Appendix on Russian Oil and Gas Auctions to accompany "The Vulnerability of Auctions to Bidder Collusion"*

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For the past few years the Russian government has held oral ascending-bid auctions for oil and gas leases. Data on these auctions are available on the website for the Center for the Study of Auctions, Procurements and Competition Policy at Penn State: http://econ.la.psu.edu/CAPCP/.

The auction rules require that there be at least two bidders at the auction for it to proceed. The Russian government sets a reserve price for each lease and determines the bid increments. The lowest feasible bid is one bid increment above the reserve price.

Three empirical regularities are worth noting about the Russian oil and gas lease auctions. First, of the auctions with more than two bidders, there often appears to be vigorous competition. Second, in the large plurality of auctions that have only two bidders, many end after submission of only one bid, which is the smallest increment needed to award the lease. Third, many, but not all, of the bidders that participate in the two-bidder auctions never win any oil or gas leases in our data. In other words, for many of these two-bidder auctions it appears that the second bidder is a shill bidder that is acting as the agent of the winning bidder. Their presence appears to

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be motivated solely by the auction rule requiring that at least two bidders be present. The process is such that it may not be clear whether one of the bidders is a shill of the other.

With regard to the design of these auctions, the bidder registration process,[1] which occurs in advance of the main auction, reveals some but not all information about the bidders. The results below illuminate the importance of the information revealed through the bidder registration process for inhibiting or facilitating collusion.

We have data for 620 auctions from 2004 to 2007. For 121 auctions the data are complete, but for 499 auctions there is only partial information available currently. On average, the 121 auctions for which are data are complete are slightly larger than the others in the sense that their average reserve price is 71,503,769 rubles and the average reserve price for the remaining 499 is 49,484,900 rubles. Of the 121 auctions where the data are complete, five were cancelled. In addition, in one of the auctions, criteria other than just the bid were used in making the award. Most of our focus will be on the remaining 115 auctions for which the data are complete. In what follows we refer to these auctions as the "subsample of 115 auctions."

Table 1 focuses on the subsample of 115 auctions and shows the distribution of auctions by number of participants and winning bids (in terms of the number of bid increments above the reserve price). As the table shows, 20% of the auctions involved two bidders where only one bidder bid and won the object at the lowest feasible price of one bid increment above the reserve price. Also shown in the table, for auctions with six or more participants the winning bid is always 20 or more increments above the reserve price, but for auctions with five or fewer participants there is at least one auction for which the winning bid was only one increment above the reserve price, which is the lowest feasible bid.

[1] What we refer to as registration corresponds to the application and approval process of the Russian oil and gas lease auctions.

Table 1: Winning bids and number of participants for the subsample of 115 auctions

	Winning bids – fraction within Z bid increments of reserve					
Participants	$Z = 1$	$Z = 2$	$Z = \{3, ..., 19\}$	$Z = \{20, ..., 99\}$	$Z \geq 100$	Total
2	0.20	0.10	0.03	0.03	0.02	0.37
3	0.01	0.03	0.08	0.12	0.06	0.30
4	0.01	0.00	0.02	0.02	0.07	0.11
5	0.01	0.01	0.02	0.01	0.04	0.09
6	0.00	0.00	0.00	0.01	0.03	0.03
7	0.00	0.00	0.00	0.01	0.01	0.02
8	0.00	0.00	0.00	0.01	0.00	0.01
9	0.00	0.00	0.00	0.01	0.03	0.03
10	0.00	0.00	0.00	0.01	0.01	0.02
11	0.00	0.00	0.00	0.00	0.02	0.02
Total	0.23	0.13	0.15	0.22	0.28	1.00

Table 2 shows the data in slightly different form by conditioning the distributions on the number the participants in the auctions. The table clearly shows differences in the distribution of winning bids between auctions with two bidders, auctions with three to five bidders, and auctions with six or more bidders.

Table 2: Proportion of auctions with winning bids of varying numbers of bid increments above the reserve price conditional on number of participants for the subsample of 115 auctions

Number of participants	Number of bid increments that the winning bid is above the reserve price					Sum	Number of auctions
	1	2	3-19	20-99	100 or more		
2	53%	26%	9%	7%	5%	100%	43
3	3%	9%	26%	41%	21%	100%	34
4	8%	0%	15%	15%	62%	100%	13
5	10%	10%	20%	10%	50%	100%	10
6 or more	0%	0%	0%	33%	67%	100%	15
Combined	23%	13%	15%	22%	28%	100%	115

Examining further the data on the subsample of 115 auctions, there are 43 two-bidder auctions. In 34 of these 43 two-bidder auctions (79%), the winning bid is

only one or two bid increments above the reserve price. One possible explanation for the apparently low interest in these auction is that they may be small licenses of interest only to regional bidders. In fact, the average reserve price for this sample of 34 two-bidder auctions with winning bids that are one or two bid increments above the reserve price is 27,515,294 rubles, which is less than half the average reserve price for the full set of 620 auctions.

If only a single bidder registers for an auction, then the auction is not held. So if a license is only of interest to a single bidder, then that bidder may have an incentive to arrange for a second bidder to register but not compete at the auction. In fact, our data is suggestive of this type of behavior. To see this, focus on the 34 two-bidder auctions with winning bids that are one or two bid increments above the reserve price. For these auctions, we assign identifying letters to each of the participants (bidder names are often long and are in Russian). See the Table 4 at the end of this appendix for the details of these assignments.

As shown in Table 3, there are 24 distinct winning bidders and 26 distinct losing bidders. There are 26 distinct ordered pairs of winning and losing bidders. Also shown in the table, it is often the case that the losing bidder never wins any auctions in our sample of 620 auctions. For example, bidder Y won 6 two-bidder auctions with a winning bid of one or two bid increments above the reserve price, and in all six of these auctions, bidder Y's opponent was bidder $1Y$. Bidder $1Y$ never won any of the auctions for which we have data. Also shown in the table, bidders 1L and 1N show up as both winning and losing bidders—bidder 1L won an auction with 1N as the losing bidder, and bidder 1N won an auction with bidder 1L as the losing bidder (bidder 1L also won an auction with bidder 1M as the losing bidder).

Table 3: Bidder identities for the sample of 34 two-bidder auctions for which data are complete and the winning bid is one or two bid increments above the reserve price

Auctions with two bidders and a winning bid that is one or two bid increments above the reserve price			
Winner	Loser	Number of auctions	Other auctions in our sample of 620 auctions won by the second-place bidder
1B	1C	1	
1D	1E	1	1
1F	1G	1	1
1H	1I	1	
1J	1K	1	
1L	1M	1	2
1L	1N	1	1
1N	1L	1	2
1O	1P	1	1
1Q	1R	1	
1S	1T	1	
1U	1V	1	3
A	B	1	
C	D	1	
E	F	1	2
G	H	2	
I	J	1	1
K	L	1	
M	N	2	1
M	Q	2	1
O	P	1	
R	S	1	1
T	U	1	
V	X	1	
Y	1Y	6	
Z	1A	1	
Total		34	17

This data suggest that some of the losing bidders may not have been competitive

bidders. We use the data to classify the 26 distinct losing bidders in the 34 two-bidder auctions with a winning bid of one or two bid increments above the reserve price as "pure shills," "occasional shills," or "rotating bidders" as follows:

We classify 13 of the losing bidders, B, D, H, L, P, X, 1Y, 1A, 1C, 1I, 1K, 1R, and 1T, as "pure shills" because:

1. the losing bidder either did not bid or bid only once (the object was sold at one or two bid increments above the reserve price),

2. the losing bidder never won a lease at any of the 620 auctions for which we have data, and

3. the losing bidder did not participate in any auction in the absence of the winning bidder.

We classify 2 of the losing bidders, 1L and 1N, as "rotating bidders" because as a pair, the two bidders participated in multiple two-bidder auctions, with each bidder winning at least one auction at a price only one or two bid increments above the reserve price.

Finally, we classify the remaining 11 losing bidders, F, J, N, Q, S, U, 1E, 1G, 1M, 1P, and 1V, as "occasional shills." These bidders either did not bid or bid only one time, allowing the other bidder to win the item at a price one or two bid increments above the reserve price. But these bidders either won auctions in our sample of 620 auctions (bidder 1G), or participated in auctions without their partner (bidder U), or both (bidders F, J, N, Q, S, 1E, 1M, 1P, 1V).

Particularly in the cases of pure shills, one might suspect that these losing bidders were merely shills for the winning bidder, attending the auction to fulfill the requirement that there be at least two bidders at the auction.

Our model allows for different registration regimes, including the possibility for bidders to register multiple times. Thus, our model allows the creation of shill bidders as appears to have happened in the Russian oil and gas lease auctions.

Because we would classify the Russian oil and gas lease auctions as semi-transparent, our results, particularly Proposition 5, suggest that there is no role for shills in a well-functioning cartel. However, if we consider the 13 "pure shills" identified in the Russian oil and gas data, we find that two of these pure shills, L and X, participated

with their partners (the winning bidders) in auctions with more than two bidders.[2] Our model is not dynamic, so perhaps dynamic considerations create a role for shill bidding. For example, the partners might use these other auctions to try to establish the credibility of their shills as bidders. Our model also assumes a non-strategic auctioneer (except for setting a fixed reserve price), but perhaps with a strategic auctioneer there is a role for shills to disguise the presence of a cartel or limit the auctioneer's ability to behave strategically (e.g., by using a "quick knock" to try to allocate the item to a non-cartel bidder). Finally, our model assumes that the number and identities of the cartel bidders are common knowledge within the cartel. If this were not the case, a cartel member might have an incentive to develop a shill and enter that shill into the cartel in order to capture an additional share of the collusive gain. We leave for future research a more detailed exploration of the various roles for shill bidders.

[2]Bidder L and its partner, bidder K, participated in a three-bidder auction, which K won (5 bid increments) and a four-bidder auction, which neither K nor L won (320 increments). Bidder X and its partner, bidder V, participated in a four-bidder auction, which V won (12 increments). Bidder B participated in another two-bidder auction with its partner, bidder A. The number of bid increments in this auction is not known. None of the other pure shills participated in any auctions outside the 34 auctions on which we have focused.

Table 4: Assignment of identifying letters to bidders in Russian oil and gas lease auctions with two participants and a winning bid of one or two bid increments above the reserve price

Participant	Company
A	ООО "РосНедра Астрахань"
B	ООО "ВолжСторНЭСТ"
C	ЗАО "Нефтегазовая компания АФБ"
D	ЗАО "Концерн "Нефтепродукт"
E	ООО "Интенсификация и повышение нефтеотдачи пласта"
F	ООО "ЗААБ Инвест"
G	ЗАО "Фроловское нефтегазодобывающее управление"
H	ЗАО "Вольновскнефть"
I	ЗАО "Транс Нафта"
J	ООО "Газнефтесервис"
K	ООО "Авангард"
L	ООО "Истенойл"
M	ОАО "Новосибирскнефтегаз"
N	ООО "Тагульское"
O	ООО "Северное сияние"
P	ООО "Гранит"
Q	ОАО "Тюменнефтегаз"
R	ООО ПКФ "Селена"
S	ООО "ДДМ"
T	ОАО "Пермоблнефть"
U	ООО ПФК "Центртехснаб"
V	ООО "Парма-Ресурс"
X	ООО "Проминвест"
Y	ОАО "АНК Башнефть"
1Y	ООО "Башминерал"
Z	ООО "ДНК"
1A	ООО "Жиллеттойл ЛТД"
1B	ОАО "Ингушнефтегазпром"
1C	ООО "НПЦ Ингушроссгео"
1D	ООО "Холмогорнефтегаз"
1E	ОАО "Самотлорнефтегаз"
1F	ОАО "Сахалин-Девелопмент"
1G	ООО "Томгазнефть"
1H	ОАО "Уралнефть"
1I	ООО "Уралтрансгаз"
1J	ОАО "Батайскнефтегаз"
1K	ОАО "Аксайнефтегаз"
1L	ООО "Славутич"
1M	ООО "Союзнефтестрой"
1N	ООО "ФУТЭК"
1O	ОАО "Негуснефть"
1P	ОАО "Ульяновскнефть"
1Q	ООО "Холдинговая компания Сигма-групп"
1R	ОАО "Инвестиционная группа "Алроса"
1S	ОАО "Эвенкийская топливно-энергетическая компания"
1T	ООО "Горно-промышленная компания "Самсон"
1U	ООО "НК "Мангазея"
1V	ОАО "Сибнефть-Ноябрьскнефтегаз"