WILL CHINA LEAPFROG THE WEST?
A Political Economy Perspective on
Development and Convergence

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Abstract

The purpose of this paper is to analyze the dynamics of Chinese economic growth. The rapid development of China during this decade has led some scholars to wonder if China is going to leapfrog the Western world, and if is to become the next leader.

This paper shows that if in the short and medium run, and during periods of innovations, China is growing quickly and is converging to the output of a developed country; in the long run, this will not be the case. The parameters that lead to high growth today are also the parameters that will detract from higher growth in the future, with the main one being the repressive apparatus.

Key words: reforms, innovations, inventions, economic growth, political economy

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I. Introduction

The rate of growth of China during this last decade has been so rapid that China has become the fourth largest economy in the world. The rapid development of China has led some scholars to wonder if China is going to leapfrog the developed countries, and if it is to become the next leader.

The purpose of this paper is to show that if in the short and medium run, China is growing quickly and is converging to the output of a developed country; In the long run, given its political system, China’s long run rate of growth will be lower than the leading countries’ rate of growth. The claim of this paper is that the institutions and parameters that lead to high growth today are also the parameters that will detract from higher growth in the future.

The dynamics of economic growth can be roughly divided into two phases. During the phase of convergence to the West, the increase in output is due to a Solowian growth and to innovations. However, in order to leapfrog the West during a second phase, it is necessary to develop new and main inventions (see Brezis et al., 1993). The claim of this paper is that China's political and economic system is permitting high growth when innovations are the basis of growth, but is impeding inventions in the second phase, and therefore leapfrogging cannot occur.

In order to examine the dynamics of China in the present and future, it is necessary to investigate the political and economic changes that have occurred in China during the last decades in comparison to the path of other former communist countries. The main features of former communist countries is that the economic system (relating economic growth, innovations and inventions) is driven by the political system, in which the main parameter is the repressive apparatus. Therefore, this paper examines the economic growth of China in a political economy perspective.

In comparing the path of former communist countries, it is striking that there is a marked difference in the transition dynamics that have taken place over the past decades between China and Eastern Europe, both politically and economically.

In the political realm, Chinese communist dictatorships show no signs of weakening, while in Eastern Europe we were witness to the collapse of communism. In the economic realm, the type of reforms undertaken in China entailed the establishment of private enterprises, while leaving the public sector essentially untouched by privatization reforms. In Eastern Europe, economic reforms were not gradually implemented; it was mostly to sell the public sector to the nomenklatura.

The relationships between all the variables are presented schematically in table 1. In this paper, we show how these political and economic choices affect long run and short run growth, and we also show that the choice in the long run is negatively related to short run growth.
In the first part of the paper, we analyze the one-to-one relationship between the political system and the economic system, which is described in the first and second row of table 1. This relationship between economic and political choices has already been examined in the previous literature. These models have shown that there are two conceptually very different kinds of privatization, and the choice between these two is related to the means of repression. When the means of repression are low, the elite in power prefers to perform what has been termed *Nomenklatura privatization*, that is, the nomenklatura received the most benefits of privatization.

When the means of repression are high, the nomenklatura adopts the second type of reform, i.e., *socialist privatization*, leaving the state sector unchanged but permitting to members of society to engage in private economic activity free from barriers to entry. So, as presented in table 1, 2nd row, we get that depending on the size of the repressive apparatus the country either decides to keep power or to democratize and at the same time decides if to adopt a nomenklatura privatization (in the case of democratization) or socialist privatization (in the case of keeping power). The parameters linked to means of repression are essential for understanding the dynamics of transition. In China, military power was strong and therefore the nomenklatura stayed in power. In Eastern European countries, since military power was weak, the nomenklatura preferred to resign.

The second part of the paper shows that these choices have opposite effect on the long and short run growth. While in the short run, it is preferable for the nomenklatura to have a strong military power and stay in power, in the long-run, it has negative effects on the rate of growth. In a model of growth, in which the ability of workers in the Research and Development sector has an influence on the rate of growth, one cannot afford to overlook the fact that social environment affects this ability. An environment in which people have freedom of speech is conducive to more research and innovations than one in which people are afraid of expressing their point of views. Mokyr (1999) has emphasized the importance of freedom and religion on the development of innovations. In this paper we emphasize the effects of political freedom on innovations and inventions.

In this paper, we show that China will develop more rapidly in the first phase of growth. The parameters linked to the means of repression permits a higher output in the short run. However these same parameters will have a negative influence on long-run growth.

The paper is divided in three parts. In the second part of the paper, we present the model. We first examine the elements affecting growth rates, and we show that means of repression negatively affects rates of growth. We then turn to analyze how means of repression are determined endogenously. Part three provides some conclusions.

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1 See Brezis and Schnytzer, 2003; Brezis and Verdier, 2003; Qian and Xue, 1993; and Qian et al., 1999
2 see in particular Brezis and Schnytzer, 2003
### Table 1.
Relationships between the different variables

<table>
<thead>
<tr>
<th>Choice of different political system:</th>
<th>↔</th>
<th>Choice of different Economic system</th>
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<tbody>
<tr>
<td>Democracy vs. Non-democracy</td>
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<td>Exogenous variable: Repressive apparatus vs. Socialist privatization</td>
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<td></td>
<td>↓</td>
<td>Nomenklatura privatization</td>
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<tr>
<td>High vs. low growth in the long run</td>
<td>← [opposite effects] →</td>
<td>Low vs. high growth in the short run</td>
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II. The Model

A. General Description of the economy

Economic growth is affected by two main factors. The first one is an increase in the factors of production, and the second one – technological progress. During the first stage of development, an economy is growing due to an increase in its factors of production, labor and capital. The country converges to its "Solow" steady state. When the country is already near its steady state, the only way the country can continue to grow is through innovations and technological progress. The economy is growing due to the discoveries of new technologies in the R&D sector.

In this paper we focus on the second stage. There are two main sectors in the economy: the production sector in which the final good is produced, and the R&D sector in which newer and more productive machines are being developed. Capital is embedded in machines, which are the intermediate goods with which one starts production. The principal input in this model is the effective units of labor, i.e., human capital.

Innovations and technological progress are affected by ability of workers. The higher the ability of workers in the R&D sector, the higher the rate of growth of technological changes affecting economic growth. Ability of workers is affected by the type of political system.

The production sector in our model is in fact similar to the Romer model (1990) in which the increase in the number of intermediate goods that are produced with capital, enables growth in the economy. The emergence of new machines is actually the determinant of the rate of growth in the economy, and the higher the productivity of human capital in the R&D sector, the higher the rate of growth.

In this model, workers are not homogenous; they are different in their ability, which can be influenced by political and economic institutions. While workers can work efficiently in a mass production system, whatever the political system, this is not the case in the R&D sector. Workers who work in R&D are affected by the economic and political environment. An environment in which there is freedom of speech and no fear of arrest is more conducive to good research than that in a quasi-prison environment. This pervasive effect of "intellectual environment" has been emphasized by Mokyr (1999) regarding religion, and by Lindert (2003) with respect to democracy. In this paper, we analyze how the "freedom effect" affects the economy.

The framework presented in this paper permits us to examine the difference in the long run dynamics of former communist countries -- China and the Eastern European countries. We first describe the elements that affect the rate of growth. We then turn to analyze how

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3 Aghion and Howitt (1992) present an improved framework, as explained in Aghion and Howitt (2005). However, since in this context, both models lead to the same outcomes, we adopt the previous model of Romer.
these elements are affected by the political system. Finally, we determine the optimal political system.

**B. The Long Run Growth Rate**

1. Ability of Workers and the Production Sector

   The ability of workers affects their productivity. We assume that the amount of effective units of labor is a linear function of their ability. The workers in different economies differ by the levels of their ability.

   In countries in which people feel that they are not free to discuss and express various points of view, they are not prone to having original ideas. In consequence, we obtain that the ability of people in research and development, denoted by \( a_r \), is a negative function of the level of repression in the country, which we denote by \( \beta \). So

   \[
   a_r = \mu \beta \quad \text{where } \mu < 0 \quad (1)
   \]

   The economy produces one final homogenous good, which is consumed. This good is produced with labor and intermediate goods. The production function takes the form:

   \[
   Y = H_y^{1-\alpha} \int_0^t x_j^\alpha dj 
   \]

   where: \( Y \) is the output at each period; \( H_y \) the effective units of labor, and as explained above, \( H_y = a_y L_y \), where \( a_y \) - the ability of the labor force working in sector \( y \). \( L_y \) is the number of workers who work in the production sector. \( A \) is the level of the technology, which is represented by the total number of machines \( x_j \), which can be understood as improving the productivity of the labor using the capital at each period.

   The firms involved in the production sector are maximizing profits:

   \[
   \max_{L_y, x_j} (a_y L_y)^{1-\alpha} \int_0^t x_j^\alpha dj - w_y L_y - \int_0^t p_j x_j dj \quad (2)
   \]

   Where: \( p_j \) – the rental price for capital good \( j \)

   \( w_y \) - the wage rate paid for labor in sector \( y \).

   The first-order conditions characterizing the solution to this problem are:

   \[
   w_y = (1-\alpha) \frac{Y}{L_y} \quad (3) \quad \text{and} \quad p_j = \alpha (a_y L_y)^{1-\alpha} x_j^{\alpha - 1} \quad (4)
   \]
2. The Intermediate-Goods Sector

The intermediate-goods sector consists of monopolists who produce the capital goods that are sold to the final goods sector.

The profit maximization problem for an intermediate goods firm is:

\[
\max_{s_j} \pi_j = p_j(x_j)x_j - rx_j
\]  

(5)

It should be noted that each intermediate-goods firms owns a patent and is therefore a monopoly that sees the price as negatively related to the demand. The first-order condition for this problem, for each \( j \) is:

\[
p'(x)x + p(x) - r = 0,
\]

(6)

From equation (4), we note that the demand elasticity is equal to \( \alpha - 1 \). Substituting into equation (6), we get that:

\[
p = \frac{1}{\alpha} r.
\]

(7)

So the intermediate-goods firm charges a price over its marginal cost, \( r \): This is the solution for all the monopolist firms, and all capital goods sell for the same price. Because the demand functions are also the same, each capital good is employed by the final-good firms in the same amount: \( x_j = x \).

Therefore, from equations (7) and (4) we get that the profit for each capital-goods firm is given by:

\[
\pi = \alpha(1 - \alpha) \frac{Y}{A}
\]

(8)

The total demand for capital by intermediate-goods firms is actually equal to the total capital stock in the economy: \( \int_0^A x_j \, dj = K \). Since each intermediate supplies the same amount, it will be denoted \( x \), and we have that:

\[
x = \frac{K}{A}.
\]

(9)

So we can rewrite the production function as:

\[
Y = A(a_L L)^{1-a} x^a, \quad \text{or:} \quad Y = A(a_L L)^{1-a} A^{-a} K^a = K^a (Aa_L L)^{1-a}
\]

(10)

Equation (10) shows that instead of integrating the intermediate-good sector in output, one can instead include capital. Moreover, the total number of machines, \( A \), is entering the output function in the form of technological progress. It is then important to examine the elements affecting economic growth in this model.
3. The Rate of Growth of the Economy

In this model, we assume that the factors of production are constant, i.e. there is no growth of population, and capital is constant. The only factor that leads to growth is the increase in the number of new technologies existing, which are embedded in new intermediate goods available on the market. Based on Galor and Tsiddon (1996) and Grossman and Helpman (1991), we assume that the intensity of technological progress, i.e., the number of new inventions, is a function of (i) the ability, (ii) the size of the labor force in the R&D sector, and (iii) the size of the technological already in existence (this is the usual externality of spillover effects). Therefore:

\[ A = \delta a_r \cdot L_r \cdot A \]

where: \( a_r \) is the ability of the labor force in the R&D sector, \( L_r \) the size of the labor force in the R&D sector, \( A \) the amount of machines existing, and \( \delta \) is a positive parameter.

We also assume that \( \delta \) is greater than one. It means that the ability of workers has a higher impact in the R&D sector than in the production function. In other words, we assume that ability affects more the productivity in the R&D sector than in the production sector.

In consequence we get that, in steady state, the rate of growth of the inventions, which is also (from equation 10) the rate of growth of the economy- \( g \) - is constant:

\[ g = \frac{\dot{A}}{A} = \delta a_r \cdot L_r \]

4. The Research Sector

In the research sector, new designs for new machines are discovered. The inventor can patent his invention and sell the exclusive rights to produce a new capital good. The inventor sells the patent to an intermediate-goods firm, which uses it as a set of instruction to transform a unit of raw capital into a unit of a new capital good. From the asset pricing arbitrage equation we get that:

\[ rP_r = \pi + P_r \]

where \( P_r \) is the price of the patent of the new design, and \( \pi \) the profits.

We have noted in the previous section that since there is no increase in population, output \( Y \), and inventions, \( A \) grow at the same rate, \( g \). Since profits, \( \pi \), are proportional to \( Y/A \) (see equation 8), \( \pi \) in steady state stays constant, and from equation (13) patent price \( P_r \) is also constant. So we get:

\[ P_r = \frac{\pi}{r} \]
5. Size of the labor force in the R&D sector

In section 3, we have shown that the rate of growth of the economy is a function of the size of the labor force in the R&D sector, \( L_r \). We therefore have to calculate the size of this labor force. Let us note that since in one country we assume that all workers are identical, then all workers hired either in the R&D sector or in the production sector get the same wage rate.

The wage rate in the production function is given by equation (3):

\[
w_y = (1-\alpha) \frac{Y}{L_y}
\]  

while the salary earned while working in the R&D sector is:

\[
w_r = \delta a_r \cdot A \cdot P_r
\]  

Substituting the price \( P_r \) from equation (14), and profits \( \pi \) from equation (8), and equating salaries in both sectors, we get that the size of the labor force working in the production, denoted \( L_y \) is:

\[
L_y = \frac{r}{\alpha \cdot \delta a_r} 
\]  

Assuming that the labor force is constant and denoted by \( \bar{L} \), then we get that the ratio of the population working in the R&D sector as a percent of the total labor force, \( s \) is:

\[
s = 1 - \frac{r}{\alpha \cdot \delta a_r \cdot \bar{L}}
\]  

The rate of growth of the economy given by equation (12) becomes:

\[
g = \frac{A}{A} = \delta a_r \cdot \bar{L} - \frac{r}{\alpha}
\]  

We therefore get the next Proposition.

**Proposition 1**

*The rate of growth in the economy is determined by the ability of workers in the R&D sector, which is a function of the amount of repression in the economy.*

The proof is directly linked to equation (1) and (18). The rate of growth is a linear and positive function of the ability of workers in the R&D sector, which is negatively related to the amount of repression in the economy.

This part of the paper has shown that developing countries like China and Eastern European countries, after having converged to their steady state, will be affected by the
political system in their country. It is quite clear that China has an enormous amount of repression, while Eastern European countries do not anymore. The question is then why if in the long run, the system can be impeaching higher growth, China is keeping its system.

We show in the next part of the paper that from the point of view of the Nomenklatura of China, the choice of a high repressive sector is optimal and is letting to higher output in the short run. We start first by presenting the structure which relates political and economic choices to repression, and then we find the optimal amount of repression in China.

C. Optimal Amount of Repression

In the previous section, we have shown that means of repression affects the rate of growth in the long run. However, the size of means of repression is chosen by the nomenklatura and is related to political and economic goals. The intuition underlying the model is that when the means of repression at the disposal of the rulers are relatively weak and the probability of regime collapse is high, the rulers choose to “resign”, retaining the assets that they privatize. The benefit for the rulers is that in case of regime collapse, they do not end up with nothing but the privatized assets. In other words, the purpose of this economic choice is to ensure that, should the regime collapse, the communist rulers of today become the rich capitalists of tomorrow’s democracy. Therefore, a nomenklatura privatization is chosen by such rulers, and it is optimal for them to resign and democratize.

However, if the means of repression are strong enough such that the probability of continued communist dictatorship is high, the type of privatization chosen is to permit the establishment of private enterprises, but with the state sector left fundamentally unreformed. This is the choice adopted by China (see Qian and Xue, 1993; and Qian et al., 1999). Such privatization is optimal, since as those in political power at the onset of this process, the rulers also profit as entrepreneurs from the growth of the private sector, although they lose their grip on some of the allocation of the country’s resources. This type of economic reform will be termed herein socialist privatization. We will show that when the means of repression are substantial, socialist privatization is chosen, and the rulers do not choose to democratize but rather to stay in power. Moreover, we will show that this is the optimal solution, and therefore this is the choice taken by the Chinese government.

1. Timing of decisions

There are three stages. First, in each country, the rulers have to choose a certain level of repression $\beta$ which has a linear resource cost $C(\beta)=c\beta$ with $c>0$ being a positive constant. In a second stage, the rulers have to take three decisions: they decide whether to stay in power or to resign (thereby opting for an end to a communist monopoly of political power). They also decide on which type of privatization to choose and the amount of
privatization. Moreover, if they do not resign, they decide upon the distribution of output -
they decide how much output to allocate to the workers. Given their share of output, workers in the third stage then decide, whether or not to fight the regime, depending on the relative payoffs under fight and no-fight. Equilibrium in the model is, therefore, the outcome of a Stackelberg game.

2. Privatization and output

The choice of privatization strategy is endogenously determined by the rulers, and they choose between two possible reform policies. The first possible method of privatization, *nomenklatura privatization*, is simply to sell all state property to the private market. Enterprise managers, who are members of the ruling elite, restructure state enterprises so as to reduce their notional market value, and then buy the enterprises at very low prices.

The second type of privatization that can be implemented by the rulers is carried out by keeping the extant state sector non-privatized, but to allow citizens to open private firms, or what is termed *socialist privatization*. This policy implies that there is no internal disruption of the state sector, but simply the parallel creation of a new privatized economy. State enterprises are not privatized; thus, the free market operates parallel to the state sector, and some workers receive their salaries from working at state enterprises while others own private enterprises.

Privatization, as with any decision made by the rulers, has consequences for the allocation and level of output. We assume that nomenklatura privatization implies not only a change in decision-making power, but also massive changes that lead to a disruption of established links within the economy (Desai, 1997). We therefore assume, as do Brezis and Schnytzer (2003), that the greater the number of firms privatized, the greater the disruption. In socialist privatization, there is no disruption of the economy. On the opposite, the private sectors show higher productivity. This has been explained essentially by greater competition (see Gelb and Singh, 1994). In consequence, the size of the privatization has a positive effect on output.

Therefore, in the case of nomenklatura privatization (termed privatization 1), output is a negative function of the proportion of assets privatized, and:

\[
Y_1 = Y_1(\gamma_1)
\]

where \( Y' < 0 \) and \( \gamma_1 \) is the proportion of state assets privatized under nomenklatura privatization.

In the case of socialist privatization (privatization 2), the output in the economy is produced in two different sectors: the original state sector and the new market economy. We define \( \gamma_2 \) as the ratio of workers working in the free enterprise sector, i.e., the proportion of privatization in the economy. So:
\[ L_s = (1 - \gamma_2)L \quad \text{and} \quad L_m = \gamma_2 L \]  

(20)

L is the labor force normalized to 1. \( L_s \) and \( L_m \) are the workers in the state and private enterprises respectively.

Based on the output function, equation (10), and assuming for matters of simplicity that \( K \) is one (since this does not affect the results) and is distributed between sectors proportional to labor, so total output is:

\[ Y = \lambda + \gamma - \alpha - \alpha + \lambda + \gamma = (1 - \gamma_2)Y + \gamma_2 Y \]  

(21)

To be consistent, we finally assume that the two privatization strategies start from the same initial point (i.e., \( Y_1(0) = Y_2(0) = A_s^{1-\alpha} \)).

3. Allocation of output

The rulers determine the allocation of output between wages and their own rents. The rulers’ rents \( R \) write as:

\[ R = Y - W \quad \text{where} \quad W \geq 0. \]  

(22)

where \( W \) is the allocation of output to workers.

In the case of socialist privatization, one has to describe the allocation of output between the two sectors. We assume that wages differ between the state and private sectors. The rulers determine the wages in the state sector, \( W_s \). In private enterprise, workers obtain their marginal product, but the rulers receive a proportion \( t(\gamma_2) \) of the output of the private sector. We assume that this proportion falls as the size of the private sector increases. The income earned by the workers in the private sector is then:

\[ W_m = [((1 - \alpha)Y_m] \]  

(23)

Thus, we have that the allocation of output to workers is:

\[ W = W_s (1 - \gamma_2) + \gamma_2 W_m \]  

(24)

4. Equilibrium

---

4 we assume that the productivity of workers in the state sector, \( A_s \), is smaller that the productivity, \( A_m \), of workers in the private sector of the economy.

5 Indeed there will inevitably be some barriers to entry, since not each worker will receive the right to engage in private enterprise (for example, well-known “enemies” of the regime).

6 As the major capital holders in the society, the rulers have an evident advantage in the private sector when it is first introduced. However, as the market grows the extent of this advantage decreases. Therefore i.e., \( 0 < t < 1 \), \( t' < 0 \), and \( t'' < 0 \).
In this framework, there are only two strategies that are non-dominated equilibria, as is stressed in the next proposition.

**Proposition 2**

*From all the optimal payoffs under the various strategies, the only two possible equilibria that are not dominated are:*

1. no fighting, adopting nomenklatura privatization and resigning (NFR); and
2. no-fighting, adopting socialist privatization and no resigning (NF, 2).

**Proof.**

There are three possible sets of payoffs. The first set follows rulers’ decision to give up political power. We define the payoffs to workers and rulers in this case as, respectively: \( V_{NFR} \) and \( U_{NFR} \) (the subscript NFR denotes no-fight and resign).\(^7\) The second arises when rulers choose to remain in power but workers fight, the payoffs to workers and rulers, respectively being \( V_F \) and \( U_F \) (the subscript F is fight). The third set arises when rulers stay in power and workers do not fight, with payoffs \( V_{NF} \) and \( U_{NF} \).

(i) First, in the event of resignation, the payoffs are as explained above: rulers keep assets which have been privatized, and the workers get the rest. In the case of resignation, the rulers cannot decide after resigning the allocation of output between rulers and workers. In other words, the only possible type of privatization undertaken by a ruler deciding to resign is the first type of privatization, and in this case the payoffs in case of resignation and no fight are therefore:

\[
\begin{align*}
U_{NFR,1} &= \gamma_1 Y_1(\gamma_1) \\
V_{NFR,1} &= (1 - \gamma_1) Y_1(\gamma_1)
\end{align*}
\]

(ii) When rulers decide to stay in power and distribute output, if the workers do not fight, they receive wages, \( W \), and their payoff is:

\[
V_{NF} = W
\]

while the rulers get the rents \( R \) and the payoff is:

\[
U_{NF} = R
\]

(iii) If the workers fight, then with probability, \( p \), they overthrow the regime. Assume that \( p \), defined on the closed interval \([0,1]\), is a negative function of the means of repression, \( \beta \): \( p = p(\beta) \), \( p' < 0 \) and \( p'' > 0 \). Assume further that \( p(1) = 0 \), and \( p(0) = 1 \).

Should the revolution be successful, workers seize all output, while the rulers’ payoff is zero. Conversely, a failed revolution leaves workers with their original consumption bundle, but they are harassed and punished so that their utility is set to the level \( -H < 0 \) for

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\(^7\) The node ‘resign and fight’ is never chosen, and therefore we do not present the payoffs for this node.
having tried to overthrow the regime. The payoffs for workers and rulers in consequence of a fight are:

\[ V_F = pY - (1 - p)H \]  

(29)

\[ U_F = (1 - p)R = (1 - p)(Y - W) \]  

(30)

In the case of privatization 2, we assume that if the workers in the state sector decide to fight, those in the private sector join them. As before, when workers fight, should the revolution be successful, workers seize all state output, while the rulers' payoff is zero.\(^8\) Equation (29) in case of privatization 2 is therefore:

\[ V_{F,2} = p(A_sL_s)^{1/\alpha} - (1 - p)H \]  

(29')

We can now determine the equilibrium. Recall that an equilibrium is a set of decisions by the rulers (in the first stage, a level of repression \( \beta \), in the second stage the decision to resign, the amount of privatization and the allocation of output), and by the workers (in the third stage to choose between fight (F), or not fight (NF)) which maximizes their utility. Since the equilibrium is the outcome of a Stackelberg game, we solve it by backward induction. In the appendix we show that indeed only two possible equilibria are not dominated.

This previous proposition states that the only two possible outcomes that can be chosen by the nomenklatura are either to resign (what has been done in Eastern Europe) and the economic choice that goes with resigning is *nomenklatura privatization*. The other possibility is to stay in power, choose the type of privatization implemented in China.

In the next proposition, we stress that this equilibrium is optimal in the short run. We also link political decisions to the economic ones related to privatization. The difference of political path between China and Eastern Europe is related to the different economic paths about privatization.

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\(^8\) In the case of a revolution, it seems reasonable to assume that also the private output in the hands of the rulers will be appropriated. Since the state workers decide to fight upon taking into account the allocation of state output (and not private output), we assume implicitly that the rulers’ private assets are left in the hands of the private workers.
Proposition 3
(i) In an economy in which the means of repression are sufficiently large to ensure a low probability of successful fight, the rulers choose to stay in power (and they choose Socialist privatization)

(ii) In an economy in which the means of repression are small and the probability of successful insurrection is high, the rulers choose to resign (and they choose the nomenklatura privatization)

(iii) In case the country can choose the size of its repressive apparatus, since their payoffs are higher in case of "staying in power", this is the solution they choose.

Proof:
We assume that:
\[ U_{NF,2}^* (1) > U_{NFR,1}^* > U_{NF,2}^* (0) \]

About (i) and (ii):
As \( U_{NF,2}^* (\beta) \) is an increasing function in \( \beta \), there exists a unique \( \beta^* \) in \([0, 1]\) such that \( U_{NF,2}^* (\beta^*) = U_{NFR,1}^* \). For \( \beta > \beta^* \) type 2 privatization strategy dominates type 1 privatization strategy and conversely for \( \beta < \beta^* \) (see figure 1).

(iii)
It remains now to consider the first stage of the game, namely the optimal choice of the size of the repressive apparatus \( \beta \). From proposition 2, the net payoff structure for the rulers in that stage can be written as:

\[
U(\beta) = \gamma^*_1 Y(\gamma^*_1) - c\beta \quad \text{for } \beta < \beta^* \\
U(\beta) = U_{NF,2}^*(\beta) - c\beta \quad \text{for } \beta > \beta^*
\]

We saw that the gross payoff \( U_{NF,2}^* (\beta) \) is increasing and concave in \( \beta \), and the resource cost of repression, \( c\beta \) is a straight line going through the origin. As is shown in figure 2, the net payoff at the optimal repressive apparatus is higher in case of no resigning, and implementing privatization type2.

This framework enables us to understand why the Chinese nomenklatura has chosen concomitantly to stay in power alongside a socialist privatization. Eastern European countries did not choose the same path due to the international relations system extant at the end of the 20th century. The former USSR did not permit these countries to have strong armies. They were supposed to be dependent on Russia. When the power of USSR diminished, the nomenklatura of the Eastern European countries faced the choice of resigning or fighting, with a high probability of loosing. Our model predicts that in this case, resigning was optimal.
III. Conclusion

The purpose of this paper was to analyze the dynamics of Chinese economic growth. The rapid development of China during the present decade has led some scholars to wonder if China is going to leapfrog other developed country, and if is to become the next leader.

This paper shows that if in the short and medium run, China is growing quickly and is converging to the output of a developed country; in the long run, this will not be the case. The parameters that lead to high growth today are also the parameters that will detract from higher growth in the future, with the main one being the repressive apparatus.

China is ready for economic openness, but not for political openness; this outcome is due to the maximization of the nomenklatura’s payoffs. The nomenklatura has chosen an optimal amount of repression so that it stays in power, and adopts an economic policy leading to high output. Without exogenous shocks occurring, political openness will be restrained, and while we will face a convergence of China to the output levels of the West, we will not face leapfrogging. In order to develop new technologies and inventions that can permit leapfrogging, political freedom is needed.

In consequence, when comparing China to Eastern European countries (EEC), we clearly see two opposite paths. On one hand, the EEC, which could not accumulate high levels of repression as in China, have chosen political freedom. On the other hand, China’s rulers have no reasons to resign since they have accumulated high means of repression. So the path followed by EEC is not in the interest of the Chinese rulers in the short run. China’s nomenklatura will retain their political power and will not permit political openness. In the short run, it is a clever policy. However, in the long run, the path followed by EEC permits higher growth rates.
Appendix

In order to prove proposition 2, we have to first prove the next Lemma, which outlines the optimal decision of rulers as a function of the worker’s decision, since we solve the equilibrium by backward induction.

Lemma

(i) When in the third stage workers do not fight, in the second stage the workers allocation of output that is optimal for rulers is: \( W = p(\beta)Y_1 - [1 - p(\beta)]H \) in the case of privatization 1 and \( W_s = p(\beta)Y_s - [1 - p(\beta)]H \) in the case of privatization 2.

(ii) When in the third stage workers fight, the rulers’ best response in the second stage is giving them the lowest allowable payoff; that is: \( W = 0 \).

(iii) When privatization 1 is chosen, and the rulers do not resign and stay in power, there is no privatization (\( \gamma_1 = 0 \)) and the rulers strictly prefer the workers not to fight.

(iv) The equilibrium rate of privatization 2 is \( \gamma^*_2 \) and is not zero.

Proof

(i) For a non-fighting outcome to be an equilibrium it is necessary that:

\[ V_{NF} \geq V_F. \]

The rulers' best response is to choose the smallest \( W \) that satisfies equation (29); that is:

\[ W = p(\beta)Y_1 - [1 - p(\beta)]H \quad \text{in the case of privatization 1} \]  

\[ (A.1) \]

and

\[ W_s = p(\beta)Y_s - [1 - p(\beta)]H \quad \text{in the case of privatization 2} \]

\[ (A.2) \]

(ii) In case of a fighting equilibrium, the allocation that maximizes (A.1) is to give the workers the minimum, i.e. 0.

(iii) Consider the cases where rulers do not resign. The payoffs in cases of no-fight and fight are, respectively:

\[ U_{NF,1} = [1 - p(\beta)][Y_1 + H] \]

\[ (A.3) \]

and

\[ U_{F,1} = [1 - p(\beta)]Y_1 \]

\[ (A.4) \]

Hence, No Fight dominates Fight when \( H > 0 \) and in both cases, the payoffs are a negative function of \( \gamma_1 \). Therefore, the optimal extent of privatization for the rulers, if they do not resign, is zero, and as \( Y_1 (0) = A_{s^{1-\alpha}} \), we finally get:

\[ U_{NF,1}^* = [1 - p(\beta)][A_{s^{1-\alpha}} + H] \]

\[ (A.5) \]

and
\[ U_{F,1}^* = [1 - p(\beta)]A_s^{1-\alpha} \quad (A.6) \]

(iv) About the last part of the lemma, for a non-fighting outcome to be an equilibrium it is necessary that the workers in the public sector are paid at least what they would receive if fighting:
\[ W_s = p(\beta)Y_s - [1 - p(\beta)]H \quad (A.7) \]

then substituting into (22) and (28) we get:
\[ U_{NF,2} = (1 - p)[Y_s + H(1 - \gamma_2)] + pY_s\gamma_2 + [Y_m - \gamma_2 w_m] \quad (A.8) \]

Under a fight, workers are paid the minimum, \( W_s = 0 \). Substituting into (30), the rulers’ payoff becomes:
\[ U_{F,2} = [1 - p(\beta)]Y_s + [1 - p(\beta)][Y_m - \gamma_2 w_m] \quad (A.9) \]

It is easy to see that for any \( \gamma_2 > 0 \), \( U_{F,2} \) is smaller than \( U_{NF,2} \) and No Fight dominates Fight for the type 2 privatization strategy.

The extent of privatization that maximizes the rulers' payoff in case of NF, denoted \( \gamma_2^* \), is such that it is the argmax of equation (A6).

\( U_{NF,2} \) has an inverted U-shape as a function of \( \gamma_2 \). The intuition underlying this equilibrium is that privatization leads to growth of output, which benefits the rulers. However, for too high a rate of privatization, rents fall. Therefore there is an optimal extent of privatization. As opposed to the case of privatization of type \( \gamma_1 \), where if the rulers did not resign the optimal value is 0, here under both NF and F, the optimal \( \gamma_2 \) is greater than zero.

Substituting the optimal amount of privatization, \( \gamma_2^* \) in equation (A.8) the optimal payoff for the rulers when choosing privatization 2 is then:
\[ U_{NF,2}^* = (1 - p)[Y_s + H(1 - \gamma_2^*)] + pY_s\gamma_2^* + [Y_m - \gamma_2^* w_m] \quad (A.10) \]

We now turn to analyze the NFR case:

In the event of resignation (NFR), the extent of privatization that maximizes the rulers' payoff, denoted \( \gamma_1^* \), is simply the argmax of (25), and since \( Y_1' < 0 \), it is therefore different than zero.

The payoffs in equilibrium in the case of NFR, in which rulers resign are:
\[ U_{NFR,1}^* = \gamma_1^*Y(\gamma_1^*) \quad (A.11) \]
\[ V_{NFR,1}^* = (1 - \gamma_1^*)Y(\gamma_1^*) \quad (A.12) \]

For privatization 1 as for privatization 2, the amount of privatization chosen is different than zero. For privatization 1, the reason why there is a non-zero optimal amount of privatization, is different. “Nomenklatura privatization,” on the one hand, has a negative impact on the rents since it reduces output. On the other hand, since the rulers keep those
assets that have been privatized if they take the resignation option, privatization has a positive impact on rents.

We now turn to prove proposition 2.

When comparing the payoffs, it is immediately apparent that the strategy “privatization type 1 and No Fight,” (NF,1) is dominated by “privatization type 2 and No Fight,” (NF,2) (otherwise $\gamma_2$ would not be strictly positive). Also for any $\gamma_2 > 0$ $U_{F,2}$ is smaller than $U_{NF,2}$. So No Fight dominates Fight for the type 2 privatization strategy.

In consequence, the characterization of the equilibrium solution of the second stage of the game involves then only the comparison between the payoffs $U_{NFR,1}$ (Resign and privatization strategy of type 1) and $U_{NF,2}$ (No fight and privatization strategy of type 2).

The two curves are represented in figure 1 as a function of the size of the repressive apparatus, $\beta$. $U_{NFR,1}^*$ is a flat curve independent from $\beta$, and $U_{NF,2}^*(\beta)$ is an increasing concave function of $\beta$.

QED

Bibliography


Figures 1 and 2

Note: P1, and P2 denote that country y adopts privatization type 1 and 2 respectively.

Net payoffs

β

β

P1

P2

P1

P2

Note: P1, and P2 denote that country y adopts privatization type 1 and 2 respectively.