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The Success and Failure of Reforms in Transition Economies

This paper argues that an important reason why Russia's performance and China's performance under capitalism have differed dramatically is that different arrangements governing the determination of prices and work practices evolved during the transition process. In Russia, the arrangement, which conferred monopoly rights to industry groups leftover from socialism, prevented the adoption of better technology. In China, the arrangement that evolved contained no such monopoly elements. The key factor in determining which arrangement evolved was the strength of the central government. We put forth a model that implements these ideas and provide evidence in support of this theory.

IN THE LAST PART of the 20th century, both Russia and China moved to capitalistic systems. Their experiences with capitalism have proven very different. According to the *Penn World Tables 5.6*, Russia's per capita GDP relative to the U.S. level declined from 30% to 22% between 1985 and 1998. China's per capita GDP relative to the U.S. level, in contrast, rose from 7% to 10% over this period. Why did capitalism prove to be such a disappointing experience for Russia but not China over this period?

This paper argues that differences in the arrangement governing the determination of prices and work practices that evolved during each country's transition, account for much of the difference in the performances of these two countries under capitalism. In

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Russia, the arrangement that evolved conferred monopoly rights to factor suppliers leftover from socialism. This arrangement prevented the adoption of superior technology and led to inefficient work practices. In China, the arrangement that evolved was competitive and conferred no such monopoly rights to factor suppliers. As such, better technology was adopted and operated efficiently.

The paper further argues that the key factor in determining which arrangement evolved was the strength of the central government at the start of the transition. In both countries, suppliers leftover from socialism had similar incentives to obtain (or maintain) monopoly rights over the supply of their factor's services in the product market that employed their factor. This is because a monopoly right enables a group of factor suppliers to the current production process to earn economic rents. These rents are destroyed if firms using superior technology enter the product market. Local governments will want to erect barriers to entry to preserve the monopoly rents of their constituents. A benevolent central government, in contrast, will not want to erect barriers, as the monopoly rights arrangement lowers the average living standard in the country. A strong central government is, therefore, needed to prevent local governments from erecting barriers to entry on behalf of their constituents.

Our argument is based on three components. The first component consists of empirical evidence. In particular, we provide evidence that suggests that the monopoly arrangement was prevalent in Russia but not in China. Additionally, we document the key role that local governments in Russia assumed in preventing firms from changing work practices and adopting better technologies, and the key role that the central government in China assumed in stopping local governments there from doing the same.

The second component is a quantitative theory of per capita output differentials between the United States and Russia under capitalism based on the type of arrangement used to allocate resources in each country. The theory, which is based on Parente and Prescott (1999), assumes the arrangement was competitive in nature in the United States and monopolistic in Russia. The same theory, when applied to a country like China with very low initial productivity, indicates that the implementation of the competitive arrangement can produce a large increase in per capita output in a short period of time.

The third component of our argument is a quantitative theory of the transition in which either the monopoly arrangement or the competitive arrangement evolves. The theory examines the choice of arrangement in a market by factor suppliers leftover from socialism within a game-theoretical construct. The only Nash equilibrium of a finitely repeated version of such a game is one where all such markets behave monopolistically. This is because the monopoly arrangement in the market that employs the factor's services is a dominant strategy. From the standpoint of an individual market, the only rational choice is to become a monopolist regardless of what is done in other markets. We conclude that the existence of a centralized authority capable of affecting the behavior of agents in specific industries is a crucial factor in avoiding the monopoly rights equilibrium outcome. It is this

differential power of the central government that we see as being primarily responsible for the differential performances of Russia and China.

In the case of Russia, we further conclude that all individuals there would have wanted a sufficiently strong central authority capable of coordinating reform across industries. This is because the payoff matrix to the game resembles a prisoner's dilemma. This result is an empirical rather than a theoretical one, as the size of the payoffs depends importantly on the number of factor suppliers employed at the end of socialism in the sector where the monopoly arrangement can be implemented. Only when the size of this sector is large, so that the monopoly arrangement in each market leads to very inefficient work practices there, does the payoff structure of the game resemble a prisoner's dilemma. The initial size of this sector in Russia is sufficiently large in the context of the calibrated model to generate a prisoner's dilemma payoff structure.

The issue of a prisoner's dilemma in the case of Russia is interesting in that it suggests that all Russians would have preferred a central government that was the opposite of the one we claim came to power. Had there been no prisoner's dilemma payoff structure, the majority of Russians would have preferred a weak central government. The issue is not particularly interesting in the case of China because the number of factor suppliers employed at the start of the transition period in the sector where the monopoly arrangement could be implemented represented a minority of the population. Hence, even if there were no prisoner's dilemma payoff structure, the majority of Chinese still would have preferred a strong central government.

The literature that deals with the comparative development of transition economies is by now huge. We mention three subsets of papers within this literature. The first set of papers, that includes Li (1999), Debande and Friebel (1999), Blanchard and Aghion (1996), Sachs and Woo (1994), and Brown, Ickes, and Ryterman (1993), emphasizes the structure of industry and rent holders that countries inherited from socialism. The second set, that includes Weingast (1995), Shleifer (1997), Qian, Roland, and Xu (1999), Blanchard and Shleifer (2001), and Berkowitz and Li (2000), emphasizes differences in governmental structures. The third set, that includes Johnson, Kaufmann, and Shleifer (1997), and Roland and Verdier (2003), emphasizes coordination failures associated with fiscal policy and the provision of public goods.

It is true that many of the themes emphasized here pervade these other papers. Despite this, we see our work as being distinct in a number of ways. First and most importantly ours is the only paper to investigate the plausibility of theory by deriving its quantitative properties using general equilibrium methods. As such, our theory has undergone a rigorous test. Additionally, this investigation has identified an element not present in these other papers, namely, the existence of a prisoner's dilemma. Each industrial group would like to see all other industries in the economy operate under the competitive arrangement. And each industrial group would like to have a central government in power that is sufficiently strong to stop it and all

other industries from acting in their own self-interest by acquiring monopoly rights in their industry.

There are certainly other factors besides the strength of the central government that affected the evolution of the arrangements in each country. Politically, it was probably easier for factor suppliers leftover from socialism in Russia to capture local governments for a number of reasons. First, the privatization scheme implemented in Russia gave Soviet managers and workers control of their firms. According to Earle and Estrin (1998) roughly 75% of firms in Russia in 1994 were controlled by the firms' managers and workers under socialism. Second, local governments supplied land to local firms. Third, most towns and cities in Russia had very few firms. According to Brown, Ickes, and Ryterman (1993), 90% of towns and cities in Russia had 9 or less firms located there.

We do not consider the effect of these other factors for two reasons. First, we abstract from the political process by which groups of factor suppliers acquire the support and protection of local governments. This is in contrast to Polishchuk and Savvateev (2001), Sonin (2000), and Krusell and Ríos-Rull (2003). We make this abstraction in order to give a detailed picture of the economics of transition and a simple mechanism for the implementation of competitive behavior. Second, despite these differences, the evidence suggests that factor suppliers in China tried to acquire the protection of local governments, and local governments tried unsuccessfully to erect barriers to entry.

The paper is organized as follows. Section 1 provides some empirical support for our theory. Section 2 briefly describes the economics of the environment on which our analysis is based. Section 3 offers a quantitative interpretation of the performances of the U.S., Russian, and Chinese economies under capitalism. Section 4 presents our theory of the transition and the evolution of the alternative arrangements. Section 5 concludes the paper.

1. EMPIRICAL SUPPORT

The central tenets of our theory are that the monopoly rights arrangement is prevalent in Russia but not China, and that differences in the relative strengths of governments are important in understanding the evolution of the different arrangements. Before proceeding, it is instructive to ask what is the empirical support for our theory.

The idea that the central government in Russia was weak whereas the central government in China was strong relative to local and regional governments is uncontroversial and well documented. For this reason, the focus of this section is on the first tenet of our theory. We do include some discussion of the relative strengths of the governments for the purpose of documenting how the various levels of government of each country acted when confronted with firms' attempts to change work practices and adopt better technologies.

As there are no aggregate statistics that measure the prevalence of the monopoly rights arrangement in a country, we base the empirical support for our theory on case studies of firms and industries. Our discussion centers on a comparison of the experiences of two firms that attempted to change work practices, one located in China and the other located in Russia. Both were leftover from socialism and acquired by foreigners. The experiences of the firms are representative of the experiences of other firms in each country.

1.1 Russia: The Segezhabumpron Paper Mill, Karelia

Fox and Heller (2000) document the failed efforts of owners to change work practices and technologies at a number of plants in Russia in the 1990s. One of these plants is the Segezhabumpron Paper Mill, one of Russia's largest pulp and paper mills, located in Karelia. In the early 1990s, Assidoman of Sweden acquired a 57% majority stake in Segezhabumpron, and soon thereafter, put forth a $100 million plan to modernize the plant. The investment proposal, however, raised the fear that jobs would be eliminated. The plant's employees backed by local government officials attempted to effectively run the Swedes out of town by challenging the legality of Assidoman's initial purchase of shares and by physically threatening the plant's managers. After the regional government and a major pulp distributor, which co-owned the mill, refused to co-fund the working capital needed to keep the plant open, Assidoman abandoned its investment plan and wrote off its ownership of Segezhabumpron.

The Segezhabumpron case demonstrates the strength of local governments in Russia and how they have worked to prevent the adoption of better technology. The McKinsey Global Institute's study (2000) also shows this. For example, the study reports that in the confectionary industry, local governments have banned best-practice firms from eliminating excess workers. In residential construction, local governments have typically awarded contracts to firms that guaranteed no layoffs. Local governments have also banned large retail formats, and have used energy subsidies to keep obsolete plants afloat in the steel and cement industries.[1]

1.2 China: The Meite Packaging Company, Tainjin

Rosenthal (2000) documents the successful efforts of owners to change work practices at a number of plants in China in the 1990s, including the Meite Packaging Company in Tainjin. In the early 1990s, the Ball Corporation of Broomfield, Colorado acquired partial ownership of Meite through a joint venture and began to manufacture

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1. According to Brown, Ickes, and Ryterman (1993), the barriers erected by local and regional governments have led to a very localized market structure in Russia. Although concentration ratios for Russian industries are no higher than concentration ratios for U.S. industries, markets, as defined in the standard Arrow-Debreu sense, do appear to be more monopolistic in nature. Although having a monopoly on the product side of the market is not essential to our theory, we nevertheless mention it because it is probably easier for factor suppliers to organize and acquire monopoly rights in this case. The hypothesis that markets in Russia tended to be monopolistic is consistent with the findings of the 1992 report of the *Anti Monopoly Committee* and the study of Earle and Estrin (1998) that found that 25% of firms in 1994 reported that they had no major competitor.

soda and beer containers there. Prior to this, Meite was a state owned enterprise that manufactured pipes. By the end of the decade, Ball acquired full ownership of Meite as well as three other packaging facilities in Tainjin. At this point, Ball decided to consolidate the activities of all four firms into a single entity that would operate in a special economic development zone. The consolidation was to result in a large number of layoffs at the Meite plant. Faced with this prospect, Meite's workers took to the streets in protest, and kidnapped several of the plant's foreign managers. Although these actions may have increased severance payments, they did not stop Ball from closing the plant, and eliminating jobs. The official communist-run Trade Union of Workers offered little resistance to the proposed layoffs due to tight control of their actions by the central government.[2] The local government, likewise, did very little to aid the workers' campaign.

In other instances, local governments did try to do more to aid the efforts of their constituents. In the end, their efforts failed on account of direct intervention by the central government. This is evident in the interregional trade wars documented by Young (2000) that developed in the late 1980s and early 1990s. The interregional trade wars were the consequence of economy-wide overcapacity that resulted from centrally controlled prices. Once central price controls were relaxed, inefficient producers faced industry exit. Provincial, county, and even city governments reacted by erecting various barriers to interregional trade. As Young reports, the central government responded to these developments in three ways: by sending out a central task force to mediate disputes among regions, by establishing a *Ministry of Internal Trade*, the purpose of which was to encourage circulation and distribution, and by sending out a large number of circulars and directives against interregional trade barriers.

To summarize, the evidence shows that the arrangement used to allocate resources in Russia is more in the nature of the monopoly arrangement than the competitive one whereas the opposite is true in China. Moreover, the evidence suggests the central government in Russia was a lot weaker than in China. Additionally, economic activity has been much more dynamic in China. (For example, patent applications in 1997 numbered 61,000 in China compared to 48,000 in Russia; high technology exports as a fraction of GDP in 1998 were 15% for China versus 2% for Russia; and perhaps more significantly, the volume of foreign direct investment in China in 1997 was over $43 billion whereas for Russia it was $3 billion.) Empirical support for our theory exists. The question that remains is whether our theory is quantitatively plausible. We next turn to this question.

2. THE MODEL ECONOMY

The economics of the model are essentially those in the Parente and Prescott (1999) monopoly rights paper. This model generates large differences in per capita

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2. See Eckholm (2001).

output that are attributed solely to differences in the arrangement used to determine prices and work practices. The model economy consists of a household sector, an industrial sector, and a farm sector. In any period, a household is either a worker in the farm sector, a worker in the industrial sector, or part of a group of entrepreneurs who adopt a technology in the industrial sector. The industrial sector produces a continuum of differentiated goods. Each industrial good can be produced with one of three technologies that differ only in the labor input required per unit of output. The alternative arrangements pertain to the industrial sector only: the farm sector is perfectly competitive, and its good serves as the economy's numeraire. We now describe the economy in detail.

2.1 Household Sector

There is a continuum of measure 1 of infinitely-lived households with period utility defined over an agricultural good denoted by $a(t)$ and a continuum of industrial goods denoted by $x(i,t)$. Period preferences of the household are given by

$$\log \left(\int_0^1 x(i,t)^\gamma \, di + \mu a(t)^\gamma \right)^{1/\gamma} . \tag{1}$$

In Equation (1), γ is a parameter that determines the elasticity of substitution of the goods, and μ is a parameter that determines the relative importance of the agricultural good and the industrial goods to the household.

Each household is endowed with one unit of time each period and one unit of land. Households are not allowed to trade land. Additionally, households are not allowed to trade bonds. While these assumptions may seem restrictive, they are not; the assumptions are non-binding, and reduce the household's maximization problem to a sequence of static problems.

The household's maximization problem is the same regardless of the nature of the arrangements that govern the industrial sector in the economy. In each period, each household chooses $x(i,t)$ and $a(t)$ to maximize Equation (1) subject to its budget constraint,

$$a(t) + \int_0^1 p(i,t)x(i,t)di \le w(t) + r(t) ,$$

where $p(i,t)$ is the price of the ith differentiated good, $w(t)$ is the wage rate (which can differ across occupations in an economy with the monopoly rights arrangment), and $r(t)$ is land rental income. This yields a household's demand for the ith differentiated, good given by

$$p(i,t) = \frac{x(i,t)^{\gamma-1}}{\mu a(t)^{\gamma-1}} .$$

2.2 Farm Sector

The farm sector produces a single good using a composite of the industrial goods and a composite of land and labor services as inputs. More specifically, the agricultural good is produced according to the following constant-returns to scale nested CES production function:

$$A(t) = \left[\psi \left(\int_0^1 X_a(i,t)^\sigma di \right)^{\rho/\sigma} + (1 - \psi)(N_a(t)^\alpha L_a(t)^{1-\alpha})^\rho \right]^{1/\rho}, \qquad (2)$$

where $X_a(i,t)$ denotes the input of the ith industrial good, $N_a(t)$ denotes labor services, and $L_a(t)$ denotes land services. In Equation (2), σ is a parameter that determines the elasticity of demand for the differentiated goods; ρ is a parameter that determines the elasticity of substitution between the composite inputs; α is a parameter that determines labor's share in the composite land-labor input; and ψ is a parameter that determines the relative importance of the two composite inputs in the production of agriculture.

The farm sector is competitive and thus takes the rental price of land, the rental price of farm workers, and the price of each industrial good as given. The maximization problem of the representative farm is static. In particular, the farm chooses $A(t)$, $X_a(i,t)$, $N_a(t)$, and $L_a(t)$ each period to maximize

$$A(t) - w_a(t)N_a(t) - r(t)L_a(t) - \int_0^1 p(i,t)X_a(i,t)di ,$$

subject to Equation (2). This yields farm demand for the ith differentiated, good given by

$$p(i,t) = \psi A(t) \left(\int_0^1 X_a(j,t)^\sigma dj \right)^{\rho/\sigma - 1} X_a(i,t)^{\sigma-1} .$$

An assumption on the elasticity parameter in the farm production function, namely $\sigma < 0$, ensures that farm demand for each industrial good is price inelastic. A similar restriction on household preferences, namely $\gamma < 0$, implies that aggregate demand for each industrial good is price inelastic. These restrictions simplify the analysis in the economy with monopoly arrangements. More importantly, these restrictions are needed to account for the observation that firms in Russia operate current technologies inefficiently.

2.3 Industrial Sector

Each industrial good can be produced by any of three technologies, $\pi_0 < \pi_1 < \pi_2$. These technologies differ in the labor input required per unit of output. No firm-specific investment is required for an individual or group of individuals to adopt any

of the three technologies. Output of the ith industrial good, $X(i,t)$, when technology π_k is used and $N(i,t)$ workers are employed is

$$X(i,t) \leq \pi_k N(i,t) .$$

2.4 The Arrangements

Two arrangements are possible in an individual industry: the monopoly arrangement and the competitive arrangement.[3]

Monopoly arrangement. The initial state of each differentiated good industry is the number of workers that start out there. The nature of reform, as shall be described, will be directed by the actions of this group of factor suppliers. The monopoly right pertains to only those firms in the group's industry that use the π_1 technology, and not to firms that use either the π_0-technology or the π_2-technology. The monopoly right, therefore, is over a technology, and not the industry. The monopoly arrangement allows these workers to set the membership size of its group, $N_x(i)$, the rental price to be paid for members' services, $w_x(i)$, and the productivity of its members, $\pi_x(i) \leq \pi_1$.

Certainly, the type of monopoly arrangement we assume conveys less power than one that can be transferred across technologies. A group in the model, however, does not need this additional power to block reform and the adoption of the superior technology. Historical evidence strongly suggests that the non-transferable monopoly arrangement is far more prevalent than the transferable one. There is a strong theoretical justification for this. New technologies typically require new types of machines and skills. Consequently, important inputs into the current production process are typically unimportant for operating a superior technology. A group of factor suppliers to the current production process will have little ability to dictate that firms using the new technology employ its factor if its factor is not an important input. In textiles, for example, the inputs used in woolen cloth were of little value in the production of cotton fabrics. Even within the woolen industry in England during its Industrial Revolution, factor inputs to the current production processes had no rights over the use of superior technologies.[4] In transportation, inputs to shipping were of little value to railroads, and inputs to railroads were of little value to trucking. Following Parente and Prescott, we do not explicitly model inputs as being specialized to the various technologies, but this is how we think of them.

A group's monopoly right is protected by the state. The state protects this right by erecting barriers to entry by firms using the superior technology. Without this protection, the monopoly right of the group would have no value. Following Parente and Prescott, the protection is modeled as a resource expenditure whereby a group that enters the ith industry with the π_2-technology must use $\phi(i)$ units of labor. A

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3. In the model, an industry is a product market. As pointed out by Brown, Ickes, and Ryterman (1993), this is not generally true for Russia, where markets are localized on account of regional barriers.

4. See Randall (1991).

real-world counterpart of this protection is government regulation.[5] The state does not erect any barriers with respect to the π_0-technology. The empirical counterpart of this technology is a home-based production technology. Any household can use this technology at any time and use his labor services to produce any of the differentiated goods.

A group that enters an industry with the π_2-technology does not subsequently gain a monopoly right over the use of the π_2-technology. If a firm has entered the ith industry with the π_2-technology in period t, then any firm can use this technology in that industry in period $t + 1$ without having to expend any resources. Effectively, a firm that overcomes the resistance to entry in an industry paves the way for any firm to subsequently enter that industry with the superior technology.

Competitive arrangement. Under the competitive arrangement, firms in an industry are not constrained in the technologies they use or the workers they hire to operate those technologies. Each firm sets the productivity at which its workers operate the technology and pays its workers a competitively determined wage rate.

2.5 Equilibrium Under the Alternative Arrangements

In what follows we describe the necessary conditions for an equilibrium where all industries are governed by the competitive arrangement and the π_2-technology is used in every period. Additionally, we describe the necessary conditions for an equilibrium where all industries are governed by the monopoly arrangement and the π_2-technology is not used in any period. Equilibria, in which all industries are characterized either by the monopoly arrangement and the use of inferior technology or by the competitive arrangement and the use of superior technology, are not the only ones possible. The symmetric steady-state equilibria that we subsequently describe are the easiest to characterize and compute, and are sufficient for interpreting the relative experiences of Russia and China under capitalism.

Competitive arrangement. The arrangement in each industry is competitive. As there are no firm-specific costs to using any of the three technologies, and the π_2-technology is the most productive one, the π_2-technology is used in each industry in each period in equilibrium. As firms in the industrial sector are price takers and there is free entry, $p = w_x/\pi_2$ in each industry. Households are either farm sector workers or industrial sector workers. Since labor is not sector-specific, the wage rate is the same across occupations, namely, $w_x = w_a$. The equilibrium allocations must also solve both the household's problem and the farm's problem. Additionally, the labor market, the land rental market, the agricultural good market, and each differentiated good market must clear.

Monopoly arrangement. All differences between the equilibrium conditions under the competitive arrangements and the monopoly arrangements involve the industrial

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5. There are surely other forms that the barrier can take, such as bribes and subsidies. Subsidies in the form of energy may be particularly relevant in the case of Russia. Indeed, the use of subsidies may be particularly important in understanding how monopoly rights can exist in the absence of economy-wide regulation erected by the central government. By subsidizing existing plants, a local or regional government can erect an effective barrier to entry at the national and international level.

sector. The utility maximizing conditions, the farm profit maximizing conditions, and the market clearing conditions are the same.

As long as no entry has occurred in an industry prior to the current period, there is a game between the group of factor suppliers in the industry and the potential entrant. These players take as given the demand for their industry's product as well as the competitive wage rate in the economy on account that each industry has measure 0. The inverse demand for industry i's product, $D_i(p(i))$, in a given period is the sum of the demand from farm sector workers, industry sector workers, agricultural firms, and from households who are part of a group of entrepreneurs adopting the π_2-technology.

The game consists of three stages. In the first stage, members of the group of factor suppliers from the previous period decide non-cooperatively whether they want to continue in the coalition. No member of the previous period's group can be forced or persuaded to leave the industry. The group may admit new members. The coalition size in the ith industry, $N_x(i)$ thus is the sum of those factor suppliers working in the industry from the previous period less the number of these individuals who voluntarily leave plus new members. At this stage of the game, the coalition size for the period is set, and an individual who is part of this group is committed to working in the industry in the period.

In the second stage of the game, a potential entrant decides whether to overcome the resistance and enter the industry with the superior technology. If there is no entry, then in the third stage of the game the coalition chooses the wage to be paid for its member services, $w_x(i)$ and the work practices, $\pi_x(i) \leq \pi_1$, to maximize member compensation.[6] Conditional on no-entry, the product side of the market is perfectly competitive. Membership compensation is thus,

$$w_x(i) = p(i)D_i(p(i))/N_x(i) . \tag{3}$$

The group will choose $w_x(i)$ and $\pi_x(i)$ so as to maximize Equation (3) subject to satisfying industry demand, namely,

$$\pi_x(i)N_x(i) = D_i(p(i)) . \tag{4}$$

Given that demand is price inelastic, industry revenues $p(i) D_i(p(i))$ are maximized at the highest price that does not elicit entry by households using the π_0-technology. Given that any household can use the π_0-technology without having to incur a cost and given the opportunity cost of the household's time, it follows that this price is $p^* = w_a/\pi_0$. Effectively, the group is able to capture the monopoly profits of the industry through its choice of member compensation and work practices. A necessary condition for the group to exist is that the compensation of coalition members exceeds the competitive agricultural wage rate,

$$w_x(i) \geq w_a . \tag{5}$$

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6. If there is entry, then in the third stage the group of industry insiders chooses the wage and work practices, and the entrant chooses the price simultaneously. We do not describe this case in more detail because the focus of the analysis is on symmetric equilibrium with no entry.

A necessary condition for the group to deter entry is that the expected period profits of the entrant are less than or equal to the cost of overcoming resistance. The potential entrant can hire any amount of labor at the competitive wage rate, w_a. Consequently, the potential entrant has infinite capacity and marginal cost w_a/π_2. The coalition, in contrast, has finite capacity $\pi_1 N_x(i)$ and zero marginal cost. Because the coalition is committed to the industry, the potential entrant can correctly anticipate that the coalition will produce $\pi_1 N_x(i)$ units of the good. Consequently, it can expect to sell $D_i(p((i)) - \pi_1 N_x(i)$ units of the good. The opportunity cost to the potential entrant of entering the industry is the forgone wages, $\phi(i)w_a$. Thus, entry is deterred if the

$$\max_{p_e}\left\{\left(p^e - \frac{w_a}{\pi_2}\right)(D_i(p^e) - \pi_1 N_x(i))\right\} \leq \phi(i)w_a . \tag{6}$$

Equation (6) shows that the group's size acts as a deterrent to entry. A group may in fact set its size above the level needed to meet industry demand to ensure that the profits of a potential entrant are sufficiently low. This occurs when government protection is fairly low. This gives rise to inefficient work practices. If the size of the protection in the industry is sufficiently large, then the group's size is irrelevant, as no firm will find it profitable to enter using the π_2-technology even if the group did not exist. We think that in the case of Russia government protection is the key mechanism by which entry is blocked and so group size probably plays a very small role. Inefficient work practices will still exist in this case provided the number of workers that start the period in the industry is large relative to the number needed to satisfy industry demand.

The game is repeated in a given industry in every period as long as there has not been entry by a group of entrepreneurs with the superior technology in a prior period. In the case where all industries are the same and entry is blocked, Equations (3)–(6) complete the list of necessary industrial sector equilibrium conditions in each period.

3. INTERPRETING CAPITALISM IN RUSSIA AND CHINA

We now explore the plausibility of the theory in accounting for the relative experiences of Russia and China under capitalism. This we do by first restricting the parameter values of the model to match the experiences of these economies relative to the United States in the late 1990s. In the case of Russia, we attribute the entire difference between its per capita output level and the U.S. level to differences in the arrangements governing the determination of prices and work practices. As such, we assume that firms in both countries have access to the same set of technologies.[7]

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7. We attribute all output differences between the two countries in the paper to differences in arrangements, not because we think that no other differences mattered, but because we seek to determine whether this difference alone is quantitatively important.

In calibrating the model, the parameter values are restricted so that the symmetric monopoly equilibrium of the model matches the Russian experience and the symmetric competitive equilibrium of the model matches the U.S. experience in the 1990s. In the symmetric equilibrium under the monopoly arrangement, the π_1-technology is used in all industries and typically operated inefficiently. Moreover, workers in industry earn more than their counterparts in the farm sector. In the symmetric equilibrium under the competitive arrangement, the superior technology is used efficiently in each industry, and all workers earn the same wage rate.

As mentioned equilibria in which all industries are characterized either by monopoly rights or by perfect competition, are not the only ones possible. Clearly, not all U.S. industries are competitive and not all Russian industries are monopolistic in the sense of this paper. The assumption of the fraction of industries that are competitive in each country is not critical to the results we subsequently establish. In light of this, we adopt the symmetric case, which is the simplest case to analyze.

In the case of China, we do not assume that firms there had access to the same set of technologies as firms in the United States. The assumption that China had access to a different set of technologies is made to reflect fundamental differences between the United States and China that we see as being important for determining output levels and that are not included in the model. Lower education of the Chinese workforce, for example, may contribute to lower productivity in a competitive industry relative to its U.S. counterpart, either directly or indirectly by slowing the diffusion of better technology. For the argument that follows it is not important that we identify these other differences. What is key is that we interpret industries in China that have been liberalized as being competitive in their arrangements. For simplicity, the calibration is based on an interpretation that all industries in China were competitive in their arrangements under capitalism. For sure, not all industries in China were competitive. But again the fraction of industries that are assumed to be competitive in each country in these experiments is not critical to the results we subsequently establish.

To economize on space, we limit our description to the calibration of the model to the relative experience of Russia and the United States in the 1990s. This calibration exercise alone is sufficient to establish the point we wish to make about the transition process. In terms of the calibration to the Chinese economy, the only parameter values that differ between the Russian and Chinese model economies are the industrial sector parameters: π_0, π_1, π_2, and ϕ.

In addition to these four parameters, there are two parameters pertaining to household preferences and another four pertaining to the agricultural technology. The initial size of industry workers and the period length are also parameters of the model. Equilibrium allocations and prices are independent of the period length, and in this sense period length is irrelevant. Nevertheless, we set it to a decade. A decade is reasonable because a period in the model represents the time it takes for a market penetrated by an entrant with the superior technology to become perfectly competitive. Additionally, by setting the length to a decade, we can treat the transition as an instantaneous adjustment from socialism to capitalism. As described in Parente

and Prescott (1999), only the ratios π_2/π_1 and π_1/π_0 matter and for this reason π_0 can be normalized to one. This leaves 10 parameters whose values must be assigned.

The set of empirical conditions used to restrict these 10 parameters is listed in Table 1. Nine observations are listed. Implicitly, we assume the number of coalition members in the monopoly rights equilibrium is equal to the initial number of factor suppliers in each industry at the start of the transition. This effectively amounts to a tenth observation. We take this approach rather than use the observation for total industrial employment at the end of the Soviet Union because there is no mechanism in the model to reduce membership size. The calibrated parameters are: $\pi_1 = 7.5$, $\pi_2 = 15.0$, $\phi = 0.17$, $\alpha = 0.86$, $\psi = 0.23$, $\mu = 0.50$, $\rho = 0.72$, $\sigma = -5.0$, and $\gamma = -0.11$.

The observations listed in Table 1 are taken from a number of sources and pertain to different years. Relative per capita output is based on the *Penn World Tables 5.6*. The industrial sector employment share for the competitive equilibrium corresponds to non-agriculture's share of employment in the United States in 1995 from the *2000 Economic Report of the President*. The industrial sector employment share for the monopoly equilibrium corresponds to the fraction of individuals employed in the state-sector reported by Gomulka (1998, table 2.1) plus one-third of all those employed in the rest of industry in Russia under capitalism. Our estimate of the fraction of workers in Russia at the end of socialism who were employed in industries that could come under the monopoly rights arrangement is at best a guess. We note, however, that the results that follow are not sensitive to this fraction.

Relative wages are for 1990 as reported by Sachs and Woo (1994). In the calibration, the entire difference in wages between agricultural and industrial workers in Russia is attributed to the monopoly arrangement. For sure some of the difference is due to educational difference between the two types of workers. In this sense, our calibration almost surely overestimates the actual difference. The results we subsequently establish, however, do not change if a lower wage differential is used in the calibration. We further note that for our purposes it is not necessary to identify which individuals in industry, namely workers or management, are the main beneficiaries of the monopoly right.[8]

TABLE 1

RESTRICTED EQUILIBRIUM OUTCOMES

1. Per Capita Output in Russia Relative to U.S.	0.20
2. Industrial Sector Employment in the U.S.	0.95
3. Industrial Sector Employment in Russia	0.60
4. Relative Industrial to Agricultural Wages in Russia	1.15
5. Productivity of Industrial Workers in Russia Relative to U.S.	0.07
6. Full Potential Current Productivity in Russia Relative to U.S.	0.50
7. Intermediate Goods' Share of Total Farm Output in Russia	0.20
8. Intermediate Goods' Share of Total Farm Output in U.S.	0.90
9. Land's Share of Agriculture Output in the U.S.	0.14

8. Within any group of industry insiders, individuals clearly will differ in bargaining power, and so monopoly profits will not be shared equally. Wage arrears in the latter part of the 1990s in Russia have been a major problem, which suggests that managers and not workers have been the main beneficiaries of monopoly rights (see Desai and Idson 2000).

The observation for productivity of industrial workers in Russia relative to the United States corresponds to π_x/π_2 in the monopoly rights equilibrium. The observation is based on the McKinsey Global Institute Study (2000), which reports actual productivity for ten Russian industries in 1997 ranging from 7% to 38% of their U.S. counterparts. The observation for full potential productivity of Russian workers relative to the United States corresponds to π_1/π_2. The observation is also taken from the McKinsey study. That study reports that, on average, productivity of Soviet legacy assets could be increased to 65% of U.S. productivity if minor investments were made and modern forms of organization introduced. We lower this figure to 0.50, as only productivity increases associated with changes in organization are relevant for the purpose of the paper.

Observations (7)–(9) in Table 1 are used to restrict the agriculture technology parameters. Because the agriculture technology implies the same share of land rental income in agriculture between the monopoly and competitive economies, no observation pertaining to Russia is reported. The intermediate goods' share of total farm output for the United States reflects the value of fertilizer, fuels, seeds, irrigation, and depreciation on farm equipment in the United States. Since there is no capital in the model, depreciation of farm equipment is treated as an intermediate good. For the monopoly equilibrium outcome, we use an intermediate goods' share of 0.20. This is surely a guess, but our results are not sensitive to this number.

We note that our theory offers a plausible explanation for the excess workers in Russian industry documented by the McKinsey study. According to this study, roughly 30% of workers in the industries examined were considered to be excess. The model predicts a slightly larger number equal to 57%. We note that the calibration attributes the entire inefficiency of these workers to there being a large number of initial workers in the industrial sector inherited from socialism. More specifically, the value of ϕ is set to the smallest amount of protection that ensures that no firm would find it profitable to enter an industry with the π_2-technology even if the coalition did not exist. Our results are not sensitive to whether we use this interpretation for the inefficiency or the alternative one where the group size acts to deter entry.

Our theory also offers a plausible explanation for the decline in productivity that is associated with Russia's transition to a market-based economy. Namely, as long as workers in the Soviet Union operated technology at one-half its potential or more, the model predicts a decline in Russian worker productivity in the transition.[9]

4. TRANSITION TO THE MONOPOLY OR COMPETITIVE ARRANGEMENT

We now put forth a theory of the transition that accounts for the evolution of the monopoly and competitive arrangements in Russia and in China. The transition in

9. Atkeson and Kehoe (1997) note that in a transition where there is a large increase in the number of new enterprises, it takes a long time for output and productivity to begin to grow. They claim that starting an enterprise is a turbulent and time consuming process and that it takes between 5 and 7 years for productivity to exhibit. While this may very well be the case, our theory points to differences among countries with the same timing of transition.

our model is an instantaneous event, whereby the central planning mechanism is abandoned and a capitalistic mechanism is established. As part of this event, factor suppliers allocated to industry under socialism determine whether it is in their interest to have the monopoly or competitive arrangement for their industry.[10]

Towards this goal, we calculate the payoffs of an individual in the ith industry depending on whether his industry becomes monopolistic or competitive for the case where the rest of industry is competitive and the case where the rest of industry is monopolistic. The calculations are based on the calibrated model economy of the previous section, and so pertain to Russia. The calibration assumed that 60% of the workforce in that country was allocated under central planning to industries that could be made monopolistic. Although we do not consider the parameterized case of China, we note that the same underlying problem applies there; namely, each industry group leftover from socialism would want its own industry to be under the monopoly arrangement.

Table 2 lists the payoffs. The payoffs are measured in terms of normalized utility rather than earnings because prices differ between economies with different arrangements. More specifically, the payoffs are determined by calculating the factor by which consumption of the industrial goods and the agricultural good of the worker in the ith industry must be scaled up so his period utility equals the period utility he realizes in the case where all industries including his own are competitive. The numbers reported in Table 2 are the inverse of these scale factors.[11] Earnings, $w_x(i)$, productivity, $\pi_x(i)$, and employment, $N_x(i)$, for the ith industry under the four scenarios are reported in Table 3.

Two things are clear from the tables. First, from the standpoint of an individual industry the only rational choice is to become a monopolist regardless of what other industries do. As Table 3 clearly shows, industrial workers always earn more

TABLE 2

INDUSTRY REWARDS UNDER ALTERNATIVE ARRANGEMENTS

| | | All Other Industries | |
		Mply	Comp
ith	Mply	16.0	1.8
Industry	Comp	0.1	1.0

10. It is well known that China proceeded much more slowly in its reforms compared to Russia, which followed a 'big bang' strategy. The results would be unchanged were we to extend the reform process over time so that it lasts $t > 1$ consecutive periods with fraction $1/t$ industries in each period choosing the type of arrangement for their industries.

11. The relevant outcomes for the purpose of computing the payoffs of an individual in the ith industry when the rest of industry is monopolistic correspond to the symmetric monopoly equilibrium. When the rest of industry is competitive, the relevant outcomes correspond to the symmetric competitive equilibrium. This is because each individual industry has measure zero.

TABLE 3

EMPLOYMENT, PRODUCTIVITY, AND WAGE COMPARISONS

		All Other Industries are Competitive		
		$w_x(i)$	$\pi_x(i)$	$N_x(i)$
ith	Monop	9.51	4.57	0.96
Industry	Comp	2.10	15.00	0.95
		All Other Industries are Monopolistic		
		$w_x(i)$	$\pi_x(i)$	$N_x(i)$
ith	Monop	0.83	1.21	0.60
Industry	Comp	0.68	15.00	0.55

when their industry is under the monopoly arrangement. Thus, the only Nash equilibrium of a game like this is for all industries to behave monopolistically. This feature of the game has nothing to do with the parameterization of the model, and hence applies equally to the case of China. Having the rest of industry be competitive only serves to increase the value of the monopoly arrangement for the individual working in the ith industry, as demand for his industry's product is higher in this case. Given that an individual industry's demand is increasing in the measure of industries that are competitive, this result applies to the case where only a fraction of the industries are competitive.

The second result that emerges from the tables is that there is a prisoner's dilemma problem; all individuals are worse off when all industries behave monopolistically compared to when all industries behave competitively. This feature of the payoff matrix is dependent on the parameterization, and hence applies only to the case of Russia. In this sense, the existence of the prisoner's dilemma situation is an empirical result rather than a theoretical one.

The result depends importantly on the fraction of individuals at the start of the transition who are assumed to be able to dictate the nature of their industry's reforms, as well as how productive the π_2-technology is. A prisoner's dilemma type situation is less likely to arise for lower values of the π_2-technology and for smaller fractions of workers in industry at the start of the transition. The reason why a prisoner's dilemma fails to exist in these cases is that there tends to be fewer excess workers in each industry in the symmetric monopoly equilibrium, and so earnings per member tend to be higher. We note for the calibrated model economy, the prisoner's dilemma fails to exist only if the fraction of workers in industry at the start of the transition is less than 35% of the labor force. This is well below the 60% estimate used in the calibration, which suggests that the existence of the prisoner's dilemma problem is fairly robust.

To summarize, per capita output for the economy would be higher if all industries were prevented from behaving monopolistically. Additionally, payoffs to industry workers in the case of Russia would be higher if industries were prevented from behaving monopolistically. Workers in all sectors would prefer that all industries

including their own behave competitively compared to all industries including their own behave monopolistically. The obvious question is how to implement the competitive outcome.

One answer is through a central government that is capable of coordinating industries so that none behaves monopolistically and that is willing to prevent such behavior. The existence of such a government should not be taken for granted. It must have sufficient power over local and regional governments and should not be in the hands of a subset of the industries in which case it will not enforce competitive behavior. This is our explanation for the success of China and the failure of Russia. China had a benevolent central government that was sufficiently strong relative to local governments (and their constituents). Russia, in contrast, had a weak central government relative to local governments and their constituents.[12] This difference is well documented between the two economies.

5. CONCLUSION

This paper puts forth a theory to account for the dramatically different experiences of Russia and China under capitalism. In our theory, the key impediment to economic growth is whether factor suppliers to the current production processes acquire monopoly rights. In Russia, industry groups leftover from socialism successfully acquired such rights because the central government was relatively weak. The result was a period of economic stagnation. In China, in contrast, such groups failed to acquire such rights on account of the central government being relatively strong there. The result of this was rapid growth, nearly 10% per year.

Although the paper focuses exclusively on explaining the relative performances of Russia and China under capitalism, we think that our theory is useful for understanding the experiences of other transitional economies. Like Russia, Europe's other transitional economies followed a big bang strategy of reform. Unlike Russia, most of these countries have not suffered absolute declines in per capita in the decade that followed their switch to capitalism. The five most successful of these economies, in fact, all share a common element, namely their central governments committed their countries to join the European Union (EU). This is significant for two reasons. First, membership in the EU required each country to conform to certain standards, which could not be done absent a strong central government. Second, membership in the EU restricted the abilities of governments to erect barriers to entry as the Union assures the free flow of goods and people.

Additionally, we think our theory is useful for understanding the experiences of other less developed economies. The problem of groups acquiring monopoly rights over the use of current technology is not limited to former communist countries. Shleifer and Treisman (2003) argue that Russia is not so very different from such countries as Mexico and Argentina. We share this view.

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12. The issue of whether central government officials in Russia were controlled by industries is an open issue and one that is not taken up here.

The current failure of Russia does not necessarily mean that we believe it is doomed forever to fall further behind the world leaders. Joskow, Schmalensee, and Tsukanova (1994) have offered some reasons for optimism. Our theory suggests a different reason. An implication of our theory is that as the level of the superior technology increases, the protection the state must give to industry insider groups must rise. We think that as the citizenry of Russia sees the success of other transitional economies, they will not tolerate the attempts by local governments to increases the barriers to trade and entry, and will demand greater integration with the rest of Europe. The current groups of industry insiders will have no choice to disband. And as long as new groups are not given the opportunity to take their places, Russia will catch-up to the industrial leaders.

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