Tolling Arrangements in the Russian Industries: An Institutional Perspective[*]

Svetlana Avdasheva

Institute for Industrial and Market Studies, State University – Higher School of Economics, Moscow, Russia

Abstract

This paper presents an overview of a specific type of arrangement for input supply widely applied in the Russian and Ukrainian industries. Over the last five years the arrangement, known as *tolling contract*, has been accounting for a large and stable share of the total volume of several homogenous industrial outputs. I will hereby examine the contract as a way of reallocation, in the short-run, of property rights to enterprises having refining capacities. Tolling can also be considered as a tool of vertical integration. It enables the supplier of input to neutralize "double marginalization" in a vertical chain and therefore

increases both the profit of supplier and social welfare. Usage of tolling does not provide a "vertical profit" in the sense of Mathewson and Winter, however, control over input supply helps a new company to reduce sunk costs, making the acquisition of refining capacities unnecessary. Evidence from the Russian food-processing industry supports the view that tolling is a mean of entering the market by new firms, and at the same time of restructuring refining enterprises.

KEYWORDS: tolling contracts, transition, Russian industries, disorganization, restructuring, ownership rights, vertical integration

JEL classification L22, L42, M130, P31

Introduction

Tolling contracts (or "daval'chestvo" in Russian) are extensively used in Russia as a form of supply of raw materials to be processed at refining enterprises. Under the arrangement, suppliers provide a refinery with inputs (raw materials), pay a tolling fee, and take back the resulting product. The refinery receives the tolling fee (i.e. payment for the "refinery services") in the form of a share of the final product or, alternatively, of the raw materials. From the legal point of view, the supplier of input remains the owner of the final product while part of it is transferred to the refinery (the processor). Typically, a tolling contract envisages one cycle of refinement only (exception is made when the input supplier belongs to the same holding companies as the refinery enterprise). However, its exact scope might be defined by a long-term cooperation agreement between the supplier and the processor. Both independent from the legal point of view, firms that belong to the same holding company or business group can participate in tolling arrangements. The latter is the case for oil refining in Russia, the oil supplier often being the parent company. However, below I will focus mostly on the case of input provision by (formally) independent suppliers.

To draw a historical parallel, tolling contracts are quite similar to those used by local producers of wool and textiles in the early stages of industrial development. The Russian word "daval'chestvo" went out of use as far back as the middle of the XIX century and just 10 years ago was remembered by a few people.

Tolling arrangement was intensively developed in the early 90's alongside such forms of in kind payments as, for instance, barter. By the middle of the 90's it

was in wide use across the Russian industries. Table 1 in the appendix shows the extent of tolling usage in certain important areas of industrial production. Although at the beginning of the transition period tolling was considered to be a short-lived phenomenon, it survived the recession years and has remained stable over the period of recovery.

One can find that tolling arrangements in the industries under review not only substitute partially buying the input and selling the output but prevail as a specific organizational form. Besides, over the last ten years, tolling arrangements have been widespread in the Russian non-ferrous metallurgy, especially in the production of primary aluminum.

Ukraine is the only former socialist country where tolling is as widely used in industrial transactions as in Russia. A long-term contract in an industrially developed nation can hardly be compared with a tolling agreement. The most significant difference between tolling and long-term contracting is the objective of the arrangement. The hybrid form of a contract covering supply of input by the buyer of refined product (for instance, in the agri-food sector) is not unknown in European and North-American countries. However, in these countries it is usually aimed to insure quality of the process and the product. Whereas, the list of products refined on the tolling basis demonstrates that such products are mostly homogenous and do not require extensive quality control of both input and output.

The most prominent attribute of a tolling arrangement is that the input supplier and the output owner are the same legal person. Thus, the supplier considers a possibility of signing the contract instead of selling input as a sort of "make-or-buy" decision. From this point of view, tolling is a specific form of vertical integration among other hybrid organizational forms. The objectives of this paper are to explain the origin of this contractual arrangement, to identify reasons for choosing it as a tool of coordination, and to assess the impact of such form of business relations on organization of industries and market efficiency.

To achieve these objectives it is important to concentrate on three areas modern literature. The first is the concept of disorganization at the moment of breaking-down the socialist centralized planning system. The *disorganization (see Blanchard and Kremer, 1997)* became the significant cause of output decline in transitional economies. *Konings and Paul* (1999) and many other authors focused on disorganization that influenced production with complex input. However, if the complexity of input structure strengthens the effects of

219

disorganization on output it does not cause it. Even in the markets of rather homogenous products characterized by the presence of numerous potential suppliers and potential buyers the impact of disorganization is significant. In exploring the disorganization concept, *Recanatini and Ryterman* (2001) interpret networks of directors and managers of the Russian enterprises as a device that can overcome disorganization on the market. The analysis I will offer below is slightly different one from that of Recanatini and Ryterman. It focuses on a specific institutional arrangement, which provides a relatively efficient coordination device independent from personal links and personal reputation, while the Recanatini and Ryterman research is focused on personal trust.

Underdeveloped financial and commodity market infrastructure, asymmetric information and imperfect contractual enforcement system increase cost of using market-oriented coordination thus making hierarchical coordination preferable. There are different types of such coordination. A lot of new organizational forms have emerged and remained stable during the first ten to fifteen years of transition. The two most important results of the *Stark* (1996, 1997) research are (a) the ways to coordinate restructuring in the former communist economies vary across diverse settings where transaction forms are chosen by economic agents; (b) these types of coordination can differ substantially from the blueprints widespread in the Western countries. In the framework of the Stark's concept, tolling can be interpreted as a sort of *recombinant property,* which is outlined by *Stark* as a specific phenomenon of transitional economies. Like any other type of recombinant property, a tolling arrangement results in a non-coincidence of formal and actual boundaries of the firm. Partners in a tolling arrangement could be considered as forming a network that Stark considers as an efficient organization of industry in transition. Many authors found specific types of institutional arrangements in transition economies that have no apparent analogues in the developed markets. *Gow and Swinnen* (2001) proved that types of contracting out used in agricultural production in transition economies are very similar by the origin and by the impact on markets to the tolling reviewed in this paper. However, in contrast to Stark who considered diversity of organizational forms as natural, I will try, in this paper, to explain why of all the different forms of contracting available in the existing institutional setting economic agents prefer tolling arrangements.

Since tolling implies in kind payments for refinery services, have to be mentioned papers devoted to the use of barter inside the networks in transition economies and the impact of barter on the efficiency and performance of

producers (for instance, Commander and Mummsen, 1999). In this context, barter deals are considered as a tool for reducing transaction costs associated with product exchanges, otherwise very high.

Finally, there is a wide range of literature on vertical integration and vertical restraints to be accounted for. The discussion on the impact of vertical integration on the efficiency of resources allocation was induced by a pioneer work by *Spengler* (1950). Under imperfect competition the choice of downstream firm on price, quantity and other decision variables differs substantially from that maximizing the profit of vertical chain as a whole. *Williamson* (1971) argues that a vertically integrated marketing channel can overcome this problem since "integration harmonizes interests". *Mathweson and Winter* (1984) demonstrate that vertical restraints without tight vertical integration of distribution channels could overcome the vertical externalities and therefore improve both profit of an upstream/downstream agent and the total surplus. Since tolling means "making" instead of "buying", its impact on market efficiency and surplus of market participants could be analyzed using the same approach. The implications of this analysis are presented below.

After this introductory section the paper is divided into 4 other sections. Section 2 outlines reasons and evidence of reallocation of property rights between agents participating in tolling contracts. Tolling contracts are assessed in the framework of the process of restructuring under transition. Section 3 presents a model that explains the impact tolling produces on market efficiency and distribution of profit between the supplier and the refining firm. The objective is to answer the question why economic agents prefer tolling to market exchange between independent firms. The model developed here is designed to determine whether tolling can help generate an excess profit comparable to that provided by market deals between fully independent firms. The neutralization of negative vertical externalities is considered as a source of excess profit. In this context, tolling is explained as insufficient vertical restraint. Section 4 contains results of a statistical analysis aimed to highlight the role of tolling in the dynamics of the Russian industries. The main objective of this section is to explain why economic agents prefer tolling arrangements to full integration when vertical integration provides excess profit. Section 5 draws conclusions.

Tolling contracts, reallocation of property rights, and restructuring of Russian enterprises

Supply of input under tolling arrangements is a very interesting example of the influence of inter-firm contracts on real boundaries of firms. Supposing an

enterprise that refines raw materials supplied under tolling contracts over years (Table 1 in the appendix shows that it is not a rare case in Russia). Since key decisions on what to produce and who to sell to (at least about the largest share of the final product), are made outside the enterprise, it cannot be considered as a firm.

Tolling effectively prevents formally independent firms from using the market signals to coordinate their activities. For instance, there are reasons to suppose that this enterprise will not increase output if the market price of the final product rises. First, it sells only part of the final product (estimations show that this share is about 20 - 50% across the sectors). Second, it cannot buy enough input to increase output.

The last statement requires additional comments. Why is it possible to say that a refining enterprise is locked inside the tolling? The answer is connected to the so-called "deficit of working capital problem" which is faced by most of the Russian enterprises. In the absence of a short-term credit system (both commodity and banking ones), an enterprise has to use earnings of the previous period as the only source of its working capital. (*In the early stage of transition, accompanied by hyperinflation, it caused an extensive use of barter that remained a huge problem for years.*) Proposition: In the early stage of transition, hyperinflation caused an extensive use of barter that remained a huge problem for years. The hard constraints on the amount of working capital is probably one of the most important obstacles for enterprises to increase the quantity produced, introduce new types of products, and switch from exclusively refining to market activities. That is why many Russian entrepreneurs characterize tolling as "lop-sided stable": in the presence of excess capacities in the industry a supplier can relatively easily switch from one refinery to another, but a refinery cannot easily switch from tolling to buying the input and selling the output on its own.

Therefore, under tolling, an enterprise has a very limited access both to the resource market and to the final goods market. On the other hand, tolling means that a supplier of raw materials acquires certain property rights in the company providing refinery capacities, since it is empowered to make decisions on the quantity and quality of output, and the choice of the consumers to whom the final goods are to be sold.

Interestingly, Russian entrepreneurs treat stable tolling contracts exactly in the same way. Very often a potential investor backs out of the transaction since the enterprise is obliged to continue refining the tolling input under the long-term

222

contracts, by force or under a specific decision by regulatory authorities. One of the latest (spring 2001) examples was the abortive move by YUKOS to acquire a controlling interest in the Angarsk petrochemical company. YUKOS was planning the transaction over at least half a year and incurred big preliminary expenses but had to abandon it after the regional office of the Ministry of Anti-Monopoly Policy prevented termination of the tolling contract between the Angarsk company and a group of independent suppliers who had filed a complaint against the petrochemical company. YUKOS believed that the tolling arrangement would increase the costs of ownership rights acquisitions in the petrochemical company. Finally the acquisition was completed and now Yukos itself supplies the input to Angarsk petrochemical company.

The other examples demonstrate that tolling is a way of reducing the acquisition cost of ownership rights. Not long ago (spring 2001) the conglomerate leading by "MDM (Moscow Business World) bank" - tried to acquire the "Phosphorite" company (one of the biggest producers of chemical fertilizers in Russia). MDM managed to take under its control the supply of raw materials and, as first step, forced the enterprise to switch from buying input and selling output to an exclusive tolling arrangement. This shows that from the parent company's point of view such form of supply of raw materials was a way to obtain better control over the assets of the subsidiary and to secure ownership rights.

Another example of protection of ownership rights in the subsidiaries is the policy of "SIBUR" (Sibirian-Urals petrochemical company). This company affiliated with "GAZPROM", in the second half of 1990s, became the influential shareholder of many Russian petrochemical enterprises and introduced tolling arrangements of input supply for most of them. Finally, almost all Russian oil companies use tolling contracts to supply oil for refining. This fact provides additional support to the statement that tolling is an important tool both to redistribute and to protect property rights.

Many authors argue that the main reason for the use of tolling arrangements is connected to tax evasion. This is possible in Russia due to very weak tax collection administrations and tax control of newly established enterprises. Tax authorities try to force industrial enterprises to pay taxes they are due. But, at the same time, both federal and regional tax authorities can hardly control tax collection from most part of new-established intermediary firms. This can be an additional incentive to use tolling contracts where new-established intermediary firm is the supplier of input. But it is necessary to note that the possibility of tax evasion arises in all the deals with new-established (sometimes they are called

223

"one-day") companies. Tolling is not the only type of contract that allows a decrease in tax pay. That is why I think that we need an alternative explanation for the usage of tolling, in connection with restructuring of enterprise and reallocation of property rights.

The first question to arise is how to estimate the effect tolling produces on reallocation of property rights in the frameworks of transformation of Russian firms and industries.

Reallocation of property rights (both formal and informal) in Russia is related to the need to restructure enterprises. The restructuring itself is probably the most paradoxical part of the evidence of transition. On the one hand, it has been mentioned repeatedly that on the enterprise level there is little evidence that the Russian enterprises have restructured their production and marketing activities, or their management and corporate governance. On the other hand, on the level of certain markets many *de novo* firms provide products and services in the manner corresponding to a relatively developed market system. At the same time, a major part of the Russian enterprises work at a loss while supplying many Russian products to domestic and foreign markets is a very profitable business.

The explanation of these and many other paradoxes of Russia and other transition economies lies in the non-coincidence between the formal and the actual boundaries of the firm, as mentioned by Stark (1996, 1997).

At the beginning of the radical reforms in the Central and Eastern Europe and the FSU countries, restructuring was expected to be performed within the boundaries of enterprises established under socialism. This approach implies that enterprises in market and socialist economic systems are almost the same thing. Evidently, this is not so. Firm boundaries in a market economy are the result of rational choice *in a market environment*, while boundaries of an enterprise in a soviet-type economy are defined by a completely different reasoning. This explains why dramatic changes in the economic environment made it impossible for enterprises to survive and particularly to restructure within organizational forms inherited from the old system.

Some inefficiencies were connected with the inconsistent allocation of economic activities across enterprises, which provided significant incentives for restructuring. Over the 90-s, for a large part of the Russian enterprises investments in restructuring proved to be inefficient. Expected explicit and implicit costs of investment in restructuring exceeded the expected profit. The

224

reasons are extensively analyzed in literature. The most important among them are: predominant importance and inherent production inefficiency, limited access to market infrastructure, including access to information (see, for instance, McKinsey, 1999), and inefficiency of ownership rights allocation (Stiglitz, 1999).

Under these circumstances, restructuring in the Russian industries has to be initiated from outside of enterprises. In other words, new economic agents have to emerge, and in most cases they are different from the former enterprises and their owners or managers. Examples of restructuring Russian enterprises initiated from the outside are numerous. Recent mergers and acquisitions that have been widespread since 1998 provide a lot of evidence of a radical reorganization of enterprises through their inclusion into a wider economic entity. Mergers, acquisitions and tolling contracts could be viewed as different tools of achieving the same objective – reallocation of property rights in relation to company assets - and of choosing the most efficient way of using them.

There is evidence that enterprises in a transition economy enter the wider economic entities (that are commonly named as "networks") on the informal basis and function as their units. Networks provide a hybrid-type of coordination and correspondingly reallocate property rights in relation to the assets of the units forming a network. As a result networks but not enterprises constitute the borders of economic agents subject to restructuring in transition economies (Stark, 1996, 1997). In this context, tolling contracts could be treated as a specific way of creating networks – i.e. new firms. Making a comparison of networking and mergers in Russian industries is outside the scope of this paper. However, it is worth mentioning that the choice between one of the two ways of property rights reallocation depends on costs of on the enforcement of these rights. From this point of view, wide use of tolling or any other type of networking as a substitute for buying shares in the Russian enterprises is induced particularly by extremely high costs of formal ownership rights enforcement in the context of insider-dominated decision making inside typical Russian company.

It seems obvious that tolling contracts as an institution provide a supplier of input with substantial rights to use refinery assets, as it controls quantity and quality of output. Naturally, the question arises: does tolling actually make a difference as far as profits from provision of input and from selling raw materials to a refinery are concerned? In the next section I will demonstrate

225

that tolling promotes efficiency viewed as social welfare on the market of final goods.

Efficiency of a tolling contract as a tool of vertical integration

We will consider the model of the tolling impact on the outcome of vertical coordination. Under imperfect competition, due to neutralization of negative vertical externalities, vertical integration increases the sellers' profit as well as social welfare. Under separation of the participants in upstream and downstream markets accompanied by monopoly power on any of these markets a decision on quantity results in a decrease in profit relative to its amount under vertical integration (Spengler, 1950). In this context, vertical integration or vertical restrictions could be profit enhancing. It is possible to find the type of vertical restriction that will be sufficient, in the sense that it insures the same amount of profits and consumers' surplus in downstream markets as in vertical integration.

It seems reasonable to use the framework of market power in considering specific contract in the Russian industries. Russian markets are extremely segmented by region and by buyer types and therefore even producers with relatively low share in the overall volume of production can easily obtain market power. That is why it seems that the concept of seller (especially the seller of intermediate goods) being monopolist is applicable to the regular case of the Russian industrial market.

Consider then the Cournot oligopoly on downstream market and monopoly on the upstream market. There are n identical producers of final product. Inverse demand function is: $P = \theta - Q$, $Q = \sum_i q_i$, where q_i - quantity produced by i-th downstream producer, Q - quantity produced by the downstream industry; number of identical downstream producers is n). Downstream producer uses only two types of input: input A and input B. To produce one unit of output, one unit of input A and one unit of input B are needed. The inputs are used in a fixed proportion (I take Leontieff production function with constant return to scale). One upstream supplier, who is the monopolist on an upstream market, supplies A, under a tolling contract. Unit cost of production of input A is zero. Input B in this context means all inputs less input A. The unit cost of production of input B or, in this context, the cost of refining of unit of input A, equals c. The market of input B is perfectly competitive, so the market price is equal to cost. Terms of the tolling contract

are identical for each downstream firm in the market. These terms define the share of output (final product) to be retained by the downstream producers as in kind payments for processing services. Denote this part of final output α. The monopolist (upstream producer) chooses α and then the downstream producer chooses the quantity of the final product to be produced. So, $(1-\alpha)$ is the share of the final product, which belongs to the upstream producer. The overall quantity produced by downstream producers is then sold on the market.

Since the monopolist (upstream producer) is the first to make a decision it allows him to maximize profit through observing the future reaction of downstream producers. The constraint of profit maximization of upstream monopolist is $Q(\alpha) = \sum_{i=1}^{n} q_i(\alpha)$ - the dependence of quantity chosen by downstream producers on α. Since volume, price, and therefore profit of upstream supplier depends only on α, the monopolist chooses α in order to maximize it's profit.

Now we will compute the equilibrium. For the sake of simplicity, let us assume $\theta = 1$. Then the profit of i-th downstream producer is: $\pi_i(q_i, \alpha) = aPq_i - cq_i$. Profit maximization of the downstream producer gives us his output as a function of α: $q_i* = \dfrac{1 - \dfrac{c}{\alpha}}{n+1}$. The downstream market price is $P = \dfrac{1 + \dfrac{nc}{\alpha}}{n+1}$. Since the profit of the upstream firm is $\pi(\alpha) = (1-\alpha)P(\alpha)Q(\alpha)$ we obtain the optimal value of α. Sequential computation gives us

$$\alpha* = (c^2 n + (c^4 n^2 + b)^{\frac{1}{2}})^{\frac{1}{3}} + (c^2 n - (c^4 n^2 + b)^{\frac{1}{2}})^{\frac{1}{3}}$$

where:

$$b = \frac{c^3(n + cn - 1)^3}{27}$$

α * decreases with the number of firms on downstream market and increases with the costs of refining ($\frac{\partial \alpha *}{\partial n} < 0; \frac{\partial \alpha *}{\partial c} > 0$). Profit of the upstream producer decrease as the number of downstream firms increases.

To estimate the impact tolling contracts produce on welfare, let us now compare total amount of profit of upstream and downstream producers under three vertical regimes:

      i.   Separation of upstream and downstream producers accompanied by independent choice of output;

      ii.   Tolling contracts for supply of input A, as described above;

      iii.   Vertical integration, when a vertically integrated firm (thus the monopolist on the downstream market) determines the product price and the quantity to be sold.

The amount of profits of the upstream and downstream firms depends on the contract type, as presented in the Table 1 below:
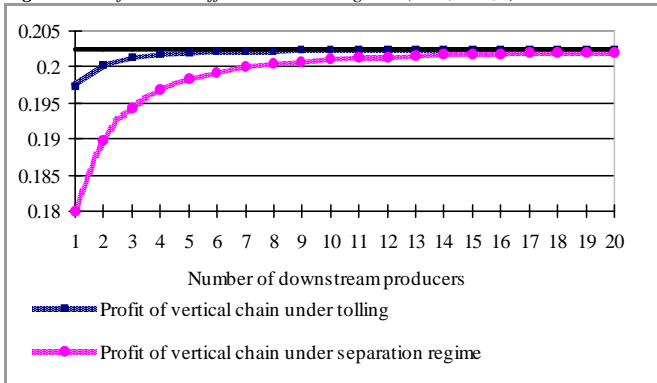
Table 1. *Profit of upstream and downstream producers under different vertical regimes (vertical regimes are denoted as described above)*

	Vertical regimes		
	i	ii	iii
Profit of upstream monopolist	$\frac{n(\theta-c)^2}{4(n+1)}$	$(1-\alpha^*)P(\alpha^*)nq(\alpha^*)$	$\frac{(\theta-c)^2}{4}$
Profit of *n* refineries	$\frac{(\theta-c)^2}{4(n+1)^2}$	$q(\alpha^*)(\alpha^*P-c)$	
Total sum of profits	$\frac{n(n+2)(\theta-c)^2}{4(n+1)^2}$	$nq(\alpha^*)(P(\alpha^*)-c)$	

Figure 1 presents a comparison of total profits in two markets for $\theta=1$ and $c=0,1$ depending on the number of downstream producers. We can see that tolling results in higher profits than separation of upstream and downstream firms. But it is less efficient than vertical integration. Therefore, tolling contract is an insufficient vertical restraint (in the sense of Mathweson-Winter, 1984).

This result is quite expectable. It seems normal that this type of vertical arrangement under which decentralized decisions are combined with centralized ones (that is, in our context, the choice of quantity by the downstream producer and the choice of α by upstream supplier) would provide an outcome ranging between the outcome of pure centralized decision-making market (that in integrated firm) and pure decentralized decision-making market (that is separation of upstream and downstream sellers).

Figure 1. *Profit under different vertical regimes ($\theta=1$; $c=0,1$).*

In addition to welfare-enhancing impact, tolling arrangement results in redistribution of profit between upstream and downstream producers. In the model here developed profit of the upstream (correspondingly, downstream) firm is higher (correspondingly, lower) under tolling than under vertical separation (see Figures 2a and 2b). Profit of the input supplier under tolling arrangement increases not only due to the increase of the total profit, but also due to the redistribution of profit from the downstream producers to the upstream ones. This redistribution is made possible by the monopoly power of the upstream supplier.

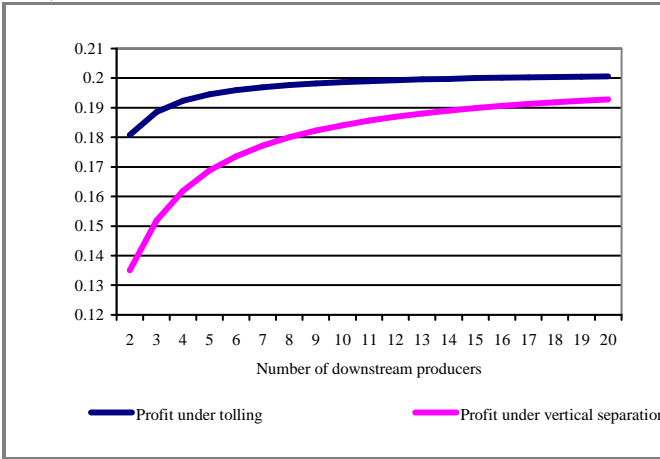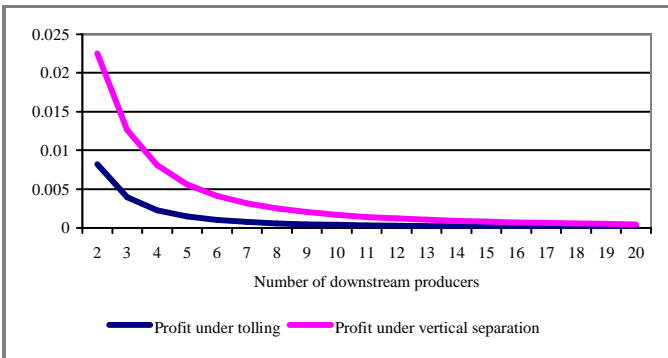**Figure 2a.** *Profit of upstream producer under different vertical regimes (θ=1; c=0,1).*

Figure 2b. *Profit of downstream producers under different vertical regimes (θ=1; c=0,1).*

230

The important conclusion is that tolling is not a perfect substitute for selling-input/buying-output transactions. Tolling increases profits and, perhaps, here, among other things, lies the explanation why this type of transactions in the Russian industries is being so extensively explored.

One interesting feature of tolling to be mentioned when comparing tolling arrangement with other types of vertical restrictions (such as franchising contract, exclusive dealing, exclusive territories etc.), is that in contrast to many other forms of vertical integration (both mergers and restrictive vertical arrangements) tolling does not induce the foreclosure effects. Under tolling arrangement, the supplier has very limited power to prevent the entry of potential competitors on the market either in the form of new sellers of final product or new supplier of input for processing.

Therefore, in the short-run, tolling increases profit of input suppliers as compared with selling of input, but it does not insure supplier's profits on the market in the long run. This fact again brings on the question of why do input suppliers prefer using tolling arrangement to buying the refining enterprise itself considering that, as we have seen: (i) profits under tolling are lower than the vertical integration profits; (ii) it seems that tolling does not produce the foreclosure effect both on input and final products market and therefore profit of vertical chains can be easily undermined by entry of new market participants.

In the next section I will try to answer this question.

Vertical contracting-out: searching for efficient assets to invest into

The main question, which arises after analyzing the presented implication of the model is: why suppliers of input for refining under tolling do not acquire shares of the companies providing the capacities they need? One could think that such a strategy would allow them, first, to increase profits and, second, to protect the right to use the capacities over time. One possible answer to that is that in Russia shareholding as a tool to protect property rights is simply inefficient due to the underdeveloped legal system, instability of legal rules, and weak enforcement of ownership rights. One could say that under extremely imperfect market infrastructure, which makes enterprises dependent on suppliers and buyers, a firm controlling the channels of input supply and output selling of a formally independent producer would enjoy stronger property rights: than in the position of a shareholder.

There are examples in the Russian industries when enterprises become so dependent on suppliers of input or on sale agents that these obtain substantial influence on decisions concerning the range of products, quantity and quality of output. This associates with market power abuses, which take place even on low-concentrated markets, due to the extremely high segmentation, which creates high switching cost. In other cases the extreme dependence of enterprises on input supplier or on financial institutions is just a myth, which helps insiders to deprive the owner of his ownership rights. In some cases the so-called "inequality provisions" of a contract providing a privileged position to one of the contracting parties are simply explained by assets striping by top-management of enterprises.

However, it is necessary to note that all these cases are easily explained in the framework of reallocation of property rights as part of enterprise restructuring. The ultimate objective of those who control enterprises (remaining formally outside them) is to establish a new company operating under common market economy models of corporate governance although exhibiting a lot of specificity in the context of transition. That is what obviously happens with the Russian industries and seems to be the main explanation of the wave of mergers and acquisitions since 1998. After restructuring one enterprise, or a number of enterprises, the new owner establishes a new structure of shareholding and corporate governance.

There are reasons to be more or less certain that although the Russian transition has provided rich evidence of ownership rights being acquired outside any legal form, the organizational structures that have emerged by this process are likely to be unstable and transitional.

Therefore, the numerous inefficiencies that induce high costs of insuring ownership rights cannot perfectly explain the choice of tolling instead of buying enterprises. Is another answer possible?

There are reasons to suppose that such an answer will be related to searching for and screening of capacities. If tolling opens a way to the market, new entrants have every possibility to choose more efficient assets. In Russia many industries have enough reserve capacities that are ready to be explored, due to the high exit barriers, mostly connected with the pressure of the public authorities. Therefore, even if an enterprise works at only 10-15% of its rated capacity, it remains operative for years. For such enterprises opportunity costs of tolling or any other way to load the capacities are very low which makes the use of the capacities extremely profitable. Since the market of temporary use of

capacities has to be even more segmented than the market of intermediary goods, a strategy of searching for and selecting capacities to be used on the short-term basis should be the optimal one for agents with relatively low switch and searching costs. Uncertainties that are associated with entry to a new market, in a transition economy in particular, increase gains obtained by following this strategy, since temporary use instead of the acquisition of capacities decreases sunk costs of entry.

In this context one interesting feature of mergers and acquisitions in Russia is to be mentioned. The desire to put an enterprise under full control based on the ownership rights correlates negatively with the excess capacities in the industry. This tendency is seldom mentioned probably because industries where almost all capacities are in use are at the same time the most profitable ones (oil industry, ferrous and non-ferrous metallurgy). But, till now, new owners are not willing to acquire shares of enterprises in all industries with very high profitability ratio. Profitability of chemical products is not much lower than profitability of ferrous metals, but since the ratio of excess capacities in chemical industry is high the number of takeovers is correspondingly lower.

Thus, the main explanation for the persistence of tolling in the Russian industries could be summarized as follows. In the presence of high exit barriers in the industries and high ratio of excess capacities a firm entering a homogenous goods market can effectively decrease the sunk costs of entry and subsequent production costs through supplying inputs for tolling instead of investing in the existing or new enterprise.

If the presented framework reflects important tendencies, corresponding evidence could be found. It seems that only certain part of capacities available in a given industry could be used efficiently. Evidently efficiency of capacity use is connected not only with the characteristics of the enterprise but also with many other variables. One of the most important of them is the enterprise's location in relation to the markets with high elasticity of demand. A rational supplier chooses the most efficient capacities of all the available ones. *(Since a rational supplier is aware of the profitability of using capacities of a particular enterprise in a given region for production, the high ratio of capacities temporarily used on the tolling basis has to result in a high rate of production growth in the next period.* On the other hand, a higher ratio of capacity utilization by temporary user and a higher expected profitability of production mean higher opportunity costs of provide capacities for temporary use and more efficient entry on the market in the form of investments in new capacities.

For the following analysis of tolling and its impact on market structure and outcomes we will use data on production of flour, cereals, vegetable oil, butter and sugar. The industries are divided according to the Russian 4-digit industrial classification. Regional data on the share of the tolling-based final product in total volume of the output is available for 1998-2000. The data on total production volume, including that produced on the tolling basis are reported in different issues of State Statistical Committee of RF (Goskomstat RF), among them are "Shipment of production by large and medium-size enterprises on the basis of quantity" and "Balance of production capacities for large and medium-size enterprises". Both issues include data on a number of enterprises, making possible the crossing of information for a number of enterprises. The first title has been printed in 1998, and the second – in the beginning of the 90's. As we need disaggregated data, only the period of 1998-2000 can be considered. This period is interesting for this analysis since it is characterized by an increase of production volume in the Russian economy; the industries under review being no exception. This means that we can observe the influence of tolling exactly in the period when entry was expected to be profitable.

For the purpose of this paper it would be appropriate to consider regions as units of observation. Of course, to say that each region (at least according to the administrative classification) forms a separate market is stretching a point. However it seems obvious that every region is characterized by specific features, which influence the efficiency of both using the existing capacities on a temporary basis and investing in new ones.

The number of observations (i.e. regions) for each product was reduced because of non-coincidence of observations units for part of the regions, or absence of data for several regions (either because the product is not produced in the regions, or because only one issue provides information and the other does not). In consequences, the final number of observations is of 67 for flour production, 47 for cereal production, 70 for butter, 19 for sugar and 30 for vegetable oil. Furthermore, in the case of butter only the period from 1999 to 2000 is considered. For every region and year the following data are available: the number of enterprises (large and medium ones), the ratio of capacity utilization, the total volume of output and the volume of production based on input other than that supplied on tolling basis; therefore, the ratio of utilization of existing capacities can be calculated easily. Appendix provides the descriptive statistic for the data.

As the objective is to test the association between tolling and the production growth rate on the one hand, and tolling and investment in new capacities on

234

the other, two regressions are presented. I have tried to explain changes in the production growth rate in the *t* year, *i* region and *j* industry in the first regression, and changes in the number of enterprises in the *t* year (compared with *t-1* year), *i* region and *j* industry in the second one. In both regressions the explanatory variable is the ratio of capacities utilized to process materials on the tolling basis in the period *t-1* and dummies for industries. Unfortunately, due to lack of data it is not possible to control all necessary variables, which influence an impact on the expected profitability and therefore on the incentives for production in a region. The only exception is a proxy for index of concentration of production. As a proxy for concentration it was exploited $\frac{1}{n}$, where *n* – the number of enterprises in the regions which is an imperfect substitute for Herfindahl-Hirschman concentration index that depends on the number of firms in the market and variance of their market shares as

$$HHI = \frac{1}{n} + n\sigma^2$$, where n – the number of firms, σ^2 -variance of market shares.

In the next tables the variables are denoted as follows: PROC – the share of input supplied on the tolling basis; CONC - proxy for concentration of production in the regions; ENT – the change in the number of enterprises actually producing the product in the regions compared with the last year, in percentage; GROW – change in output compared with the last year, in percentage.

Table 2 presents results of tests on the dependence of production growth rate and the number of enterprises on the ratio of capacity utilized on a temporary basis. Obviously, we obtain significant positive dependence of the rate of growth on the ratio of capacity utilized by the input supplier for processing in the previous year (valid both for 1999 and 2000). As for the entering new enterprises in the regions, the evidence is ambiguous.

It is worth mentioning that the obtained result of positive correlation between market performance (measured by production growth rate) and the processing variable coincides with outcomes of a number of researches devoted to testing the influence of in kind payments on performance (Marin and Schnitzer, 1999, Guriev and Ickes, 1999). The authors found that at least for this particular group of enterprises barter transactions help to prevent sharp output decline.

Table 2. *The impact of processing on increase of production and the entrance of new firms on the market (t-statistics in brackets)*

	Dependent variable – GROW t		Dependent variable – ENT t	
	1999	**2000**	**1999**	**2000**
(Constant)	-0,278***	0,038	0,054	-0,057
	(-2,769)	(0,228)	(0,064)	(-1,116)
PROCt – 1	1,040***	1,860***	0,592***	0,041
	(5,758)	(5,538)	(3,868)	(0,407)
CONCt – 1	-0,011	-0,189	0,056	0,174**
	(-0,076)	(-0,844)	(0,497)	(2,562)
Flour	0,171*	-0,457**	0,068	0,028
	(1,682)	(-2,552)	(0,786)	(0,514)
Vegetable oil	0,166	-0,116	0,197*	-0,019
	(1,233)	(-0,517)	(1,723)	(-0,284)
Butter	0,269**	0,024	-0,054	0,063
	(2,472)	(0,128)	(-0,584)	(1,115)
Sugar	-	0,321	-	0,042
	-	(1,019)	-	(0,4445)
R²	0,185	0,266	0,181	0,035
R²adj	0,166	0,246	0,161	0,010
F-statistics	9,460	13,634	9,179	1,376
Significance	0,000	0,000	0,000	0,225
Number of observations	214	233	214	233

*** Significant at 1%
**Significant at 5%
* Significant at 10%

Conclusions

The paper examines tolling contracts that are extensively used in the Russian industries to produce a number of homogeneous industrial products. Tolling is interpreted as a way of entering market and at the same time as a tool to reallocate property rights in on-going enterprises and therefore to restructure industries. Data and cases illustrate the impact of processing on the evolution of firms and their performance. Results of the analysis allow us to draw conclusions splitting into two categories: about economic nature of tolling

contracts in transition themselves and about organizational forms of restructuring the activity of enterprises and entering the markets under extremely imperfect infrastructure.

We have enough grounds to conclude that as a vertical restraints tolling is an insufficient tool of suppressing negative vertical externalities ("double marginalisation" analyzed above is an example of them) and that it promotes efficiency.

As an institutional arrangement in the specific Russian institutional context tolling is an important device to establish and protect property rights in relation to formally independent firms;

From the perspective of the development of market structure, tolling is a substitute for investments in new capacities under a high ratio of excess capacities and persistent barriers to exit, which generate low opportunity costs of providing capacities for temporary use (including that on the tolling basis).

One more point I would like to stress is that use of tolling (among other specific types of contracts) to establish a new model of organization of the Russian industries supports the view expressed by Williamson (1990) and Stark (1996) that in post-socialist economies new institutional forms emerge to meet the development needs. Therefore, the organizational development of firms and markets in many post-socialist economies is far from being only the transition to the market economy viewed as an ideal model.

References

Blanchard, O., and Kremer, M., 1997, Disorganization, *Quarterly Journal of Economics*, Vol.67, Pp.1091-1126.

Commander, S., and Mummsen, C., 1999, Understanding Barter In Russia, European Bank for Reconstruction and Development, EBRD Paper Series, Wp 37, January.

Gow, H.R., and Swinnen, J.F.M., 2001, Private Enforcement Capital And Contract Enforcement in Transition Economies, *American Journal of Agricultural Economics*, Vol. 83 (No 3), pp. 686-690.

Guriev, S., and Ickes, B. W., 1999, Barter in Russian Enterprises: Myths vs. Empirical Evidence*, Russian Economic Trends*, Vol.8 (No 2), pp. 6-13.

Konings, J., and Paul, P., 1999, Disorganization in the Process of Transition: Firm-Level Evidence from Ukraine*, Economics of Transition*, Vol.7 (No 1), pp. 29-46.

Supprimé :

Marin, D., and Schnitzer, M., 1999, Disorganization and Financial Collapse, William Davidson Institute at the University of Michigan Business School, William Davidson institute Working Papers Series, # 285.

Mathewson, F., and Winter, R., 1984, An Economic Theory of Vertical Restraints, *Rand Journal of* Economics, Vol.15 (No 1), pp.27-38.

Mckinsey et al, 1999 Unlocking Economic Growth in Russia. Mckinsey Global Institute.

Moers, L., 2000, Determinants of Enterprise Restructuring in Transition: Description of a Survey in Russian Industry. *Post-Communist Economies*, Vol.12 (No 3), pp. 307-332.

Recanatini, F., and Ryterman, R., 2000, Disorganization or Self-Organization: The Emergence of Business Associations in Transition Economy, World Bank Working Paper Series, WP # 2539.

Spengler, J., 1950, Vertical Integration and Anti-Trust Policy, *Journal of Political Economy*, Vol. 58 (No 4), pp.347-352.

Smyth, R., 1998, New Institutional Economics in the Post-Socialist Transformation Debate. *Journal of Economic Surveys*, Vol.12 (No 4), pp. 361-398.

Stark, D., 1996, Recombinant Property in East European Capitalism. *American Journal of* Sociology. January, Vol. 101 (No 4), pp.993-1027.

Stark, D., 1997, Recombinant Property in East European Capitalism. in: Grabher G. and D.Stark (eds.) *Restructuring Networks in Post-Socialism.* London, Oxford University Press, pp.35-69.

Stiglitz, J., 1999, Whither Reform? Ten Years of the Transition. Denote Address at the 1999 Annual World Bank Conference for Development Economies, WB.

Williamson, O., E., 1971, The Vertical Integration of Production: Market Failure Considerations, American *Economic Review, Papers and Proceedings*, Vol.61 (No 2), pp.112-123.

Williamson, O., E., 1990, A Comparison of Alternative Approaches to Economic Organization. *Journal of Institutional and Theoretical Economics*, Vol.146 (No 1), pp. 61-71.

Appendix

Table 1. *Share of goods produced in Russia under tolling arrangements (1996-2000, %*

Product/Year	1996	1997	1998	1999	2000
Vinyl chloride resins	54,19	50,45	54,77	45,70	57,01
Polyethylene and polypropylene	70,58	79,88	76,97	50,20	59,79
Synthetic rubber	51,72	42,56	43,31	29,60	41,80
Lime	77,29	75,05	86,46	89,10	85,00
Automobile petrol	54,65	66,79	81,38	88,20	92,42
Diesel oil	58,08	70,53	88,88	88,20	91,49
Fuel oil	72,79	85,70	89,28	95,10	95,89
Iron	79,53	82,51	94,74	88,80	87,50
Steel	79,93	81,12	94,4	94,90	94,49
Electrical steel	7,76	9,01	11,43	98,20	97,19
Coke (moisture content – 6%)	86,37	82,54	76,81	78,00	82,62
Flour	33,94	39,62	45,4	40,30	41,35
Cereals	55,35	56,7	53,43	48,50	46,76
Vegetable oil	80,54	77,85	75,02	75,70	65,56
Butter	12,65	13,03	15,87	17,90	19,79
Sugar	90,86	89,65	89,3	94,10	93,37

Source: State Statistical Committee of Russia (Goskomstat RF), 1997-2001, author's computations.

Table 2. *Tolling, structural and growth characteristics of selected industries: descriptive statistics*

	1999				2000			
	Min	Max	Mean	St.Dev	Min	Max	Mean	St.Dev
Cereals (N=47)								
PROC $_{t-1}$	0,00	0,81	0,2120	0,2146	0,00	0,80	0,1859	0,2277
CONC $_{t-1}$	0,08	1,00	0,3901	0,2848	0,08	1,00	0,3639	0,2741
ENT $_t$	-0,50	2,00	0,1531	0,4981	-0,50	1,50	0,0135	0,2940
GROW $_t$	-0,90	4,00	0,0610	0,7022	-0,89	4,09	0,3157	1,1433
Flour (N=67)								
PROC $_{t-1}$	0,00	0,87	0,2734	0,2011	0,00	0,67	0,2233	0,1731
CONC $_{t-1}$	0,03	1,00	0,3223	0,2789	0,03	1,00	0,2780	0,2596
ENT $_t$	-0,25	2,50	0,2535	0,4699	-0,67	1,00	0,0280	0,2458
GROW $_t$	-0,52	3,17	0,1748	0,5114	-0,63	0,73	-0,055	0,2981
Vegetable oil (N=30)								
PROC $_{t-1}$	0,01	0,95	0,4702	0,2119	0,00	0,84	0,3100	0,2414
C0NC $_{t-1}$	0,03	1,00	0,5860	0,3851	0,03	1,00	0,4900	0,3939
ENT $_t$	-0,33	3,25	0,5137	0,7418	-0,80	1,00	0,0214	0,3999
GROW $_t$	-0,40	2,26	0,3714	0,5331	-1,00	3,11	0,4070	0,8969
Butter (N=70)								
PROC $_{t-1}$	0,00	0,85	0,0576	0,1398	0,00	0,52	0,0583	0,0895
CONC $_{t-1}$	0,02	1,00	0,1426	0,1858	0,02	1,00	0,1460	0,1909
ENT $_t$	-0,50	1,32	0,0617	0,2122	-0,29	1,60	0,0336	0,2727
GROW $_t$	-0,86	2,40	0,0494	0,5316	-0,60	1,88	0,1437	0,4772
Sugar (N=19)								
PROC $_{t-1}$					0,01	1,00	0,7350	0,2496
CONC $_{t-1}$					0,09	1,00	0,5092	0,3645
ENT $_t$					-0,27	0,50	0,1041	0,2184
GROW $_t$					-0,13	8,47	1,6308	2,5733

Source: State Statistical Committee of Russia (Goskomstat RF), 1997-2001, author's computations