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The Role of Contract in Quality Assurance

Yoram Barzel

Professor, Department of Economics, University of Washington

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The Issue

In recent years a debate has raged about the accuracy of the cost-of-living index. A major bone of contention regards capturing the changes in the quality of goods. Were it easy to measure quality, disputes about the magnitude of the change would have not arisen. The difficulty in pinpointing quality is not merely an academic or policy question; it also poses a major problem for exchange. When the quality of the exchanged commodities is uncertain, costly disputes about what one gives and the other receives are bound to arise. Such disputes are a matter of property rights, of who owns what.

Implications and Conclusions

The heart of my argument is that, because of the difficulty of assessing “quality,” individuals who own commodities cannot fully exercise what seem to be their ownership rights over these commodities. I first address the difficulties people face when trying to sell “their” commodities for what may seem to be their “full” value. I then discuss the methods that are used to assure quality, and the conditions under which transactors are expected to switch from one method to another. Contracts have a comparative advantage when the levels of the attributes are easy to measure at the time of exchange. The existence of standards makes contracts especially attractive, and the level of contracting is expected to increase when new standards are formed. On the other hand, when measurement at exchange is expensive and the measurement that takes place at consumption difficult to verify, enforcing exchange by long-term relations has an edge over enforcing it by contract.

Let me emphasize first that I make no attempt to survey the literature on the subject. Rather, I am elaborating on and extending my own ideas (primarily Barzel, 1982). Second, as I am an armchair economist, it is likely that the institutional details to which I refer are less than accurate. It is to be hoped that the main conclusions offered here are not affected seri-

ously by this shortcoming. Third, my analysis is strictly positive, and, although I do not test my hypotheses, I do derive a number of refutable implications. Finally, I offer no suggestions for improving quality or its assurance.

The Nature of the Problem

Economists routinely embrace the Walrasian system as a proper representation of reality. This system produces our standard competitive model, which assumes that commodity information is costless and that rights are well defined. Under these conditions, every commodity would end up in the hands of the person who valued it more than did anyone else.

In reality, information about commodities is costly to produce. It is necessary nevertheless. Would-be buyers of a commodity must have a sense of what they are about to purchase. They have to discern the quality of the commodity before deciding what price they are willing to pay for it. Operationally, a commodity may be viewed as a collection of attributes, and knowing its “quality” means knowing the levels of each of its (valued) attributes. These attributes, then, must be measured.

The fact that information is costly is at the root of two related property-rights issues. One, already mentioned, is that the commodity one is about to sell will not, in general, find its way to the person valuing it most. The other is that some value is left in the public domain.

Regarding the first issue, people are reluctant to buy a commodity before they satisfy themselves of its quality, and of course will not acquire it if they are not aware of its existence. But because the acquisition of such information is costly, people fail to acquire any information about most commodities, and acquire only partial information about the rest. The buyer of a commodity, then, is not necessarily the one who values it most; for the same reason, the original owner may retain it even though some other individuals value it more than he or she does.

Because measurement is costly, it is economized on, which necessarily leaves some value in the public domain. As measurement is not carried out to perfection, commodity attributes are measured with error. Consider the timing of the measurement. There are two distinct opportune times to carry it out. One is at the time of the transaction, which need not be fixed. Presumably, it is chosen, in part, so as to reduce the cost of measurement. The other opportune moment is at the time the commodity is actually used. Measurement takes place automatically as the commodity is used or consumed, and therefore these are the economical points in time for effecting it. This measurement is problematic, however; it is often not verifiable, and therefore cannot be used in contracts. I return to this problem below. I should point out the user is not necessarily the low cost measurer, a problem I abstract from.

Because of the errors of measurement, property rights are not well defined. It is not clear who is the economic owner of the differential between the value of a commodity as measured and its error-free (or “true”) value. I argue that, at least in part, the differential lies in the pub-

lic domain. This is because, in a non-cooperative environment, each transactor is expected to spend resources in the attempt to gain at his partner's expense, in this case by exploiting the measurement errors. The seller of a commodity may gain by providing specimens of quality lower than those promised (perhaps implicitly). The buyer may gain by selecting specimens of higher quality than what (perhaps implicitly) he agreed to pay for. Quality assurance, which may be viewed as an attempt to convert a non-cooperative environment to a cooperative one, is a way to cope with the problem. Like measurement, however, such assurance is never free.

Methods of Assuring Quality

Individuals have at least four ways to enforce their transactions, each with its own implicit method of handling quality assurance:

1. Operate within firms.
2. Transact on a caveat emptor basis.
3. Transact in the market by using contracts.
4. Transact in the market by using long-term relations.

Transacting within firms, as opposed to transacting in the market, is conducted without recourse to contracts and to the contract enforcement mechanism of the state. I indicate below, albeit very briefly, how quality is assured there. Caveat emptor transactions are, of course, in the market, and the state enforces the trade. The contents, or the quality of the trade, however, must be self-enforced.

The remaining two forms of effecting exchange are also in the market between independent operators. However, the two differ significantly from each other in the role played in them by the contractual relations. In the remainder of this paper I focus mostly on the differences between these forms, and especially on the assurance of product quality they induce. The comparison between futures contracts and forward contracts is used to illuminate much of the discussion in this section.

I use the term "contract" to indicate an agreement, or part of an agreement, that the state agrees to enforce. Other agreements must be self-enforced or enforced by third parties other than the state. I first assert that contracts, as I use the term, accomplish less than they popularly seem to because they cover only parts of agreements. Later I argue that, paradoxically, as a result of their transferability, contracts play a bigger role in enhancing trade than they popularly seem to.

Contracts accomplish less than is popularly thought because very few transactions are actually governed by contract alone. I argue that in spite of being called "contracts" neither futures contracts nor forward contracts are fully governed by contract; they do, however, differ significantly from each other in the degree that contracts govern them.

An essential feature of contracts is that the state itself takes on the task of enforcing a contract's explicit stipulations as well as the ones implicit in the laws and regulations governing

the transaction. The state, however, does not enforce whatever implicit stipulations the parties have made.

Futures contracts are contracts between the ultimate buyer and the futures exchange, and the ultimate seller and the futures exchange. What the ultimate seller is expected to deliver and the ultimate buyer to receive are fully governed by the contract. Indeed, such contracts provide ample detail about the transacted commodities. These contracts, however, are effected through the intermediation of the futures exchanges, and the relationship between the exchanges and the ultimate exchange parties is not symmetric. The exchanges' obligations are different in their nature from, and are more subtle than, those of the ultimate transaction parties.

To deliver on its part of the transaction, an exchange must possess a brand name, which, as a rule, is highly valued. The exchange is able to commit to perform in the future by staking its brand name. This aspect of the relationship is self-enforced rather than being enforced by the state. Futures are often viewed as strictly contract transactions. As just pointed out, however, an important aspect of their governance is by reputation rather than by contract. In other words, quality assurance requires that the seller would be able to make good on his or her promise, which requires the possession of guarantee or reputational capital. This issue is far from trivial, but I am abstracting from it here. In Barzel, 1997 (pp. 80-84), I briefly discuss the problems involved.

One of the costs people incur in exchange is that of measuring the attributes of the exchanged commodities. In the case of futures this cost consists, in part, of the direct cost of measuring the attributes stipulated in the contract. Another, less apparent, cost of futures is indirect. Certain attributes are not stipulated in the contract, seemingly because they are too costly to measure. (Another reason for not stipulating attributes is to make sure that the market does not become so thin that it would be easy to corner.) As the quality of the commodities under futures contracts is governed by explicit specifications only, the attributes not stipulated contractually are left in the public domain. Suppliers who control the levels of the unspecified attributes will provide low levels of the positively valued ones and high levels of the negatively valued ones. The "low" and "high" are in comparison with the levels that would have been stipulated in a more complete contract (see Alsberg, 1926 for evidence).

Consider now forward contracts. Such contracts are characterized by leaving out of the contract explicit stipulations regarding many of the valued attributes of the exchanged commodity. These attributes are rather guaranteed by the seller's reputation. Thus, although measurement is necessary in any transaction, in the forward contract transaction the transactors can take advantage of the measurement that occurs when the commodity is actually used even if it is not verifiable. The seller's promise here takes a form such as the promise, "satisfaction guaranteed." Such a seller's commitment is not one that the courts could enforce. The buyer, then, has no recourse to the law. As a buyer measures the commodity through use, he may dis-

cover that the commodity he received is not up to norm. If he bought it from a reputable seller with whom he maintains long-term relations, he can punish the seller by withholding his future business or by tarnishing the seller's name. One implication is that when a commodity becomes easier to measure, futures will tend to replace forward contracts. For instance, standardized financial instruments are easy to measure, and their futures are often held to maturity, presumably with no parallel forward contracts in existence.

Forward contracts, then, require a lower effort to specify and to measure than do futures contracts. More importantly, they are expected to provide near optimal levels of the attributes that futures leave in the public domain. For this reason, the net value forward contracts are expected to yield is higher than that of futures contracts in trading the same commodities. Note also that forward contracts are well suited as a way to hedge against the risk of one party defaulting (by not delivering on time, say). Futures, as a rule, are not subject to problems of default.

Besides their superior ability to assure quality, forward contracts have an additional advantage over futures contracts. Forward contracts may be used for trade between states that do not respect one another's contracts. In that case, the parties rely entirely on their reputations. Futures contracts, of course, cannot be enforced under these conditions. Thus, under current conditions, Americans who wish to trade with Russians are more likely to rely on the latter's reputations than on contract enforcement by the Russian courts and police.

It may seem that, because of their ability to assure quality and their suitability for certain interstate trade situations, forward commodity contracts would always be preferred to futures commodity contracts. Not all the advantages, however, are on the same side. Futures contracts have at least two advantages over forward contracts. One is their ease of transferability; the other is that the cost of enforcing them tends to be lower. I will concentrate on the first and discuss the second only in passing.

Transferability

As stated, the ultimate transactors to futures contracts rely entirely on contract specifications. Their personal characteristics, then, are of no relevance to their ability to transact. That allows them, among other things, to be anonymous to each other. Anybody willing to take over the position of another transactor can do it. All that is required of such a person is to come up with the appropriate deposit. This is why these holdings are so liquid. (Telser and Higinbotham, 1977, discuss extensively the liquidity of futures.) Forward contracts are not so readily transferable, because they rely on the transactor's reputation and a transactor's consent is required before the other can reassign his or her (non-contractual) obligations.

To better see the nature of the transferability problem, I consider first a very simple exchange—a fruit stand transaction; I then proceed with discussion of more elaborate exchanges. A fruit stand transaction between the seller and a buyer, usually a final consumer, tends to be subject to caveat emptor; it is fully consummated at transaction time, with no lin-

gering obligations. The buyer, then, must satisfy himself on the spot that he is getting a good value. If he is not careful, the seller, who need not fear being penalized, may deceive him. Although the transaction is simple, it requires burdensome precautions. This seems to be why this form of exchange is used so seldom.

If the orchardist also owns and runs the fruit stand, a single transfer suffices to get the commodity from the original producer to the final consumer. If another person owns the fruit stand, at least two transfers are required, and the costs associated with transfer will increase. However, each can become more specialized, the farmer in farming and the seller in selling.

Typically, specialists enhance the value of goods by changing their physical attributes or by changing their locations. Consider the change in location first. When all transactions are subject to caveat emptor, the merchandise has to be reevaluated at each transfer juncture. The costliness of such repeated evaluation may explain why merchants sometimes travel great distances with their merchandise in spite of the corresponding sacrifice in the level of specializing.

Merchandise transfers may take place within firms, in this case horizontally integrated shippers. The amount of measuring at each within-firm transfer point is expected to be low, since the employer does not benefit from encouraging measurement. Employees also do not see a large benefit from measurement, although they do see some. Employees have to demonstrate some contribution to output. Output may appear larger than it is if its quality is low but the low quality is undetected. Output may also appear larger than it is if the employee can substitute higher quality inputs for lower quality inputs, thus saving himself or herself some effort, and still produce the expected, average-quality product for the employer. Nevertheless, employees' incentive for measurement is less than that for independent workers. Generally, because of employees' less than "optimal" effort, the output that firms can extract from employees tends to be lower than the output that independent workers produce for themselves.

Unlike employees, independent transactors may gain at each other's expense, as is the case with caveat emptor. Each, then, must guard against capture losses to the other. Capture losses may be reduced by the use of guarantees. Transactors may guarantee their actions either by their reputations, or by using contracts. In general, under specialized production each link in the chain of transfers must be functioning properly if the output of the original producer is to reach the final recipient. As the chain of transfers increases, guaranteeing commodity quality by reputation becomes less advantageous. When each link is guaranteed by reputation, the greater the number of links in the chain, the more opportunities (and therefore the higher the chance) for the reputational enforcement mechanism to break down.

The quality of a commodity such as wheat may be guaranteed by contract stipulations. Whereas reputation is not transferable, provided the identity of the transactors is moot, a contract may be transferred along with the merchandise. Contracts document the measurements of the transacted commodities. Enforcement by contract has an edge over enforcement by

long-term relations in that contracts can be transferred, and thus save the costs of measurement that would have otherwise been needed when reselling the commodity. The actual use of the courts is expensive, but disputes regarding quality will seldom erupt as long as contracts clearly specify the attributes of the commodity.

I now turn to the production of commodities rather than their transportation. The problem of assuring quality may arise when some of a commodity's physical characteristics are altered, which is typical to the vertical production process. Here too contract guarantees play an important though subtle role in facilitating transfers. In general, a guarantee constitutes a promise of a certain level of performance, that is, of a certain quality level. Consider a machine guaranteed by its manufacturer. Buyers know that when a guaranteed attribute fails to perform, they will be compensated through the "free" guarantee service, as it is the producer's obligation to bring the machine up to par. The seller, of course, is induced to provide high quality machines to reduce the cost of the actual guarantee service. The existence of a guarantee, then, reduces buyers' incentive to measure the commodity.

This also applies to the resale of the machine. Suppose that a firm that has been using a machine which is still under guarantee decides to sell it. Provided the terms of the guarantee have not been violated, it is common practice for the manufacturer to continue to honor the guarantee. The new buyer, too, is spared the cost of inspection of the guaranteed attributes of the machine. Thus the guarantee component of the contracts makes transfer easier, as the need to measure what is transferred at the time of transfer is reduced.

The foregoing discussion of the guarantee applies quite generally. Besides vertical production processes, it applies also, among other things, to transfers over space. In my discussion of the shipment of commodities, I implicitly assumed that commodities are not altered in shipment. In reality, commodities tend to deteriorate while in shipment. The rate at which they deteriorate or are damaged depends on how they are handled. In order to facilitate transferability, the exchange might be by a contract that stipulates only those attributes that are unlikely to change during shipping (or those that will change in a predictable way). The remaining attributes, that is, those that are prone to mishandling (which is difficult to measure) may be enforced by long term relations, or by on-the-spot inspection.

Standards and Quality Assurance

“Standards,” or “grades,” are agreed upon characterizations of commodities and of commodity attributes; I focus here on standards for attributes. Prior to the emergence of a standard, various methods of characterizing attributes are in use concurrently. These are all necessarily imperfect; otherwise only one would be used. Describing attributes, then, is a process fraught with difficulties, and one subject to confusion. A standard tends to emerge when the cost of characterizing an attribute in a particular way has declined (or the benefits from using it have increased). By adopting a standard, not only is a low cost method put into

use, but the earlier confusion about what is meant by the attribute is reduced.

Product uniformity is complementary with standardization. The greater such uniformity, the greater is the advantage of using standards, as they can be applied to more specimens. The converse is also true: once a standard is formed, it is advantageous to produce to it, because no extra costs are incurred in using it. Whether standardized or not, assessing quality is easier when a product is uniform, because measuring one specimen provides useful information about all of them. Uniformity is synonymous with the absence of variety, and variety itself is often of value. On the other hand, provided people are aware of it, uniformity implies that they know better what it is that they are getting. As with standards, product uniformity is expected to favour exchange by contract rather than by long-term relations or by operating within firms.

The emergence of standards provides an opportunity for making various kinds of predictions. I make one general prediction and several more specific ones. The general prediction is that when a new standard for an attribute emerges people are likely to use it in contracts, whereas prior to its emergence they would have been more likely to enforce the level of the attribute by other methods. I offer three idiosyncratic predictions: First, consider an attribute of a commodity, say, the level of an impurity. One person partially removes it, and then transfers the commodity to someone else. When a standard for the impurity level emerges, the likelihood is higher that market exchange will replace exchange within firms at the transfer juncture after the impurity is operated on. Second, it is predicted that before the emergence of the standard firms (and individuals) will tend to perform a larger set of activities than after its emergence, when they will become more specialized. Third, in recent decades the costs of computing and of conducting certain chemical analyses have declined dramatically. Presumably, this has lowered significantly the costs of measurement while also enhancing the formation of standards. These changes are expected to have increased the use of contracts relative to other forms of transacting. The recent increase in outsourcing (that primarily constitutes trade between firms) replacing within-firm transfers, may be a reflection of this phenomenon.

Enforcement of Agreements

In the preceding discussion I implicitly assumed that agreements are always enforced. Obviously, this is not generally true. Even in states governed by a high level of the rule of law, the state does not fully protect all legal rights. For instance, the rate of theft may be reduced, but it is never reduced to zero. More importantly here, the state does not enforce all contracts and contract provisions, and enforcement is not always impartial. The extent to which parties to an agreement choose to enforce it by contract is a function of the parties' perception of the impartiality of state's enforcement and of its enforcement level. The lower the parties' expectations of the state in this regard, the greater is the probability that the parties will use some non-state method of enforcement. For example, given the nature of current law

enforcement in Russia, the use of futures contracts introduced by Russian futures exchanges is expected to be much less than the corresponding use in the United States. One would expect rather that quality assurance in Russia would rely on long-term relations to a much greater extent than is the case in the United States.

Conclusions

Quality may be assured by a whole array of methods. Individuals can assure quality by the simple expedient of doing things themselves. Quality may be assured by operating within firms or within close-knit organizations. It can be assured by inspection at the time of the transaction, or by using long-term relations for enforcement. Finally, it can be assured by stipulating the appropriate quality level in contracts that the state enforces. Each form has its advantages and disadvantages. I have focused here mainly on the use of long-term relations as compared with the use of contracts for assuring quality. I argue that contracts, which tend to be impersonal, require explicit specifications of commodity attributes. They have a comparative advantage when the levels of the attributes are easy to measure at the time of exchange. The existence of standards makes contracts especially attractive, and the level of contracting is expected to increase when new standards are formed. On the other hand, when measurement at exchange is expensive and the measurement that takes place at consumption difficult to verify, enforcing exchange by long-term relations has an edge over enforcing it by contract.

Explicit measurement and the formation of standards are subject to economies of scale. Of course, such economies apply to batch size. They also apply to the overall volume of individual commodities within a state's jurisdiction. As the volume of transactions increases, the level of contracting is expected to rise and the use of other forms of assuring quality to decline. On the other hand, as political relations between states deteriorate, whatever trade that takes place between them is likely to be dominated by long-term relations.

References

- Alsberg, Carl L. 1926. Protein content: A neglected factor in wheat grades. *Wheat Studies of the Food Research Institute* 2: 163-76.
- Barzel, Yoram. 1982. Measurement cost and the organization of markets. *Journal of Law and Economics* 25(April): 27-48.
- Barzel, Yoram. 1997. *Economic Analysis of Property Rights*. 2nd ed. Cambridge University Press.
- Telser, Lester G., and Harlow N. Higinbotham. 1977. Organized futures markets: Costs and benefits. *Journal of Political Economy* 85(5): 969-1000.