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Transition Economies:
A Tragedy of the Commons?*

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Comments Welcome

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Decentralization in Transition Economies: A Tragedy of the Commons?¹

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Abstract

China began its gradual economic reform in the late 1970s; Russia initiated radical reform in the early 1990s. During the course of reform, China has enjoyed rapid growth while Russia has contracted. This paper argues that one reason for this difference in performance is that Chinese local governments enjoy more sharply defined rights of taxation than their counterparts in Russia. The argument is developed in the context of a model which also applies to developing economies. When rights of taxation are well defined, a local government has the exclusive right to tax enterprises located within its territory. Property rights over the tax base become fuzzier as the number of agencies which independently tax enterprises increases. The model has three possible outcomes. When the number of tax agencies, J , is low and rights of taxation are sharply defined, a unique high equilibrium in which all firms invest in growth-oriented activities tends to emerge. When J is sufficiently large and property rights are very fuzzy, a unique low equilibrium in which all firms choose "informal profit-seeking activities" which are convenient for tax evasion arises. When J is in an intermediate range, both the high and low equilibrium can exist and the probability of selecting the low equilibrium is increasing in J . Capital mobility tends to increase a firm's tax burden and generally increases the likelihood that a low equilibrium emerges. The model suggests that decentralization in China has encouraged local governments to effectively interfere with their enterprises, while decentralization in Russia has led to a tragedy of the commons in which many local governments are part of a predatory tax system. Differences in subnational governments' rights of taxation provides an explanation for the success of Russian regions which are on the "single-channel" tax system in attracting investment capital. The theory also presents an explanation of why privatization of commercial land is not a critical component of the Chinese reform.

1. Introduction

China initiated its economic reform in the late 1970s; Russia began a more radical reform program in the early 1990s. The difference in the performance of these two economies is striking. Since 1978, GNP per capita in China has grown at a remarkable annual average rate of 9.5 percent. However, according to one conservative estimate, real GDP in Russia fell by 37.8% between 1990 and 1995 (EIU, 1996, p.5). Investor confidence is also quite different. Between 1990 and 1994, gross and fixed investment in Russia in 1990 rubles fell by an astounding 53.8 and 59.3 percent (Gavrilenkov and Koen, 1995, table 5, p.112). Investment in China in 1990 prices has grown at a rate of 11.6 per annum between 1984-93 and has continued at an impressive rate of 12.7 and 10.5 percent in 1994 and 1995 (World Bank, 1996, p.5). The upper bound on estimated foreign direct investment in Russia is 5.3 billion dollars between 1989 and 1995 (EIU, 1996, p.39); foreign direct investment in China was about 37.7 billion dollars in 1995 (World Bank, 1996a, p.80). These investment figures are consistent with survey and anecdotal data on Russia and China: while new factories and major buildings are being developed in coastal cities and are penetrating the interior of China, even potentially profitable sectors in Russia such as crude oil production and transport are short on investment capital for renovation and expansion.

Recently, several scholars have argued that the emerging partnership between local governments and state and non-state enterprises is an important reason for China's remarkable growth performance. Walder (1995) argues that local governments in China operate as a "helping hand" in promoting economic activity for enterprises. Local governments provide important services such as obtaining credits, export and import licences and adjudicating informal business contracts. There is evidence that local governments have used their power both to tax and to provide essential business services in a way which enhances the efficiency of firms under their jurisdiction (see Chang and Wang (1994), Weitzman and Xu (1994), Li (1996), Chow (1997) and Li (1997)).

There is evidence, however, that many local and regional governments in Russia hinder the efficient operation of firms located in their territory. As regions in Russia have been given more freedom to set their own taxes, the number, unpredictability and overall burden of taxation has increased. In a recent paper, Frye and Shleifer (1997) show that there are exorbitant costs of operating a new business in Moscow. Using survey data, they find that it takes almost four times

longer to establish a business in Moscow than in Warsaw. New firms in Moscow are subject to significantly more inspections, pay significantly more fines and pay more bribes to multiple collectors and regulators than their counterparts in Warsaw. The excessive taxation and regulation of firms is one of the reasons for the fall in output and investment. Ickes et al. (1997) argue that at “a superficial level, tax rates appear reasonable. Yet, firms complain that the fiscal system imposes an unreasonable burden. Taxes are proliferating, particularly at lower levels of government... This excessive burden has driven an important part of the economy underground, lowering the tax base, creating pressure on the government to increase the tax rates”.

Why are some governments “helping hands” while other perform as “grabbing hands”? This paper argues that local governments will function as a “helping hand” when their rights of taxation are well defined and are “grabbing hands” when these rights are ill defined. In both China and Russia enterprises are the most important source of tax revenue and local and provincial (county) governments have, over time, acquired the right to tax firms on their territory. In China the process of fiscal decentralization has been slow and deliberate and local government property rights over the tax base tend to be well defined: the local government either has the exclusive right to set enterprise tax rates or, shares the enterprise tax base with just a few other tax agencies such as export or supply organs. Sharing rules between local, provincial and federal governments are well-defined and operational. However, in Russia, the process of fiscal decentralization has been rapid and chaotic and the emerging system of system of federalism is highly non-transparent and fluid (Wallich, 1994). Fragmentary survey evidence suggests that local governments, county (oblast) governments, the federal government and non-governmental agencies such as mafias compete in an uncoordinated fashion for the same tax base. Sharply defined claims to enterprise outputs and cash flows in China along with well-defined sharing rules between the different levels of government have aligned the interests of firms and local governments and have induced local governments to help their firms; the existence of uncoordinated overlapping claims to the same tax base in Russia have pitted local governments against sub-city, county and federal level governments and mafias.

The assignment of property rights over the tax base is related to the tragedy of the commons. When a government and many tax agencies can simultaneously tax a firm’s cash and/or output, the tax base is a common pool or open access resource and property rights are ill-defined. Any

independent tax agency that raises its tax rate increases its own income. However, such a rate increase imposes an external cost on the other agencies because it reduces both their tax base and collections. In a Nash equilibrium, each tax agency ignores this externality when choosing its tax policy. As the number of independent tax agencies increases, the negative impact of the externality is exacerbated and the overall tax rate increases. Thus, as a government's property rights become fuzzier, the overall tax rate increases and a particular government's tax policy becomes part of a predatory system which discourages investment and encourages tax evasion.

There are several papers which try to explain the behavior of local governments towards firms. Weitzman and Xu (1994) argue that many local governments in China tend to promote the efficiency of their TVEs because of their historical and culturally determined tendency to cooperate. Thus, greater impatience, expressed in a high discount rate over future returns, would explain why a local government is predatory. Shleifer and Vishny (1994) posit that politicians benefit from excess employment of labor within a firm even when this is unprofitable. In a scenario which is closest to our model, the managers of a corporatized firm have complete control rights. Nevertheless, the politician's ability to bribe firms and to obtain subsidies from the Treasury which are necessary to keep unprofitable firms in business results in excess employment. In both of these papers, the predatory nature of the government is built into government preferences and does not depend upon the institutional environment. However, in the case of Russia, there is evidence that with the advent of democratic local elections in 1990, many local politicians have become much more responsive to constituent interests.¹ This paper starts with the premise that a government strives to be a "helping hand" and analyzes institutional conditions under which it becomes a "grabbing hand".

Our paper is also related to recent work on tax competition within fiscal federations. Keen (1996) argues that in many fiscal federations there is *concurrent taxation* in which distinct levels of government have discretion in setting tax rates on essentially the same base. Keen notes that there is significant concurrency between the federal and subnational governments in Canada, Russia and the United States. In a model in which a federal and a subnational government simultaneously commit

¹See Hahn (1994). In contrast, Shleifer (1996) argues that since many local governments in Russia do not promote firm level efficiency and constituent welfare because they are dominated by elites from the old system who are uncertain about their future.

to a tax policy, he shows that the total tax rate is excessive from the standpoint of social welfare. We show that the overall tax rate is increasing and eventually chokes off investment in growth-oriented activities as the number of independent tax agencies increases. Keen and Kotsogiannis (1996) show that the equilibrium tax rate falls but, is still excessively high, when concurrency is combined with tax competition between many subnational governments over a mobile tax base. This result is important, since it is well known in the public finance literature that horizontal tax competition between subnational governments over mobile factors restrains tax rates set by subnational governments (Gordon (1983) and Wildasin (1989)). In our model, mobility does not restrain subnational governments. The reason for this is that our tax agencies operate in a primitive fiscal environment in which commitment to a tax policy is not possible. The upshot of this is that mobility exacerbates a firm's tax burden and makes it harder for any region to attract investment.

The rest of the paper is organized as follows. The next section briefly compares the process of decentralization in China and Russia. Section 3 develops a model a regional economy in which many independent tax agencies can regional enterprises. Section 4 solves the model. Section 5 incorporates capital mobility. Section 6 concludes with a discussion of some of the empirical implications of the analysis.

2. Decentralization: China and Russia Compared²

In China there was a decentralization of tax and spending policy during Mao's reforms in the 1950s. The process of decentralization took on a new direction with the implementation of reforms in 1978. This process of gradual reform appears well coordinated *ex post*. The reform transferred the administration of the vast majority of state enterprises to local governments. Most of these governments had jurisdiction over municipalities. This decentralization has also granted state enterprises autonomy in making output, pricing and, increasingly, investment decisions. Furthermore, enterprise managers and workers have effective incentives to maximize profits (see Groves, Hong,

²This survey in this section draws upon Groves, Hong, McMillan and Naughton (1994a, 1994b), Laffont (1995), Naughton (1994), Li (1997) and Qian and Weingast (1996) for China and Berkowitz and Mitchneck (1992), Morozov (1996), Stoner-Weiss (1997), Wallich (1994) and World Bank (1996b) for Russia. See Solnick (1996) for a comparison of China and Russia.

McMillan and Naughton (1994a, 1994b)). By the mid-1980s, there was significant entry of non-state industrial firms. The consensus among scholars of the Chinese economy is that these firms have always had a great deal of autonomy in their decision making and are highly profit oriented.

Parallel to these changes, China has also decentralized its fiscal structure and effectively transferred well defined rights of taxation to the local governments. The central government designs a unified tax structure which defines tax bases and tax rates that in principle should apply to all localities. The actual implementation of tax policy is left to the local governments, which can decide how much of each tax to collect: this effectively assigns local governments the right to set their own tax rates. Local governments often set an annual revenue quota for its tax bureaus, irrespective of the potential for revenue collection as stipulated in the current federally set tax law. As fiscal redistribution among regions in China is small, the source of local government revenue is locally collected taxes. In addition to collecting the profits and revenues generated in centrally administered state enterprises in strategic sectors such as energy and defense, the central government is also entitled to a share of the locally collected taxes. The sharing arrangement is negotiated between local and central governments and is often fixed for three to five years (Oi, 1993). Typically, the central government's marginal tax rate over the local tax base is low since most since it receives most of its revenues in the form of lump sum payments. Thus, local governments have an almost exclusive right to tax within its jurisdiction. Since the overwhelming share of local revenue comes from local taxes, local governments have an incentive to increase the value of its tax base.

Starting in the late 1980s, managers of state owned firms in the Former Soviet Union (FSU) gained more control over the operations in their enterprises. The reforms (perestroika) eventually destroyed the traditional system in which ministerial officials and party functionaries monitored state enterprises. As no new and effective regulatory institutions replaced the old institutions, a process of spontaneous privatization was unleashed in which enterprise managers seized their firm's assets. In order to mitigate the "grabbling" of state assets, the Russian Federal government in 1992 instituted a formal privatization program. Most of the shops and small businesses under jurisdiction of local or regional governments were privatized by the end of 1993. Sales of assets often included restrictions on layoff policies, pricing for goods sold to the poor and profile restrictions on future activities. Price controls and employment policies may place some limits on control rights. However,

as Barbereris et al. (1996) note that, "... profile restrictions rarely bind since shops can always devote a small fraction of floor space to the original business and sell whatever they want in the original space" (p.767) Many medium and large state owned enterprises have been sold since 1992 in the process of mass privatization. This process allowed many insiders who had already seized assets to legalize their defacto ownership rights.

Russian local and provincial governments's rights to tax enterprises on their territory are often ill-defined. During the disintegration of the Former Soviet Union and with the formation of the Russian Federation, a completely chaotic system of inter-budgetary relations emerged. Tax laws were ignored as federal and regional tax payments were determined spontaneously on the basis of political competition, conflicts and compromises between established federal and regional powers and elites. Many local governments became involved in battles with other provincial governments, mafias and the federal government for tax rights over the same enterprise. The Federal Parliament determines formal sharing rules which assigns each government level a specific share of a tax base. However, in practice, the sharing rates are determined on an ad hoc basis in which the different levels of government negotiate with the Federal government and each other. The formal rules set an upper bound on the tax rate which local and county governments can charge enterprises. However, many local and regional governments effectively exceed the maximum and transfer their additional revenues to "extra-budgetary funds". Extra-budgetary funds finance local and regional programs and are not included in the unified Russian budget. Local and regional governments which are obligated to pay a large share of their tax base to the federation typically shift collections to extra-budgetary funds.

Taxation of Russian enterprises is often complex and non-transparent. Enterprise managers complain about the complexities involved in paying taxes to many different government budgets. In 1994, regional and local governments "introduced more than one hundred different types of local taxes and fees". (Morozov, 1996, p.43) It is very difficult for firms to keep abreast with all of the changes in the local, regional and federal tax code, especially since many of the changes are put into force retroactively. Finally, besides paying taxes to different government organizations, many enterprises also pay krisha (protection money) to mafias.

This highly complex system has encouraged widespread evasion. In a survey of 1700 small companies conducted in 1994 throughout Russia, 33.1 percent reported that they concealed up to one

fourth of the transactions from tax authorities; 28.9 percent hid up to one half and, 18.4 hid all of their business (Morozov, 1996, p.45). In a detailed survey of fifteen manufacturing enterprises in two major cities, Hendley et al (1996) learned that from 1992 till 1996, barter as a share of total sales increased from 5 percent to 40 percent! General directors reported that barter, while an awkward method of conducting business, is a convenient way to evade tax obligations (pp.19-23).

In China and Russia the fiscal system is still primitive and governments can tax firms on a somewhat discretionary basis. In China a local government's property rights over its tax base are well-defined since it has either exclusive rights to determine that tax base and set rates or it competes with a small number of independent tax agencies. In Russia, a government's property rights may often be ill-defined and it often competes in an uncoordinated fashion with many other agencies to raise revenue from the same base. In the next section, we develop a model which analyzes the implications of these differences in property rights for the relationship between governments and their firms.

3. A Regional Economy with Immobile Capital³

We initially consider a one-period closed regional economy. There is a representative consumer, with a utility function defined over a unit interval of private goods, $x(q)$, which are indexed by q , and a public good, g :

$$u^c(x(q), g) = \int_0^1 \ln x(q) dq + \ln g \quad (1)$$

The public good, g , is supplied by $J \geq 1$ independent tax agencies: $g = \sum_j g_j : j = 1, \dots, J$. The public good represents social infrastructure such as, transport, a financial sector and a legal system.

A consumer's income is comprised of payments for labor services, L , which she supplies inelastically and her share of profits generated within the region. If the consumer's wage rate is normalized at unity and she owns all of the regionally generated profits, then aggregate expenditures on private goods equals income:

³This model in this section extends general equilibrium model developed by Murphy, Shleifer and Vishny (1989) to incorporate taxation and public goods.

$$\int_0^1 p(q)x(q) = y \equiv \pi^{agg} + L \quad (2)$$

where π^{agg} denotes aggregate profits and $p(q)$ is the consumer price of good q .

Production in each sector q is conducted with either one increasing returns to scale (IRS) technique or many parallel constant returns to scale techniques. Because employing the IRS technique requires fixed costs and only one firm per sector can use it, its output is completely visible to all the tax agencies. The CRS technique, however, is in the public domain; anybody can duplicate it and it requires no fixed costs. Thus, the tax agencies can observe only a share $\theta < 1$ of this output. The tax base is sales (output). Each tax agency sets a rate of t_j and the overall tax rate is $t = \sum_{j=1}^J t_j$.

The CRS technique converts a unit of labor into a unit of output. Free entry and exit imply that CRS firms are perfectly competitive and sell at a producer price equal to marginal cost of one and earn zero post-tax profits. Since the tax agencies observe a share $\theta < 1$ of sales, effective tax collections per unit sold is $t\theta$ and the consumer price is $p = \frac{1}{1 - t\theta}$.

The owner of firm with access to the IRS technique in a sector either invests $F > 0$ labor units and employs the IRS technique or chooses not to invest. We initially assume that investment capital is immobile and relax this assumption later on. If employed, the IRS technique converts a < 1 labor units into a unit of output. The consumer price is $\frac{1}{1 - t\theta}$ since the IRS firm would be under-cut by the CRS firms if it charged a higher price. Since demand for the private good is unitary elastic, the IRS firm would not want to set a price less than $\frac{1}{1 - t\theta}$. Because the IRS firm can not evade taxes, its producer price of $\frac{1 - t}{1 - t\theta}$ is lower than the producer price of a CRS firm. In equilibrium, the consumer price is the same for all private goods. Therefore, demand for each $x(q)$, is aggregate income divided by the consumer goods price: $x(q) = y(1 - t\theta)$. The IRS firm earns profits of

$$\pi = y(1 - t\theta)\left(\frac{1 - t}{1 - t\theta} - a\right) - F \quad (3)$$

When there are n IRS and $(1 - n)$ CRS sectors, overall tax collections are

$$T(n) = tny + t(1 - n)\theta y \equiv t[n + (1 - n)\theta]y \quad (4)$$

The CRS technique captures what Ickes et al. (1997) refer to as “informal profit-seeking activities”. Such activities are convenient for purposes of evading taxes and “... produce wealth for management, without generating official profits. These activities are characterized by short horizons, small scale and limited investment.” (p.2) The IRS technique, however, requires substantial investment (fixed costs) and can generate profits which are distributed throughout the economy. Furthermore, the IRS technique generates more tax revenue per unit labor than the CRS technique.

Each tax agency converts its tax collections into public goods according to the linear production function of $g_j = s_j t_j [n + (1 - n)\theta]y$. When s_j is close to zero, an agency an inefficient supplier of public goods. For example, a mafia which receives krisha (bribes) from a firm for protection makes only a very small contribution to social infrastructure. However, a local government which uses the tax revenue to improve the local transport, local banking and the court system makes a much larger contribution. We assume, for simplicity, that $s_j = s$ and all agencies have the same production function.

Tax collections which finance social infrastructure drive down production costs. In the Former Soviet Union and in China, an underground economy always operated even when the government tried to exclude this sector from the benefits of this social infrastructure. Private farmers operating in city markets thrived even when denied access to the transport and banking system. Private construction thrived in a disorderly system in which builders were forced to bribe officials in order to conduct business. While the underground firms have operated even thrived even when denied access to key public goods, new and larger scale businesses with substantial fixed costs depend on a modern banking, transport and legal system. For these reasons, we assume that the benefits of social infrastructure spillover only to the IRS techniques:

$$F = F_0 - sT \quad (5)$$

where

$$1 - a > s \quad (\text{A1})$$

Assumption (A1) says that that the net output of one unit of labor in an IRS technique exceeds the reduction in fixed costs from allocating a unit of labor to public goods. Assumption (A1) implies that private production is more productive than public production on the margin. The IRS technique is also assumed to be profitable in the absence of taxation:

$$1 - a > F_0/L \quad (\text{A2})$$

Combining Eqs (3) and (4), aggregate profits when n firms employ the IRS technique are

$$\pi^{agg}(n) = n[y(1 - a - t(1 - \theta a)) - F_0 + sT] \quad (6)$$

Substituting in eqs (4) and (5) into (6), aggregate profits are

$$\pi^{agg}(n) = n[(y(1 - a - t(1 - \theta a - s(n + (1 - n)\theta))) - F_0] \quad (7)$$

Finally, inserting eq (7) into (2), the reduced form expression for aggregate income is

$$y(n) = \frac{L - nF_0}{D}, \quad (8)$$

where:

$$D = 1 - n[1 - a - t(1 - \theta a - s(n + (1 - n)\theta))]$$

It can be verified that $D \geq a$. By inspection of eq (8), $1/D$ is the income multiplier.

There is full information and taxation and resource allocation are determined in the following two stage game. In the first stage, each investor simultaneously decides whether or not to invest in

the IRS technique.⁴ Let n denote the number of sectors that employ the IRS technique at the end of first stage; the other $1 - n$ sectors use the CRS technique. In stage two, each tax agency observes n and each simultaneously chooses its tax rate. Once the J agencies set their taxes, production and consumption take place.

Since contracts and legal institutions are underdeveloped in transition economies, we assume that the local government and the tax agencies cannot commit to a tax policy. In Russia, published tax rates often have nothing to do with the actual tax that enterprises are charged. In many cases, such as the oil transit industry in Russia, transit rates charged by the federal pipeline agency, the customs agency and the different regions through which the oil flows, are not even published. Legislated sharing arrangement between different levels of government are often ignored.⁵ In China, while the federal government publishes local tax rates, in practice local governments exercise discretion in taxing their enterprises.

In transition economies, decentralization of power has forced local governments to become more receptive to their constituents. When the standard of living have fallen in Chinese cities, local governments have had to contain street demonstrations. Local governments in Russia in an effort to get re-elected have taken measures to support the local standard of living. Local governments are also under more pressure to raise own revenues. In order to capture this situation, it is assumed that a local government trades off social order and own tax revenues.⁶ Let $T_j = t_j T(n, t_j + t_{-j})$ denote agency j 's taxes, let $x^{\min}(n)$ denote the minimum level of per capita consumption, and let

⁴In a more general model, each investor chooses a probability of $p_i \in [0,1]$ of entering. At the end of stage one, $n = \int_0^1 p_i di$ sectors employ the IRS technique. This formulation adds no insight and we therefore, employ the simpler choice of $p_i = 0$ or 1 .

⁵Roland and Verdier (1994) argue that governments often cannot commit to a privatization policy. Because new political institutions in transition economies are fragile, a government which commits to a suboptimal privatization policy is in danger of being toppled from power by some coalition which proposes a Pareto-superior policy of renationalization.

⁶The results in this paper can be generated with alternative objective functions such as the weighted sum of industry profits and own tax revenues or the weighted sum of consumer welfare and own tax revenues. Clearly, some agencies such as mafias and perhaps, the county and federal government organs, may have a lower weight on the constituency welfare component than the local government.

$\Omega = x(n, t_j + t_{-j}) - x^{\min}(n)$ denote the distance between realized and minimum per capita consumption. Hence, Ω is an index of social order. Since consumption is decreasing in the tax rate, then x^{\min} is obtained when the tax rate is unity:

$$x^{\min}(n) = x(n, t = 1) = \frac{(L - nF_0) * (1 - \theta)}{D(n, t = 1)} \quad (9)$$

As long as some sectors employ the CRS technique, there is tax evasion and positive consumption when $t = 1$. Each agency simultaneously chooses a tax rate t_j to maximize its own utility of

$$U_j = \ln T_j(n, t_j + t_{-j}) + \ln \Omega(n, t_j + t_{-j}), \text{ where} \quad (10)$$

all tax agencies have the same preferences and the same production functions for converting their collections into the public good.⁷ According to this specification, each agency always wants some positive level of social order since its utility becomes arbitrarily low as $\Omega \rightarrow 0$.

Consumption, $x(q)$ is a private good for the citizens in the economy. However, social order is increasing in private consumption. Since all collection agencies benefit from social order and there are no congestion effects from increasing the number of collection agencies, private consumption, $x(q)$, is a public good for each tax collection agency.

4. Taxation and Property Rights

In order to study the impact of the number of taxing agencies, J , on economic performance, we first characterize the second stage equilibrium. In the second stage all J agencies take n as given and simultaneously choose t_j to maximize their utility. It can be verified that each tax collection agency's utility function is quasi-concave. Furthermore, the equilibrium can be characterized by a set of real-valued reaction functions:

⁷If there is enough dispersion in this preference parameter, then tax collection agencies with relatively high preferences for order will charge no taxes. Otherwise, asymmetry of preferences has no substantial impact on our analysis.

$$t_j = \varphi_j(t_{-j}, n): j = 1, \dots, J. \quad (11)$$

Eq (11) represents a tax collection agency's optimal tax policy. An increase in t_j lowers aggregate income which lowers the tax base and aggregate consumption. This depresses the marginal benefit of taxation and raises the marginal costs of lower social order. This implies that, under fairly general conditions, that t_j is decreasing in t_{-j} .

Symmetry of preferences implies that $t_j = (t_{-j}, n)/(J - 1) \forall J \geq 2$. Therefore, if a symmetric Nash equilibrium exists, each tax rate is $t_j^* = \varphi_j((J - 1)t_j^*, n)$ and the overall tax rate is $t^* = J t_j^*$. Proposition 1 characterizes the symmetric Nash equilibrium.⁸

Proposition 1. Given assumptions (A1) and (A2), there exists a unique symmetric Nash equilibrium in the second stage with a tax rate of $t^*(J, n) = J t_j^* \in (0, 1)$. The equilibrium tax rate is bounded:

1. $t^*(J, n) < t^*(J, 0) = J/(1 + J) \forall n > 0$ and $\forall J \geq 1$;
2. $(J - 2)/(J - 1) < t^*(J, n) \forall n \geq 0$ and $\forall J \geq 2$;

The next Proposition analyzes the impact of an increase in the number of taxing agencies, J , on the second stage symmetric Nash equilibrium.

Proposition 2. In the second stage symmetric Nash equilibrium, as J increases,

- 1 the overall tax rate increases $\{ \partial t^*/\partial J > 0 \}$;
- 2 aggregate income falls $\{ \partial y/\partial J < 0 \}$;
3. consumption falls $\{ \partial x/\partial J < 0 \}$;
4. social order deteriorates $\{ \partial \Omega/\partial J < 0 \}$;
5. industry profits decline $\{ \partial \pi^{agg}/\partial J < 0 \}$.

When tax policy is uncoordinated, each agency's policy imposes an externality on all other

⁸The formal proofs for these, and all other results in this paper, can be found in the Appendix. We will provide informal sketches in the text as necessary.

agencies. A higher t_j raises the overall tax rate which lowers aggregate income. This has two effects. First, it lowers the tax base, which lowers collections for all other agencies. Second, it lowers consumption, which depresses social order. If tax policy was coordinated by a supra-government which maximizes the equally weighted utility of all the agencies, then each agency obtains an equal share of the monopoly government's tax rate: $t^{**}(J,n) = t^*(1,n)/J$. As J increases each agency cuts its tax rate so that the overall tax rate, overall tax collections and social order remain constant.

When tax policy is uncoordinated, each tax agency realizes that its potential contribution to social order becomes less important as the number of agencies increases.⁹ This implies that the overall tax rate increases, while aggregate income, consumption, profits and social order falls as J expands. Thus, the entry of independent tax agencies leads to a tragedy of the commons.

The next Proposition analyzes the impact of an increase in the number of IRS sectors, n , on the second stage symmetric Nash equilibrium.

Proposition 3. In the second stage symmetric Nash equilibrium, as n increases,

1. each agency's tax rate and the overall tax rate falls $\{\partial t_j^*/\partial n < 0, \partial t^*/\partial n < 0\}$;
- Furthermore, if $\pi(n, t^*(J, n)) \geq 0$, then
2. output increases $\{\partial y^*/\partial n > 0\}$, and
 3. individual profits increase $\{d\pi/dn > 0\}$.

Figure 1 illustrates the results of Proposition 3. Segment AB illustrates a high productivity IRS technique in which investment is profitable even when $n = 0$. Segment EF illustrates a low productivity IRS technique in which investment is never profitable. Segment CD illustrates an IRS technique with an intermediate level of productivity. If many other enterprises in the economy invest: $n \geq m^*$, output will be sufficiently high and taxes sufficiently low to make investment profitable. In this case, all firms invest. For any $n < m^*$, output will be low and tax rates high and the enterprise will choose not to invest. In this case, no firm invests.

We now turn now to the first stage of the game. Rationally anticipating the overall tax rate

⁹ When $J = 1, 2$ or 3 an agency may increase or decrease its own rate. However, $\forall J \geq 4$, the own tax rate is decreasing in J .

in stage two, an investor chooses whether or not to enter taking n , the number of sectors she expects to employ IRS techniques, as given. In an equilibrium in which all sectors invest in an IRS technique, each sector at least breaks even:

$$\pi(n = 1, t^*(J, 1)) = \frac{L(1 - a - t^*(J, 1)(1 - a\theta - s) - F_0}{a + t^*(J, 1)(1 - a\theta - s\theta)} \geq 0 \quad (12)$$

Therefore, if $t^*(J, 1) \leq t_H = (1 - a - [F_0/L]) / (1 - a\theta - s)$, a *high equilibrium* ($n = 1$) can be sustained as a Nash equilibrium. In figure 1, a high equilibrium exists at $n = 1$ on segments AB and CD.

When there is no investment ($n = 0$), any sector which unilaterally invests suffers losses:

$$\pi(n = 0, t^*(J, 0)) = (1 - a - t^*(J, 0)(1 - a\theta - s\theta)L - F_0 < 0 \quad (13)$$

Therefore, if $t^*(J, 0) \geq t_L = (1 - a - [F_0/L]) / (1 - a\theta - s\theta)$, a *low equilibrium* ($n = 0$) can be sustained as a Nash equilibrium. In figure 1, a low equilibrium exists at $n = 0$ on segments CD and EF. It follows that in the first stage a high and/or a low equilibrium always exists.

The next Proposition describes the relationship between J and the equilibrium regimes.

Proposition 4. There exist critical values, J_L and J_H , which are real and unique solutions to:

$$t^*(J_L, 0) = t_L; \quad t^*(J_H, 1) = t_H, \text{ where}$$

$$J_L = \frac{1 - a - F_0/L}{a(1 - (\theta + s)) + F_0/L},$$

$$J_H > \max[J_L, 0]:$$

1. there exists a unique high equilibrium when $1 \leq J \leq J_L$;
2. there exists a unique low equilibrium when $J_H \leq J$;
3. there exist multiple equilibria, i.e., both the high and low equilibrium can be sustained when $J_H > 1$ and $J_L < J < J_H$.

Figure 2 illustrates the results of Proposition 4. Tax rates are on the vertical axis and the number of tax agencies, J , is on the horizontal axis. The parameters are $a = .4$, $s = .3$, $F_0/L = .3$ and $\theta = .8$. It follows from Propositions 2 and 3 that $t^*(J, 0) > t^*(J, 1) \forall J$ and both tax rates are increasing J . In this example $t^*(J_L, 0) = t_L = 53.4\%$ at $J_L \approx 1.15$ and $t^*(J, 1) = t_H = 78.9\%$ at $J_H \approx 4.6$. Therefore, the high equilibrium is unique when $J = 1$; either the high or low equilibrium can be sustained when $J = 2, 3, 4$; the low equilibrium is unique for all $J = 5, 6, \dots$. The next Proposition analyzes the impact of property rights on equilibrium selection when there are multiple equilibria.

Proposition 5. If the economy is capable of sustaining a high and a low equilibrium, then there exists a unique critical mass of sectors investing in the IRS technique, $m^* \in (0, 1)$:

$$\frac{\partial m^* / \partial J}{dm^*} = -\frac{\partial \pi^* / \partial t^* \cdot \partial t^* / \partial J}{d\pi^* / dm^*} > 0$$

Sketch of Proof

If a high and a low equilibrium can both exist, then $\pi(0, t^*(0, J)) < 0$, $\pi(1, t^*(1, J)) > 0$ and, by Proposition 3, $d\pi(n, t^*(n, J))/dn > 0 \forall \pi(n, t^*(n, J)) \geq 0$. Therefore, there is a unique m^* : $\pi(m^*, t(m^*, J)) = 0$. Differentiating w.r.t. J , then $d\pi(m^*, t^*(m^*, J))/dJ = (\partial \pi / \partial t^*) (\partial t^* / \partial J) < 0$, since $\partial \pi / \partial t^* < 0$ and $\partial t^* / \partial J > 0$. Therefore, by the implicit function theorem, $\partial m^* / \partial J > 0$.

When there are multiple equilibria, the critical mass, m^* , represents the probability that the low equilibrium is selected. As shown in figure 2, when $n \geq m^*$ sectors invest, then the rest of the IRS firms will invest and earn positive profits. However, for any $n < m^*$, profits are negative and no IRS firm will invest. When multiple equilibria exist, aggregate income, consumption and the provision of public goods are all greatest in the high equilibrium. Thus, the probability that the Pareto inferior equilibrium is selected is increasing in the number of tax agencies.

5. Capital Mobility

In the public finance literature, capital mobility restrains the tendency of one government to tax firms under its jurisdiction (Gordon (1983); Wildasin (1989)). A government which sets high

taxes in the absence of mobility will lower its tax rate in order to keep mobile investment in the region. Keen and Kotsogiannis (1996) show that an increase in the number of subnational governments which compete over mobile capital will lower the excessively high tax rates set by two governments which concurrently tax the same subnational tax base. In all of these papers, governments commit to a tax policy. However, in transition economies legal and fiscal institutions are underdeveloped and governments often cannot commit. In this section we will show that in the absence of commitment, mobility has no restraining effect on taxation. In contrast, mobility aggravates the tax burden which each firm faces and tends to push the regional economy to a low equilibrium.

Any firm that is mobile can earn a profit of $\pi^* > 0$ net of moving costs in another region. Thus, π^* is the profit hurdle that any mobile firm must at least achieve in order to stay within the region. We assume that all IRS sectors are mobile. Allowing only a share of firms to be mobile would have no substantial impact on our results. Once a mobile firm invests in the region, its fixed costs are sunk. Because the J tax agencies do not commit, they ignore these sunk costs when setting tax rates. The next Proposition characterizes the impact mobility on the second stage equilibrium.

Proposition 6. In the second stage symmetric Nash equilibrium, the tax rate is independent of the profit hurdle:

$$t^*(J, n, \pi^*) = t^*(J, n)$$

Figure 3 illustrates the impact of mobility on the emergence of a high or low equilibrium. When capital is immobile, the profit hurdle is zero. The high equilibrium is unique on segment AB; both the high and low equilibrium can be sustained on segment CD; the low equilibrium is unique on segment EF. Fixing J , these segments shift up as the level of IRS technology increases because of a fall in variable or fixed costs. However, fixing technology, the segments shift down as J increases.

Suppose that both the high and low equilibrium can be sustained when capital is immobile (segment CD). In this case, any IRS sector will invest when the number of IRS sectors is no less than the critical mass, m^* . However, when capital is mobile, investors who stay in the region must clear the profit hurdle $\pi^* = \pi^L$ on segment π^L π^L . The hurdle is cleared if and only if the number of

IRS firms is at least $m^L > m^*$. Therefore, mobility raises the critical mass from m^* to m^L and increases the probability that the low equilibrium is selected.

Suppose that the high equilibrium is unique when capital is immobile (segment AB). Mobility has no impact on the high equilibrium when the profit hurdle is π^L . However, a sufficiently high profit hurdle of π^h (segment $\pi^h \pi^h$) intersects segment AB at m^h . Therefore, if a unique high equilibrium emerges when capital was immobile, then there exist multiple equilibria when capital is mobile and the return on investment outside the region is sufficiently high.

Finally, suppose that the low equilibrium is unique when capital is immobile (segment EF). In this case, there is no investment since the internal profit hurdle of zero cannot be cleared. Since capital mobility introduces a higher hurdle, it has no impact on the equilibrium.

This model clearly predicts that mobility can depress regional welfare but makes no predictions about its impact on national welfare.¹⁰ There are two implications. First, because the regional governments and agencies do not commit to a tax policy, mobility has no *direct impact* on tax policy, since the sunk costs of investment are observed before rates are set. The indirect impact, however, is very significant since mobility can significantly increase the probability that a low equilibrium is selected with high or even certain probability. Second, since mobility can reduce regional welfare, regional governments have strong incentives to erect barriers to stop the outflow of investment capital. Such barriers have been observed during the reforms in China and Russia where financial market liberalization, the easing of trade restrictions and the breakdown of planning has allowed capital to become more mobile.

5. Conclusions

We have argued that ill-defined property rights over the tax base force local governments which strive to be “helping hands” to become part of a predatory tax system. There are two reasons for this. First, when there are many tax agencies, each agency ignores the external costs of its tax policy on the other agencies. As the number of agencies grows, the negative impact of this externality

¹⁰This is a second-best result. The economy has many distortions, including imperfect competition, complementarities and agencies which do not maximize social welfare. Removing the distortion of capital immobility can, by the theory of the second-best, depress welfare.

is exacerbated and the overall tax rate increases to a rate which eventually discourages investment and encourages tax evasion. Second, when investment capital is mobile and agencies cannot commit to tax policy, it becomes more difficult to push the economy towards an equilibrium with investment in growth-enhancing activities. An increase in the number of tax agencies coupled with mobility increases the probability that an equilibrium with no investment and massive tax evasion emerges. The analysis suggests that measures taken by the Chinese to carefully define a local government's property rights have allowed these governments to act as helping hands. The Russian experience suggests that a rapid price liberalization and a rapid privatization of firms is problematic when local governments must fighting with other agencies for revenues from essentially the same tax base to finance projects.

One prediction of this model is that the regions in Russia which negotiated tax autonomy should be attracting investment. Under the single channel tax system, the ethnic and autonomous regions of Tatarstan, Bashkortostan and Sakha (Yakutia) obtained the power to choose tax bases and to set tax rates. In contrast to most oblasts (county governments), regional officials, rather than workers on the federal payroll, collect taxes and send a share of their collections to Moscow. The specific share is negotiated annually. The federal government has limited opportunity for direct control of these regions since, as of January 1995, these regions had the lowest share of federal property in all of Russia (Bylov, editor, 1997, Volume 1, chapter 8).¹¹ In an index comparing aggregate investment attractiveness of Russia regions, Tatarstan, Bashkortostan and Sakha (Yakutia) were placed in the highest category (Bylov, editor, 1997, Volume 2, chapter 5). While these regions lack the financial infrastructure and convenient location of Moscow city and Moscow oblast, which are among the most attractive regions for investment, these regions are mineral rich and their governments have well-defined rights of taxation. Thus, these government have the ability to set taxes in a way which attracts investors.

The issue of control over a firm's premises sharply captures contrasting views of local

¹¹Formally, the federal government still chooses the tax bases and the the tax rates. However, de facto, the agreements are not enforced and these three regions post-hoc can reset tax bases and rates through idiosyncratic implementation. We thank Professor Steven Solnick for raising this point.

governments in Russia and China. A rapid privatization of urban land and real estate is considered to be essential for reform in Russia because governments are predatory and use their position to extract tax/bribe revenue from their lessees (see Harding (1995)). Local governments in China also lease the land and many of the buildings which their firms use. Yet, there has been a great deal of investment and restructuring of firms under local jurisdiction and tax evasion is not as problematic as in Russia. Our theory suggests that the problem in Russia is that local governments have too little power to collect revenues and, therefore, privatization, *in the absence of measures to establish local rights of taxation*, will not necessarily enhance the efficiency with which local real estate and commercial property is utilized.

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Figure 1
Firm-level profits

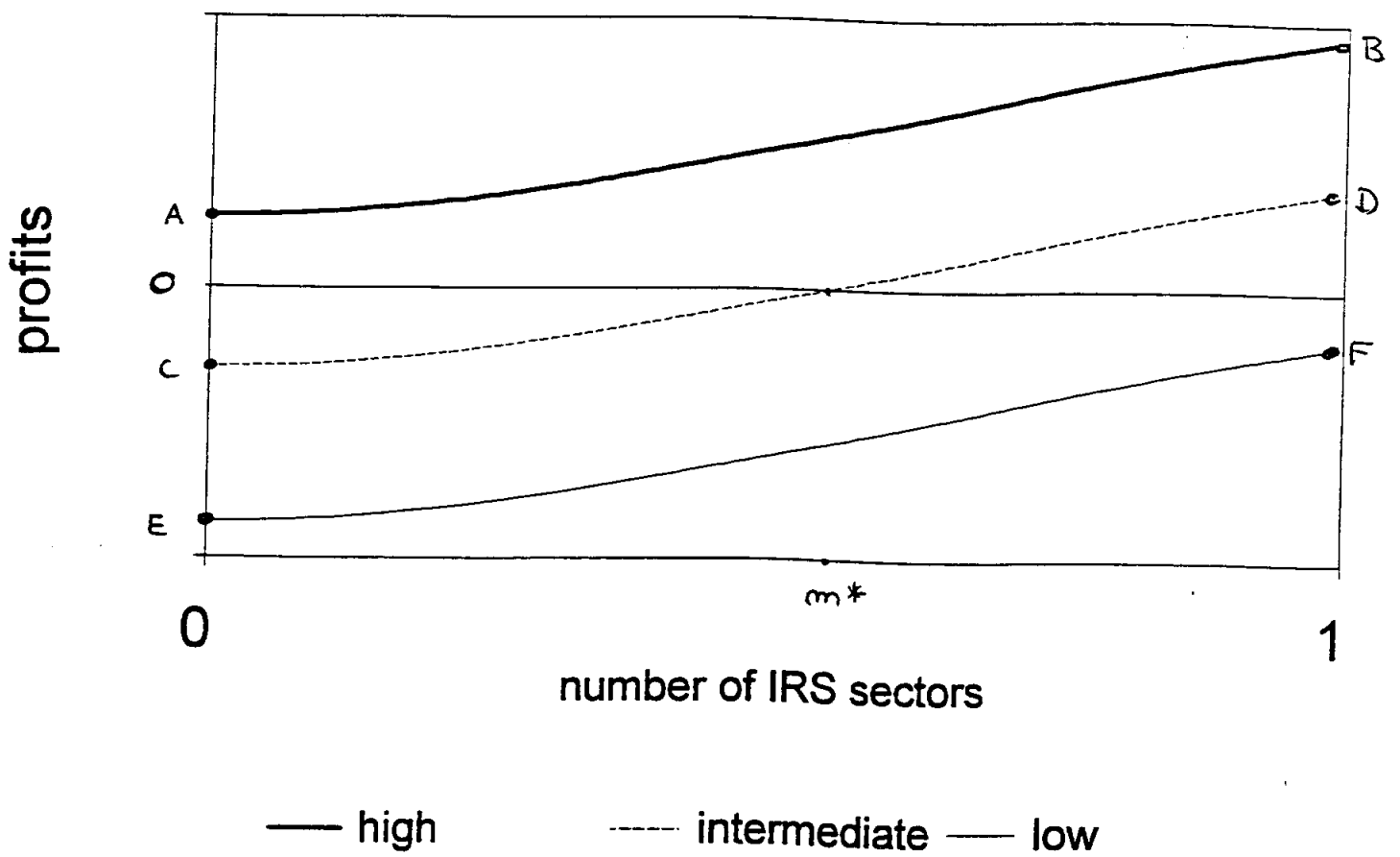


Figure 2: Optimal taxation

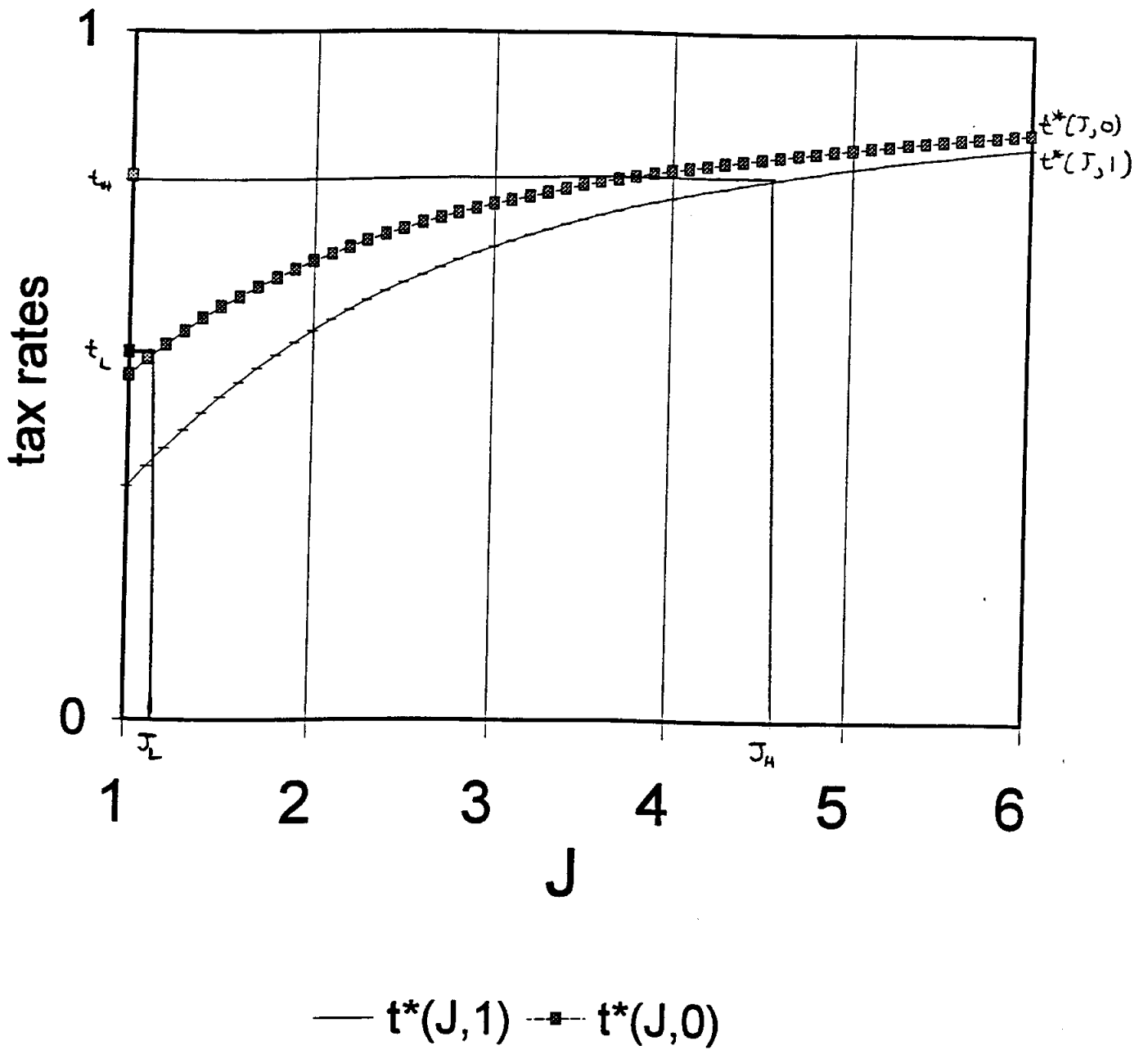


Figure 3

Capital mobility

