

Contracting for Quality under a Dictator: the Soviet Defense Market, 1930 to 1950*

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Abstract

Military procurement in the Soviet economy under Stalin provides a novel historical context for a standard problem of market organization, that of contracting for quality. The Soviet ministry of defense was engaged in the procurement of military goods from Soviet industry. An internal market was formed and contracts were made. In the market, the contractor had power over the buyer and typically used this power to default on quality. In the background loomed a dictator, imperfectly informed, but with the power to tear up any contract and impose unlimited penalties on the contractor. The buyer's counter-action took the form of deploying agents through industry with the authority to verify quality and reject substandard goods. The final compromise restored quality at the expense of quantity. Being illicit, it had to be hidden from the dictator. Our case provides an historical illustration of the limits of dictatorship.

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JEL Codes: L2, N4, P2.

Contracting for Quality under a Dictator: the Soviet Defense Market, 1930 to 1950

The record of Soviet defense procurement under Stalin presents an apparently standard problem in market organization: contracting for goods when quality matters. What took it out of the ordinary was the institutional setting in which the contractor operated: not a law-governed market economy but a centralized dictatorship. What sort of market could there be, when the seller was owned by the state, the buyer was a government agency, and both were subject to centralized plans that had the force of law? What kind of contract could there be, when at any moment the dictator could step in, tear up the contract, and shoot the contractor? These turn out to be far from trivial questions.

Contracting for quality is a problem the world over. It was specifically a problem in all branches of the Soviet economy where quality mattered. In the military sector, however, the Soviet defense ministry was willing to incur the significant cost of employing tens of thousands of military procurement officers to work on site with the contractors to enforce contractual standards for the quality of military goods, endowed with sweeping powers to test and reject deliveries. As a result, the military agents were able to learn about many if not all dimensions of the quality of the goods they were accepting.

Recent research has thrown up a puzzle. The military agents were not corrupt, and were genuinely tough on the enforcement of quality standards. But they often colluded with contractors to conceal quantitative violations of the plan for deliveries of weapons, not on a private basis but with their superiors' clear knowledge and approval.

We attribute their behavior to a hold-up problem in the market for weapons. In this paper we set out how the problem arose and how it worked out, along with the evidence for our reasoning. Our evidence is taken from the records of the Soviet defense ministry, the defense industry, and the Communist Party's "control commission" – Stalin's first-line agency for monitoring the implementation of his commands.

The paper is organized as follows. In Part 1, we discuss the institutional arrangements of the Soviet defense market. Part 2 suggests how the hold-up problem arose and why the advantage lay on the side of the seller. Part 3 presents a model in which there is bargaining power and also collusion to conceal the bargain; Parts 4 and 5 discuss the historical evidence on bargaining power and collusion respectively. The final section concludes.

1. The Soviet Defense Market

In all countries, markets for military goods do not work well. This seems to be largely independent of the constitution of the state and the social and economic system. There is one buyer. Sellers are highly

specialized and few in number. Entry is costly. Exit is impeded by the perception that the government will not allow big defense corporations to fail. As a result, defense markets have become notorious for rent seeking and underperformance.

National defense markets are not all the same, however. Jari Eloranta (2008), for example, has researched the historical variation in competitiveness and public accountability of European markets for military goods. The Soviet market had several unique features; both buyer and sellers were state-owned, for example, so that it was to a large extent an artificial or internal market. Despite this, the Soviet economy supported a revealed comparative advantage in military equipment for many decades.

Western observers gave considerable attention to the problem of quality in the Soviet economy. Since the defense sector was shrouded in comprehensive secrecy, their studies began with civilian enterprise. They found a pervasive privilege for quantity over quality. Sheltered from competition and guaranteed economic survival by state plans, civilian managers faced strong temptations to seek a quiet life for themselves and their employees by fulfilling the plan for least effort (Granick 1954; Berliner 1957). The authorities assigned plans in rubles of gross output subject to fixed plan prices and technical specifications. Quality, however, was costly to the producer. Once plans and prices had been written down, the main scope for the factory to economize on effort lay in finding ways to reduce quality that were hard to verify. Kornai (1980) pointed to pervasive shortage and successive waves of mobilisation as conditions that undermined consumer sovereignty and enabled sellers to impose poor quality and narrow assortment on buyers. Davies (1989, 1996) has documented the rapid deterioration of product quality that accompanied the historical transition to the command system.

In the hope of limiting the producers' opportunism the authorities turned first to industrial self-regulation. Every factory, civilian or military, had its own quality department, following arrangements detailed by Harrison and Simonov (2000) and Markevich and Harrison (2006). In theory the quality department was responsible for ensuring that the factory's products met contractual standards. Not surprisingly, this was largely ineffective. Managers had only weak incentives to submit to self-regulation. Work in quality assurance brought little pay or recognition; the employees saw themselves as paid mainly to take the rap for management when things went wrong. If they tried to enforce external benchmarks, managers slapped them down.

Western studies of Soviet defense procurement produced a strong contrast with the civilian sector (Albrecht 1993, Alexander 1978, Almquist 1990, Holloway 1982). Whereas the civilian consumer and industrial user were powerless to refuse substandard goods, the same was not true of the powerful defense ministry, which stationed an army of serving officers on its contractors' facilities – more than 20,000 in number by 1940, as we now know (Harrison and Simonov 2000). These officers, trained in military engineering and procurement, were empowered to oversee production and assure the quality of deliveries. The management was obliged to support the military agents with

necessary accommodation and equipment. Faced with substandard products the military agents could halt acquisition and, if necessary, production itself. Under this regime quality was upheld, although at heavy cost to both seller and buyer, by high rates of mass production and high rejection rates.

Some puzzles remained. One was the extent of corruption among the military purchasing agents. Alexander (1978: 59n) asked, for example, whether the seller would not seek to induce the purchasing agent to betray his superiors and overlook defects, either for reward or just for the sake of goodwill. The Stalin-era archives suggest that the military agents' independence from management was well protected. They were prohibited from accepting rewards or benefits from the side of industry (Harrison and Simonov 2000). By the standards of the industrial employees alongside whom they worked, they were well paid and not unduly taxed by overtime or other burdens. In fact, corruption allegations were most infrequent; rare reports went straight to the highest level (Markevich and Harrison 2006).¹

In short, the defense procurement officials are best seen as loyal agents of their employer.² Despite the cost of reserving thousands of serving officers for this work, the defense ministry valued their services highly. In wartime, for example, when the front was crying out for additional commanders, the ministry three times rejected proposals that would have redeployed many military agents to the battlefield.³

While clearing up such old puzzles, the archives have presented new ones. One is that the military procurement apparatus was not able to prevent widespread quantitative shortfalls in procurement. There are many possible explanations, but few that stand up to scrutiny. These include planning errors, differences in military and civilian supply chain economics, and a propensity to issue (and accept) a larger volume of defense contracts than could ever be fulfilled.

The scope for planning errors in the defense sector should not be underestimated. Perfect planning was impossible in the presence of uncertainty, asymmetric information, and computational limits. All these factors were certainly at work, and they form the starting point for any account of the general failures of Soviet economic planning. But they do not sufficiently explain the plan failures that were specific to the defense sector. This becomes clear when we consider the comparative success of planning in the civilian sector. A striking result from the archives (Gregory 2003) is that defense procurement plans failed more frequently and by wider margins than civilian plans. This

¹ What could have been more tempting for any Soviet official in the 1930s than the lure of *la dolce vita*? A review of the work of Soviet military purchasing agents in Italy, dated October 1935, noted that local contractors had offered them bribes to accept substandard goods and that they had rejected the inducements (GARF, 8418/8/175: 95-101).

² These were not the only loyal agents in the Soviet economy; for other examples see Belova and Gregory (2002) and Markevich (2007b).

³ Hoover/RGANI, 6/2/49: 9 (July 7, 1943).

cannot be explained by differences in planning procedures, which were closely similar in military and civilian branches (Markevich 2008).

Differences in military and civilian supply chains should, if anything, have worked to advantage of the defense sector. The important factor was the priority system, designed to ensure that, when overall supplies fell short, orders for defense and construction (including defense industry investment) had the first claim on resources (Levine 1966). Except in wartime, the Soviet defense market was a relatively small part of the economy as a whole. In the mid-1930s, for example, when the behaviours we are studying were already well established, the defense budget was running at one twentieth or one fifteenth of national income, and about one third of the budget went to pay for weapons and equipment (Davies and Harrison 1997). This element of the budget made disproportionate demands on high quality capital, labour, and materials, but the priority system was designed to protect it. As a result, defense contractors did not have to fight over a fixed pool of resources. For this reason alone, defense targets should have been met more frequently and margins of failure should have been narrower than in the civilian sector.

Lastly, did strategic interaction of some kind lead to systematically more contracts being issued than could ever be actually fulfilled at the rates they were originally planned for? This happened elsewhere, for example in Soviet public investment (Dyker 1983:36-39). But in our case it was not the key thing. Most important, there was no lobbying or drive by the producers to expand the procurement budget beyond the capacity of the economy. Soviet equipment manufacturers did not need defense contracts to survive, did not have to fight to get them, and frequently displayed reluctance to accept them.

When we look more closely we see that defense shortfalls were registered at two stages, corresponding to pre- and post-contract. At the pre-contract stage, the defense ministry was given an annual equipment procurement plan but its agents were typically unable to place enough contracts to meet it. At the end of 1938, for example, the minister of the defense industry asked the government to trim its plan for deliveries in the year ending by 532 million rubles, or more than 4 per cent, appending a list of items that it wished to drop. Among the reasons he gave was that the defense ministry had placed a contract for less than the planned quantity or had failed to place one at all.⁴ If defense suppliers were unwilling to accept contracts, it cannot be just that they feared shortages further back in the supply chain, because they knew that a defense contract automatically gave the contractor an entitlement to priority in supply.

Once contracts had been placed, there was a second stage of underperformance. Here the action of the purchasing agents was often critical; many cases have come to light where they rejected significant fractions of a factory's monthly output on grounds of substandard quality. Again, this cannot be explained by shortages elsewhere in the

⁴ GARF, 8418/22/463: 46-63 (Mikhail Kaganovich to Molotov, 1938).

supply chain; for one thing, if the supply chain was a factor it was the purchasing agent's responsibility to fix it.

When we look closely at post-contract shortfalls, we find a further puzzle. Post-contract shortfalls were often a consequence of the tough action taken by military agents to prevent the acceptance of substandard items. Having taken tough action over quality, however, it was not uncommon for them to collude with industrial suppliers to conceal quantity violations. Why they should have done this is not immediately obvious. It is strongly suggestive of some kind of private renegotiation, but whatever took place was not privately corrupt. On the contrary, we will show that the concealment frequently had the knowledge and approval of superior officials, sometimes on both sides of the market.

Our explanation is rooted in market behaviour, which may seem out of place in a command economy. We do not mean that there was a market relationship between the Red Army and the defense industry as corporate entities. At the highest level there was political bargaining between the defense minister and a few industrial ministers, not a market relationship. The internal market emerged, as Markevich and Harrison (2006) have suggested, at a lower level where military purchasers representing the defense ministry had to match requirements and negotiate terms with individual defense factories.

In the present paper we suppose that the internal market developed unevenly. By implication, Soviet defense purchasing went on partly within a sphere of command allocation where planners assigned quotas from above, and partly in an internal market that featured search, matching, and voluntary contracting.

The market had less scope where established models were in serial production year after year so that contracts could be planned in advance on the basis of previous experience. But for many lines including ship, airplane, and vehicle building defense buyers were continually seeking contractors for new or unique items. Innovation in military machinery was particularly rapid in the mid-1930s and this accelerated the year-on-year turnover of products (Davies and Harrison 1997). At such times directive planning lost influence because the planner lacked the information to select producers or lay down quality standards and prices. Instead, voluntary contracting took the place of planning. Table 1 summarizes this distinction.

The best evidence of voluntary contracting in the internal market is that it was possible for the seller to refuse a contract. In fact, the defense ministry was forced each year to wage a costly and frustrating military-style "contracts campaign" to place orders for new products with industrial suppliers. Harrison and Simonov (2000: 231) previously identified major obstacles to the contracts campaign as "the difficulty of finding willing suppliers of new defense products, and the desire of industry to secure a relatively homogenous assortment plan that would allow concentration on long runs of main products without a lot of attention to spare parts and auxiliary components, no matter how essential to the customer"; the resistance of potential contractors could go so far as to leave significant orders completely unfilled.

Table 1. The Internal Market versus Command Allocation

Command Sphere	Internal Market
Established products	New products
Given quality	Variable quality
Random assignment by planner	Search and matching by buyer
Compulsory quotas	Voluntary contracts

When the placing of contracts ran into difficulties, the government was reluctant to intervene on principle; it insisted that the defense ministry and the defense industry had to sort things out among themselves.⁵ When the defense ministry appealed to the government to force state-owned enterprises to accept its orders, the government typically did nothing.⁶ Even during accelerated rearmament, industrial firms were able to refuse defense orders with impunity. In 1938, for example, defense industry factory no. 145, the sole supplier of two-headed lubricators for artillery, refused a contract on the grounds that its workshop was under reconstruction; meanwhile, it started to sell off unique equipment required for the manufacture of these products.⁷

2. The Hold-Up Problem

The most important problem in the Soviet military market was the quality of weapons. Both quantity and quality can be observed. But they differ in the time and effort required to observe and verify them. Quantity is easily observed and verified, and quality less so. Harrison and Markevich (2006) considered the problem that arose when quality was not freely observable before purchase: the defense ministry used its army of purchasing agents to slow down acquisition and learn about quality from delay. In contrast, we will examine the problem that arises when quality, although observable before purchase, cannot be verified: the buyer is aware of substandard quality but cannot prove it.

We find analytical foundations in various literatures, in first place that on contractual incompleteness. The problem of quality arises when quality is variable and contractual quality requirements cannot be written down or, if written down cannot be observed or, if observable cannot be enforced. A considerable literature from Grossman and Hart (1986) and Hart and Moore (1988) has considered the implications. Hart and Moore (2006), for example, “suppose that trade is only partially contractible. Specifically, we distinguish between perfunctory performance and consummate performance, or performance within the letter of the contract and performance within the spirit of the contract. Perfunctory performance can be judicially enforced, while consummate performance cannot.”

Contracting for quality is a recognised problem in defense markets. Defense orders for complex machinery fit perfectly the class of

⁵ GARF, 8418/4/39: 1 (Rykov to Voroshilov and Kuibyshev, 1930).

⁶ GARF, 8418/24/2: 7-9. (Ivanov and Nikolaev to Safonov, 1934).

⁷ RGAE, 7515/1/404: 46-53 (Savchenko to Mikhail Kaganovich, brother of the more famous Lazar, 1938).

contracts that can be fulfilled either consummately or perfunctorily. In practice the economic literature on defense procurement is largely policy-driven and ephemeral.⁸

Hold-up problems in the spirit of Goldberg (1976) and Williamson (1985: 61-63) are a feature of defense markets where, to realize the benefits of a potential exchange, buyer and seller sometimes invest in costly relationship-specific assets. In market economies there is a typical form (Rogerson 1994). The defense contractor must invest in specialised R&D and production facilities to produce military goods for which there is only one potential buyer. If the relationship breaks down, these assets will be less valuable in their best alternative use. As a result the contractor becomes vulnerable to hold-up by the government buyer.

The risk presented by the hold-up problem is that, in order not to be held up, agents will avoid investing in the specific assets that make them vulnerable; as a result, society as a whole will lose the gains from trade. The hold-up problem has standard solutions, however, that should bring the incentives of buyer and seller back into approximate alignment (Schmitz 2001). One is vertical integration, which brings the parties together under a single authority and completely replaces their market relationship by hierarchy. Other solutions retain the market relationship but regulate it by long-term contracts with some combination of joint financing of initial joint costs and contingent rules for distributing the subsequent benefits.

In both world wars, for example, the vast capital expansion of war industries in each major market economy had to overcome business resistance and was largely government-financed for this reason. During World War II the U.S. Defense Plant Corporation and other federal agencies provided and afterward wrote off capital facilities for war production to the private sector valued by Gordon (1969) at \$45 billion (at 1958 prices).

In the Soviet defense market we see the hold-up problem with a difference. Under capitalism the defense producer is vulnerable to being held up by the government buyer. Under socialism it was the other way round. The Soviet government generally made research and production facilities available to every industrial firm free of charge; this weakened the hand of any buyer, including the government itself. The buyer of new high-grade or high-tech products was vulnerable, on the other hand, because of the cost of searching and matching with a producer. The annual “contracts campaign” for new defense orders provides evidence of this.

Suppose the Soviet defense buyer faced a fixed selection cost, which was also the cost of switching from one seller to another. Once formed, the relationship with the particular seller was then worth at least this fixed cost to the buyer and this value is what the buyer stood to lose if the initial relationship broke down. It became part of the quasi-rent that was the profit created by the relationship, but it did not necessarily accrue to the buyer. Who actually received it depended on post-contract

⁸ But there are exceptions, e.g. Tirole (1986) and Rogerson (1994).

renegotiation. The seller could hold up the buyer: by threatening to withdraw from the relationship, the seller faced the buyer with a potential loss at least equal to the switching cost so the buyer would be willing to pay the seller up to this value to avoid the loss. The extent of the transfer depended on the relative bargaining strengths of the two sides; the party with more to lose was more likely to lose it.

We suggest that search costs in the internal market left the Soviet defense buyer vulnerable to hold-up by the seller. Given this, what form did the hold-up take? Under Soviet arrangements, once the contracts campaign was over, the main opportunity for the seller lay in undershooting on quality, knowing that the buyer would have difficulty in taking its business away.

Standard solutions to this problem were unavailable in the context of Stalinist dictatorship. Stalin ruled out vertical integration of the buyer and seller because he did not want to encourage the formation of a powerful military-industrial complex. In fact, when military interests advocated integration with the defense industry, Stalin opposed it. In 1927 army commanders Tukhachevskii, chief of the general staff, and Unshlikht, a member of the Revolutionary Military Council, sought new powers for the Red Army; they wanted to oversee appointments to the defense industry, plans and reports of defense factories, and plans for capital investment in the industry. Stalin rejected these proposals (Harrison and Simonov 2000: 230; Samuelson 2000: 42-47). Tukhachevskii's subsequent resignation as chief of staff was most likely because his project to control the defense industry had failed (Samuelson 2000: 55-59). As for Stalin's motivations, he built his power on divide-and-rule and this included keeping soldiers and industrialists at odds (Harrison 2003).

An intermediate solution to the hold-up problem is long-term contracting. Under Soviet rules, however, all contracts were rewritten at least once a year (Markevich 2008); no long term contract was worth more than the paper it was printed on. In any case Stalin could not credibly promise to uphold long-term agreements between his agents to share gains from trade since he had the power to break any contract and expected to confiscate all gains for the state.

Because of these limitations the buyer could not eliminate the harm threatened by the seller's behaviour. The damage could be limited, however, by an illegal compromise. The compromise required conspiracy between the parties since, if not hidden, it would trigger an intervention by the dictator that both parties wished to avoid.

3. A Model

We illustrate with a simple dynamic game of three moves: the defense buyer's search, the contractor's hold-up, and a readjustment.

There are two players, Defense and the Contractor. Defense aims to maximise the military utility of its available equipment, derived from some expectation of its effectiveness in use on the battlefield. This effectiveness is decided by their quantity and quality. Defense seeks a Contractor to supply units of a particular weapon, a tank or an airplane for example, that can be of high or low quality. The Contractor aims to

maximise a surplus over costs. This surplus could be measured equally well in monetary terms or in terms of the reduced effort required to extract Defense's cash; which is more appropriate depends on the form in which rents were shared within the Soviet industrial firm, but does not matter for present purposes.

Off stage is a Dictator, whom we do not model explicitly.⁹ The Dictator shares Defense's preferences over quantity and quality; when the players have contracted between themselves, he validates the contract and will punish those contract violations that can be verified.

In our model, only quantity is verifiable. The quality of its execution, therefore, is the difference between consummate and perfunctory performance of the contract. Perfunctory performance can be enforced, while consummate performance cannot. In our model consummate performance is more costly to the producer, and perfunctory performance is less valuable to the buyer.

Our supply side has two sectors. There is a sphere of command allocation in which a high-priority buyer such as the defense ministry can routinely procure goods of low quality; that is, on being notified of military requirements, the planner can assign the quota to a producer that, randomly selected, provides low quality and low cost. Items of high quality are available only from an internal market that the buyer must search so as to match with a contractor by mutual agreement.

Before the game, the Dictator endows Defense with a fixed sum of rubles for the procurement of weapons. We normalise this budget to $1 + \bar{S}$ where \bar{S} is the fixed cost of searching for a high-quality contractor; \bar{S} is payable if and only if Defense chooses to search.

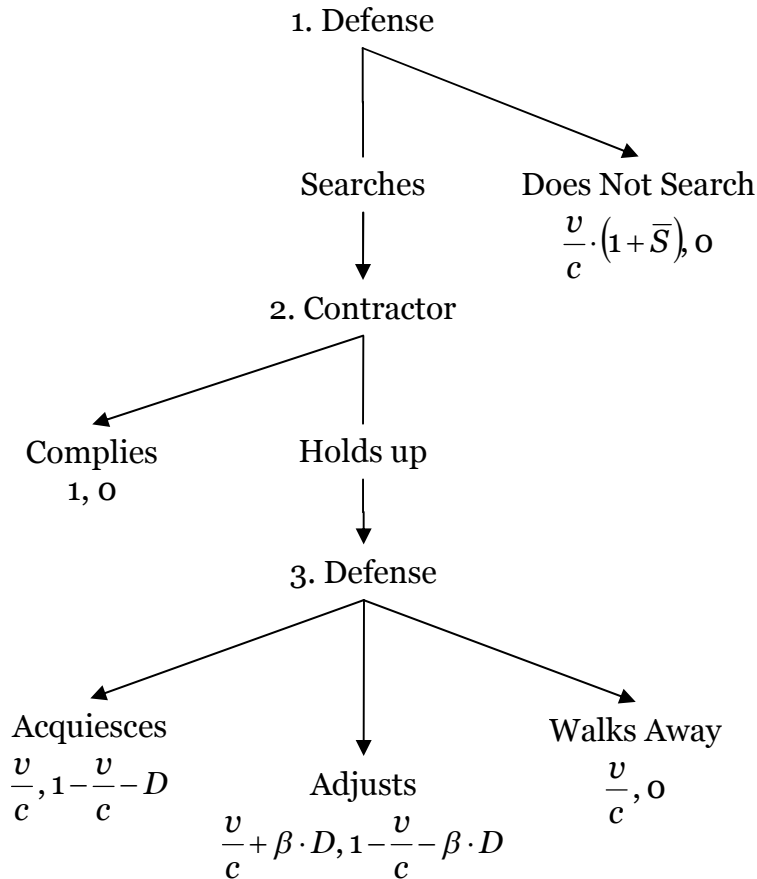
Figure 1 illustrates the timing of the game. At various points Defense must take its budget, or what is left of it, either to the command sphere (to the right) or to the market (down and to the left). At the first move Defense can seek to allocate this budget to weapons of High and Low quality, and Low has the advantage over High that it is available without search. If Defense chooses at the outset to procure goods from the command sphere without searching, its entire budget of $1 + \bar{S}$ can be spent on Low. Under the prevailing law of contracts and prices, the low-quality items are acquired at cost, so the producer receives a zero surplus.

Alternatively, Defense can enter the market for High by paying the search cost \bar{S} as an entry fee. Down this path, Defense and the Contractor agree terms for a contract, but \bar{S} is now a sunk cost so Defense can commit only 1 to the purchase of High.

Down the path to the internal market, the Contractor must deliver units of High to Defense in contractually agreed quantities and qualities, for example, 500 tanks of a specific model, subject to agreed technical and performance standards, at prices fixed on the basis of the Contractor's production costs. In that case the Contractor again covers its costs and receives zero.

⁹ Markevich (2007a) suggests how this might be done.

Figure 1. Timing and Payoffs



Note: Payoffs are (Defense, Contractor).

Symbols:

- β Bargaining power of Defense
- c Contractor's relative cost per unit of low quality: $1 > c > 0$
- D Deadweight loss from hold-up
- \bar{S} Defense's fixed cost of search
- v Defense's relative utility per unit of low quality: $1 > c > v > 0$

For the Contractor, *consummate fulfilment is no better than loss of the contract*. Perfunctory fulfilment is the only way the Contractor can extract a surplus of revenue over costs, and this must be at the expense of Defense. The Contractor's surplus could be gained by delivering the agreed number of tanks produced with lower standards of care or quality of materials, for example. As a result the quality standards agreed in the contract would be violated, and the tanks would be of less military value than Defense anticipated.

In the second move along this path the Contractor chooses between consummate and perfunctory execution of the contract, and perfunctory execution is its dominant strategy.

Given perfunctory fulfilment, the third move belongs to Defense, which at first sight must either acquiesce (to the left), or walk away (to the right), leave the market and return to the command sphere where it can spend its remaining budget on Low. This option provides Defense with its reservation utility, which turns out to be v/c . Defense will

acquiesce provided its loss from perfunctory fulfilment is kept within a limit set by this reservation utility.

The Dictator will also acquiesce provided that the total number of units of any quality remains the contracted number. It is true that he shares Defense's preference for consummate fulfilment, and in principle Defense could appeal to the Dictator for justice, but the latter could observe only the quantity, not the quality of fulfilment. Or, in other words, we assume that the probability of proving perfunctory fulfilment in court was zero.

We will show that the Contractor's gain is less than the harm done to Defense; there is a deadweight loss D . Based on an intuition of Harrison and Markevich (2008), our argument is that the hold-up involves the substitution of Low for High, and the relative cost of Low must exceed its relative utility ($c > v$) since otherwise Low would always be preferred. This creates an opportunity for Defense to lessen the harm done and offer a benefit to both parties in further renegotiation. A final round of bargaining eliminates the deadweight loss by restoring quality at the expense of quantity. The two parties share the gain in proportion to their mutual bargaining power, β for Defense, so $1 - \beta$ for the Contractor. Because bargaining is at the expense of quantity, however, there is no longer even perfunctory fulfilment. The fact that the contract is no longer fulfilled in quantity risks the intervention of the Dictator. Only Defense can give permission for this to go forward, and must collude with the Contractor to hide it.

We now analyse the players' possible payoffs. At the outset the Dictator gives Defense a budget of $1 + \bar{S}$ rubles to procure a stock of a particular weapon. Defense has preferences over weapons that can be of high or low quality based on their military applications, so its (military) utility function is:

$$V = H + v \cdot L \quad (1)$$

Here H and L are the (non-negative) quantities of High and Low respectively. For calibration each unit of H gives Defense one unit of utility, and v is the relative utility of a unit of L . Defense maximises V , subject to procurement costs C remaining within its budget, but the amount of its budget that will be available to spend on procurement depends on whether or not Defense engages in the costly search for a high quality supplier. Thus:

$$\text{No search: } C \leq 1 + \bar{S} \quad (2)$$

$$\text{Search: } C \leq 1 \quad (2a)$$

Meanwhile, procurements costs are also the Contractor's production costs:

$$C = H + c \cdot L \quad (3)$$

Again for calibration, each unit of H costs the Contractor one ruble and c is the relative ruble cost of a unit of L . We assume that the unit value and cost of High exceed the unit value and cost of Low respectively and, without loss of generality, that the relative unit cost of Low to the seller exceeds its relative value to the buyer:

$$1 > c > v > 0 \quad (4)$$

How much utility is available to Defense depends, first, on its choice to search or not. If Defense declines to search and sets out to procure only Low, given the cash available, and combining equations (1) and (3) with inequality (2), it follows that its utility and procurement will be:

$$V_{no-search} \leq \frac{v}{c} \cdot (1 + \bar{S}) \text{ and } L_{no-search} \leq \frac{1}{c} \cdot (1 + \bar{S}) \quad (5)$$

If Defense searches the market and finds a Contractor for High, in contrast, the utility available to it from a contract is found by combining equations (1) and (3) with inequality (2a):

$$V_{search} \leq 1 - (c - v) \cdot L \quad (5b)$$

From (4), and using stars to denote the terms of Defense's optimal contract, this expression is maximized when $L = 0$, so:

$$V^* = 1; H^* = 1; L^* = 0 \quad (6)$$

We find the motivation for the subsequent hold up in the Contractor's problem: since its contract revenue cannot exceed 1, it can create a surplus only by reducing total costs (equation 3) below the contracted level. The Contractor will covertly substitute units of Low for the same number of units of High, one for one, up to a limit set by two constraints. One is Defense's participation constraint, and the other is the Dictator's intervention constraint. We assume that, while the Dictator shares Defense's preference for high quality, he does not observe the substitution; he sees only the number of items delivered. He has no basis to intervene as long as this number matches the quantity H^* stipulated in the contract. The Contractor is safe while it delivers $H + L \geq H^*$. Recall that $H^* = 1$, so we will write the Dictator's *intervention constraint* as:

$$H \geq 1 - L \quad (7)$$

As for keeping up the contractual relationship, the Contractor must maintain Defense at or above its *reservation utility*. This is the utility that would be available if Defense now stopped trying to procure High, walked away from the contract, returned to the command sphere, and asked the planner to assign a supplier of Low. Combining equations (1) and (3) with inequality (2a) and setting $H = 0$ yields the utility from spending 1 in this way as v/c and this is Defense's reservation utility. Using primes to denote the values obtaining in the hold-up, it gives us Defense's *participation constraint*:

$$H \geq \frac{v}{c} - v \cdot L \quad (8)$$

Combining equations (7) and (8), Defense will remain within the relationship *and* the Dictator will not intervene as long as:

$$L' \geq \frac{1}{c} \cdot \frac{c - v}{1 - v} \text{ and } H' \geq \frac{v}{c} \cdot \frac{1 - c}{1 - v} \quad (9)$$

In the hold-up the Contractor reduces costs by shading on quality, substituting units of Low for High, one for one, to the maximum extent permitted by inequality (9). At this point Defense must know it is being cheated but will not walk away; the Dictator may well observe customary bickering among his agents but will not intervene.

Payoffs to each side now vary from those anticipated in the contract. The relative magnitudes are driven by inequality (4): the comparative cost of Low exceeds the comparative utility of High, and so $1 > c > v > 0$. Military utility was previously 1. The Contractor's perfunctory fulfilment drives it down to the reservation level v/c . The Contractor's utility was previously zero. Now it increases because the substitution of Low for High reduces total costs that, under consummate fulfilment, were also previously equal to 1. The reduction in total costs, which is the Contractor's gain, may be computed from equations (3) and (9) as $1 - \frac{v}{c} \cdot \frac{1-c}{1-v} - \frac{c-v}{1-v}$.

The chief proposition of the model is that in the hold-up, total costs fall by less than the reduction in military utility, so there is a *deadweight loss*. The loss is found by subtracting the Contractor's gain from Defense's loss, that is:

$$D = 1 - \frac{v}{c} - \left(1 - \frac{v}{c} \cdot \frac{1-c}{1-v} - \frac{c-v}{1-v} \right) \quad (10)$$

which simplifies to $\frac{(c-v)^2}{c \cdot (1-v)}$. From $1 > c > v > 0$ we can check that

$$1 > \frac{(c-v)^2}{c \cdot (1-v)} > 0 \text{ and so } D \text{ is a positive fraction.}$$

Anticipating such losses, what could Defense do? Deprived of the remedies available in a law-governed market economy, Defense's last resort was to strike a bargain with the Contractor to restore quality at the expense of quantity, eliminate the deadweight loss, and share the gain from doing so. The gain was shared according to the players' relative bargaining power. Defense was still held up by the Contractor, but less inefficiently than otherwise. In the process the Dictator's intervention constraint was violated and so the readjustment was sustainable only if the players colluded to conceal the violation.

First, we define limits on the bargain. At one limit, defense could keep the entire gain by holding the Contractor's costs constant. Total costs at hold-up, producing some low quality items, were $\frac{v}{c} \cdot \frac{1-c}{1-v} - \frac{c-v}{1-v}$ (equation 10). We use double-primes to denote the values resulting from the readjustment. After eliminating Low altogether from the package, the Contractor could increase the delivery of High to $\frac{v}{c} + D$ without any increase in cost. At the other limit, after eliminating Low, the Contractor could increase the deliver of High to v/c without any loss of utility to Defense. The actual outcome can be thought of as a

weighted average of the two bounds arising from the exogenous bargaining power β of Defense, so:

$$H'' = \frac{v}{c} + \beta \cdot D; H^* > H'' > H' \quad (11)$$

Whatever bargain is struck, however, the plan is being violated in quantity since $H^* > H''$, and the final readjustment moves both players into a region where the Dictator would intervene on being informed. The Contractor faces a clear risk: after the bargain, Defense can denounce it to the dictator for breaking the contract in quantity, and the Dictator can confiscate the Contractor's surplus or worse. To be willing to strike the bargain, the Contractor must bind Defense not to denounce it afterward, and Defense must be willing to be bound. There has to be a mechanism for collusion: Defense must join a conspiracy that hides not just the hold-up but also the bargain that restores quality at the expense of quantity. Otherwise, both sides will have to accept the deadweight loss and remain at the hold-up.

Weighing up all possible outcomes of the game, we learn about Defense's best initial choice. Having chosen to search for high quality, the best outcome for Defense is consummate fulfilment of the contract, which pays 1. But only perfunctory fulfilment pays the Contractor a surplus, so that is what the Contractor will always deliver. Backward induction then tells Defense whether or not to search in the first place. Given its own preference for high quality and that the Contractor will never deliver it in the spirit of the contract, Defense should search anyway if it can still claw enough back from the illicit bargain that follows the search. The unconditional expected payoff from search, contract, hold-up, and renegotiation, $\frac{v}{c} + \beta \cdot D$, must exceed the payoff

$\frac{v}{c} \cdot (1 + \bar{S})$ from going straight to the command sphere without searching first; simplifying,

$$\text{Search if } \beta \cdot c \cdot D > v \cdot \bar{S} \quad (14)$$

In words, Defense should play Search in the market for High only when its relative bargaining power, the relative cost of Low, and the potential deadweight loss (which stands for the scope for bargaining after the hold-up), are large enough to offset the small relative utility of Low and the high cost of searching.

4. Bargaining Power

What decided bargaining power at the stage of renegotiation? The defense ministry's main bargaining instrument in the market for weapons was its purchasing officers, their inside knowledge of the contractor, and their capacity to threaten a quantitative shortfall in the contract.

The archives testify with notable consistency (Harrison 2003; Markevich and Harrison 2006) that industry's officials and representatives saw the military agents in an adversarial light. This hostility arose because the military agents made frequent use of the

main instrument at their disposal for enforcing quality, their right to reject substandard deliveries. When they rejected deliveries they endangered the ability of the defense contractors to show compliance with supply plans and contracts, and correspondingly threatened the careers and personal security of the industrial managers.

Military agents were certainly willing and able to exercise these powers; many cases are reported when high proportions of monthly deliveries were returned or scrapped, sometimes up to 100 percent. In January and February 1934, for example, the Tula gun factory produced 3,000 carbines and 106 ShKAS machine guns, but only 800 rifles were accepted for the defense ministry and no machine guns at all. The 3,000 carbines “were presented for acceptance 23,000 times, almost 8 times per carbine on average.”¹⁰ In March 1938 the military agents rejected the entire monthly output of defense industry factory no. 205 “in view of the totally unsatisfactory installation of electric plugs in all articles supplied.”¹¹ This degree of screening was much tougher than that arising from industrial self-regulation. Among the aircraft that the quality department of factory no. 126 passed in 1940, for example, the military agent found up to 80 defects.¹² In the first nine months of 1940, of 6.6 million shell cases produced at munitions factory no. 184 the quality department scrapped less than three percent; after that, the military agent scrapped a further 10.5 percent.¹³

The power of the military agent to reject on grounds of quality was nonetheless more limited than might appear at first sight. One reason was the inability to verify observed quality to others. Military agents rarely looked to higher authority to impose punishments for low quality, and when they did they were typically unsuccessful. In 1933, for example, a military agent tried to use the party committee of aircraft factory no. 24 to bring to account those responsible for “malicious toleration of defective parts,” but without success.¹⁴ We have found only one case that, of naval armament factory no. 347, where a military agent took the managers to court on criminal charges of supplying substandard goods; the court cast doubt on the accusations and the file was returned for further enquiries. A review by the ruling party’s control commission found that the judicial route was inappropriate and substituted dismissal for the criminal charges.¹⁵

Another limitation on the authority of the agent was that the contractor had avenues of appeal, and not infrequently in shifting the blame for delivery problems onto the military agents. In the case of the rejected output of the Tula gun factory in 1934 control commissioners

¹⁰ Hoover/RGANI, 6/1/22: 34 (1934); original emphasis omitted.

¹¹ RGAE, 7515/1/404: 158 (Savchenko to M. Kaganovich, 1938).

¹² Hoover/RGANI, 6/2/27: 108 (1940).

¹³ Hoover/RGANI, 6/2/34: 158-159 (1940).

¹⁴ Hoover/RGANI, 6/1/91: 10 (1934).

¹⁵ Hoover/RGANI, 6/6/1616: 128 (1941). For more about the party control commission see Markevich (2007b).

concluded that “discord between management and representatives of military acceptance on the score of product quality” lay behind persistent plan breakdowns.¹⁶ In 1944 the control commissioner for the Khabarovsk region reported that “vexatious litigation,” with managers on one side and the quality department and military agents on the other, had taken hold of aircraft factory no. 126 on the issue of parts and components that did not conform to the blueprints. “These disputes ... sometimes drag on for weeks ... while business stands still.”¹⁷ If agents demanded inflexible adherence to standards, they laid themselves open to criticism for excessive zeal or caution. A control commission report of 1940, for example, condemned the quality department and military agent at aircraft factory no. 126 for “a tendency to over-insurance.”¹⁸ Surveying the work of military agents in 1943 the control commission demanded that “the military agent should in most cases rule on the acceptability of one or another deviation [from standards] so as not to delay products for the front.”¹⁹ Thus, while military agents may have tried not to accept unserviceable goods, there was pressure on them to tolerate some level of defects.

Finally, the army needed weapons. In the years of urgent prewar rearmament, equipment supplied to military units often turned out to be unfit for service although the military agents had previously passed them as acceptable. Since high-ranking officials of the defense ministry were sometimes complicit in this, it must be supposed that for the armed forces, too, quantity was sometimes more important than quality. Chief of the air force purchasing administration Efimov, for example, was accused of colluding with malpractices: “not only did [he] not take measures to restore order but [he] even suppressed criticism of the defects, describing the communists who raised the criticisms as ‘cry-babies’ and threatening them with dismissal.”²⁰ Further confirmation is found in evidence that standards were allowed to slip further in wartime (Markevich and Harrison 2006).

In short, when military agents did not rigorously enforce defense ministry guidelines on substandard equipment, the main reason was that, as loyal agents of the armed forces, they could not reject everything that industry supplied.

5. Collusion

To summarise, the defense ministry tried to reach across the market for weapons by deploying thousands of military engineers to the factories of the defense industry. These agents had a dual role. Their first duty was to prevent the defense ministry from being held up and to enforce its contracts. They monitored the process of contract fulfilment with

¹⁶ Hoover/RGANI, 6/1/22: 36 (1934).

¹⁷ Hoover/RGANI, 6/2/27: 108-109 (1940).

¹⁸ Hoover/RGANI, 6/2/27: 109 (1940).

¹⁹ Hoover/RGANI, 6/2/49: 9 (1943).

²⁰ Hoover/RGANI, 6/2/17: 47 (1939).

special regard to quality, and aimed to reject items for purchase when their quality fell below some threshold level. The work of the military agents made the quality of military goods to a large extent observable at the time of purchase. When contractors tried to cut the supply of high-quality items, the defense ministry sought to prevent their replacement by low-quality items, and this opened contractors up to penalties for defaulting on quantity.

In practice, however, the military agents and their superiors tended not to make trouble for the contractors over quantitative shortfalls. This suggests that the contractor's cooperation was available at a price: the defense ministry had to accept shortfalls on quantity and help conceal them from the dictator's prying eyes.

In setting out the hold-up problem in the defense market, we made two predictions. First we suggested that, when held up by the seller, the buyer would find it more important to uphold quality than quantity. Second, we suggested that buyer and seller would be jointly interested in collusion to conceal the resulting shortfall on quantity. Consistent with these expectations, we find that military agents typically took a harder line over quality than quantity. They were ready to offer some leeway to contractors over quantitative fulfilment as the price for maintaining quality. The outcome was a bargain which fell short of the initial contract but, by restoring quality at the expense of quantity, was more efficient than the contractor's initial post-contract offer. The defense ministry was still held up, but less inefficiently than would have happened otherwise, and in return allowed its agents to help conceal the contractor's otherwise verifiable shortcomings.

Procurement delays were often concealed. The control commission archive contains many cases of reports falsified by both civilian and defense enterprises. Usually, output was overstated within the accounting period by including *pripiski*, goods that did not exist yet but would be produced in the next period. In short, *pripiski* allowed the enterprise to claim fulfilment of the plan and the associated reward by "borrowing" future deliveries.

This practice involved criminal deception. A single enterprise could not undertake it successfully in isolation, therefore; ministerial superiors had to know about it and the customer had to go along with it in silence. The wider the circle involved, the greater were the risks of disclosure. Despite such risks, however, in the seller's market for civilian goods the power of suppliers was often enough to win the cooperation of both superiors and purchasers (Berliner 1957).

A report of 1946, for example, claimed that a tank factory director "is systematically engaging in the *pripiska* of goods that have not finished production" and that his superior, although aware of this, "has not only not prevented but has even rewarded it."²¹ Similarly, the control commission found that in 1944 officials of the armament ministry told a factory director "to report inflated information to the ministry."²² In September 1944 the control commission acknowledged

²¹ Hoover/RGANI, 6/2/98: 81, 85 (1946).

²² Hoover/RGANI, 6/2/67: 11 (1944).

that *pripiski* were widespread: in 1943 and 1944 an armament factory had “continually reported falsely inflated information about the fulfilment of the factory’s program, typically using from 5 to 20 days of the following month to complete production”; an aircraft factory had reported “incorrectly inflated information about plan fulfilment” in 1943 and for the months of January, February, and March 1944; the managers of a tank factory “have also been deceiving the government and ministries by reporting false information on the fulfilment of the production program.”²³ There were even *pripiski* in a vehicle repair factory of the defense ministry itself; the ministry’s vehicles administration, while “aware of all the factory’s shortfalls and lack of management, took no measures to overcome them.”²⁴

Widespread *pripiski* indicate a systematic tendency for industry to ignore delivery deadlines: goods were regularly delivered to the defense ministry a month or more late. The military agents had to be aware of this; it could never have happened without their knowledge. Yet they virtually never took independent action to enforce deadlines. Of all the cases of *pripiski* that the control commission uncovered, only two were reported by military agents. In September 1941 a military engineer reported an unacceptable delay in an order for gas protection equipment placed with the ministry of general engineering.²⁵ The control commission’s intervention secured a new deadline for the order, but no penalty for the delay. In 1943 a military agent and his senior technician reported on “deception and irregularities” at an electrical factory; this led to a special audit commission which confirmed the various violations.²⁶ We have found no other cases.

Auditors from the control commission themselves uncovered other *pripiski*. When they did so, they found that the military agents had colluded in the deception. In 1942, for example, the control commissioner for Sverdlovsk district found evidence of largescale *pripiski* for September, October, and November at the Uralmash factory not just “with the ministry’s knowledge” and “on the instruction” of the minister and deputy minister, but also with the collusion of the military agent.²⁷ This collusion could extend into the upper reaches of the defense ministry itself. In 1944, for example, the military agent joined the director of an armament factory in signing a cable reporting 101.5 percent fulfilment of the April program when both knew this to be false since it included items delivered only in May. Significantly, higher officials representing *both seller and buyer* had approved the *pripiska* by April 30.²⁸ This was clearly not an isolated case. The same officials justified their action on the basis of precedent;

²³ Hoover/RGANI, 6/6/1583: 10-13 (1944).

²⁴ Hoover/RGANI, 6/6/1583: 31 (1948).

²⁵ Hoover/RGANI, 6/6/47: 18 (1941).

²⁶ Hoover/RGANI, 6/2/55: 1-2 (1943).

²⁷ RGAE, 8752/4/108: 151-1510b (1942).

²⁸ Hoover/RGANI, 6/2/63: 159-160 (1944).

the defense ministry representative noted that he had approved similar arrangements in other cases “to avoid a breakdown of the plan and provision for the needs of the troops.”²⁹

In short, deadlines for the supply of armament seem to have caused little anxiety to military agents; even their superiors were ready to approve delays. The military agents did have to *look* as if they supported firm deadlines. This led them to collude with enterprise managers in falsifying reports of plan fulfilment. In return, they extracted cooperation over quality.

Contracting from quality in civilian branches of the Soviet economy suffered from similar difficulties but appear to have lacked the same opportunity to substitute quality for quantity through post-contract renegotiation. Civilian users of industrial equipment, for example, had little institutional capacity for search or power to bargain. Civilian supply ministries had no analogue to the statutory powers of the defense ministry’s purchasing agents; while they could and did employ private agents, these agents had no right to reject deliveries, and consequently had little or nothing to offer for the purposes of post-contract renegotiation. Any attempt to renegotiate was likely to give the civilian buyer fewer goods of the same low quality as before. In short, civilian users and consumers typically had to take what the system gave them, regardless of quality. Finally, the dictator was less troubled by the problem of contracting for quality in civilian branches since the price was paid by his citizens in their living standards; this affected his security indirectly, rather than directly in the case of defense.

Conclusions

We have looked at the problem of contracting for quality in the Soviet defense market. We have shown that in this market it took the typical form of a hold-up: the seller held up the buyer by defaulting on quality.

The historical setting of a harsh, personal dictatorship ruled out the conventional solutions recommended by economic theory: vertical integration was not in Stalin’s political interest, and long-term contracting was ruled out by the discretionary logic of allocation under a dictator. Imperfectly informed, however, Stalin was unwilling to intervene directly to enforce quality standards. Instead, he allowed the defense ministry to manage its problem by other means, deploying agents through industry to observe quality, reject substandard goods, and threaten industrial contractors with an easily verifiable shortfall on quantity.

The defense ministry willingly employed thousands of purchasing agents and paid them well for their loyalty, even in the midst of a total war. These agents, however loyal, still had to reach a compromise with the industrial contractors. Although they were often the injured party, the military agents turned out to be better off bargaining behind Stalin’s back than asking him for redress. In return for greater cooperation on quality, they would typically agree to overlook the

²⁹ Hoover/RGANI, 6/2/63: 21 (1944).

contractor's quantity violations – and, by concealing them, to keep Stalin out of the picture.

Although the defense market lay at the heart of the Soviet command economy, and was relentlessly scrutinized by overlapping auditing and monitoring agencies that reported directly to the dictator, it turns out to reveal some of the limits on Stalin's power. Although he could and did direct the lives and deaths of millions, he did not have absolute power over the implementation of a military contract.

This story also throws light on the evolution of institutions. According to North (1990), institutions are rules of the game, designed and reformed through politics; being imposed from above on economic agents, they constrain future development irrespective of their efficiency. In contrast Greif (2006) has analysed institutions as equilibrium outcomes of games. In this view they evolve through trial and error, rather than arising from acts of deliberate creation. The institutions in our case appear to reconcile both approaches. The dictator creatively designed the apparatus of procurement agents to overcome the difficulty of contracting for quality in the Soviet defense market; where analogous problems existed in civilian branches, attempts to solve them in the same way did not work or were not allowed to work. The mechanism of renegotiation that led to the solution in the defense market, however, was far from that initially projected. There can exist, in the words of Hayek (1973), a “made” order of society, and at the same time the equilibrium solution can evolve in directions other than the one the designers intended.

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