УДК 330.1:334
ББК 65.01
А 95

Avdasheva S. Processing (Tolling) Contracts in Russian Industries: an Institutional Perspective.

The paper is devoted to the specific for Russian and Ukrainian industries contract for input supply that exhibits great and stable share in production of several homogenous industrial outputs over the last five years. This contract, named processing contract, is analyzed as a way of reallocation of property rights on the assets of refining enterprises in the short-run. Processing can be considered as a tool of vertical integration. It enables a supplier to neutralize "double marginalization" in vertical chain and therefore increases profitability of business. Although use of processing does not provide "vertical profit" in the sense of Mathewson and Winter, processing instead of buying an existing enterprise reduces the sunk cost of entry on the market to new firm controlling the supply of input. An evidence of use of processing in Russian food industries supports the rationalizing of processing as a form of entering the market by new firms, and at the same time of restructuring the activities of enterprises those hold the refinery capacities (JEL Codes: L22, L42, M130, P31).

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1. Introduction

Processing contracts (tolling, or "daval'chestvo" in Russian) are extensively used as a form of supply of raw materials for refinement in Russia. In spite of the name "tolling", the contracts have a little similar with the tolling as a payment for use of roads. That is why below I use the word "processing" instead of "tolling" to identify "daval'chestvo" contract. According to this arrangement, a refinery gets the certain part of final product (alternatively, we can think about the corresponding quantity of raw materials) from a supplier of input (raw materials) as a fee for "refinery services". In terms of law, the supplier of input remains to be the owner of final product except the part of it that is transferred to refinery enterprise (processor). The contract of processing supply is typically concluded for one cycle of refinement, but the framework of processing can be established in long-term agreements of cooperation between supplier and processor. The fact that makes the processing arrangements more complex and more difficult to understand is that related contracts are completed not only between formally independent firms but also between firms that belong to the same holding company. That is the case for oil refining in Russia as supplier of oil is often a parent company. However, below I focus mostly on the case of processing of input for (formally) independent supplier.

For historical parallels, processing contracts are quite similar to those organized in the early stages of industrial development by merchants in local areas in production of wool and other textile products. Even the word "daval'chestvo" in Russian language only ten years ago was considered to be out-of-date since the middle of XIX century.

Processing (or tolling) arrangements are intensively developed in early 1990-s together with the other payments in kind such as, for instance, barter transactions. To the middle of 1990s processing supply of input to refining put into practice in a number of Russian industries. Table 1 indicates the extent of processing in production of the certain important industrial products. In spite of processing in the early transition was considered as a one-day phenomenon, it remains stable over the period of recovery, as it was at the years of economic fall.

One can find that processing arrangements in the presented industries not only partially substitute buying of input and selling the output but fairly prevail as a specific organizational form. Besides, processing arrangements were widespread in Russian non-ferrous metallurgy, especially in the production of primary aluminum, during the last ten years.

Table 1. Share of goods refined from raw materials supplied by processing contracts in Russian industries (1996—2000, %)

Product/Year	1996	1997	1998	1999	2000
Gum vinyl chloride	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
Reduced fuel oil	72,79	85,7	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
Electric steel	7,76	9,01	11,43	98,20	97,19
Coke (6% wet)	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.

Ukraine is the only former socialist country, which demonstrates scope of processing in industrial transactions, which is comparative to that in Russia. Long-term contract in country with developed industrial relations can hardly be considered as similar to processing form of agreement. The most important difference between processing and the long-term contracting is the objective of arrangement. The hybrid form of contract, which includes the supply of input by the buyer of refined product (for instance, in agro-food sector), exists in European and North-American countries. But it is usually aimed to insure the quality of experience or the credence of products. As we can easily see from the list of products refined on the processing basis, these products are mostly homogenous and do not require extensive quality control of

both input and output. So, we can conclude that processing contract is a specific one for transition economy (or, more precisely, for the group of countries in transition).

The most prominent attribute of processing arrangement is that supplier of input and owner of output become to be one person. Thus, a supplier considers the possibility of signing the contract instead of selling input as a sort of "make-or-buy" decision. From this point of view, processing is the specific form of vertical integration, among hybrid organizational form. The objective of the paper is to explain the origin of this contractual arrangement, to determine reasons of choosing it as a tool of coordination and impact of such form of business relations on industries' organization and market efficiency.

To achieve the objectives three lines in the modern literature are important. 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. *Blachard and Kremer*, *Koning and Paul* (1999) and many other authors focused on disorganization that influenced production with complex input. However, the complexity of input structure strengthens the effects of disorganization on output. Even in markets of rather homogenous product, with numerous potential suppliers and numerous potential buyers, impact of collapse of traditional coordination (that is disorganization) is significant. Exploring the disorganization concept, Recanatini and Ryterman (2001) rationalize networks of directors and managers of Russian industrial enterprises as a device that can overcome disorganization on the market. The below-mentioned analysis is slightly different from that of Recanatini and Ryterman. It focuses on the specific institutional arrangement, which provide relatively efficient coordination device independently from personal links and personal reputation, while Recanatini and Ryterman research is based on personal trust.

Underdeveloped financial and commodity market infrastructure, asymmetric information and imperfect contractual enforcement system increase cost of using of market-oriented tool of coordination in favor of hierarchical coordination. There are different types of such coordination. A lot of new organizational forms appeared and remain stable during ten-fifteen years of transition. The most important results of Stark (1996, 1997) research are (a) the way of restructure coordination devices in former communist economies vary across diverse set-

tings in which economic agents choose the forms of transactions; (b) these types of coordination can differ substantially from the blueprints widespread in Western countries. In this occasion, processing can be rationalized 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, processing arrangement results in non-coincidence of formal and actual boundaries of the firm. Partners of processing arrangement could be considered as a form of network that Stark considers as efficient organization of industry in transition. Many authors found specific types of institutional arrangements in transition economies, those have no evident analogues in the developed markets. *Gow and Swinnen* (2001) proved that types of contracting out in agricultural production and processing are very similar by origin and by impact on markets to processing that is the subject of this paper. However, in contrast to Stark who considered diversity of organizational form as a natural itself, in this paper I try to explain the choice of economic agents participated in processing arrangements between different forms of contracting available in existing institutional settings.

As processing implies the payment-in-kind for the services of refinery producers, I find it reasonable to analyze literature, which consider the use of barter inside the networks in transition economy and the impact of barter on the efficiency and performance of producers (for instance, Commander and Mummsen, 1999). In this context, networks are considered as a tool of reduction of the transaction cost associated with exchange of products, which is very high otherwise.

Finally, there is rich literature on vertical integration and vertical restraints. The discussion of impact of vertical integration on efficiency of resources allocation was induced by pioneer work of *Spengler* (1950). The literature pointed out that the preferences of downstream firm to whom pricing authority has been delegated differ from those of the common interest of vertical chain. *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 the profit of upstream/downstream agent and the total surplus. Since processing indicates "making" instead of "buying", it's impact on market efficiency and surplus of market participants could be analyzed by use of the same approach. The implications of this analysis are presented below.

The remainder of paper is organized as follows. In Section 2 the reasons and evidence of reallocation of property rights between agents participated in processing contracts are considered. Processing contracts are estimated in the framework of the process of restructuring in transition. Section 3 presents model that explains the impact of processing on market efficiency and distribution of profit between a supplier and a refining firm. The model developed tries to answer the questions can processing provide an excess profit comparative to the arrangement between fully independent firms. The neutralization of negative vertical externalities is considered as source of excess profit. In this context, processing is explained as insufficient vertical restraint. Section 4 contains results of statistical analysis aimed to highlight the role of processing in the dynamics of Russian industries. The main objective of this section is to explain why economic agents prefer to arrange processing contract instead of to fully integrate, if it is the vertical integration that provides excess profit. Section 5 concludes.

2. Processing contracts, reallocation of property rights and restructuring the activity of Russian enterprises

Processing supply of input is very interesting example of the influence of design of inter-firm contracts on the real boundaries of the firm. Lets think about an enterprise that refines raw materials supplied in the framework of processing contracts over years (Table 1 shows that it is not rare in Russia). Though the key choice about what to produce and whom to sell (at least about the most part of final product) is made outside the enterprise, it cannot be considered as a firm itself.

Processing effectively prevents formally independent firms from use the market mechanism to coordinate their activities. Refining enterprise will unlikely change the supplier of input even if another supplier puts the lower price, since the enterprise does not buy raw materials at all. Besides there are some reasons to suppose that this enterprise will not rise output if market price of final product rises. First, it sells only a part of final product (estimations show that this share is about 20—50% in various industries). Second, it cannot buy enough input to increase the quantity of production.

The last statement requires additional comments. Why can we say that the refining enterprise is locked inside the processing contract? The answer is connected with the so-called "deficit of working capital problem" which is faced by most of Russian enterprises. In the absence of short-term credit system (both commodity and banking ones), an enterprise has to use its revenue of the previous period as working capital. In the early stage of transition, accompanied by hyperinflation, it caused the extensive use of barter that became the huge problem for years. The hard constraints on the quantity of working capital is probably one of the most important obstacle of enterprises to increase quantity produced, to change the kind of product produced, and to switch from refining to market activity by itself. That is why many Russian entrepreneurs characterize processing supply as the contract of "one-sided stability": in presence of reserve capacities in the industries, a supplier can relatively easy switch from one refinery for the other, but refinery cannot easily switch from processing to buying the input and selling the output himself.

So, under the processing, an enterprise has a very limited access both to the market of resources and to the market of final goods. On the other hand, a supplier of tolling raw materials acquires some part of property rights on the refinery's capacities, since it is powered to make a decision about quantity, quality of production and consumers to whom final goods are to be sold.

It is interesting, that Russian entrepreneurs treat the stable processing contracts exactly the same way. Very often potential buyer of a company abandon the transaction since the enterprise is obliged to continue refining the processing input because of long-term contracts concluded or because of special decision of regulatory authorities. One of the last examples of such situation is the failed buying of blocking shareholding of Angarsk petrochemical company by YUKOS (spring 2001). Planning the transaction during at least the half of year and making big preliminary expenses on it, YUKOS finally failed to complete the transactions after regional division of Ministry of Anti-trust prevented the break-off of processing of the input of group of independent suppliers, those made a complain against the petrochemical company. So, YUKOS considered that processing would increase the cost of acquiring property rights on the capacity of petrochemical company. The other examples demonstrate that processing is a way of reduction of the cost of acquiring property rights. Not long time ago (spring 2001) famous conglomerate "MDM (Moscow Business World)" tried

to perform acquisition of company "Phosphorite" (that one of the biggest producers of chemical fertilizers in Russia), and already obtained over control the supply of raw materials, as a first step, forced the enterprise to switch from buying input and then selling output to processing only. So, from the parent company point of view such form of supply of raw materials was a way to obtain better control over the assets of the subsidiary and secure property rights. Almost all Russian oil company use processing to supply oil for refinement. This fact provides the additional support for the last statement.

The question is how we have to estimate the influence of processing as a tool of reallocation of property rights in technological chains, on the dynamic processes performed in Russian industries.

Reallocation of property rights (both formal and informal) in Russia was originated by need of restructuring of enterprises and their activity. The restructuring itself is probably the most paradoxical part of the evidence of transition. On the one hand, it was more than once mentioned that on the level of enterprises there was too little evidence that Russian enterprises restructured their production and marketing activities, management and corporate governance. On the other hand, on the level of certain markets many de novo firms provide products and services on the manner corresponding to relatively developed market system. On the one hand, activities of major part of Russian enterprises result in losses. On the other hand, supply of many Russian products on domestic and even on foreign markets is very profitable.

The explanation of these and many other paradoxes of Russia and other transition economies lies in the non-coincide of formal and actual boundaries of firms, as it was mentioned by Stark (see for instance Stark, 1997).

At the beginning of radical reforms in Central and Eastern Europe and FSU countries restructuring of production activities is expected to be performed in boundaries of enterprises established under socialism. Implicitly these expectations reflected that enterprises in market and socialist economic systems are almost the same thing. Evidently it is not so. Boundaries of a firm in market economy are the result of rational choice in market environment, while boundaries of an enterprise in soviet-type economy are implied by completely different reasoning. Dramatic changes in economic environment made it impossible to survive and particularly to restructure inside of organizational forms inherited from the old coordination system for significant part of economic activities.

Some inefficiencies were connected with the inconsistent allocation of economic activities across enterprises, and they provided significant incentives for restructure. During the 90-s for large part of the Russian enterprises investments in restructuring were inefficient. Explicit and implicit cost of investments in restructuring exceeded the expected profit. The grounds of it are extensively analyzed in literature. Some of them are predominant importance and inherent production inefficiency, limited access to infrastructure of marketing, including access to information (see, for instance McKinsey, 1999) and inefficiency of property rights allocation (Stiglitz, 1999).

In these circumstances restructuring in Russian industries has to be initiated from outside of enterprises. In other words, new economic agents had to emerge, and in most cases they were different from the former enterprises and their owners or managers. Examples of restructuring initiated by outside are numerous in Russian industries. Recent mergers and acquisitions, that are extremely vigorous since 1998, provide a lot of evidence of radical reorganization of enterprise activities due to including in the wider economic unit. Mergers, acquisitions and processing contracts could be judged as different tools of achieving the same objective — reallocation of property rights on an enterprise assets and choosing of the best way of use of them.

There is an evidence that enterprises in transition economy enter the broader economic units (that are commonly named as "networks") and function as parts of these units. Networks provide a hybrid-type (between market and hierarchy) coordination and correspondingly reallocate property rights on assets of the unit, composing to the network. Networks, instead of enterprises themselves, constitute the borders of economic agents those are subjects for restructuring in transition economies (see Stark, 1996 and 1997). In this context, processing contracts could be treated as specific way of creation of network, or, better to say, new firm. As far as comparison of networks and acquisitions is not the focus of the paper, it is only worth to mention that choice of one of two ways of property rights reallocation depends on cost of enforcement of corresponding property rights. From this point of view, wide use of processing or any other type of networking, instead of buying shares in Russian and Ukraine, is induced particularly by extremely high cost of property rights insure in these two countries.

It seems clear that processing contracts as an institution provide supplier of input substantial rights to use refinery assets, as he/she controls quantity and quality of output to be produced. In this occasion

the main question is: does processing actually imply any difference in profit of supplier of input comparative to selling of the input to refinery? In the next section I show that processing promotes efficiency as social welfare on the market of final goods.

3. Efficiency of processing contract as vertical arrangement

Consider the model of processing impact on the outcome of vertical coordination. Impact of vertical integration on downstream market is the increase of social welfare due to neutralization of negative vertical externalities. Under separation of upstream and downstream market, accompanied by monopoly power on any of these markets, succeeding choice of quantity results in decrease of profit relative to its potential level in the situation of vertical integration (Spengler, 1950). In this context vertical integration as far as any other form of vertical restrictions could be effective. It means that it is possible to find the type of vertical restriction that will be sufficient in the sense that it insure the same sum of profits as well as consumers' surplus in downstream markets as vertical integration.

I find it reasonable to use the framework of market power through considering specific contract in Russian industry. Russian markets are extremely segmented by regional ones and by types of buyers, and therefore, even producers with relatively low share in overall production can easily obtain market power. That is why it seems the concept of the seller (especially the seller of intermediate goods) as a monopolist is applicable to the regular case of 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: $P = \theta - Q$, where $Q = nq_i$ (q_i — quantity produced by i downstream producer, n — number of downstream producers). Downstream producers use 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 (we suppose Leontieff production function with constant return to scale). Input A is supplied under processing contract by one upstream supplier that therefore is monopolist on a upstream market. Unit cost of production of input A is zero. Input B in this context

means all inputs, besides input A. The unit cost of production of input B or, in this context, the cost of refining of unit of input A, equals to *c*. Let's suppose then that terms of processing contract are identical for each downstream firm in the market. The terms include only the share of output (final product) that is to be retained by the downstream producers as a payment-in-kind for processing service. Denote this part of final output α. The monopolist (upstream producer) chooses aa and then downstream producer determines the quantity of final product to be produced. So, $(1 - \alpha)$ is the share of final product, which belongs to the upstream producer. But whole the quantity of final product is sold on the downstream market.

As the monopolist (upstream producer) makes his decision first it allows him to maximize profit, observing the future reaction of downstream producers. The constraint of profit maximization of monopolist is the reaction function on this choice of α by the downstream supplier. Since quantity, price and therefore profit of upstream supplier depends only on α, monopolist chooses α in order to maximize profit.

Now compute the equilibrium in this interaction. For the sake of simplicity, let's assume $\theta = 1$. Then the profit of a downstream refining firm *i* is: $\pi_i(q_i, \alpha) = \alpha P q_i - c q_i$. Profit maximization of the downstream producer gives us his reaction function that is $q_i = \frac{\theta - \frac{c}{\alpha}}{n+1}$. Then the downstream market price is $P = \frac{\theta - \frac{nc}{\alpha}}{n+1}$. Since the profit of the upstream firm (supplier of input A for processing) is $\pi(\alpha) = (1-\alpha)P(\alpha)nq_i(\alpha)$ we can obtain the optimal value of α. Straightforward computations gives us

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

where:

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

* decreases with growth of number of firms on downstream market and increases with costs of refining $(\partial \alpha^* / \partial n < 0;\ \partial \alpha^* / \partial c > 0)$. Profit of the upstream producer decreases with increase of number of downstream firms.

To estimate impact of processing contracts on welfare, let's compare total sum of profit of refineries and supplier of raw materials under three vertical regimes:

Separation of upstream and downstream producers, accompanied by independent choices of output (in this case upstream producers chooses output depending on price of upstream one and therefore makes a derived demand, while the upstream supplier maximizes profit over the derived demand and chooses the price of input A);

Processing contracts of supply of input A, as described above;

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

Sum of profits of firms that are parts of the supplier-producer chain depends on type of contract, as follows:

Table 2. Profit of upstream and downstream producers under various vertical regimes (vertical regimes are denoted as described above)

	Vertical regimes		
	i	ii	iii
Profit of a supplier of raw materials	$\frac{n(\theta - c)^2}{4(n+1)}$	$(1-\alpha^*)P(\alpha^*)nq(\alpha^*)$	$\frac{(\theta - c)^2}{4}$
Profit of n refineries	$\frac{(\theta - c)^2}{4(n+1)^2}$	$q(\alpha^*)(\alpha^* P - c)$	
Total sum of profit of pyramid of producers	$\frac{n(n+2)(\theta - c)^2}{4(n+1)^2}$	$nq(\alpha^*)(P(\alpha^*) - c)$	

Figure 1 presents a comparison of total profits in two markets for $\theta = 1$ and $c = 0{,}1$. We can see that processing in comparison with separation of upstream and downstream firms increases profit. But it is

less efficient than vertical integration. Though processing contract is not-sufficient vertical restraint (in sense of Mathweson-Winter, 1984). This result is quite expected. It seems normal that this type of vertical arrangement, when the decentralized decisions are combined with the centralized one (that is, in our context, the decisions on quantity by the downstream producer and the choice of aa by upstream supplier), would provide outcome in-between the outcome of the market with pure centralized decision-making (that in integrated firm) and pure decentralized decision-making (that is separation upstream and downstream stages of production).

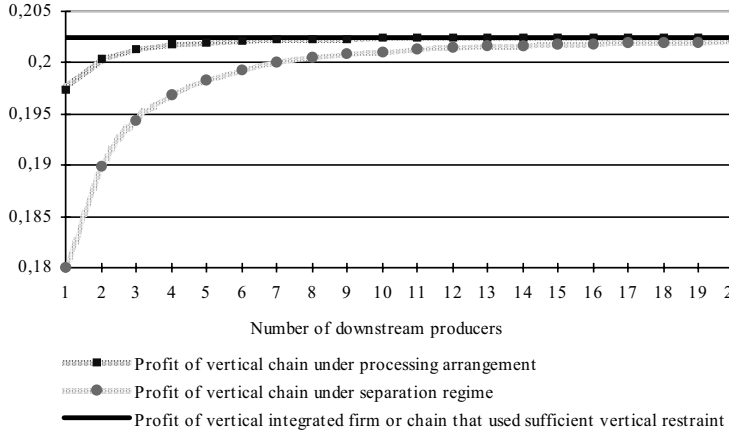

Figure 1. Comparison of profits under different vertical regimes on the upstream-downstream market ($\theta = 1$; $c = 0{,}1$).

The important result of the model is that processing is not perfect substitute for selling input – buying output transactions. Processing increases sum of profits and maybe this, among all, explains the extensive exploring of this type of transactions in Russian industries.

Comparing the processing arrangement with other types of vertical restrictions (such as franchising contract, exclusive dealing, exclusive territories etc.), one interesting feature of processing has to be mentioned. In contrast to other types of vertical integration (both

mergers and restrictive vertical arrangements) processing does not induce the foreclosure effects. Under processing arrangement, supplier has very limited abilities to prevent entry of potential competitors on the market either in form of entry of new sellers of final product or in form of entry of new supplier of input for processing. The only exception is connected with dominant position of supplier on input market.

Therefore, processing increases profit of supplier of input comparative to selling of input in the short-run, but it does not insure profits of the supplier on the market in the long-run. This fact again brings on the question why the supplier of input prefers to use processing arrangement instead of buying refining enterprise itself, if, as we have seen: (i) profit under processing is lower than the vertical integration profit; (ii) it seems that processing does not provide foreclosure effect both on input and final good market and therefore profit of vertical chained can be easily undermined by entry of new market participants.

In the next section I try to answer this question.

4. Vertical contracting-out: searching for efficient assets to invest

4.1. Problem Description

The main question, which arises after analyzing of the presented implication of the model is: why suppliers of input for processing do not acquire shares of companies those capacities they actually use? From the normative point of view this strategy would allow first, to increase profit and second, to secure right for use of the capacity over time. One possible answer is that acute insider-outsider problems shareholding as a way of property rights insurance is simply inefficient due to insufficient law system, instability of legal rules and other well known problems with enforcement of property rights in Russia. One could say that under extremely imperfect market infrastructure, which makes enterprises dependent on suppliers and buyers, a firm which has power over channels of input supply and output selling of formally independent producer, would have more secure property rights than in the case of being an owner of shares.

This answer is correct but only to limited extent. There is a number of examples in Russian industries when industrial enterprises become so dependent from a supplier of input, or from a seller, that they obtain substantial influence on decisions about variety of products, quantity and quality of output. In some cases such evidence is associated with the abuse of market power, which arises even on low-concentrated markets because of extremely high segmentation that creates high switching cost. In other cases, the extreme dependence of industrial enterprises from input supplier, or financial institutions is just a myth, which helps insiders to expropriate (or hold up) property rights from the owner. In some cases so-called "non-equal conditions of contracts" which provides the privileged position for one party in a contract, are explained simply by asset stri ping by top-management of industrial enterprise.

However, it is necessary to note, that all these cases are easily explained from the framework of reallocation of property rights as a part of restructuring of activity of enterprises. The ultimate objective of those who control activity of industrial enterprises being formally outside them, is the foundation of new company, that use common for the market economies models of corporate governance, although they exhibit a lot of specificity in the context of transition. That what we see in Russian industries and it seems to be the main explanation of the wave of acquisitions since 1998. After re-organization of activity of one enterprise or a number of enterprises, new owner (probably not an "efficient owner" from strong normative point of view, but at least more efficient then the previous one) establishes the new architecture of shareholding and corporate governance.

Now we can say more or less certainly that in spite of the fact that Russian transition provided rich evidence of acquiring property rights without using secondary market of them, the organizational structures emerged in this way were unstable and really transitional ones.

So, the numerous inefficiencies that induce high cost to insure property rights cannot explain perfectly the choice of processing instead of buying enterprises. Is another answer possible?

There are some reasons to suppose it is because of searching and screening of capacities. If processing provides a way of entering a market for new partici pant entrant has excellent possibility to choose the assets those are more efficient to explore. In Russia many industries have enough reserve capacities that are ready to explore because of high exit

barriers, mostly connected with the pressure of public authorities. Therefore even if an enterprise produces only 10—15% of normative capacity, it remains personal for years. For such enterprises opportunity cost of processing or any other way to load capacity is very low, and it makes use of the capacities extremely profitable. As market of temporary use of capacities have to be even more segmented than market of intermediary goods, strategy of searching and selecting the capacity to be used on the short-term basis should be the optimal one for agents with relatively low switch cost and cost of searching. Uncertainties that are associated with entry on new market and even so in transition economy increase gains from following this strategy, since temporary use of capacities instead of buying them decreases sunk cost of entry.

It is worth to mention one common characteristic feature of products extensively produced on the basis of processing (Table 1), which is homogeneity. The described strategy of temporary use of capacity would not be profitable through production of heterogeneous goods, or experience goods, in terms of asymmetric information theory (quality of goods is unknown before consumption). In the case of homogenous goods with the low cost of quality control (and relatively low incentive for producers to reduce quality of products), a supplier is able to choose enterprise to refine materials at each production cycle.

It is interesting to mention one tendency of mergers and acquisition in Russia. An aspiration to put an enterprise under full control, including the take-over desire depend negatively on its reserve capacities. 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). However, profitability of chemical products is not much lower than profitability of ferrous metals, but since share of capacities out-of-use in this industry is high, number of take-over in this industry is correspondingly lower.

So, the main explanation of persistence of processing in Russian industries could be summarized as follows. In the presence of high exit barriers in industries and high share of out-of-use capacities, originating low opportunity cost of temporary use of capacities, a firm entering the market of homogenous goods could decrease effectively the sunk cost of entry and subsequent cost of operations either by supplying inputs for processing instead of buying them, or by take-over of existing enterprise or by investing in new one.

If the presented framework reflects existing tendencies, corresponding evidence could be found. It seems that only certain part of capacities available in a given industry could be used efficiently. Evidently the efficiency of using given capacities is connected not only with characteristics of an enterprise, but also with many other variables. One of the most important of them is the location of the enterprise toward the markets with high-elastic demand. The rational supplier chooses the most efficient capacity of all available ones at each given price it should to pay for temporary use of them (in terms of part of final product, or in terms of money). Since rational supplier is aware of the profitability of production using a capacity of the particular enterprise in the certain region, high share of available capacity temporarily used by the supplier of input for processing has to result in high rate of production growth in the next period. From the other hand, the higher the ratio of capacity utilization by temporary user and higher the expected profitability of production, the higher an opportunity cost to provide the capacity in temporary use, and more efficient entry on the market in the form of investing in new capacities.

The next sub-section provides some evidence of influence of ratio of capacity utilization by processing suppliers on the rate of growth and entry of new enterprise on the market.

4.2. Data and variables

For the following analysis of processing and its impact on market structure and outcomes I use data on production of flour, cereals, vegetable oil, butter and sugar. The industries are divided in Russian 4-digital industrial classification. Regional data on share of output produced on processing basis in total output is available for 1998—2000. Overall output data and data on output, which is produced "not from the materials supplied for processing", are reported in different issues of State Statistical Committee of RF (Goskomstat RF). The first is "Shipment of production by large and medium-size enterprises on the basis of quantity" in which data on the production "not from the materials supplied for processing" for the region is reported. The second is "Balance of production of capacities for large and medium-size enterprises" where data on overall quantity produced and the shares of capacity utilized is presented. Both issues include data on number of enterprises, so it is possible to control whether enterprises taken into

account in both issues are identical. The first issue is available since 1998, and the second — since the beginning of 1990-s. As we need disagregated data, only the period of 1998—2000 can be considered. The period is not bad for the analysis, since it is characterized by rise of output in Russian economy; the selected industries are not exemptions. It means that we can observe influence of processing exactly in period when entry is expected to be profitable.

For the objective of this paper it is not bad to consider regions as units of observation. Of course regions (at least according to administrative classification) are tricky to treat as separated markets, however it seems obvious that every region is characterized by specific features which influence the efficiency of both using existing capacities on temporary basis and investing in new ones.

Number of observation (those are regions) in the case of each product was reduced because of non-coincidence of units of observations for part of regions, or the absence of data for several regions (either because there is no production of given product in the regions, or because only one issue provide information and the other does not). So, the final number of observations is 67 for flour production, 47 for cereals production, 70 for butter. Besides in the case of butter I consider period from 1999 to 2000 only. For every region and year the following data is available: number of enterprises (large and medium ones), ratio of capacity utilization, output produced and output produced using input different from the supplied on processing basis; therefore, ratio of utilization of existing capacity can be calculated easily. Appendix provides the descriptive statistic for the data.

As the objective is to test the association between processing and rate of growth of production, from the one hand, and processing and investment in new capacity on the other, two regressions are presented. I try to explain changes in growth rate of production in the t year, i region and j industry in the first regression, and changes in number of enterprises in the t year (in comparison to $t - 1$ year), i region and j industry in the second one. In both regressions the explanatory variable is the share of capacity utilized to refine materials on the processing 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 those impact the expected profitability and therefore incentive 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 $1/n$, where

n — number of industrial enterprises in the regions, that is imperfect substitute for Herfinahl-Hirshman concentration index that depends on number of firms in the market and variance of their market shares as $HHI = 1/n + n\sigma^2$, where n —number of firms, σ^2 — variance of market shares.

In the succeeding tables the variables are denoted as follows: PROCES — the share of input supplied on the processing basis; CONCENTR — proxy for concentration of production in the regions; ENTER — the change of the number of enterprises actually produced the product in the regions, comparative with the last year, in percents; GROWTH — change of output comparative with the last year, in percents.

The next sub-sections describe the results obtained.

4.3. Processing in Russian food industries: the effect on entry and output

Before testing the correlation between processing, growth rates and number of enterprises in the region I examined some indicators of stability of quantity of input supplied to be processed in the subsequent years. As we can see from the Table 1, on the level of industries under investigation as a whole, the share of output produced on the processing basis is rather stable. If the temporary utilization of the capacity by supplying input on the processing basis is explained by search for the best capacitates, inside regions the ratio of capacity utilized for refining of processing materials must be, on the contrast to the industry ratio, unstable.

The data in Table 3 provides explicit evidence that in food industries processing supplies are indeed run about the regions. The share of input supplied on the framework of processing is fairly unstable in the given region and does not depend on the quantity of input processed last year. This supports the rationalizing of processing a search of the best capacity to use.

Table 4 presents results of testing the dependence of production growth rate and number of enterprises on the ratio of capacity utilized on the temporary basis. As we can see, we obtain significant positive dependence of the rate of growth on the share of capacity utilized by supplier of input for processing in the previous year both for 1999 and 2000 years. For enter of new enterprises in the regions, the evidence is ambiguous.

Table 3. Correlations of the share of processing in input supply for selected food industries across regions: 1998—2000 (significance in brackets)

Years/Products	Cereals	Flour	Vegetable oil	Butter	Sugar
1999 to 1998	0,212 (0,153)	0,301* (0,013)	0,436* (0,016)	0,362** (0,002)	—
2000 to 1999	0,522** (0,000)	0,715** (0,000)	0,411* (0,024)	0,280* (0,019)	0,384 (0,105)
Number of observations	47	67	30	70	19

** Significant at the 1%.
* Significant at the 5%.

Table 4. The impact of processing on increase of production and enter of new firms on the market (t-statistics in brackets)

	Dependent variable — GROWTH t		Dependent variable — ENTER t	
	1999	2000	1999	2000
(Constant)	−0,278*** (−2,769)	0,038 (0,228)	0,054 (0,064)	−0,057 (−1,116)
PROCES $t-1$	1,040*** (5,758)	1,860*** (5,538)	0,592*** (3,868)	0,041 (0,407)
CONCENTR $t-1$	−0,011 (−0,076)	−0,189 (−0,844)	0,056 (0,497)	0,174** (2,562)
Flour	0,171* (1,682)	−0,457** (−2,552)	0,068 (0,786)	0,028 (0,514)
Vegetable oil	0,166 (1,233)	−0,116 (−0,517)	0,197* (1,723)	−0,019 (−0,284)
Butter	0,269** (2,472)	0,024 (0,128)	−0,054 (−0,584)	0,063 (1,115)
Sugar	— —	0,321 (1,019)	— —	0,042 (0,4445)

	Dependent variable — GROWTH *t*		Dependent variable — ENTER *t*	
	1999	2000	1999	2000
R^2	0,185	0,266	0,181	0,035
R^2_{adj}	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 the 1%.
**Significant at the 5%.
* Significant at the 10%.

It is worth to mention 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 payment-in-kind on the performance (Marin and Schnitzer, 1999, Guriev and Ickes, 1999). The authors found that at least for the certain group of the enterprises barter transactions help to prevent sharp output decline.

5. Conclusion

The paper considers processing contracts those are widely and persistently used in Russian industries to produce a number of homogeneous industrial products. The processing is rationalized as a way to enter the market and at the same time as a tool to re-allocate property rights on existing capacities and therefore to re-organize the industries. Data and cases illustrate impact of processing on evolution of firms and their performance. Results of the analysis allow drawing the conclusions splitting into two lines: about economic nature of processing contracts in transition themselves and about ways of restructuring of activity of enterprises and entering the markets under extremely imperfect infrastructure. For processing contracts we can conclude that: processing as a vertical restraints could be considered as an insufficient tool

to suppress the negative vertical externalities, for instance, "double marginalization problem" and there is an evidence that use of tolling promotes efficiency;

in the specific institutional context processing is an important device to protect property rights over shareholdings and to establish and sustain property rights over formally independent firms;

processing substitutes investments in new capacity under conditions of high ratio of capacities out of use and persistent barriers to exit, that originates low opportunity cost of providing capacity to temporary use.

One more point I would like to stress is that experience of using processing among other specific contracts to establish new model of organization of Russian industries supports the view expressed by Williamson (1990) and Stark (1996) that in post-socialist economies new institutional forms will be built appropriate for development instead of the pure transition to the market economy as a benchmark will take place.

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Appendix

Processing, structural and growth characteristics of selected industries: descriptive statistics

	1999				2000			
	Min	Max	Mean	St.Dev	Min	Max	Mean	St.Dev
Cereals ($N = 47$)								
PROCES $_{t-1}$	0,00	0,81	0,2120	0,2146	0,00	0,80	0,1859	0,2277
CONCENTR $_{t-1}$	0,08	1,00	0,3901	0,2848	0,08	1,00	0,3639	0,2741
ENTER$_t$	−0,50	2,00	0,1531	0,4981	−0,50	1,50	0,0135	0,2940
GROWTH $_t$	−0,90	4,00	0,0610	0,7022	−0,89	4,09	0,3157	1,1433
Flour ($N = 67$)								
PROCES $_{t-1}$	0,00	0,87	0,2734	0,2011	0,00	0,67	0,2233	0,1731
CONCENTR $_{t-1}$	0,03	1,00	0,3223	0,2789	0,03	1,00	0,2780	0,2596
ENTER$_t$	−0,25	2,50	0,2535	0,4699	−0,67	1,00	0,0280	0,2458
GROWTH $_t$	−0,52	3,17	0,1748	0,5114	−0,63	0,73	−0,055	0,2981
Vegetable oil ($N = 30$)								
PROCES $_{t-1}$	0,01	0,95	0,4702	0,2119	0,00	0,84	0,3100	0,2414
C0NCENTR $_{t-1}$	0,03	1,00	0,5860	0,3851	0,03	1,00	0,4900	0,3939
ENTER$_t$	−0,33	3,25	0,5137	0,7418	−0,80	1,00	0,0214	0,3999
GROWTH $_t$	−0,40	2,26	0,3714	0,5331	−1,00	3,11	0,4070	0,8969
Butter ($N = 70$)								
PROCES $_{t-1}$	0,00	0,85	0,0576	0,1398	0,00	0,52	0,0583	0,0895
CONCENTR $_{t-1}$	0,02	1,00	0,1426	0,1858	0,02	1,00	0,1460	0,1909
ENTER$_t$	−0,50	1,32	−0,0617	0,2122	−0,29	1,60	0,0336	0,2727
GROWTH $_t$	−0,86	2,40	0,0494	0,5316	−0,60	1,88	0,1437	0,4772
Sugar (N=19)								
PROCES $_{t-1}$					0,01	1,00	0,7350	0,2496
CONCENTR $_{t-1}$					0,09	1,00	0,5092	0,3645
ENTER$_t$					−0,27	0,50	0,1041	0,2184
GROWTH $_t$					−0,13	8,47	1,6308	2,5733

Contents

Avdasheva S. Processing (Tolling) Contracts in Russian Industries: an Institutional Perspective = Авдашева С. Давальчество (толлинг) в российской промышленности: институциональный анализ: Препринт WP1/2002/04. — М.: ГУ ВШЭ, 2002. — 28 с.

А 95

Статья посвящена специфическим для российской и украинской промышленности давальческим контрактам на поставку сырья и материалов, на протяжении последних пяти лет занимающим высокую и стабильную долю в производстве ряда однородной продукции. Содержание и результаты использования давальческих контрактов проанализированы в контексте перераспределения прав собственности на активы перерабатывающих предприятий в краткосрочном периоде. Давальчество служит одним из способов вертикальной интеграции. Использование давальческих поставок позволяет повысить прибыль поставщика сырья благодаря нейтрализации "двойной надбавки". Давальческие контракты не являются эффективным типом вертикальных ограничений (в том смысле, что они не позволяют достигать той же суммы прибыли, что и вертикальная интеграция). Одновременно их достоинством служит снижение для поставщика сырья первоначальных затрат входа на рынки готовой продукции. Проанализированные данные об использовании давальческих контрактов в отраслях пищевой промышленности подкрепляют гипотезу о роли давальчества как пути входа на рынок и одновременно — реструктуризации использования активов перерабатывающих предприятий.

УДК 330.1:334
ББК 65.01

Препринт WP1/2002/04
Серия WP1
Институциональные проблемы российской экономики

Авдашева Светлана Борисовна

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(*на английском языке*)

Публикуется в авторской редакции
Зав. редакцией *Е.А. Рязанцева*
Ответственный за выпуск *Е.Н. Ростиславская*
Оформление серии *А.М. Павлов*
Корректор *Е.Е. Андреева*
Компьютерная верстка *О.А. Корытько*

ЛР № 020832 от 15 октября 1993 г.

Подписано в печать 30.09.2002 г. Формат 60×84 $^{1}/_{16}$. Бумага офсетная.
Печать трафаретная. Гарнитура Таймс. Тираж 150 экз. Уч.-изд. л. 2,31.
Усл. печ. л. 1,63. Заказ № 269. Изд. № 250

ГУ ВШЭ. 117312, Москва, ул. Вавилова, 7
Типография ГУ ВШЭ. 125319, Москва, Кочновский проезд, 3