically centralized regime, the cost of innovation decreases and therefore the ruler is more likely to adopt the innovation policy. When the bribe from the interest group is not credible, the central ruler is more likely to adopt the innovation policy.

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1 Introduction

Over the past twenty years, transitional economies exhibit great variation in economic performance. The sharp divergence between Russia and China, two largest transitional economies, draws especially significant attention of students of political economy. The driven force of economic success in transitional economies lies in the successful implementation of innovation policy which shapes economic incentive and promotes production. Then, why do some transitional economies successfully implement innovation policy while others failed? Why do different transitional economies choose different innovation policies? Why are some innovation policies implemented in advance?

In this paper, I develop a simple theoretical model to address these questions. The central leadership in transitional economies makes the decision whether to adopt innovation policy. If all else equal, the central leadership would always favor innovation which promotes the economy. However, in transitional economies, the central leadership faces a strong resistance from the interest group whose economic interest will be eroded under innovation. To block innovation, the interest group can choose to overthrow the central ruler who adopts innovation policy, or to bribe the local leader who implements the innovation policy. To induce the local leader to implements the innovation policy, the central provides tax revenue share as in incentive. Therefore, for the central ruler, innovation has two major costs. One derives from the overthrow effect imposed by the interest group, and the other derives from tax revenue share. These considerations of the central leadership lead to the divergence in innovation decision and hence the economic performance among transitional economies.

The literature on political economy of transition mainly focus on the strategies of transition. The advocates of the Big Bang approach emphasis the merit of a fast and comprehensive implementation of innovations (Lipton and Sachs, 1990; Balcerwircz, 1995). The opponents of the Big Bang approach argue that gradualism decreases shocks of innovation and provides basis for further innovation (Dewatripont and Roland, 1992, 1995; Litwack and Qian, 1999; Lau et al., 2000). Considering the major pros and cons of two strategies, this paper explains

the positive question that why different transitional economies differ in strategy of transition.

Another branch of literature on political economy of transition looks into the role of fiscal decentralization in transitional economies. Most theoretical papers on fiscal federalism agree that fiscal decentralization provides local official strong incentive to promote economic growth (Montinola et al., 1995; Qian and Weingast, 1996; Qian and Roland 1998; Zhuravskaya, 2000). However, both positive and negative effects of fiscal decentralization on economic performance are found in empirical researches (Zhang and Zou, 1998; Lin and Liu, 2000; Jin et al., 2005). Blanchard and Shleifer (2001) argue that only with political centralization can fiscal federalism exerts positive effect on economic growth. The above research treats fiscal decentralization as exogenous and than explores the effect of fiscal decentralization on economy. This paper contends that as an incentive to induce the local officials to promote economic-enhancing policy, fiscal decentralization is chosen by the central leadership and thus endogenous.

This paper is also related to the literature on interest group. The major contention of interest group study is that the interest group may block the innovation policy to protect their economic rents (Olson, 1982; Mokyr 1990; Parente and Prescott, 1999). While adopting the above contention, this paper argues that the central leadership in transitional economy are not necessary the representative of interest groups whose economic rents will be eroded under innovation. Hence, the interest groups' influence on policy decision is indirectly.

The remainder of this paper is organized as followers. In the next section, I set up a basic model to illustrate the mechanism of the innovation decision in transitional economies. In section three, I will introduce the element of political centralization in the basic model. In section four, to explore the commitment problem of the interest group, a signaling game is introduced. Section five explores links between theory and evidence in China and Russia. Section six offers policy implications and concluding remarks.

2 The Basic Model

2.1 The environment

In the economy, there are three types of individuals: an incumbent central government ruler (for the sake of simplicity, I use central ruler instead of incumbent central government ruler in the following paper), an incumbent local government leader(for the sake of simplicity, I use local leader instead of incumbent local government leader in the following paper), and one interest group.

The economy is consisting of two production sectors. One is controlled by an interest group with production of B. The other is in the hand of citizens, which produces A, where A is the level of technology at the beginning of the period.

I assume that the central ruler can impose a tax on the production of the citizen with tax rate equals to 1. The production of interest group is nontaxable.[1] When a new technology of the citizens' production is introduced to the economy, A increases to αA, while the production of interest group decreases to $B - \beta$. If the central ruler decides to block innovation, there is no need to share tax revenue with the local leader. Therefore, without innovation policy, the payoff for the central ruler is A, the payoff for the local leader is 0, and the payoff for the interest group is B. If the central ruler announce the innovation policy, he has to share tax revenue, a, with local leader to induce them to implement the innovation policy. Observing the innovation policy and the tax share revenue, the interest group decides whether to overthrow the central government with a cost, z, or to bribe the local leader, or to accept the new policy. If interest group replaces the central ruler with a new one, the innovation policy is blocked. In that case, the payoff for the central ruler is 0, the payoff for the local leader is 0, and the payoff for the interest group is $B - z$. If the interest group accepts the innovation policy, the payoff for the central ruler is $(1-a)\alpha A$, the payoff for the local leader is $a\alpha A$, and the payoff for the interest group is $B - \beta$. If the interest group offers a bribe, b,

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[1]Introducing lower tax rate on citizen's production and taxation on the interest group will not change the result, as long as for the central leader the profit from citizen's production is relatively more important than that from the production of the interest group.

to the local leader, the local leader then decides whether to accept the bribe or to implement the innovation policy. When the local leader accepts the bribe, the payoff for the central ruler is $(1-a)A$, the payoff for the local leader is $aA + b$, the payoff for the interest group is $B - b$. When the local leader decides to implement the innovation policy, the payoffs for each agent is same as that in the situation where the interest group accepts innovation policy. The prior common knowledge is that z is distributed uniformly over $(-\frac{1}{2} + r, \frac{1}{2} + r)$. Thus, r is an inverse measure of the political power of the interest group.

2.2 Timing

I consider a one period game. The timing of the game is as follows. Also see game tree 1.

1. The period starts with technology at A.

2. Nature decides the cost of overthrow, z.

3. The central ruler decides whether to adopt the innovation policy, $x = 0$ or 1.

4. If the central ruler adopts the innovation policy, he announces the tax revenue share, a.

5. The interest group decides whether to bribe the local leader with b amount of money, or overthrow the central ruler, $q = 1$, with cost z, or accept the innovation policy, $q = 0$.

6. If the interest group offers a bribe, b, the local leader decides whether to implement the innovation policy or to accept the bribe, $L = 0$ or 1. If the local leader accepts the bribe, innovation is not introduced to the economy.

7. If the incumbent ruler is replaced, a new ruler comes into power and always blocks innovation. Since there is no innovation, the local leader does not share any tax revenue.

2.3 Equilibrium

I solve the equilibrium by backward induction. First, consider the local leader's implementation decision. If the interest group offers a bribe, b, to the local leader, the payoff of accepting the bribe is $aA + b$ and the payoff of implementing innovation policy is $a\alpha A$. Hence, given the bribe, b, the local leader's strategy is:

$$L = 1 \quad \text{if} \quad b > \hat{b}, \quad L = 0 \quad \text{otherwise} \tag{1}$$

where $\hat{b} = a(\alpha - 1)A$.

If the interest group accepts the innovation policy, the local leader always implements the innovation policy, $L(p = 0) = 1$.

Next, consider the interest group's decision. If the interest group offers an accepted bribe, b, the payoff is $B - b$, where $b > \hat{b}$. Hence, the interest group bribe with $b = \hat{b} + \epsilon$, where $\epsilon \to 0$. [2] If the interest group overthrows the central ruler, he receives $B - z$. If the interest group accepts the innovation policy, he gets $B - \beta$. Therefore, the strategy of the interest group is:

$$
\begin{aligned}
b = \hat{b} + \epsilon &\quad \text{if} \quad \hat{b} = \min\{\hat{b}, \beta, z\} \\
q = 1 &\quad \text{if} \quad z = \min\{\hat{b}, \beta, z\} \\
q = 0 &\quad \text{if} \quad \beta = \min\{\hat{b}, \beta, z\}
\end{aligned}
\tag{2}
$$

Then, consider the central ruler's decision of tax revenue share, a. Given the central ruler wants to promote innovation, he wants to offer some, a, such that the interest group won't be able to offer a more attractive bribe, b, to local leader. In other words, the central ruler will offer tax revenue share a, such that for the local leader the payoff from implementing the policy equals to the payoff from accepting the highest bribe, $\bar{b}_z$, for each type z. When

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[2] I assume that local leader implements the innovation policy if the payoff from implementing the policy equals to the payoff from accepting the bribe.

$z < \beta$, $\bar{b}_{z<\beta} = z$. When $z \geq \beta$, $\bar{b}_{z\geq\beta} = \beta$. I plot $\bar{b}_z$ in figure 1. However, the central ruler does not know the exact type of the interest group. In that case, the central ruler offers a tax revenue share, a, to maximize his expected payoff. I calculate the optimal tax revenue share by ruling out alternatives. First, the central ruler won't offer some, a, such that $\hat{b} < \beta$. If he did so, the interest group with $z < \hat{b}$ would overthrow the central ruler while the interest group with $z \geq \hat{b}$ would offer a accepted bribe $b = \hat{b} + \epsilon$. In both cases, the payoff for the central ruler is less than that from blocking the innovation at first. Also, the central ruler won't announce tax revenue share, a, such that $\hat{b} > \beta$, since the local leader implements the innovation policy if the payoff from implementing the policy equals to the payoff from accepting the bribe. Therefore, the optimal tax revenue share is a^*, such that $\hat{b} = a^*(\alpha - 1)A = \beta$. Therefore, $a^* = \frac{\beta}{(\alpha-1)A}$.

Finally, consider the central ruler's decision whether to adopt the innovation policy or not. Given the optimal tax revenue share a^*, the expected payoff from adopting the innovation policy is:

$$
\begin{aligned}
U(a^*, x = 1) &= (\beta - r + \frac{1}{2}) \times 0 + (r + \frac{1}{2} - \beta) \times (1 - a^*)\alpha A \\
&= (r + \frac{1}{2} - \beta)(1 - \frac{\beta}{(\alpha - 1)A})\alpha A
\end{aligned}
\tag{3}
$$

Notice that when $z < \beta$, the interest group decides to overthrow the central ruler and therefore the payoff for the central ruler is zero. When $z \geq \beta$, given that $\hat{b} = \beta$, the interest group will accept the innovation policy and hence the payoff for the central ruler is $(1-a^*)\alpha A$.

The payoff from blocking the innovation for the central ruler is:

$$
U(x = 0) = A
\tag{4}
$$

The central ruler's innovation decision boils down to the comparison of $U(a^*, x = 1)$ and $U(x = 0)$. Therefore, the central ruler adopts innovation policy when

$$(r + \frac{1}{2} - \beta)(1 - \frac{\beta}{(\alpha - 1)A})\alpha > 1 \tag{5}$$

I state the following proposition.

Proposition 1. *When $(r + \frac{1}{2} - \beta)(1 - \frac{\beta}{(\alpha-1)A})\alpha > 1$, in the Subgame Perfect Equilibrium, the central ruler adopts innovation policy, $x = 1$; the interest group with replacement cost $z \leq \beta$ replaces the central ruler, $q_{z \leq \beta} = 1$, while the interest group with replacement cost $z > \beta$ accepts the innovation policy, $q_{z > \beta} = 0$; and the local ruler implements the innovation policy, $L = 1$.*

This result implies that a higher r, a higher α, a lower β, and a higher A, always encourage the central ruler to adopt the innovation policy. The central ruler tends to innovation when the interest group has relatively small political power; the economic interest erosion for the interest group is relatively small; there is a relatively large improvement of production under ninnovation; and the beginning technology level is relatively high.

3   The Model with political centralization

In a politically centralized system, the local ruler who accepts bribe are more likely to be replaced by the central ruler. I model this issue in a simple way by introducing the probability, p, with which the local ruler will be replaced if he accepts the bribe from the interest group. Thus, p measures the degree of political centralization. Here, I assume that the new local leader will always implements the innovation policy.

Let us first consider the local ruler's decision. Now, the expected payoff from accepting bribe is $(1 - p)(aA + b) + p \times 0$. The payoff of implementing innovation policy is still $a\alpha A$. Hence, given the bribe, b, the local leader's strategy is:

$$L = 1 \quad \text{if} \quad b > \tilde{b}, \quad L = 0 \quad \text{otherwise} \tag{6}$$

where $\tilde{b} = a(\frac{\alpha}{1-p} - 1)A$.

Next, consider the interest group's decision. Notice that the expected utility from making a successful bribe for the interest group is $B - (1-p)b - p\beta$. Following the same logic in the basic model, the strategy of the interest group is:

$$b = \tilde{b} + \epsilon \quad \text{if} \quad (1-p)\tilde{b} + p\beta = \min\{(1-p)\tilde{b} + p\beta, \beta, z\}$$

$$q = 1 \quad \text{if} \quad z = \min\{(1-p)\tilde{b} + p\beta, \beta, z\} \tag{7}$$

$$q = 0 \quad \text{if} \quad \beta = \min\{(1-p)\tilde{b} + p\beta, \beta, z\}$$

Then, consider the central ruler's decision of offering tax revenue share, a. When $z < p\beta$, $\bar{b}_{z<\beta} = 0$. When $Z \in [p\beta, \beta]$, $\bar{b}_{z<\beta} = \frac{z-p\beta}{1-p}$. When $z \geq \beta$, $\bar{b}_{z\geq\beta} = \beta$. I plot $\bar{b}_z$ in figure 2. Following the same logic of the basic model, I have the optimal tax revenue share, $a^{**} = \frac{\beta}{(\frac{\alpha}{1-p}-1)A}$. Notice that $a^{**} < a^*$ and that a^{**} is decreasing in p. Hence, I have the following Lemma.

Lemma 1. *If all else equal, the tax revenue share in political centralized regime tends to be less than that in relatively political decentralized regime.*

Finally, consider the central ruler's innovation decision. The central ruler in a political centralized regime with p decides to adopt innovation policy when

$$(r + \frac{1}{2} - \beta)(1 - \frac{\beta}{(\frac{\alpha}{1-p} - 1)A})\alpha > 1 \tag{8}$$

Proposition 2. *When $(r + \frac{1}{2} - \beta)(1 - \frac{\beta}{(\frac{\alpha}{1-p}-1)A})\alpha > 1$, in the Subgame Perfect Equilibrium, the central ruler adopts innovation policy, $x = 1$; the interest group with replacement cost $z \leq \beta$ replaces the central ruler, $q_{z\leq\beta} = 1$, while the interest group with replacement cost $z > \beta$ accepts the innovation policy, $q_{z>\beta} = 0$; and the local leader implements the innovation policy, $L = 1$.*

This result says that a higher p encourages the central ruler to adopts innovation policy. Therefore, all else equal, the central ruler in a politically centralized regime may have more

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incentive to adopt innovation policy than the central ruler in a politically decentralized regime.

4 The Model with signaling game

In previous sections, I assume that the interest group will honor its commitment of bribe. In this section, I relax this assumption. To emphasize the major intuition, I now assume that there are two types of interest groups. Politically strong one with the replacement cost $z^s < \beta$. Politically weak one with the replacement cost $z^w \geq \beta$. I consider two situations. In the first situation, politically strong type will not honor its commitment. In the second situation, politically weak type will not honor its commitment.

The timing of the signaling game is the same as that in the basic model, except the nature's move. Here, nature decides the type of the interest group. With probability p, the interest group is a politically strong one. With probability $1 - p$, the interest group is a politically weak one.

4.1 the first situation

Since the politically strong type won't honor its bribe commitment, if local ruler accepts the bribe offer of the strong type, the local ruler gains aA and the strong type gains B.

I solve the Perfect Bayesian Equilibrium by first considering the subgame given that the central ruler adopts innovation policy and announce a tax revenue share a. See game tree 2 for the subgame.

In this subgame, there are two types of equilibria [3].

Proposition 3. *If $\beta > \frac{a(\alpha-1)A}{1-p}$, the following strategies and beliefs constitute a perfect Bayesian Equilibrium in the subgame: both the strong type and weak type offer a bribe, $b^{pooling1} = \frac{a(\alpha-1)A}{1-p} + \epsilon$, the local leader accepts the bribe, and when the offered is $b^{pooling1}$, he*

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[3]Since I assume that local leader implements the innovation policy if the payoff from implementing the policy equals to the payoff from accepting the bribe, I do not consider semi-pooling equilibrium here

believes that the probability of being offered by the strong type is p and that the probability of being offered by the week type is $1 - p$.

Proof. Given the strategies, Bayes' rule suggests that the local leader's equilibrium belief is that the probability of being offered by the strong type is p and that the probability of being offered by the week type is $1-p$. Given such belief and the interest group's strategy, the local leader derives utility $aA + p \times 0 + (1-p)b^{pooling1}$ from accepting bribe and he derives utility $a\alpha A$ from implementing the innovation policy. Hence, when $b^{pooling1} = \frac{a(\alpha-1)A}{1-p} + \epsilon$, it is the best response for the local leader to accept the bribe. Now, I check that the strong type's strategy is the best response. Since strong type will not honor its commitment, offering an accept bribe is always a best response. Then, I check that the weak type's strategy is the best response. Since $\beta \geq b^{pooling1}$, it is better to offer a accepted bribe rather than accepting the innovation policy. $\square$

Proposition 4. *If $\beta \leq \frac{a(\alpha-1)A}{1-p}$, the following strategies and beliefs constitute a Perfect Bayesian Equilibrium in the subgame: the strong type decides to overthrow, weak type accepts the innovation policy, the local leader implements the innovation policy, and when there is a bribe offer, the local leader believes that the probability of being offered by the strong type is 1 and that the probability of being offered by the week type is 0.*

Proof. Given such belief and the interest group's strategy, the local leader will not accepts the bribe since the utility of accepting is 0. Hence, it is the best response for the local leader implements the innovation policy. Now, I check that the strong type's strategy is the best response. Given the local leader's strategy, the strong type derives utility $B - \beta$ from bribing and utility $B - z^s$ from replacing the central ruler. Hence, it is the best response for the strong type to replace the central ruler. Then, I check that the weak type's strategy is the best response. Given the strategy of the local leader, there is no need for the weak type to offer a bribe. Therefore, it is the best response for the weak type to accept the innovation policy. $\square$

In this subgame, the following separating equilibria do not exist.

Proposition 5. *There is no Perfect Bayesian Equilibrium in the subgame in which the strong type offers bribe, the weak type accepts the innovation policy, the local leader accepts the bribe and and when there is a bribe offer, the local leader believes that the probability of being offered by the strong type is 1 and that the probability of being offered by the week type is 0.*

Proof. If the local leader believes that the probability of being offered by the strong type is 1, he will not accepts bribe since the utility of accepting is 0. Hence, this equilibrium does not exist. □

Proposition 6. *There is no Perfect Bayesian Equilibrium in the subgame in which the strong type offers bribe, the weak type accepts the innovation policy, the local leader implements the innovation policy and and when there is a bribe offer, the local leader believes that the probability of being offered by the strong type is 1 and that the probability of being offered by the week type is 0.*

Proof. Given the strategy of the local leader, the strong type derives utility $B - \beta$ from bribing and utility $B - z^s$ from replacing the central ruler. Hence, the strong type will not offers a bribe to the local leader. Therefore, this equilibrium does not exist. □

Proposition 7. *There is no Perfect Bayesian Equilibrium in the subgame in which the weak type offers bribe, the strong type overthrows the central ruler, the local leader accepts the bribe and and when there is a bribe offer, the local leader believes that the probability of being offered by the strong type is 0 and that the probability of being offered by the week type is 1.*

Proof. Given the strategy of the local leader, the strong type always wants to imitate the weak type by offering the same amount of bribe as the weak type offers. As a result, this equilibrium does not exist. □

Proposition 8. *There is no Perfect Bayesian Equilibrium in the subgame in which the weak type offers bribe, the strong type overthrows the central ruler, the local leader implements the innovation policy and and when there is a bribe offer, the local leader believes that the probability of being offered by the strong type is 0 and that the probability of being offered by the week type is 1.*

Proof. Given the strategy of the local leader, there is no need for the weak type to offer a bribe. Hence, this equilibrium does not exist. □

Now consider the central ruler's tax revenue share decision. Since β, α, A and p are exogenous, the central ruler can determine whether the condition $\beta > \frac{a(\alpha-1)A}{1-p}$ hold by changing the value of a. In the pooling equilibrium, the local leader accepts the bribe and thus the innovation is not been introduced into the economy. For the central ruler, this is worse than not adopting innovation policy at first. Therefore, the central ruler will choose the lowest a to make the equilibrium in the subgame fall into a separate equilibrium. Hence, the optimal tax revenue share is $a^{***} = \frac{(1-p)\beta}{(\alpha-1)A}$. Compared with the optimal tax revenue share in the basic model, $a^* = \frac{\beta}{(\alpha-1)A}$, $a^{***} < a^*$

Finally, consider the central ruler's decision whether to adopt the innovation policy. By comparing the utility of adopting innovation and the utility of blocking innovation, the central ruler adopts innovation policy when

$$(1-p)(1 - \frac{(1-p)\beta}{(\alpha-1)A})\alpha > 1 \tag{9}$$

Proposition 9. *When $(1-p)(1 - \frac{(1-p)\beta}{(\alpha-1)A})\alpha > 1$, in the Perfect Bayesian Equilibrium, the central ruler adopts innovation policy, $x = 1$; the the politically weak interest group accepts the innovation policy, $q_{z^w} = 0$, while the politically strong group overthrow the central ruler, $q_{z^s} = 1$; and the local leader implements the innovation policy, $L = 1$.*

Compared with the basic model, in the model where the offer of the strong type is not accountable, the central ruler is more likely to adopt the innovation policy. To see this point,

one just need to notice that if there is two types in the basic model, the condition with which the central ruler adopts the innovation policy becomes $(1 - p)(1 - \frac{\beta}{(\alpha-1)A})\alpha > 1$.

4.2 the second situation

In this situation, the politically weak type interest group won't honor their bribe offer. If the local ruler accepts the bribe offer from the weak type, he will receives a utility of aA and the weak type gains B. See game tree 3 for the subgame.

In subgame where the tax revenue share a is give, there are two types of equilibria.

Proposition 10. *If $z^s > \frac{a(\alpha-1)A}{p}$, the following strategies and beliefs constitute a perfect Bayesian Equilibrium in the subgame: both the strong type and weak type offer a bribe, $b^{pooling2} = \frac{a(\alpha-1)A}{p} + \epsilon$, the local leader accepts the bribe, and when the offered is $b^{pooling2}$, he believes that the probability of being offered by the strong type is p and that the probability of being offered by the week type is $1 - p$.*

Proof. Given the strategies, Bayes' rule suggests that the local leader's equilibrium belief is that the probability of being offered by the strong type is p and that the probability of being offered by the week type is $1 - p$. Given such belief and the interest group's strategy, the local leader derives utility $aA + (1 - p) \times 0 + pb^{pooling2}$ from accepting bribe and he derives utility $a\alpha A$ from implementing the innovation policy. Hence, when $b^{pooling2} = \frac{a(\alpha-1)A}{p} + \epsilon$, it is the best response for the local leader to accept the bribe. Now, I check that the weak type's strategy is the best response. Since weak type will not honor its commitment, offering an accept bribe is always a best response. Then, I check that the strong type's strategy is the best response. Since $z^s \geq b^{pooling2}$, it is better to offer a accepted bribe rather than overthrow. □

Proposition 11. *If $z^s \leq \frac{a(\alpha-1)A}{p}$, the following strategies and beliefs constitute a Perfect Bayesian Equilibrium in the subgame: the strong type decides to overthrow, weak type accepts the innovation policy, the local leader implements the innovation policy, and the local leader*

believes that the probability of being offered by the strong type is 0 and that the probability of being offered by the week type is 1.

Proof. Given such belief and the interest group's strategy, the local leader will not accepts the bribe since the utility of accepting is 0. Hence, it is the best response for the local leader implements the innovation policy. Now, I check that the strong type's strategy is the best response. Given the local leader's strategy, the strong type derives utility $B - \beta$ from bribing and utility $B - z^s$ from replacing the central ruler. Hence, it is the best response for the strong type to replace the central ruler. Then, I check that the weak type's strategy is the best response. Given the strategy of the local leader, there is no need for the weak type to offer a bribe. Therefore, it is the best response for the weak type to accept the innovation policy. □

In this subgame, the following separating equilibria do not exist.

Proposition 12. *There is no Perfect Bayesian Equilibrium in the subgame in which the strong type offers bribe, the weak type accepts the innovation policy, the local leader accepts the bribe and and when there is a bribe offer, the local leader believes that the probability of being offered by the strong type is 1 and that the probability of being offered by the week type is 0.*

Proof. Given the strategy of the local leader, the weak type always wants to imitate the weak type by offering the same amount of bribe as the strong type offers. As a result, this equilibrium does not exist. □

Proposition 13. *There is no Perfect Bayesian Equilibrium in the subgame in which the strong type offers bribe, the weak type accepts the innovation policy, the local leader implements the innovation policy and and when there is a bribe offer, the local leader believes that the probability of being offered by the strong type is 1 and that the probability of being offered by the week type is 0.*

Proof. Given the strategy of the local leader, the strong type derives utility $B - \beta$ from bribing and utility $B - z^s$ from replacing the central ruler. Hence, the strong type will not offers a bribe to the local leader. Therefore, this equilibrium does not exist. $\square$

Proposition 14. *There is no Perfect Bayesian Equilibrium in the subgame in which the weak type offers bribe, the strong type overthrows the central ruler, the local leader accepts the bribe and and when there is a bribe offer, the local leader believes that the probability of being offered by the strong type is 0 and that the probability of being offered by the week type is 1.*

Proof. If the local leader believes that the probability of being offered by the weak type is 1, he will not accepts bribe since the utility of accepting is 0. Hence, this equilibrium does not exist. $\square$

Proposition 15. *There is no Perfect Bayesian Equilibrium in the subgame in which the weak type offers bribe, the strong type overthrows the central ruler, the local leader implements the innovation policy and and when there is a bribe offer, the local leader believes that the probability of being offered by the strong type is 0 and that the probability of being offered by the week type is 1.*

Proof. Given the strategy of the local leader, there is no need for the weak type to offer a bribe. Hence, this equilibrium does not exist. $\square$

Now consider the central ruler's tax revenue share decision. Since z^s,α,A and p are exogenous, the central ruler can determine whether the condition $z^s > \frac{a(\alpha-1)A}{p}$ hold by changing the value of a. In the pooling equilibrium, the local leader accepts the bribe and thus the innovation is not been introduced into the economy. For the central ruler, this is worse than not adopting innovation policy at first. Therefore, the central ruler will choose the lowest a to lead the equilibrium in the subgame to a separate equilibrium. Hence, the optimal tax revenue share is $a^{****} = \frac{pz^s}{(\alpha-1)A}$. Compared with the optimal tax revenue share in the basic model,$a^* = \frac{\beta}{(\alpha-1)A}$, $a^{****} < a^*$.

Finally, consider the central ruler's decision whether to adopt the innovation policy. By comparing the utility of adopting innovation and the utility of blocking innovation, the central ruler adopts innovation policy when

$$(1-p)(1 - \frac{pz^s}{(\alpha-1)A})\alpha > 1 \qquad (10)$$

Proposition 16. *When $(1-p)(1 - \frac{pz^s}{(\alpha-1)A})\alpha > 1$, in the Perfect Bayesian Equilibrium, the central ruler adopts innovation policy, $x = 1$; the the politically weak interest group accepts the innovation policy, $q_{z^w} = 0$, while the politically strong group overthrow the central ruler, $q_{z^s} = 1$, and the local leader implements the innovation policy, $L = 1$.*

Compared with the basic model, in the model where the offer of the strong type is not accountable, the central ruler is more likely to adopt the innovation policy. To see this point, one just need to notice that if there is two types in the basic model, the condition with which the central ruler adopts the innovation policy becomes $(1-p)(1 - \frac{\beta}{(\alpha-1)A})\alpha > 1$.

4.3 comparison of two situations

Whether a^{****} is greater than a^{***} depends on the value of p. When $p < \frac{\beta}{\beta+z^s}$, $a^{****} < a^{***}$. Therefore, when the economic interest erosion for the interest group is high, the political power of strong type interest group is strong, and the probability of the interest group to be a strong type is low, the central ruler is more likely to adopt innovation policy where the bribe offer of the politically weak group is not accountable. When the economic interest erosion for the interest group is low, the political power of strong type interest group is weak, and the probability of the interest group to be a strong type is high, the central ruler is more likely to adopt innovation policy where the bribe offer of the politically strong group is not accountable.

5 Evidence and Discussion

In this section, I first provide case study of a China to show that reform history in China supports the prediction from the theoretical model. Next, I explore the difference in economic transition between China and Russia in accordance with the theoretical model. Finally, I provide a simple empirical test of theory using cross-country data.

5.1 A Case Study of China

Conventional wisdom suggests that China's reform at 1978 is due to the local official's experiments (Montinola et al., 1995; Cao et al., 1999). Indeed, it is true that major three sets of experiments, i.e. household responsible system (HRS), special economic zone (SEZ), and profit retention schemes in state-own enterprises (SOE), in the local level laid the foundation for China's economic transition. Yet, the economic takeoff in China is largely due to the central leadership's decision to promote reform experiments to the whole country. In the time of 1978, local officials are actually afraid of being label as reformers. An editorial in the People's daily on December 7, 1987 recorded that local officials are in the fear of being labeled as a capitulationist, of being dismissed from one's post, of being expelled from the party, of being divorced by one's wife, of being serving a prison term; and the fear of being beheaded. To gain the support of reform in local level, the central leadership introduced first version of fiscal federalism, which is called apportioning revenues and expenditures between the central and local authorities while holding the latter responsible for their own profit and loss, in China in 1980. In the beginning years of reform, the central leadership exploited the political centralized system (high value of p) to promote innovation at local level. Hu Yaobang and Zhao Ziyang, two major members of central leadership at that time, toured sluggish province and scolded their leaders, as well as sent teams to expose and rectify foot-dragging cadres (Burns, 1985). The Heilongjiang party leader, who resisted the HRS, was removed. Leaders in Fujian and Guangdong Provinces were replaced by Deng in 1980s because of their delay in building SEZs (Naughton, 1993).

The agriculture reform, HRS, was the first major reform project being introduced to the whole country. The reform in 1978 started from agriculture is mainly due to the low value of r and low value of β in agriculture reform. Compared with industrial reform, fewer interest groups (the Ministry of Agriculture, Animal Husbandry, and Fisheries, the Ministry of Grain, and the All-China Federation of supply and Marketing Cooperation) were concerned with agriculture reform, and they have little political clout (Shirk, 1993, pp.130-135). This leads to low r in agriculture reform. Agriculture interest groups generated deficits rather than revenues and had less control over collective farms than the industrial ministries do over SOEs. This implies low β in agriculture reform. Moreover, agriculture reform actually benefited the vested interest in industry. With more money, farmers could purchase more manufactured goods.

The spatial difference of reform served as an evidence that innovation takes place where political power of the interest group is comparatively weak. Reform first started at provinces where the central leadership had political power over the interest group. The agricultural reform started at Anhui province where Wan Li was the leader. The SOE reform was first promoted at Sichuang province where Zhao Ziyang was the leader. The SEZ reform initiated at Guangdong province where Yang Shangkun was the leader. These tree people are the strong supporters of the central leadership. Until 1981, the HRS reform spread fastest in the provinces like Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Henan, and Inner Mongolia where Dengs forces dominated, or in the remote areas like Ningxia and Yunnan (Huang, 1995).

The reform of divesting the military and other state agents of their business operation in later 1990s is a good example showing how political centralization, and political power of the interest group affect the innovation decision of central leadership. In 1990s, the business operation of military, the armed polices, the judical departments, and other party and government agencies were heavily implicated in smuggling. Premier Zhu Rongji reportedly estimated that the military establishment alone was responsible for more than 60 percent

of smuggled goods. These agents formed a strong interest group in smuggling business. Because of the special characteristics of military and the armed polices, this interest group had a very high value of r (political power). The 1989 Tiananmen crisis further increased the political power of this interest. In much of the 1990s, the central leadership were obsessed with political succession and thus suffered from a low value of p (degree of political centralization). Due to the high value of r and low value of p, the central leadership tolerated the involvement of this interest group in smuggling business for nearly a decade. However, following the death of Deng in 1997, the central leadership made carefully political moves to increase the value of p and decrease the value of r. Many children of the old revolutionaries and senior officials, called princelings, were eased out from their influential positions by retirement or promotions to trivial positions. Many princelings once held influential positions in the military-industrial-commercial nexus. The central leadership in 1998 also replaced several top leaders in local level who were involved in smuggling. The reform on the military business operation started in late 1990s when the value of p is high enough and the value of r is low enough for initiating a reform. The gradual approach towards the divestiture started in early 1998, when the Central Military Commission reportedly asked PLA (People's Liberation Army) units to sever their ties with commercial enterprises. By the end of 1998, the divestiture process had entered the substantive stage.[4]

The shock of Tiananmen crisis in 1989 provides a example to explore how political centralization affects the degree of fiscal decentralization. In the aftermath of Tiananmen crisis, the central leadership re-centralized its political power and hence the value of p increased. As a result, a new fiscal decentralization system was introduced in 1993. In the new system, provincial governments no longer collected tax for the center, and their share was cut dramatically (low value of a). See figure 3 for the trend of revenue share before and after new fiscal system in 1993.

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[4]See Yang, 2004, pp.111-149 for the detail of reform on military business operation.

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5.2 Comparison between China and Russia

The economic reforms in China formally started in 1979 following the Third Plenum of the Eleventh Congress of the Chinese Communist Party in December 1978. After Gorbachev attained power in 1985, the Basic Directions for the Economic and Social Development of the USSR for 1986-1990 was declared and the economic reform started to take place in the Soviet Union. The initial conditions of reform in China and Soviet Union were quiet different. The Chinese economy remained decentralized in comparison with economy of the Soviet Union. In China, provincial economies were more self-sufficient and internally diversified. This decentralized economic condition in China is largely due to Mao's policy to encourage local-sufficiency. In 1978, before the reform started, the share of industrial output of state-owned enterprises controlled by the central government remained less than half of the national total (Wong, 1987). Whereas in the Soviet Union, single plants often supplied the entire market (Qian and Weingast, 1996). This huge difference in the degree of economic decentralization lead to a different value of β between China and Soviet Union at the beginning of economic reform. Due to the highly centralized economic system, the rent of the interest group in Soviet Union would be eroded much more than that in China under economic reform. Therefore, it was much harder to carry out the economic reform in the Soviet Union than that in China.

In the early 1990s, the former Soviet Union countries adopted the Big Bang approach in economic transition. China, meanwhile, kept carrying out a piece meal strategy in economic reform. Upon the two strategies of transition, two camps have emerged among the students of political economy. On one hand, there are proponents of the Big Bang approach, who argue for a quick and simultaneous introduction of all reforms (Lipton and Sachs, 1990; Balcerwircz, 1995). On the other hand, there are those who favor a more gradualist approach and emphasize the sequencing of reforms (Dewatripont and Roland, 1992, 1995; Litwack and Qian, 1999; Lau et al., 2000). The argument on the two transitional strategies implies that the Big Bang approach, due to its radicalness, leads to a high value of β and also a high value

of α. According to the theoretical model, only when β is less than the critical value of $\bar{\bar{\beta}}$ will the central ruler adopts the innovation policy. From Proposition 1, we can easily derive that $\bar{\beta} = b(r, \alpha, A)$. the critical value of $\bar{\beta}$ is increasing in r, α, and A. Define the critical value of $\bar{\beta}$ for the Big Bang strategy in Russia and in China as $\bar{\beta}_R$, and $\bar{\beta}_C$ respectively. The Soviet Union were at a much higher development stage than China at the beginning of economic reform. China had a very low per capita income with a dominant agriculture sector while the Eastern European and Soviet economies were over-industrialized (Summers, 1992). As a result, the beginning value of A at Soviet Union is much higher than that in China. Therefore, $\bar{\beta}_R > \bar{\beta}_C$. The huge economic erosion in the Big Bang approach, β, may be lower than the critical value, $\bar{\beta}_R$, in the Soviet Union while higher than the critical value, $\bar{\beta}_R$, in China. Thus the Soviet Union adopts the Big Bang approach while China chose to be a gradualist in reform.

After the collapse of the Soviet Union in 1991, Russia became a less political centralized country than China. Though a number of empirical studies have provide some evidence on the tax revenue share, a, both for China and Russia, the comparison of a is somewhat murky. Jin et al. (1999) found that the value of a in China is about 0.8. Similar study from Wong (1997) also reveals a high value of a in China. In an empirical research of fiscal relations between central and local government in China, Zhuravskaya (2000) found that the marginal value of a is only about 0.1. However, according to Blanchard and Shleifer (2001), Treisman in his personal correspondence reported that, using the similar specification to that of Jin et al (1999), the value of a in Russia is not lower than that in China. In the theoretical model, the value of a is decreasing in p, increasing in β. Since China is still a political centralized country while the local governors in Russia are elected by citizens, the value of p in China is higher than that in Russia. As has been discussed before, the value of β in Russia may be higher than that in China. Therefore, the comparison of the value of a in China and Russia depends on whether the effect of p or the effect of β dominates. It is higher possible that Russia and China have similar tax revenue share between the central and local government,

as Treisman has reported.

5.3 Some Cross-Country Evidence

In the theoretical model, innovation which enhances the economic growth is decided by the central leadership. Fiscal decentralization is an incentive to induce the local official to implement the innovation policy. As the model predicted, the degree of fiscal decentralization is increasing in the economic erosion of the interest group while decreasing in production improvement under innovation and degree of political centralization (prediction 1). The degree of fiscal decentralization does not have a causal effect on economic performance (prediction 2). The existence of fiscal decentralization implies the adopting of innovation and hence related positively with the economic performance (prediction 3). Due to lack of data, I cannot test prediction 1. However, table 1 supports prediction 2 and prediction 3. In the first major regression, the dependent variable is GDP per capita 1999 and the independent variable of interest is degree of fiscal decentralization, measure by sub-national revenues share. Column (1) shows the results of OLS regression of all countries. Column (3) shows the results of OLS regression of all developing countries. Column (5) shows the results of OLS regression of all transitional economies. The degree of fiscal decentralization does not have significant effect on economic performance. This is consistent with prediction (2). In the second major regression, the dependent variable is GDP per capita 1999 and the independent variable of interest is the dummy variable of fiscal federalism. If the sub-national revenues share is more than 0, the country is defined as a fiscal federalism. Column (2) shows the results of OLS regression of all countries. Column (4) shows the results of OLS regression of all developing countries. Column (6) shows the results of OLS regression of all transitional economies. Since transitional economies are not formal British colonies and do not inherit British Law, OLS regression (6) excludes British colony dummy and British Law dummy. The results show that fiscal federalism is positively related with the economic performance. The results support prediction (3).
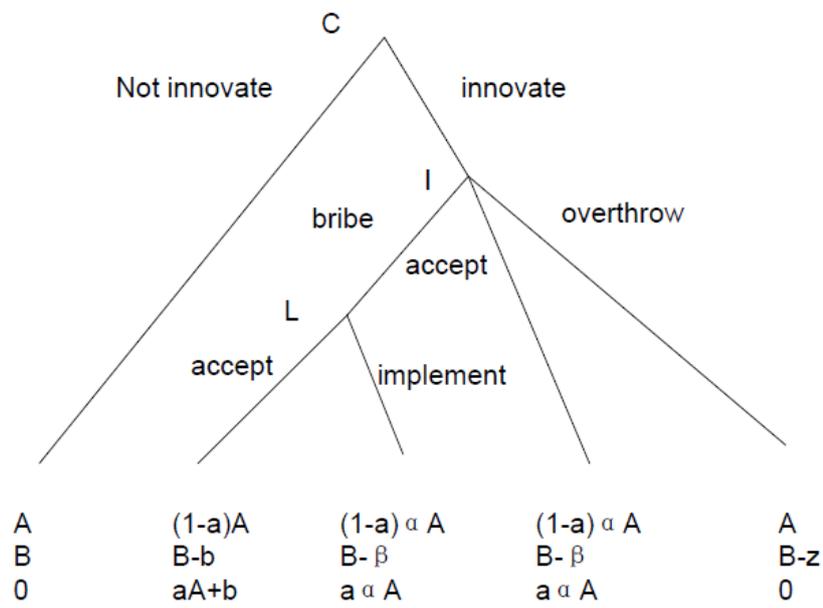
6   Conclusion

In this paper, I developed a theoretical model to explore the conditions which encourage the central leadership in the transitional economy to adopt an innovation policy. Evidence from China and Russia as well as the simple cross-country empirical study support the major results of the theoretical model. The major results of the pape also shed light on policy prescriptions in transitional economies.
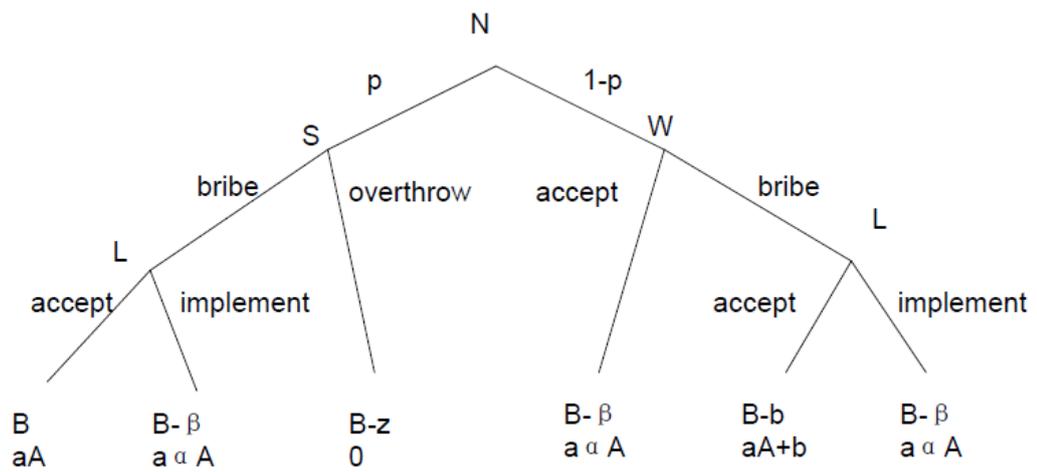
To begin with, political centralization may encourage the central leadership in transitional economy to take economic-enhancing reform. Theoretically, Putin's recently attempt to re-centralization in Russia may exert positive effect on the economic performance in Russia.

Secondly, decreasing the economic erosion of the interest group may help to promote innovation. Compensation for the interest group is necessary for an innovation to take place. However, the central leadership in the transitional economies should be cautious when offering such compensation. Since the increasing political power of the interest group will be a obstacle for future innovation, compensation which may increase the political power of the interest group must be avoid.
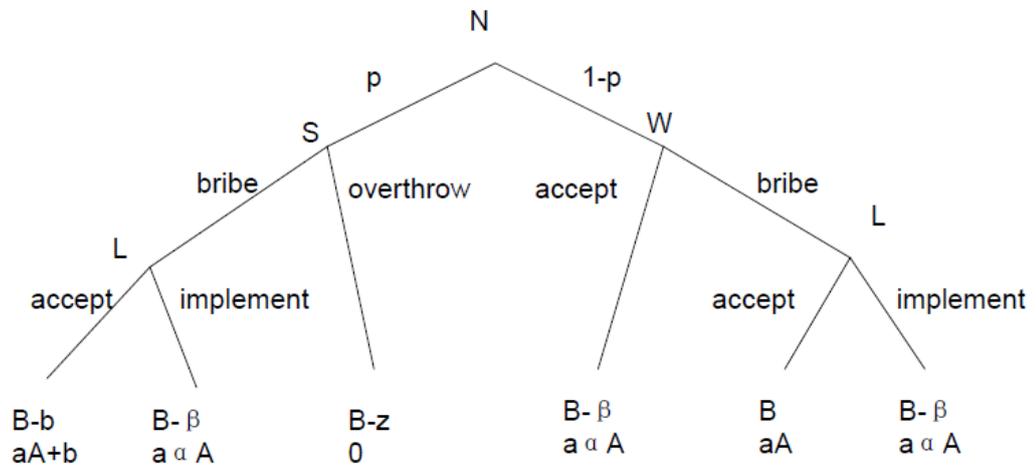
Finally, innovation will be easier to implement if the central leadership can design a mechanism which makes the interest group less credible.

C

Not innovate   innovate

I

bribe   overthrow

accept

L

accept   implement

A $(1-a)A$ $(1-a)\alpha A$ $(1-a)\alpha A$ A
B $B-b$ $B-\beta$ $B-\beta$ $B-z$
0           $aA+b$ $a\alpha A$ $a\alpha A$ 0

Game tree 1

N

p $1-p$

S   W

bribe   overthrow   accept   bribe

L   L

accept   implement   accept   implement

B $B-\beta$ $B-z$ $B-\beta$ $B-b$ $B-\beta$
aA $a\alpha A$ 0 $a\alpha A$ $aA+b$ $a\alpha A$

Game Tree 2

N

p   1-p

S   W

bribe   overthrow   accept   bribe

L   L

accept   implement   accept   implement

B-b   B- β   B-z   B- β   B   B- β
aA+b   a α A   0   a α A   aA   a α A

Game Tree 3

b̄

β =z

β

-1/2+r   r   β   1/2+r   z
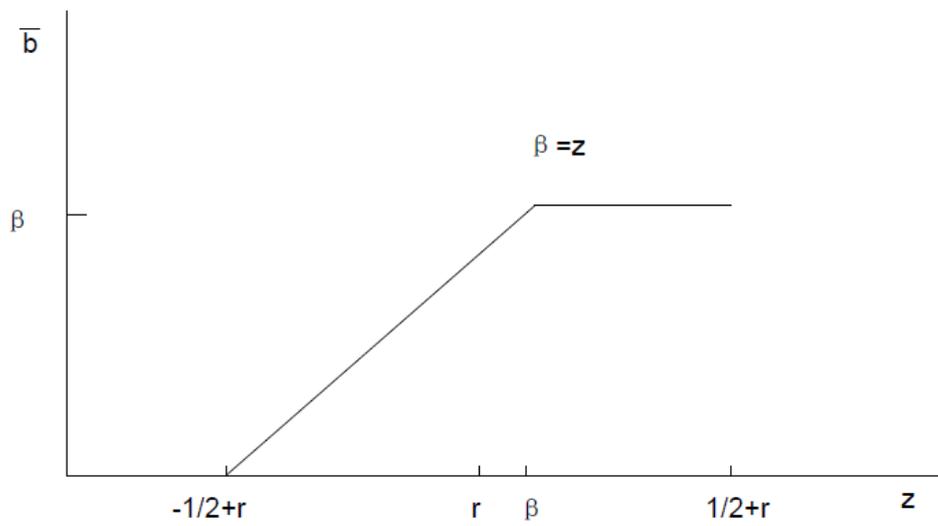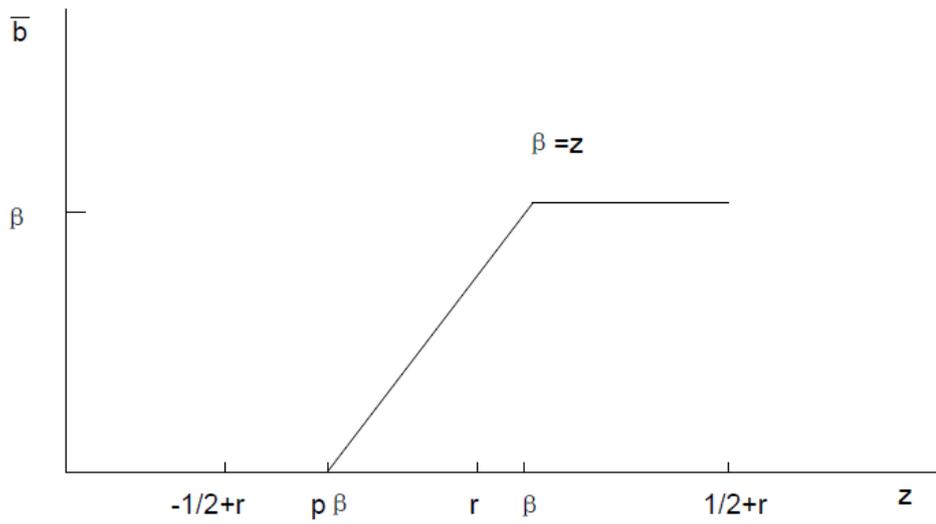
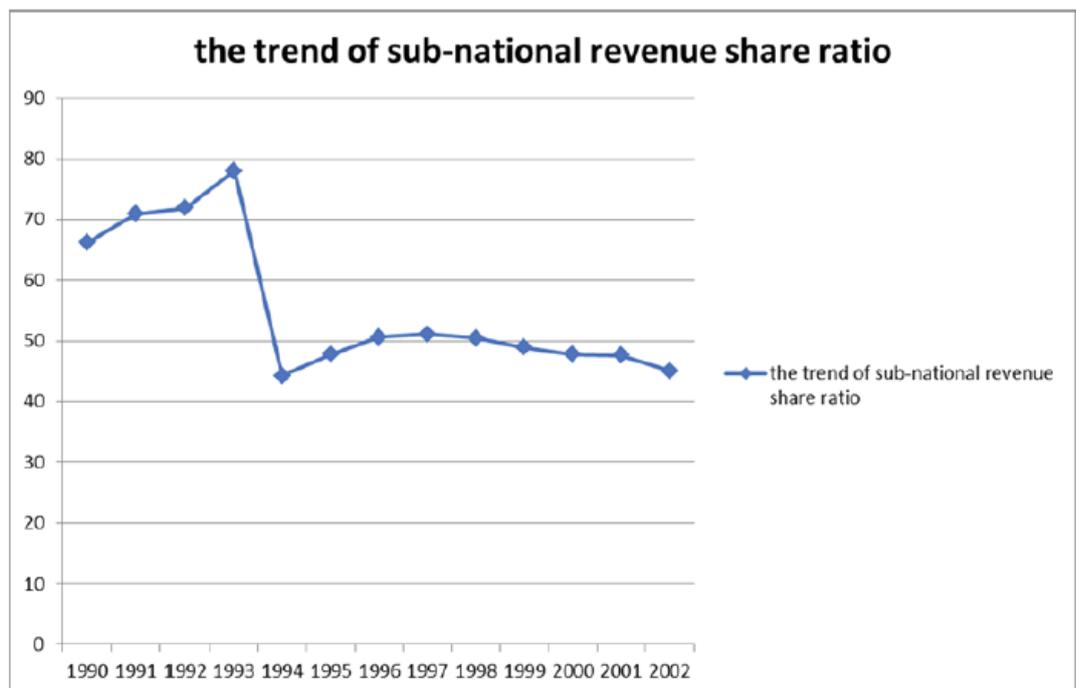Figure 1

Figure 2

Figure 3

Table 1 economic performance and fiscal decentralization
Dependent Variable: GDP per capita 1999

	OLS (1)	OLS (2)	OLS (3)	OLS (4)	OLS(5)	OLS(6)
Degree of fiscal decentralization	133.22 (90.72)		56.695 (62.89)		-146.42 (95.09)	
Fiscal Federalism		7080.28*** (1623.28)		2565.66** (1090.62)		3119.17** (1599.66)
British Colony	3740.04 (5794.74)	3820.29 (2809.61)	6324.26* (3398.34)	4225.02** (1709.78)		
Protestant	155.85*** (49.06)	135.06*** (35.51)	67.50 (69.97)	30.63 (37.66)	33.58 (64.21)	54.79 (58.64)
British Law	-1846.16 (5908.62)	-3134.68 (2906.22)	-1817.17 (3570.39)	-629.23 (1899.59)		
Fuel, metal and mineral exports	-48.34 (60.44)	18.04 (-28.81)	7.88 (39.43)	38.97 (18.19)	-47.25 (48.29)	-37.86 (32.58)
Constant	7830.11*** (2552.12)	3419.89** (1490.1)	3866.53** (1781.10)	2150.72** (964.74)	11105.13*** (2527.53)	4250.65*** (1381.20)
R-squared	0.15	0.27	0.23	0.20	0.25	0.29
N	118	118	39	93	15	25

All data comes from Daniel Treisman, Decentralization Dataset, 2008, available at: http://www.sscnet.ucla.edu/polisci/faculty/treisman/.
*P<0.10; **P<0.05; ***P<0.01.

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