International Institute for Applied Systems Analysis
Schlossplatz 1 • A-2361 Laxenburg • Austria
Telephone: (+43 2236) 807 342 • Fax: (+43 2236) 71313
E-mail: publications@iiasa.ac.at • Internet: www.iiasa.ac.at

Interim Report **IR-99-072**

Auctions Without Competition: The Case of Timber Sales in the Murmansk Region

Birgit Jacobsen (birgit.jacobsen@nibr.no)

Approved by

Sten Nilsson(nilsson@iiasa.ac.at)
Leader, Forest Resources Project

December 1999

Contents

Abstract

This report analyzes the timber-auction system introduced in Russia in 1997, focusing on the Murmansk region. The Russian auction system is strongly inspired by the North-American practice but many preconditions for the system to function efficiently are absent. The main obstacles are the shortage of auction participants and the resulting possibility of collusion. Thus, “one bidder-auctions” are common. This drives the Federal Forest Service (FFS) to lease timber at a low reservation price. By doing this, the FFS ensures social efficiency in the sense that a socially beneficial trade is carried out. However, this achievement is made at the cost of a modest rent appropriation. In Murmansk, we probably witness a true disinterest in timber resources, which is caused by unpredictable economic and political conditions. Short-term contracts dominate forestry activities and there are few incentives for developing sustainable forest use. Auction theory asserts that collusion is more likely in oral auctions than in sealed-bid auctions. Collusion is also more easily sustained in second price than in first price sealed-bid auctions. Since the latter auction form is most common, the FFS does seem to apply the formal means of control that they possess. This has made the market more transparent. However, with only a few market participants auctions may easily “collapse” into informal bilateral bargaining between the seller and the most likely buyer.

Acknowledgments

The research for this report was part of the project “Institutional Change in Forestry Management in Murmansk Oblast” funded by NFR, the Research Council of Norway (Program for East- and Central Europe). NFR is the Norwegian National Member Organization of the International Institute for Applied Systems Analysis (IIASA) and the work has been performed in collaboration with IIASA’s Sustainable Boreal Forest Resources (FOR) project.

The author wishes to thank Berit Aasen, Campell Day, Sveinung Eikeland, Vigdis Nygaard, Mats-Olov Olsson and other colleagues at IIASA, Knut Roed, and Arild Schou, who have given useful comments on this work. Special thanks to the Kola Science Center in Murmansk for scientific collaboration, and to Tamara Malkova who contributed relevant documentation and research. The author also wishes to thank the Federal Forest Service in Murmansk, in particular Pavel Pestov who contributed useful information during the work for this report.

About the Author

Birgit Jacobsen studied political science and Russian at the University of Oslo and graduated as a cand. polit. in November 1994 (with a thesis on local government in Russia in a period of political and economic transition). She has worked as a researcher at the following institutes: the Fridtjof Nansen Institute, the FAFO Institute for Applied Social Science (NORBALT project on living conditions in the Baltic states), and the Norwegian Institute of International Affaires (NUPI) at the Centre for Russian Studies (database on Russian politics). She is presently working at the Norwegian Institute of Urban and Regional Research (NIBR) in the Research Group for Environment and Development. Her focus is on forest management, institutional change, and local government in Russia.

Auctions Without Competition: The Case of Timber Sales in the Murmansk Region

Birgit Jacobsen (birgit.jacobsen@nibr.no)

1. Introduction[*]

Most empirical studies of timber auctions have been carried out in highly developed and well-functioning market economies such as the United States and Canada. The development of auction systems has been accompanied by a large body of theoretical research (cf. McAfee and McMillan, 1987, for a survey). The auctions introduced in Russia in 1997 were strongly inspired by the North-American experience. Needless to say, the timber auction system in Russia is immature and operates under highly imperfect market conditions. The present analysis deals with the Murmansk region (from now on: Murmansk) in northwest Russia. The aim of this work is first and foremost to classify the formal system of timber auctions introduced in Russia by comparing it with Western auction models. The legal acts and regulations that accompany the introduction of new institutional arrangements are fairly complicated, and we will try to bring some clarity into the new concepts formulated in these documents. The purpose is to explain, on the basis of auction theories, the conditions that have to be fulfilled for the auction system to function efficiently, and to discuss the problems facing the Russian authorities at this stage of implementation.

Forests are state property in Russia and will probably remain so in the foreseeable future. Auctions are not aimed at transferring state forests into private property. Their purpose is to allocate scarce timber resources as efficiently as possible through leasing contracts, in ways that ascertain transparency, impartiality and predictability in accordance with the law (Forest Code, 1997; The World Bank, 1996). The Federal Forest Service (FFS) is the chief administrator of the forest fund and plays the role of a monopolist in forest maintenance. The FFS is facing huge challenges. The forest sector in Murmansk has, as northwest Russia in general, experienced a structural and economic crisis in the 1990s with plummeting timber production (Ivanova and Nygaard, 1999; Jacobsen 1999a; Malkova and Ivanova, 1999). In 1995, Murmansk sawmill production was 87 percent lower than in 1990. Removal of roundwood timber was

[*] The empirical part of this paper is based on document studies (federal legislation and regulations), secondary literature and field work interviews made in Murmansk during September 1998 and March 1999. An earlier version (Jacobsen, 1999b) of this report was presented at the General Conference of EADI (European Association of Development Research and Training Institutes) 22–25 September 1999.

reduced by 88 percent. The forest sector in Murmansk is now characterized by its depletion of industrial forests, its outmoded technological equipment, lack of credits to allow around the year harvesting and production, long distances to harvesting plots, lack of infrastructure for transporting timber, and high transportation (railway) costs (Selin, 1998).

The transition of the economic policy, state institutions, and society in Russia has been accompanied by the adoption of huge amounts of legislative acts and regulations. This also concerns the forest sector.[1] Russian authorities have made efforts to streamline much of their policy according to Western standards. But the Russian context, into which these new policies have been adopted, differs from Western society in many respects. Russia is not only a country in transition, but it is also a former superpower in deep crisis. The current Russian society is a jelly-like organism absorbing policies, legal acts and decisions in its own way.

In the Soviet era, forest enterprises were part of a centralized production and distribution system. They were ensured regular access to timber resources. As the command economy gave way to a market economy, these networks were destroyed. During the decades of Soviet rule, the forest sector underwent several organizational changes (Malmlöv, 1998; Nilsson *et al.*, 1992; Malkova and Peshev, 1997). After the demise of the Soviet Union, the Russian State Forest Industry Company (*Roslesprom*) was established in 1993 on the basis of the former Ministry of Forest Industry (*Minlesprom*). Until 1996, the TPO *Murmanles* was part of *Roslesprom* and exercised the monopolist's right to extract timber resources in Murmansk. This state of affairs ended in 1996 when TPO *Murmanles* closed down. Similarly, in 1993, the Soviet State Forest Committee (*Goskomles*) was transformed into the Russian Federal Forest Service (*Rosleskhoz*). Its task is to carry out forest protection, secure reproduction, and provide management and control of the forests (Regulations... No. 544, 1998; and Regulations... No. 173, 1998).

According to official Russian policy, the privatization of logging enterprises were to take place in 1993 (The World Bank, 1996:46). In Murmansk, privatization in the forest sector was first enforced in 1996, when it happened almost overnight. It was met with local resistance and it brought no dramatic change of leadership in the forest enterprises. Afterwards many of them went bankrupt. This was the scenery behind the introduction of timber auctions in Murmansk in 1997.

This report is structured as follows. The next section describes the main auction types as outlined in the theoretical literature. Section 3 describes the auction forms that have been introduced in Russia. Section 4 discusses different aspects of the auction system. It evaluates the degree to which auctions are likely to foster true competition in northwest Russia and how the absence of competition may be alleviated by the imposition of a

[1] See, for example, Forest Code (1997); Regulations... No. 99 (1997); Regulations... No. 123 (1997); Regulations... No. 173 (1998); Regulations... No. 345 (1998); Regulations... No. 544 (1998); Regulations... No. 551 (1998); and Pappila, 1999. In 1992, Russian authorities committed themselves to follow up the UN Conference on Environment and Development in Rio de Janeiro. Within this framework Russian authorities worked out the *Federal strategic program "Forests of Russia" 1997–2000*. This program is considered a formal tool to ensure ecological, economic and social sustainability in the forest sector. Regional programs followed the federal program — in the Murmansk region the *Regional strategic program "Forests of Murmansk region" 1997–2000* was developed.

reservation price — but sometimes at the cost of spoiling a socially beneficial trade. We discuss the existence of collusion and bargaining activities that may arise when there are only a few — or only one — potential buyer(s). We look upon the extent to which sustainable utilization may be supported by long-term contracts. Section 5 presents the conclusions. The bottom line is that a sophisticated auction system was introduced in Murmansk into an environment in which there is a serious shortage of auction participants. As a matter of definition, an auction requires at least some form of competition among potential buyers. In Murmansk this is seldom the case. Auctions without competitive bidding is the rule, rather than the exception.

2. Models of Auction and Bidding Systems

An auction is "a market institution with an explicit set of rules determining resource allocation and prices on the basis of bids from the market participants" (McAfee and McMillan, 1987:701). Auctions enable the sales of products without a fixed price or a standard value. The price depends upon the demand and supply at a certain point in time, possibly influenced by anticipated future developments in the market. The typical purpose of an auction is for the seller to obtain a price, which lies as close as possible to the highest valuation among potential buyers. If the seller knew the valuations, there would have been no need to arrange an auction. The seller could then offer the 'goods' to the potential buyer with the highest valuation at a price equal to (or slightly below) that valuation. But valuations are generally unknown and auctions are essentially revelation mechanisms. We will describe four main auction types (McAfee and McMillan, 1987):

- the English auction (oral, open, with ascending bids);
- the Dutch auction (oral, open, with descending bids);
- the first-price sealed-bid auction; and
- the second-price sealed-bid auction (the Vickrey auction).[2]

The *English auction* is the most common auction form. At any point in time each bidder knows the level of the current highest bid. Bidders are able to observe their rival's bids and revise their own. Oral bidding begins at the highest of the sealed bids. The auctioneer can set a minimum acceptable increment to the highest existing bid. In a *Dutch auction,* the auctioneer calls an initial high price and then lowers the price until a bidder accepts. Under a *first-price sealed-bid auction* potential buyers submit sealed bids. Each bidder can only submit one bid and the highest bidder is awarded the item. For sealed-bid timber auctions, there is no pre-auction qualification round of bidding. The FFS collects the sealed bids until the submission deadline and awards the plot to the bidder who submitted the highest bid for a price equal to his bid (Baldwin *et al.*, 1997:691).[3] With a *second-price sealed-bid auction*, bidders submit sealed bids having been informed that the highest bidder wins the item, but pays a price equal not to his own bid but to the second-highest bid.

---

[2] After William Vickrey who wrote the seminal paper on auctions in 1961.

[3] Plot in Russian: *lesosek*, *delianka*.

A well-known but still quite remarkable result of auction theory is that all these forms of auctions on average yield the same revenue to the seller. A unique Pareto efficient Nash-equilibrium exists in each auction in which the bidder with the highest valuation obtains the 'goods', but pays a price equal to the next highest valuation of the bidders. In an English auction, which is oral and open to all participants at the same time, the result is intuitively simple. For each participant there is a dominant strategy to remain in the bidding until the price reaches the bidder's own valuation. The winning bidder does not need to reveal his true valuation because he will make a bid just slightly above the second highest valuation. In a second-price sealed-bid auction, there is also a dominant strategy. Each participant submits a bid equal to his true valuation. Again, the intuition is simple. Assume that a bidder was considering a bid below his true valuation. The only case in which this would change the outcome is if that bid were also below the second highest bid, in which case he would lose the item. Assume then that a bidder was considering a bid above his true valuation. This would only change the outcome if even the second highest bid were above his valuation, in which case he would win the item at a price above his valuation. Hence, to the extent that a deviation from the true valuation changes the outcome at all, it worsens the outcome for the potential buyer. The intuition is not as simple in the case of the Dutch auction and the first price seal-bid auction. In these cases, there are no dominant strategies; each actor's best response is dependent upon the other actors' strategies. Therefore, each actor must form expectations about the others' actions. On average it results, however, that the next highest evaluation will become the sales price, even in these cases.

2.1 The Reservation Price

How is the value distributed among the seller and the buyer in an auction?

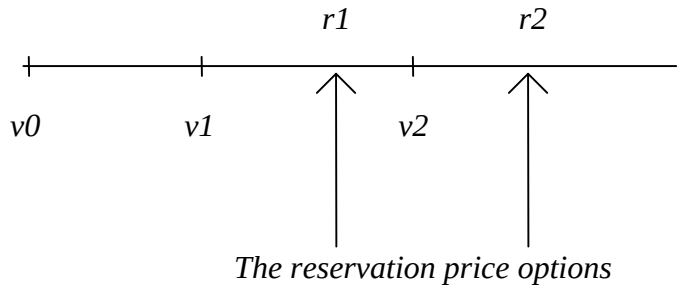

Figure 1: Distribution of value between seller and buyer in an auction.

Consider the simple case, related to Russian forestry, with only two bidders. In Figure 1, *v0* indicates the revenue (valuation) of the FFS, the seller, if it does not sell the leasing rights (the 'goods'). *v1* indicates the valuation of one bidder, and *v2* the valuation of another bidder. As we have seen, all the standard types of auctions yield the same result. Participant 2, who has the highest valuation, obtains the item. The total revenue associated with the transaction of (*v2*-*v0*) is distributed in such a way that the FFS obtains (*v1*-*v0*), while the buyer (participant 2) obtains (*v2*-*v1*). Now, if the FFS knew the valuations of the potential buyers it could obviously do much better than this. It could simply set the price equal to *v2* (or slightly below), offer the lease to participant 2, and thereby capture the whole rent.

In reality, however, the FFS does not know the true valuations of the potential buyers (in which case, the auction would be superfluous). But, realizing that a pure auction could yield an unreasonably high rent to the buyer, the FFS may set a reservation price which it believes lies close to, but not above, the highest valuation (such as *r1* in the figure). But since the valuations are unknown, it also runs the risk of overestimating the highest valuation and setting the reservation price too high (such as *r2*). In which case, an efficiency loss is imposed, from a social point of view, as the reservation price prevents gains from trade being realized.

2.2 The Number of Bidders

Increasing the number of bidders increases the seller's revenue on average, as the expected difference between the participants highest and the next highest valuation will decrease (*ceteris paribus*). Thus, the larger the number of bidders, the weaker the case is for a reservation price. At the other extreme: if there is only one bidder, he will bid the lowest possible bid, i.e., the valuation of the seller or the reservation price. According to economic literature it is not exceptional to have few bidders participating in auctions (McAfee and McMillan, 1987:703). However, if there is only one bidder the system does not result in an auction, but rather bilateral bargaining. A reasonable prediction in this case is the generalized Nash bargaining solution in which the two parties split the total surplus according to their relative bargaining power. In the Russian context this opens the ground for corruptive behavior.

A monopolist often directs auctions. Auction theory presumes that the monopolist has bargaining power because of his ability to commit himself in advance to a set of policies — and thus set some important conditions for trade. At the same time, the potential buyers know that the organizer of the auction has an interest in following the procedures of the auction. If the FFS should deflect from procedures already set when observing the bids, the bidders would act differently in future transactions and the FFS would lose credibility and thus bargaining power. The outcome of an auction depends on the institutional setting and the parties' ability to commit themselves credibly to certain actions with, e.g., "take-it-or-leave-it" offers.

2.3 Collusion

Collusion refers to *a situation where the final price — or the winning bid — results from collaboration among two or more potential buyers*. This collaboration contributes to lowering the final price. Stigler (1964) has noted that collusion is more likely to occur in oral auctions than in sealed-bid auctions because it is less costly for the actors who are colluding to detect if the other actor is cheating in oral auctions. All bidders' identities and bids are immediately known for all participants. Sealed-bid auctions prevent potential participants from colluding. Robinson (1985) made the simple but important point that a collusive agreement may be easier to sustain in a second-price than a first-price auction. Assuming that there are no problems among all of the bidders in coming to an agreement or in sharing the rewards between them and abstracting from any concerns about detection, the optimal agreement in a second-price auction is for the designated winner to bid infinitely high while all the others bid zero. No other bidder has any incentive to cheat on this agreement. In a first price auction the bidders must

agree that the designated winner bid an arbitrarily small amount, while all the others bid zero. It turns out that all the others have a substantial incentive to cheat on the agreement (Klemperer, 1999).

With a large number of potential bidders we assume that collusion is complicated because it is impossible to control all potential bidders. With few bidders the potential for collusion increases. With only one potential buyer, price setting is determined through some form of bilateral negotiation.

The potential for collusive bidding at government timber sales has long been recognized in the United States. Baldwin *et al.* (1997) conclude that bidder collusion best explains winning bids, but the data they use came from a region where the mill density is very high. Brannman (1996) found that potential competition significantly affects the size of winning bids in FFS sealed-bid auctions and has little effect on winning bids in oral auctions.[4] This result is inconsistent with competitive bidding but highly consistent with collusive behavior.

3. Auctions and Tenders in Russia

Timber auctions connect different processes of the production chain in the forest sector. They relate forest management with production, as logging companies and saw mills buy licenses or cutting permits to extract resources from the forests to meet their own production goals. Prior to a timber auction, information about the forest plots should be available to all potential bidders. Inventories of the forest stands in every region should be provided regularly and delivered to the FFS in Moscow.[5] Russian authorities have introduced two types of timber auctions and timber tenders with a longer duration:[6]

1. Competitive oral timber auctions;
2. Combined oral and sealed-bid timber auctions; and
3. Timber tenders.

Depending upon their importance, auctions are carried out by means of (1) oral auction (*ustnye sorevnovaniya, torgi*) or (2) as a combination of oral and written claims (*pismennyie zaiavleniia*) (sealed-bid timber auctions). Through these two kinds of timber auctions leasing rights in Murmansk are sold for a relatively small area for a period of one year. The criterion for determining who is to become the winner is solely that of the highest bid.

Through (3) timber tenders (*konkursy*) leasing rights are offered for rather large areas (from a few thousand to ten thousand ha). The leaseholder is only allowed to use the timber resources specified in the contract (for harvesting, hunting, tourism, etc.). In

[4] In his 1996 article, Brannman examined the impact of potential competition on winning bids in Forest Service oral and sealed-bid timber auctions held during 1977 in the Pacific Northwest.

[5] In the Murmansk region inventories have been carried out for 3,723.3 ha of the forest fund during the past 10 years, 2,208.9 ha the last 11–15 years, and 2,256.0 ha the last 16–20 years (The Regional Strategic Program, 1998).

[6] Cf. Regulations ... No. 99 (1997) and Regulations ... No. 123 (1997).

timber tenders only written bids are considered. The suggested price is only one of several criteria that determine who wins. Other criteria are the duration of contract, experience, competence, technology, and establishing jobs for the local population. The auction commission may investigate the pretenders. The leasing rights may last up to 49 years. There are two forms of tenders, open (*otkrytye*) and closed (*zakrytye*). Closed tenders are held for a restricted circle of persons selected by the commission of the forest tender. The commission decides on the form of tender.

Every region decides on which level (regional or local) timber auctions and tenders are to be carried out. In Murmansk the timber auctions are locally organized, timber tenders are conducted regionally. [7] The combined model of oral auctions and written bids is the most commonly used method. In other regions, leasing of timber plots larger than 1,000 m^3 are carried out on the regional level, while the leasing of smaller plots are locally conducted.

Competitive oral forest auctions are similar to *English auctions* with a small overture: prior to an oral auction interested bidders are required to submit sealed bids. During the auction these bids are opened. Bidders who submit sealed bids not less than a minimum price (the stumpage price) qualify for the oral bidding stage of the auction. Oral bidding begins at the highest of the sealed bids.

Combined auctions are quite similar to *first-price sealed-bid auctions*. They start as oral auctions, but end with sealed bids.[8] Each bidder can only submit one bid and the highest bidder is awarded the item for a price equal to his bid.

Timber tenders classify as *first-price sealed-bid auctions*, but differ with regard to the more subjective criteria concerning the pretenders' experience, competence, technology and potential as a creator of local jobs.

The winner of the auction and the organizer sign a protocol, which has the form of a contract. This contract describes the location and limitation of the plots, the amount and type of forest use, and payment. Finally, the forest management unit of the FFS (*leskhoz*) produces a list presenting the results of the auction. Closed auctions are announced, when bigger quantities of timber stocks are sold. Potential bidders are invited to participate in the auctions (Regulations ... No. 99, 1997).[9]

The organizer of an auction sets the initial participation fee, which should be paid in advance by potential bidders to confirm their interest in participating in the auction. The size of the fee is decided by the organizer and should not be less than 10 percent of the FFS's reservation price. This fee is subtracted from the total price if a purchase takes place. The fee is returned to those who did not purchase any timber. If the winner of the auction does not pay the realized price within 20 days after signing the contract, the

[7] According to information provided in July 1999 by Pavel Pestov of the Murmansk Forest Management.

[8] If there are equal bids for a forest plot, the dispute will be solved through a final oral competition among the relevant bidders.

[9] In the U.S. and Canada it is more common for mills to bid at private timber sales than at auctions directed by the Forest Service. The information is not publicly announced and participants are invited.

trade is canceled (and the winner will not receive his deposit) (Regulations... No 99, 1997, art. 48–49, and; Regulations... No 551, 1998, art. 50).

Lease contracts are valid for a period of one to five years (Forest Code, 1997:art. 34). *Contracts concluded on the basis of tenders* (for a period up to 49 years) must be followed by a forest management plan (*proekt vedeniia lesnogo khoziaistva na arendovannom uchastke*). *Concessions*, however, relate to plots that are undeveloped and require basic infrastructure investments (ibid.:art. 37). They are only given to foreign companies for the utilization and processing of timber resources, and the Russian Government takes this decision without the participation of local forest management units. There is still confusion in Murmansk about the difference between leasing and concessions. *Cutting permits* (*lesorubochnye bilety*) are issued for short-term use of forests (up to one year). The local forest management unit (the *leskhoz*) issues cutting permits, granting a forest user the right to procure and remove timber, resin and secondary forest resources (ibid.:art. 42). Payment is not demanded for intermediate cutting carried out in the leaseholder's area (Regulations ... No. 345, 1998, art. 29). This measure is probably directed at stimulating harvesting enterprises to make cuttings that promote sustainability.

4. The Degree of Competition in the Murmansk Forest Sector

4.1 The "Action Arena"

We consider the timber auction or timber tender as an "action arena" (Ostrom *et al*., 1994), where the "actors" are the seller — in our case it is the FFS in Murmansk — and the potential buyers or "bidders" who make their bids to lease timber plots from the Federal Forest Fund. The FFS leases timber resources to users (timber harvesting enterprises, ministries and agencies, judicial persons) and the lease agreements are concluded on the basis of tenders or auctions (Forest Code, 1997:art. 41). The FFS formulates procedures for sharing forest resources, payment of taxes, etc., and obligations relating to the investment of infrastructure facilities. Timber constitutes the "goods" which is the object of evaluation and trade during an auction. A timber auction can provide the means for the FFS to achieve a socially efficient utilization of forest resources. An important aim of the FFS is to lease timber to bidders who can make the best use of the resources while adhering to sustainability norms. The main goal of the bidders is to make a profit on forest use. Since real-life actors do not possess perfect information, they will have to estimate the value of timber resources offered through tender or auction. They use the information given in the public announcement and assessment along with their own calculations.

As shown in the theoretical discussion, the type of auction does not influence the expected price. On average, they all yield the same revenue to the seller if the bidders behave independently. However, the auction form does play a role if a risk of collusion exists among the potential bidders. Collusion activities are more easily performed during oral than in sealed-bid auctions. Collusion is also more easily sustained in second price than first price sealed-bid auctions (cf. section 2.3). Thus, the FFS can best exercise control if it conducts a first price sealed-bid auction. An oral auction ending as a first price sealed-bid auction will have this form of control.

Let us have a closer look at the extent to which the auction system is able to fulfill the following four aims, namely:

1. to obtain *social efficiency* in the sense that leasing rights are allocated to the potential buyer with the highest valuation;
2. to *extract pure rents* embedded in the timber resources;
3. to facilitate a *sustainable use* of the forest plots; and
4. to bring *transparency* into the transaction process.

Here we will try to assess the extent to which the forest sector has developed a competitive climate that is conducive to the enforcement of these goals through the auction system currently in use. In section 2.1, we concluded that auctions normally do deliver social efficiency. There are at least three cases in which this result may be violated: if a reservation price is applied; if there are restrictions on efficient use, such as prohibiting sub-leasing; or if some prospective buyers (with potentially high valuations) are excluded from participating. In the following subsections, it will be clear that all these violations are relevant in the Murmansk forest sector. Furthermore, the possibility for the FFS to extract rents depends crucially on two factors: the distribution of the buyers' valuations and the number of potential bidders. A characteristic feature of timber auctions in Murmansk is that *the spread in the participants' valuations is large* and that *the number of potential buyers is low*.

4.2 The Trade-off Between Realizing a High Price and the Risk of Spoiling Trade

As shown in the theoretical discussion in section 2, auctions with few bidders, who also have very different valuations, do not deliver on the goal of rent extraction. By enforcing a reservation price, the government faces a trade-off between the goals of maximum rent extraction on the one hand and social efficiency on the other. A low reservation price ensures social efficiency, in the sense that a larger socially beneficial trade is carried out, and the rights are allocated to the potential buyer with the highest valuation. But this achievement is made at the cost of a lower rent appropriation. A high reservation price, on the other hand, might yield a better price, but risks spoiling trade altogether.

In practice, the FFS in Moscow first sets the minimum price (*mimima'lnaia stavka*). The FFS on the regional level then adjusts the price (*konkretnaia stavka*), which cannot be lower than the price set in Moscow. Altogether, this constitutes the stumpage price (*popennaia plata* or *stoimost' drevesiny na korniu*). The stumpage price is determined by the FFS and supposed to be calculated as follows: Stumpage price = World market prices *minus* transportation costs *minus* harvesting costs *minus* other costs linked to harvesting (including taxes and fines unrelated to profits) *minus* risk and profit compensation to investors.[10] The local forest management unit (the *leskhoz*) decides the final reservation price, based on local knowledge about quality and composition of timber stock, and based on distances of hauling and distance to foreign markets.

[10] The stumpage price is differentiated according to wood tariff regions, wood tariff belts, groups of wood species, reserves of wood, and transportation distance.

According to Regulations ... No. 345 (1998, art. 27), the estimated yearly output from the forest plot(s) should be calculated at this price. It should consider the low expected production capacity of forest enterprises during the first 1–3 years and the investments that have to be made to establish and develop the production capacity. In Murmansk, there is a significant difference between the reservation price in the northern and the southern areas caused by great differences in quality and accessibility of timber.

Until the Federal Forest Code was enacted in 1997, the "stumpage price" was a charge paid at stump for the harvest of timber. These charges were administratively fixed.[11] Today, the stumpage price is the basis for the reservation price and not a general charge. Timber may not be leased below the reservation price.[12] Logging enterprises typically pay a price not exceeding 2–3 percent of the total production value. During the six first months of 1999, twelve timber auctions were carried out in Murmansk, offering 37 different forest plots for lease.

Since there were no competitive biddings that could increase the price, all these plots were eventually leased at the reservation price. There were only single potential buyers participating at all the auctions. In continuing to lease forest plots at a low price the FFS at least achieves an improved *social efficiency* in the sense that a socially beneficial trade is actually carried out, but at the cost of a small (or non-existent) *rent extraction*. If the FFS wanted to increase the stumpage price, it could hire an international company as a "third party" to make an objective certification and valuation of the forests in Murmansk. This would be reasonable under circumstances where the FFS believe that stumpage is set too low and where the expected profit by doing this certification would exceed presumed costs.

4.3 Participants' Valuations

Differences in valuations may arise because of the differences in firm specific operating costs and market access or differences in information. When logging enterprises and sawmills are secured an uninterrupted flow of logs for the production process, the leaseholder is allowed to be more flexible as to when timber is cut (Baldwin *et al.*, 1997). This seems to have a positive effect on prices and winning bids are generally higher.

Costs typically vary substantially depending upon the geographical location of mills and the associated hauling distance, as well as on the capital equipment installed in each mill. Such differences could be reduced (or even eliminated) if sub-leasing were allowed. However, according to the Forest Code (1997:art. 34) and Regulations ... No. 345 (1998, art. 5), sub-leasing is prohibited. Thus, winners of timber auctions are not

[11] In 1996, the average stumpage price in Russia was less than 1 US dollar per cubic meter, compared to up to 30 US dollars in Scandinavia and about 10 US dollars in other countries (The World Bank, 1996).

[12] The average stumpage price of 1 m^3 timber at forest plots in the Murmansk region was about 18 rubles as of mid-1998. The reservation price, which seemed to become the price paid at auctions, varied between 25–45 rubles for 1 m^3, depending upon location, stock, distance of timber hauling, the presence of transport routes, and demand for forest resources.

allowed to resell leasing rights from their leased plots to neighboring mills.[13] This contributes not only to a larger spread in potential buyers' valuations but also to an inefficient use of forest resources. Many enterprises are not able to make use of all the timber because of species variation and forest quality heterogeneity. They lack specialization and apply outmoded technologies. Thus, the value of timber plots is reduced since buyers may not resell leasing rights to others who utilize the timber in a more efficient way.

In order to ascertain that all market participants have access to the same information, relatively clear formal procedures exist for conducting auctions in the Murmansk region. As in the United States, auctions must be announced (in the regional or local newspapers) 30 days before they take place (Regulations ... No. 99, 1997). The announcement should include the date and place of the auction, a short description of the characteristics of the plots, their location and the estimated volume of allowed cutting, the stumpage price, and the sum of advance payment required for participation in the auction. The organizers of the timber auction are obliged to provide full and accurate information about the auction units to the potential buyer.

According to Regulations ... No. 99 (1997, chapter VII, pp. 51–56), the local forest management units (*leskhozy*) that actually conduct timber auctions have several obligations when evaluating the forest stands. They should delimit forest plots, ensure accurate determination of quantity and quality of timber within the boundaries of applied taxation methods, and grant necessary and reliable information about the auction units to be sold. Hence "inside information" and local knowledge about the area can influence the potential buyers' valuations and willingness to claim their bids. Information is typically asymmetric. The local industry has more direct links to the regional administration and thus can be better informed than foreign companies about the arrangement of auctions and the conditions in the forests. It appears that regional authorities are inherently skeptical towards foreign investors, an attitude that is perhaps justified from experience. However, this contributes to narrowing the range of auction participants. The low salaries could make foreign industrial investments and activities in some areas of the Murmansk forests quite profitable.

4.4 The Number of Bidders

Auction theory predicts that an increase in the number of bidders on average increases the seller's revenue. The larger the number of bidders, the smaller will be the expected difference between the participants' highest and next highest valuation. The number of firms closely located to the timber resources plays a significant role with regard to the number of potential bidders (Brannman, 1996). But when an auction involves the construction of permanent roads, only large firms may have the required financial strength to participate. Only these firms possess the needed working capital and specialized road building equipment. In Murmansk, one has tried to attract more investors by announcing the auctions in both regional and local newspapers. However, the regional authorities have concluded that announcing auctions on the regional level

[13] In the U.S. and Canada highly specialized harvesting companies and sawmills seldom make use of all the timber they have leased. They are allowed to resell considerable amounts of timber from the leased plots to neighboring mills, increasing the efficiency of forest use.

has minimal effect on the number of bidders — potential buyers are first and foremost interested in timber resources close to their own mills.

According to the *Regulations on leasing of plots from the Forest Fund* (Regulations ... No. 345, 1998, art. 8), forest plots can be leased without competition for a period of 1–5 years to forest users (including also agricultural organizations) who have been extracting the resource in the area for a longer period. These users ought to have the production capabilities of carrying out the harvesting and processing of timber.

Competition could also be strengthened through the participation of foreign firms. Formally, both Russian and foreign actors are allowed to participate in open competitive biddings. But the great economic and political uncertainties in Russia along with unclear and contradicting legislation are some reasons for the low number of foreign participants. Russia lacks trust abroad and foreign investors are cautious about making investments. Many have met restrictions set by regional authorities, which seem to favor local industry at the expense of foreigners.

On the territory of Murmansk Oblast, 26 forest plots were leased (as of March 1999) but only seven of these were for timber production. The others were leased for reindeer pasture, cattle breeding, and haymaking.[14] The long hauling distances and the under-developed infrastructure make forest plots in Murmansk less attractive to potential buyers. Forest enterprises rarely have the required working capital and specialized road building equipment. The density of the transport net in Murmansk is 0.08 kilometers per 100 ha of forestland and more than 60 percent of the roads are in a bad condition. This makes it difficult to carry out harvesting and afforestation. Actually, the building of forest roads has stopped in Murmansk (The Regional Strategic Program, 1998). In January 1998, forest lands in the Murmansk region amounted to 67.5 percent of the total area. Two thirds of the forest land contained exploitable forests. However, only 14.1 percent (9780.400 ha) of this potential was actually exploited. This was down from an exploitation rate of 25 percent two years earlier and as much as 50 percent in 1980. The development indicates a huge under-utilization of current timber resources in Murmansk. Hence, timber auctions channel only a small part of the resources that are available.

However, the commercial interest for the extraction of forest resources clearly varies with the geographic location of enterprises. The forests in the southern part of the region are more densely forested and productive than in the northern part. In the south, the distance of timber hauling is 40–50 km (compared to 200 km in the northern Kolsky *leskhoz*). The climatic conditions are more favorable in this part of the region and the demand for timber is higher due to the close location to the Finnish market. If we bear in mind that most of the forest fund, defined as cutting areas, is in short-term use, there is a very large timber reserve that remains unused.

Since the FFS's capability to extract rents depends upon the number of potential bidders — and that number is very low — it is difficult for the FFS to obtain a good price for

[14] According to Regulations ... No. 345 (1998) forestland can be leased for different purposes: timber harvesting; extraction of resin; collection and use of stumps, bark, birch-bark, fir-, spruce-, and pine branches, Christmas trees, etc; secondary forest use (haymaking, cattle pasturing, berries, fruits, nuts, mushrooms, medicinal plants, etc); hunting; cultural- and health purposes, tourism, and sport.

timber resources. When winning an auction entails the construction of permanent roads and infrastructure facilities — and enterprises have low purchasing power — it is the distance of hauling that decides who will actually bid for the timber plot and who will receive the leasing rights.

According to Russian legislation, both auctions and tenders require more than one bidder. But if the authorities would strictly follow this requirement, no forest resources would be utilized, since there are so few potential bidders in Murmansk. This would mean a loss of income for the FFS. Therefore, the authorities tend to disregard this fact and accept the bid when there is only one bidder, although this is contrary to the law. But, as one insider comments, "life brings about its own corrections". The typical procedure seems to be the following: a single bidder proposes his bid, which is (close to) the reservation price. The *leskhoz* selects an appropriate area for leasing and utilization and the formal documents are prepared. Only then is the auction or tender announced in the newspapers. If more bidders should suddenly appear — fine — this would increase the price. If not, the first single bid proposed would be realized.

Before 1999, there were no timber tenders (*konkursy*) in Murmansk. In 1999, there have been four timber tenders, all of which were closed tenders. Two of them were areas intended for harvesting, one was for tourism, and the last one never actually occurred, because the potential buyer was bankrupt. The common denominator is that there was only one bidder.

The first *closed* timber tender (April 1999) included an area of 38 thousand ha in the Kola and Pechenga districts (municipalities) with a yearly withdrawal of timber amounting to 7,000 m^3.[15] This tender was only directed at local Russian forest enterprises working in Murmansk. During the tender the price increased considerably compared to the initial price. However, this price increase was not the result of competition but the result of a decision taken by the Russian Government to raise the minimum price (*minimal'naia stavka*) by 40 percent (cf. section 4.2). This led to an increase in actual price (*konkretnaia stavka*) and, hence, the stumpage prices. Since the payment for leasing is supposed to be higher than the stumpage price (*popennaia plata*), the local forest management units (*leskhozy*) raised the reservation price. This meant a total price increase of 60 percent. The leasing right was offered to the joint-stock company "Guchur", which was then given the rights to harvest but also the duties to arrange for fire fighting, forest protection, and afforestation.

4.5 Collusion — when Auctions Break Down

As noted in section 2.3, collusion activities are less viable in sealed bid- than in oral auctions. One indication that collusion actually takes place is that winning bids indeed tend to be higher under sealed bidding than under oral bidding. When only a few bidders participate in an auction, there is still a significant potential for collusion among the bidders. In a one shot "game" the potential buyers would not so easily collude, but in repeated "games" they have a certain interest in sticking to their deal.

[15] The second closed timber tender in Murmansk was announced to take place 27 April 1999. That auction included an area of 50 thousand hectares in the Kovdor district. An enterprise with foreign capital was one potential bidder (Russian news, 1999).

Brannman (1996) argues that public policy should be concerned with obtaining the highest possible value for public timber and ensuring that forests are efficiently allocated to the firm having the highest valuation. He finds that sealed-bids widen the potential 'pool' of bidders and sealed bid auctions result in higher timber prices. Theoretically, potential bidders to an imperfectly competitive market limit the ability to charge high prices. In practice, however, in sealed-bid auctions it is impossible for bidders to identify other potential bidders (Brannman, 1996:730). In oral auctions, on the other hand, the potential bidders are participating and therefore easy to register. Formally, the Russian auction model is a combination of oral auctions and sealed-bid auctions, or pure oral auctions. In Murmansk, there have only been sealed-bid auctions. However, this does not protect the sales from collusive activities. The fact that there are few potential buyers can make it easy for bidders to cooperate or develop some common understanding about which area "belongs" to whom and who should keep out of an auction.

Since there is often only one potential buyer who is located close to the timber resources offered, the FFS faces a problem in defining a reservation price, which does not under-value the timber resources. The stumpage price may easily become the final reservation price. The potential buyer has no intention of giving a higher bid, knowing that there is no real competition going on. However, in the case of only one single potential buyer, one should probably evaluate the outcome on the basis of bargaining theory rather than auction theory. Both parties possess some degree of market power that they will seek to exploit. The bargaining strengths, in turn, depend upon the institutional setting, the sequence of moves, and on the parties' abilities to commit themselves (bargaining game, cf. section 2.2).

Auctions without competition involve a clear risk of "nepotism" and even outright corruption among the seller and the buyer. This may particularly be the case when leasing is conducted at the level of local forest management units (the *leskhoz*-level). Legislative "loopholes" and contradicting laws also complicate the implementation of new institutional mechanisms (Nilsson and Shvidenko, 1998). When timber auctions were introduced in 1997, they were carried out locally, but in 1998 auctions were organized regionally by the FFS in Murmansk. The Governor issued a decree prohibiting local authorities from taking part in auctions. Regional authorities were assumed to be more independent and less subjected to manipulation by external and local actors. However, the process of leasing became more time consuming, inefficient and impractical. There were few potential bidders and no real competition. A lot of paper work was related to the implementation of auctions — even to small forest plots with the size of 30–50 m^3.

From 1 January 1999, auctions were again carried out locally in Murmansk. Other steps have been taken to ensure impartiality. In Murmansk, auction commissions are approved by the municipal administration. The deputy mayor in the municipality holds the chairman position. Other members are representatives of the municipal financial department and the local forest management unit (the *leskhoz*). According to the Forest Code (1997:art. 35), auction commissions are to be chaired by the regional (political) authority and include representatives of the regional Forest Management, environmental protection agencies, as well as other interested organizations. The regional (political) authority ensures impartial treatment of the bidders. However, leasing should be prepared by the regional Forest Management with the participation of municipal

government agencies and forest users (ibid.:art. 34). Also, according to Regulations ... No. 99 (1997), the organizer must be the regional Forest Management and local forest management units (the *leskhozy*).

4.6 Sustainability?

Sustainable utilization and management can be handled through rules and/or incentives. In the Murmansk forest sector one relies primarily on rules. These rules are embedded in binding contracts that are part of the leasing procedure. Forest users are obliged to use forest plots according to the Forest Code (1997, art. 83). Forest users should not harm the natural environment; they should carry out operations to prevent soil erosion, conduct fire prevention activities, and minimize the negative effects of forest use. Forest users are obliged to remove timber cut from the areas within a limited time frame. They must carry out afforestation according to conditions set by the lease contract. The leaseholder is obliged to fell and remove timber within the time stated in the forest harvesting ticket and to clean the area and restore the forests.

Enforcement of rules requires monitoring, which is costly especially to an organization such as the FFS with scarce economic and human resources. Rules can often be evaded through loopholes. There is an urgent need for the FFS to establish efficient forest monitoring and inventories in order to achieve sustainable development, but this requires resources.[16] For the time being the FFS is primarily collecting data (Nilsson and Shvidenko, 1998). Incentives, on the other hand, are based on the firms' pursuit of their own self-interest. One way to provide the logging enterprises and sawmills with incentives to run forests in a sustainable way is to give them long-term contracts. However, both forest users and the FFS hesitate to enter into such contracts. The reasons are manifold.

First, it is connected with the obligation put on the leaseholder to harvest a certain amount of timber each year. If this level of harvesting is not reached, the leaseholder will nevertheless have to pay taxes on the decided amount. Second, the forest management plans that are required by a long-term contract discourages potential Russian harvesting enterprises from establishing activities in the forests. Preparing such plans costs too much.[17] Third, future revenues and losses are difficult or even impossible to calculate and the risk is high under the present unstable and stochastic economic and political conditions in Russia. Finally, the FFS is reluctant to lease the forests on a long-term basis because there is a high risk of the leaseholder becoming bankrupt. Under such circumstances, it is difficult to renegotiate a contract. And, if the leaseholder fails to appear, the last option is to bring the case to court. Hence, the typical contract is short term, usually less than five years. To date, only the private enterprise Makarova has concluded a 10-year contract in Murmansk. The well-known joint-stock company "PRIRODA" concluded a 5-year contract.[18]

---

[16] Monitoring is a system of observation, assessment and development of forecasts by the Forest Fund to inform management of the use, conservation, protection and reproduction of forests.

[17] Confirmed by Nadezhda Zemena, consultant of the Ministry of Industrial Development in the regional administration (interview, September 1998).

[18] According to Pavel Pestov, the FFS in Murmansk region, November 1999.

5. Conclusions

Auction theory states that the system of auctions used has minimal effect on the winning price in an auction. On average, the different auction systems yield the same revenue to the seller. An equilibrium exists in each auction system: given that each bidder follows his own strategy with regard to his bid, no individual bidder could do better by bidding differently. The following is of relevance for the timber price: the reservation price, the distribution of valuations, and the number of bidders. The interaction between these factors affects the existence of collusion. Collusion can appear in a situation where two or more bidders make explicit or implicit agreements attempting to reduce the timber price. Auction theory asserts that collusion is more likely in oral auctions than in sealed-bid auctions. Collusion is also more easily sustained in second price than in first price sealed-bid auctions. Since first price sealed-bid auctions are very common in Murmansk, the FFS has formal means to control collusion. However, in Murmansk there is rarely more than one bidder.

The frequent occurrence of “one bidder-auctions” may indicate that other actors stay away and do not participate in auctions of areas that they understand already “belong” to a particular bidder. If many potential bidders do this favor they achieve the desired result of reducing the FFS’s price of timber. However, in the case of timber sales in Murmansk we may witness a true disinterest in the timber resources reflected in the low reservation price. The system does not invite much collusion among potential bidders as it opens up informal “deals” between the FFS and the one “bidder”. For the time being, this may be an inevitable step to maintain a minimum level of forestry activities — keeping life in some local forest communities.

The auction system is built on a number of preconditions that are not available in today’s Murmansk, probably reflecting the situation in Russia at large. In spite of this, formal rules and procedures nevertheless influence local activities. Though having problems with comprehending and perceiving the content and complexity of laws and rules, local actors obviously attempt to follow them in Murmansk. This brings some *transparency* into the system.

References

Baldwin, L.H., R.C. Marshall and J.-F. Richard (1997). Bidder Collusion at Forest Service Timber Sales. *Journal of Political Economy*, Vol. 105, No. 4, pp. 657–699.

Brannman, L.E. (1996). Potential Competition and Possible Collusion in Forest Service Timber Auctions. *Economic Inquiry*, Vol. XXXIV, October, pp. 730–745.

Forest Code (1997). *Lesnoi Kodeks Rossiiskoi Federatsii* (The Federal Forest Code), The State Duma, 22 January. Moscow: Izdadelstvo "OS-89".

Ivanova, L. and V. Nygaard (1999). *Institutions and the Emergence of Markets — Transition in the Murmansk Forest Sector*, IIASA Interim Report, IR-99. Laxenburg, Austria: International Institute for Applied Systems Analysis (forthcoming).

Jacobsen, B. (1999a). *Balancing Interests of Local Forest Communities with Policy Goals of Ecological and Economic Sustainability*. Paper presented at the International Research Conference at the Kola Science Center: "Global and Local Socio-Economic Processes in the North", March 18–21, Apatity.

Jacobsen, B. (1999b). *Auctions without Bidders. A Case of Timber Sales in Murmansk Region*. Paper (No. 315, WG/GT A5–7) presented at the 9th General Conference of EADI (European Association of Development Research and Training Institutes) 22–25 September 1999.

Klemperer, P. (1999). Auction Theory: A Guide to the Literature. *Journal of Economic Surveys*, Vol. 13, No. 3, pp. 227–286.

Malkova, T. and N.G. Peshev (1997). *Lesnye resursy kol'skogo severa: Ekologo-ekonomicheskie aspekty lesopol'zovaniia* (Timber Resources of the Kola Peninsula: Ecological and Eco-nomic Aspects of Forest Management). Apatity: The Kola Science Center, Russian Academy of Sciences.

Malkova, T. and L. Ivanova (1999). *Napravleniia strukturnykh preobrazovanii v lesopol'zovanii Murmanskoi oblasti*, (The Direction of Structural Change in Forest Use in the Murmansk Oblast). Paper presented at the International Conference "Global and Local Socio-economic Problems of the North", March 18–21, Apatity.

Malmlöv, T. (1998). The Institutional Framework of the Russian Forest Sector: A Historical Background. In: Lars Carlsson and Mats-Olov Olsson (eds.) *Initial Analyses of the Institutional Framework of the Russian Forest Sector*. Interim Report, IR-98-027/June. Laxenburg, Austria: The International Institute for Applied Systems Analysis, pp. 7–29.

McAfee, R.P. and J. McMillan (1987). Auctions and Bidding. *Journal of Economic Literature*, Vol. XXV, pp. 699–738.

Nilsson, S., O. Sallnäs, M. Hugosson and A. Shvidenko (1992). *The Forest Resources of the Former European USSR*. Laxenburg: International Institute for Applied Systems Analysis. The Parthenon Publishing Group. Casterton Hall, Carnforth, Lancs, LA6 2LA, UK. One Blue Hill Plaza, Pearl River, New York 10965, USA.

Nilsson, S. and A. Shvidenko (1998). *Is Sustainable Development of the Russian Forest Sector Possible?* IUFRO, Occasional Paper No. 11, June (This paper can be retrieved via internet from URL: http://iufro.boku.ac.at/iufro/publications/occ-p11/index.html (May 26, 1999).

Ostrom, E., R. Gardner and J. Walker (1994). *Rules, Games, and Common-Pool Resources.* Ann Arbor: University of Michigan Press.

Pappila, M. (1999). *The Russian Forest Sector and Legislation in Transition.* IIASA Interim Report, IR-99-058. Laxenburg, Austria: International Institute for Applied Systems Analysis.

Regulations... No. 99 (1997). *Polozhenie o poriadke provedeniia lesnykh auktsionov* (Regulations on the conduct of forest auctions), No 99, 11 August. Moscow: The Federal Forest Service.

Regulations... No. 123 (1997). *Polozhenie o poriadke provedeniya lesnykh konkursov* (Regulations on the conduct of forest tenders), No 123, 30 October. Moscow: The Federal Forest Service.

Regulations... No. 173 (1998). *Polozhenie o Federal'noi sluzhbe lesnogo khoziaistva Rossii* (Regulations on the Federal Forest Service of Russia), No. 173, 10 February. Moscow: The Russian Government.

Regulations... No. 345 (1998). *Polozhenie ob arende uchastkov lesnogo fonda* (Regulations on leasing of plots from the Forest Fund), No 345, 24 March. Moscow: The Russian Government.

Regulations... No. 544 (1998). *Poriadok osushchestvleniia Federal'noi Sluzhboi lesnogo khoziaistva Rossii i ee territorial'nymi organami gosudarstvennogo kontrolia za sostoianiem, ispol'zovaniem, okhranoi, zashchitoi lesnogo fonda i vosproizvodstvom lesov* (Regulations on the performance of the Federal Forest Service of Russia and her territorial organs of state control of the condition, use, conservation, and protection of the forest fund, and the reproduction of forests), No. 544, 1 June. Moscow: The Russian Government.

Regulations... No. 551 (1998). *Pravila otpuska drevesiny na korniu v lesakh Rossiiskoi Federatsii* (Regulations on the allotment of standing timber in the forests of the Russian Federation), No. 551, 1 June. Moscow: The Russian Government.

Robinson, M.S. (1985). Collusion and the Choice of Auction. *Rand Journal of Economics*, Vol. 16, pp. 141–45.

Russian news (1999). Spros na les rastet (The demand for timber increases). *Novosti*, 13 April, Murmansk.

Selin, V.S. ed. (1998). *Problems of Stabilization of Socio-Economic Situation in North-West and Russian European North.* Apatity: Institute for Economic Problems, Kola Science Centre.

Stigler, G.J. (1964). A Theory of Oligopoly. *Journal of Political Economy*, February, pp. 44–61.

The Federal Strategic Program (1997). *Federal'naia tselevaia programma "Lesa Rossii" na 1997–2000 gody* (The Federal Strategic Program "Russia's Forests" 1997–2000). *Rossiiskaia Gazeta*, 29 October.

The Regional Strategic Program (1998). *Regional'naia tselavaya programma "Lesa Murmanskoi Oblasti" na 1997–2000.* (The Regional Strategic Program "Forests in Murmansk Region" 1997–2000). Resolution of the Governor in Murmansk Oblast, 27 May.

The World Bank (1996). *Russian Federation Forest Policy Review. Promoting Sustainable Sector Development During Transition*, Report No. 16222-RU. Document of the World Bank (World Bank Report 1996), December 10. Washington D.C.: The World Bank.

Vickrey, W. (1961). Counterspeculation, Auctions, and Competitive Sealed Tenders. *Journal of Finance*, 16, pp. 8–37.