THE EFFICIENT SCOPE OF PRIVATE TRANSACTIONS-COST-REDUCING INSTITUTIONS: THE SUCCESSES AND FAILURES OF COMMODITY EXCHANGES

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ABSTRACT

Commodity exchanges historically have served as private organizations that govern contractual relations between market participants. Their functions have included commodity measurement, contract enforcement, the policing of theft and fraud, and the mitigation of information asymmetries. In contrast to these successes, the Chicago Board of Trade failed signally in its attempt to introduce a grain grading system after the Civil War. This effort failed because (*a*) the proposed reform imposed significant costs on interests whose cooperation was essential to its success and (*b*) the transactions costs of reaching an agreement to compensate these interests for their losses under the efficient property rights were prohibitive. A comparison of the successes and failures of commodity exchanges reveals that exchanges succeed when the benefits of exchange governance are symmetric and fail when the costs and benefits are extremely asymmetric.

I. INTRODUCTION

INSTITUTIONS facilitate trade/exchange in a variety of ways. They define and enforce property rights, enforce contractual agreements, mitigate information asymmetries that can cause "lemons" problems and market failure, and provide public goods. Institutions can arise from purely cooperative interactions among private parties or may derive from the exercise of coercive power by the state. Cheung, Demsetz, Umbeck, Ellickson, Libecap, and others demonstrate that private cooperative agreements can frequently achieve efficient outcomes in a wide variety of economic environments.[1] This raises the question: what are the limits to private contracting for property rights?

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[1] Steven Cheung, The Fable of the Bees: An Economic Investigation, 16 J. Law & Econ. 11 (1973); Harold Demsetz, Toward a Theory of Property Rights, 57 Am. Econ. Rev. 347 (May 1968); John Umbeck, The California Gold Rush: A Study of Emerging Property Rights, 14 Explorations Econ. Hist. 197 (1977); Robert C. Ellickson, Order without Law (1991); Gary Libecap, Contracting for Property Rights (1989).

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Answering this question in the abstract is a daunting task. In this article, I analyze a particular set of institutional arrangements in order to shed light on the factors that affect the costs that private institutions incur to create and enforce property rights. Specifically, I examine the role of commodity exchanges as institutions that increase wealth by reducing the costs of transacting. Coase emphasizes that exchanges are essentially sources of private law.[2] Expanding on the seminal insights of Telser[3] and Mulherin *et al.*,[4] I demonstrate that commodity exchanges were historically "full-service" institutions that performed each of the five trade facilitating functions listed earlier. Moreover, they did so in a wide variety of environments with little or no state involvement (other than judicial and legislative sanctioning of their actions).

The few exceptions to this latter regularity are revealing and provide considerable insight on the division of labor between cooperative institutions and the state. In particular, although the Chicago Board of Trade (CBT) was remarkably successful in enforcing contracts, in the late 1860s it failed signally in its efforts to (*a*) regularize the grading, inspection, and weighing of grain and (*b*) mitigate severe information asymmetries in the grain trade.[5] This failure (which contrasts starkly with the ability of the exchange to implement inspection and information distribution systems in other commodities and the success of other exchanges in doing so) was due to the acute disparity of interests between various segments of the Midwestern grain trade. The warehousemen who stored grain were continuously at odds with the brokers, shippers, and receivers who bought and sold it. Although the rationalization of the process of storing, inspecting, and reporting grain stocks would clearly have produced efficiency gains, the distributive effects of such a change thwarted all attempts to achieve this result through cooperative agreement under the aegis of the CBT. Instead, the broker-shipper-receiver interests represented by the exchange (and assisted by farm interests who also bore some costs under the existing system) successfully appealed to the Illinois

[2] Ronald Coase, 1991 Nobel Lecture: The Institutional Structure of Production, in The Nature of the Firm 3 (Oliver Williamson & Sidney Winter eds. 1993).

[3] Lester Telser, Why There Are Organized Futures Markets, 24 J. Law & Econ. 1 (1981).

[4] J. Harold Mulherin, Jeffrey M. Netter, & James A. Overdahl, Prices Are Property: The Organization of Financial Exchanges from a Transaction Cost Perspective, 34 J. Law & Econ. 591 (1991).

[5] All commodity exchanges also failed to curb manipulation (that is, corners and squeezes). The explanation for this failure is virtually identical to that advanced here for the CBT's difficulties. Specifically, distributive complications can prevent an exchange from adopting wealth-maximizing measures. For details, see Stephen Craig Pirrong, The Self-Regulation of Commodity Exchanges: The Case of Market Manipulation, 38 J. Law & Econ. (1995, in press).

legislature and Constitutional Convention to enact laws that regulated warehouses. These laws constrained the power of warehousemen to exploit their information advantages and to manipulate grain quality and weight inspections.

A comparison of these successes and failures of commodity exchanges suggests that the primary condition that promotes private creation and enforcement of property rights is a relatively symmetric distribution of the resulting gains among the affected parties. When the gains are symmetrically distributed, reciprocity is sufficient to ensure cooperation. However, when the efficient rules make some parties worse off, side payments or punishments are necessary to secure their cooperation. Since the rules are in effect public goods, however, the beneficiaries have an incentive to free ride and to avoid contributing to the side payments or incurring the costs of penalizing the holdouts. In the presence of negotiation, bargaining, and other transactions costs, therefore, it may be prohibitively costly to implement the efficient rules.

This article expands on the insights of Ellickson[6] and North.[7] Each of these works forcefully dispels the notion that the state is the sole source of property rights. Moreover, each work argues that repeated interaction enforces reciprocity and thereby facilitates private cooperation. The current article adds evidence that the distribution of gains and losses from changes in property rights is also crucial in determining the success of cooperative endeavors. This result is very similar to the argument and evidence of Libecap, who also stresses that distributive considerations largely determine whether agents adopt wealth-increasing property rights.[8] Similarly, like Epstein,[9] I emphasize the centrality of bargaining costs in determining the limits of private action and the potential benefit of state action to create and enforce property rights and govern contractual relations. Thus, these results suggest that close-knit groups that are conducive to private institutions and norms are as much defined by the mutuality of their interests as by the fact that their members interact repeatedly.

The particular episode examined in detail here—the CBT's travail with the elevator operators—is of more than passing historical interest. The warehousing and railroad laws that resulted from the exchange's inability to establish an effective grain measurement and reporting system were

[6] Ellickson, *supra* note 1.

[7] Douglass C. North, Institutions, Institutional Change, and Economic Performance (1990).

[8] Libecap, *supra* note 1.

[9] Richard Epstein, Bargaining with the State (1993).

the genesis of the epochal case of *Munn v. Illinois,* which granted legislatures broad authority to regulate private transactions. Thus, the issues and events analyzed in this article have played a central role in determining the division of property rights and contractual enforcement authority between governmental and private institutions.

II. Property Rights, Contractual Enforcement, and Information Provision: The Economic Function of Commodity Exchanges

A. *Introduction*

Commodity exchanges are now almost universally identified with futures trading, but they have historically performed a far wider array of functions than the provision of rules and facilities for this activity. Most important, exchanges provide an extensive variety of transactions-cost-reducing services, such as property rights definition and commodity measurement, contractual enforcement, and information provision.

Some researchers have recognized the broader role of exchanges. Most notably, Telser[10] and Telser and Higginbotham[11] argue persuasively that they facilitate trade by standardizing transactions in two important dimensions. First, they devise rules to improve contractual performance. Second, they adopt standardized grading systems for commodities. These systems eliminate the need for repeated measurement at each trade and transform commodity claims into homogeneous, fungible securities. Similarly, the important article of Mulherin *et al.* notes that "the property rights aspects of financial exchanges have been the most misunderstood, both historically and at present."[12] They emphasize the role of financial exchanges (including commodity exchanges) in establishing property rights over price quotes.

Although illuminating, these works do not do justice to the incredible variety of transactions-cost-reducing functions exchanges have performed in the past or how the particular rules exchanges have adopted vary with market conditions in order to improve efficiency. Moreover, these works do not explore the limits of commodity exchange governance. That is, they examine neither the conditions that allow exchanges to create efficient property rights nor the conditions under which private cooperative agreements like exchanges cannot effectively do so.

[10] Telser, *supra* note 3.

[11] Lester Telser & Harlow Higginbotham, Organized Futures Markets: Costs and Benefits, 85 J. Pol. Econ. 969 (1977).

[12] Mulherin, Netter, & Overdahl, *supra* note 4, at 592.

Sections *B–F* give a detailed description of the numerous exchange property rights creating and enforcing activities. This analysis serves three purposes. First, it demonstrates the impressive breadth of exchange functions. Second, it shows that these institutions have done much to facilitate trade in the underlying commodity as well as to make futures trading practical. Third, the analysis provides a standard of comparison that makes it possible to discover the factors that determine the ability of exchanges to successfully undertake efficiency-improving actions. A comparison of the characteristics of the successful exchange described here and some notable failures discussed in Section III sheds considerable light on the factors that allow effective private contracting for property rights.

B. Property Rights Creation and Enforcement: Measurement

The property rights literature emphasizes that commodities possess diverse attributes that are costly to measure.[13] Costly measurement implies that all the attributes of a particular commodity are never delineated fully. Moreover, this imperfect measurement induces transactors to expend resources to capture the value of mismeasured goods. Thus, measurement costs are an important source of transactions costs, and efficiency can be enhanced by devising measurement methods that economize on these costs.

Although it is commonplace to think of commodities such as "wheat" or "cotton" or "lead" as homogeneous, this perception is mistaken. Each of these goods varies on myriad dimensions. The value of wheat to a miller depends on its weight per unit volume, its protein content, its moisture content, and the amount of foreign matter present, to name just a few of the relevant attributes. Similarly, a spinner of cotton is deeply concerned with its color, staple length, and moisture and foreign matter content. Since the quantities of these attributes vary radically among different parcels, measurement issues are of primary importance in commodity markets. Without a reliable means of grading them, trade in these commodities requires costly, repeated, and duplicative examination by buyers and sellers. It is not surprising, therefore, that virtually all important commodity exchanges have adopted extraordinarily detailed mechanisms to measure and grade these complex goods. Indeed, in most cases it was the need to economize on measurement costs in cash transactions in the physical commodity, rather than the desire to engage in futures

[13] Yoram Barzel, Measurement Cost and the Organization of Markets, 25 J. Law & Econ. 27 (1982); North, *supra* note 7; Libecap, *supra* note 1.

trading, that induced members of a particular commodity trade to establish a formal exchange. In fact, only after the development of reliable grading and weighing systems did traders recognize the potential for futures trading.

The history of the Chicago Board of Trade provides an illustration of this phenomenon. During the late 1840s and early 1850s, the amount of grain shipped to Chicago grew dramatically. Individual storage elevators (large, specialized warehouses where grain was kept in bins before shipment east) sorted the grain delivered to them into different qualities or grades. The elevators were erratic graders and adopted different systems. The resulting uncertainty over grading gave farmers little incentive to maintain the quality and cleanliness of their grain. Chicago wheat consequently developed a poor reputation in the major consumption markets. This constrained the growth of the city's trade. Moreover, idiosyncratic grading systems made grain less fungible, as the wheat from one elevator was an imperfect substitute for the grain from another. Since fungibility reduces transactions costs by reducing (*a*) the amount of information required in any transaction and (*b*) the costs of searching to find someone to trade with, the elevator-specific systems impaired the efficiency of the city's grain trade. Thus, city-wide standardization of grading reduced transactions costs relative to their level under warehouse-specific systems and bilateral contracting between elevators and the buyers and sellers of grain.

In order to create a city-wide system, in 1857 the Board of Trade (which until that time had been a sleepy organization that resorted to offering free meals to attract members to meetings) established formal grading systems for wheat, corn, oats, rye, and barley and appointed inspectors to implement it. The exchange also standardized measurement technology, its most important innovation in this regard being the replacement of a volume-based bushel with a more accurate weight-based one. Finally, due to difficulties in implementing the system under its original charter, the board successfully appealed to the Illinois legislature for a new one. This gave the exchange the power to hire inspectors and weighers and made their decisions legally binding on all its members.[14] When the lumber, flour, and provisions trades developed in Chicago, the CBT also created measurement and inspection systems for these commodities.

The board did not adopt these measurement systems to facilitate the futures trade. Rather, the members intended the system to improve the

[14] See William Cronon, Nature's Metropolis 116–18 (1991); and Charles Taylor, 1 A History of the Chicago Board of Trade 220–27 (1917), for a discussion of the genesis of grain grading at the Board of Trade.

efficiency of the cash grain trade; the date that true futures trading began is obscure but is certainly later than 1862, 5 years after the adoption of the new system. Although this system did not survive the stresses of the Civil War and the resulting explosive growth in the Chicago grain trade, this history shows clearly that the growth of a commodity trade spurred attempts to improve measuring technologies in order to reduce transactions costs.

The history of other exchanges is similar. A growth in trade in a particular commodity increased the value of measurement systems (and other property rights creating and enforcing activities), and the members of that trade established formal organizations to implement them. It is also important to note that these organizations provided measurement services for the cash commodity trade (that is, the trade in the physical commodity) as well as the futures trade. Indeed, for many markets (such as the New Orleans Cotton Exchange or the London and Liverpool Corn Trade Associations) the cash market measurement and arbitration systems were more important than those adopted for the futures market.

The actuals market measurement systems were not always intended to create a fungible, homogeneous instrument that could be traded like a security.[15] Instead, they often had the objective of facilitating trade in the very heterogeneous underlying commodities. They did so by providing an efficient mechanism for buyers and sellers to verify the quality of merchandise traded across vast distances. Moreover, the exchanges did not always create fixed numerical grading standards for the cash trade (which was necessary for the futures business). Rather, they created an arbitration mechanism that buyers and sellers could employ to mediate any disputes arising from disparities between the quality established in a particular cash contract and the quality actually delivered.

The arbitration system adopted by the Liverpool Cotton Association is representative.[16] Under this system, a buyer who believed that a seller delivered a lower-quality cotton than contracted for (or a seller who felt that the buyer unfairly rejected a shipment on quality grounds) could appeal to the association's arbitration board. The board appointed three knowledgeable parties to inspect the cotton in question. Two of the arbitrators evaluated the cotton and attempted to agree on a price differential to correct for deviations between the quality of the cotton contracted for

[15] Telser, *supra* note 3; and Telser & Higginbotham, *supra* note 11, stress that the creation of a homogeneous instrument is necessary to establish a futures trade.

[16] See John Alton Todd, The Marketing of Cotton, from the Grower to the Spinner, chs. 4 & 5 (1934), for a thorough description of the Liverpool arbitration system. See Graham Rees, Britain's Commodity Markets (1972), for a description of arbitration systems in the wool, rubber, tea, metals, grain, and jute trades.

and that tendered. If the two failed to agree, the third arbitrator acted as an umpire. If either party was dissatisfied with the results of the arbitration, he could appeal to a nine-member Official Appeal Committee. Most cotton imported to Britain was sold under contracts containing a Liverpool arbitration clause, which required the parties to settle any quality or performance dispute through the arbitration system rather than the courts. Thus, the Liverpool Exchange served as a contract governance mechanism that reduced transactions costs by arbitrating quality disputes.

An examination of the inspection and arbitration systems adopted by the various exchanges reveals that they varied significantly by the region of a shipment's origin. The standard contracts adopted by the London and Liverpool Corn Exchanges provide a revealing example of this regularity. Each of these exchanges adopted upward of 64 different contracts for the cash grain trade. Each contract pertained to grain originating from a particular growing area; for example, there were different contracts for East India wheat, Russian rye, and River Plate wheat. Moreover, every contract specified a particular set of grading rules, and these rules differed substantially between contracts. For instance, contracts for grain originating in Illinois were sold on "Official certificate of inspection to be final as to quality." For this grain, the quality listed on the grading certificate issued at the export elevator in the United States was definitive. Thus, grain damaged by sea water or heating in transit was accepted in the United Kingdom at its original grade under these so-called *tale quale* terms. In contrast, a buyer could reject ship- or sea-water-damaged East India wheat. Similarly, he could appeal to the exchange arbitration committee for a price adjustment on water-damaged River Plate grain. Moreover, grain originating in the United States was sold by numerical grade (such as no. 1 or no. 2 corn), while grain from Russia was sold by sample, East India was warranted to be only of "fair merchantable condition," and grain from other locations (such as Argentina or Australia) was sold under so-called fair average quality (FAQ) terms. Under the latter terms, an exchange representative collected a sample from each shipment of grain arriving from the relevant location. He then mixed a portion from each of these samples to create a corresponding representative sample. The exchange's graders then compared the residual from each individual sample to the representative sample and rejected any sample that was substantially below the quality of the representative grain.[17] Thus, under a FAQ system, there was no unvarying set of quality categories (as was

[17] See John Smith, Organized Produce Markets 1–28, 192–232 (1922); and Sidney Duly, Grain (1928), for detailed descriptions of the contracts and practices.

true of the U.S. grading system). Instead, the quality categories varied over time to reflect changing crop characteristics.

An analysis of these practices reveals that these disparate grading conventions varied with the attributes in the underlying commodities in a discriminating fashion in order to economize on measurement costs. The differences between the contract standards for American and Argentine or Australian wheat illustrate this regularity.

The use of export terminal grading certificates as final for U.S. grain relieved the seller of any liability for sea damage or in-transit heating. This diminished the incentives of exporters to undertake precautions to prevent these problems, and as a result complaints of sloppy handling and inadequate drying (which contributed to heating) were chronic.[18] Despite these problems, certificate final sales were still arguably efficient because they eliminated the need for an additional measurement. U.S. grain was almost invariably loaded into large storage elevators prior to export. It was impractical to segregate parcels owned by different individuals. Given these conditions, in order to strengthen the incentives of those shipping grain *to* the elevators to maintain quality, and to deter theft by the elevators, it was necessary to grade grain when it was loaded into and out of the elevator. Failure to do so would have caused the quality of a particular shipment of mixed grain to pass into the public domain. Selling grain on the basis of these elevator certificates, rather than on the basis of an inspection in the importing country, thereby eliminated an additional inspection without compromising quality control efforts between the point where the grain was grown and where it was loaded aboard ship.[19]

In contrast, consider the advantages of a FAQ system for grain originating from the Argentine or Australia. In the period this system was

[18] Lowell Hill, Grain Grades and Standards: Historical Issues Shaping the Future 21–31 (1990).

[19] It was nearly impossible to mix grain already loaded aboard ship or to steal from the ship, so (unlike a carload of grain delivered to an elevator) a given boatload of grain was essentially an indivisible, discrete commodity. The only real possibility for resource dissipation after grain was loaded out of an export elevator resulted from failure to take proper precautions against sea damage. Thus, the opportunism and moral hazard problems that European importers faced differed from those that farmers, shippers, and receivers faced when shipping grain from the country to the ship. This asymmetry in opportunities for dissipation implies that the value of measurement differed at the various break points along the route from farmer to consumer. Indeed, it is quite likely that opportunism problems were more acute on land than at sea, since prior to export agents could waste resources by mixing, theft, and failure to take care against degradation in quality, while only quality-maintenance problems were acute for grain aboard ship. Thus, inspection was less valuable at the import point (such as Liverpool) than at the export point (such as Chicago or New York), and as a result the commodity was measured in the latter and not in the former.

employed, handling facilities both at the ports and along the inland grain transport routes in these nations were extremely crude. Given the rudimentary state of development in these nations, elevators (a capital-intensive method of handling grain) were virtually unknown. Under these circumstances, it was most efficient to transport grain in bags from the farmer to the buyer at the export point in wagons. These conditions made control of quality variation in the exporting country problematic at best. They also precluded mixing in order to create parcels of grain meeting standardized grades as was possible in the United States and Canada. Moreover, because the crude handling methods exposed the grain to the elements throughout its time-consuming trek from the farmer to port, varying weather and insect conditions during the crop year and during the trip from field to ship caused extreme month-to-month and year-to-year quality variation. As a result of these conditions, the variation in grain quality over time swamped the variations in the quality of shipments made at a particular time from a particular location. In contrast, more advanced and expeditious handling methods, and the ability to "condition" grain in elevators, mitigated this problem in North America.[20]

All of these conditions made a FAQ system superior to a grading system for Argentine or Australian wheat. Specifically, inspection in the exporting country was not necessary to preserve the incentives of the exporter to maintain quality (to the extent of his ability to do so) because individual shipments retained their identity. Thus, inspection in the *importing* country economized on the number of measurements and gave the shipper an incentive to take due care of the cargo at sea. Moreover, the extreme difficulty of maintaining quality under the primitive conditions in these areas would have made a fixed grade system very costly to operate.[21] Arguendo, assume that the exchanges had adopted a numerical grading system for Argentine wheat. Consider a trader who agreed to ship wheat of a given grade from Argentina to Liverpool. Given the difficulties of handling grain in the country of origin, the exporter faced a high probability of delivering substandard grain even if he took efficient precautions. Such a delivery would have required a negotiated adjustment to the contract, or perhaps a formal appeal to an exchange arbitrator. In contrast, a FAQ system adjusted standards to reflect systematic factors affecting the quality of grain from a particular location on a nearly

[20] Carl Solberg, The Prairies and the Pampas: Agrarian Policy in Canada and Argentina: 1880–1930, at 142–47 (1987); Edgards Dunsdorfs, The Australian Wheat Growing Industry: 1788–1930, at 221–34 (1949).

[21] See Hill, *supra* note 18, at 1–37, for a detailed description of the difficulties of implementing such grading systems in the United States.

continuous basis. It also made fewer quality distinctions between different shipments. These features minimized the number of potential disputes and economized on transactions costs.

It is possible to provide many more examples of this sort for other commodities. It suffices to say that exchanges adopted commodity grading and arbitration systems that were minutely adapted to the peculiarities of the various commodities.[22]

In sum, in addition to providing measurement services to permit futures trading, commodity exchanges also provided extensive measurement services to the cash commodity trade. The exchanges did not use their arbitration and inspection systems solely to create fungible commodity claims. Instead, many of these systems were intended to reduce the costs of trading a very heterogeneous physical commodity. In order to achieve this objective, the characteristics of these systems varied extensively by commodity and by place of origin in order to match the characteristics of the underlying commodity in a discriminating fashion.

C. Contractual Enforcement

As Telser notes, a wide variety of commodity exchange rules are intended to increase the surety of contractual performance.[23] As is the case with measurement systems, it is important to recognize that exchanges adopted these rules to improve the performance on the cash market contracts as well as on futures contracts.

The types of rules intended to improve contractual performance are diverse. The margin system, for instance, is widespread (although not universal—the London Metal Exchange did not employ margins until after the "tin crisis" of 1985); margins are essentially contract performance bonds. Exchanges also limit membership to individuals or partnerships, rather than corporations, in order to prevent the exploitation of limited liability in order to escape contractual obligations; most exchanges require individuals to represent corporations and make the individuals designated as the firm's representative liable for all of its debts and obligations made under the rules of the exchange.[24] Some exchanges

[22] Rees, *supra* note 16, provides details on grading systems for grains, cotton, rubber, jute, wool, sugar, coffee, and tea.

[23] Telser, *supra* note 3.

[24] Virtually all U.S. commodity exchanges restrict corporate membership; U.S. Federal Trade Commission, 2 Report on the Grain Trade 206–7 (1920). Rees, *supra* note 16, reports similar rules for the major British exchanges, including the Liverpool Cotton and Corn Trade Associations, the London Corn Trade Association, the Cocoa Association of London, and the Rubber Trade Association.

(such as the London Metal Exchange) impose capital requirements on members. As a final example, virtually all exchanges have adopted rules that "substitute the agent for the principal." These rules make a broker liable for the performance of his customer. This provides a strong incentive for the agent to monitor the creditworthiness, reliability, and activities of those who trade through him.

As Telser argues, the ubiquitous rules requiring members to trade only with other members also improve the security of contracts, although perhaps for different reasons than he emphasizes.[25] Specifically, such rules are required in order to make the threat of expulsion or suspension of membership an effective penalty to a defaulting trader. Rules, and their enforcement, have important public goods attributes; exacting obedience to rules provides benefits to all who trade with those who obey them. When contemplating a transaction with an individual expelled for breaking exchange rules, however, an individual trader takes into account only the private costs and benefits of doing so. He may ignore the fact that such a transaction reduces the costs that the expelled trader incurs for his transgressions. This adversely affects the disciplinary effect of the rules. This, in turn, imposes costs on other members. In order to increase the costs of expulsion and mitigate this free-rider problem, it is therefore necessary to ensure internal discipline. One way to penalize traders who deal with the expelled or suspended is to expel them as well.[26]

Other exchange policies may also facilitate contract enforcement, although their fundamental intent is probably anticompetitive. For instance, limits on the number of members, the implementation of fixed commission rules (that is, broker cartels) which were once common, and discriminatory pricing of exchange fees create a stream of rents accruing to exchange membership that traders must forgo if they are expelled. The prospect of losing these rents can induce obedience to exchange rules and performance on contracts. Moreover, this stream can be sold to satisfy any delinquent claims. The efficiency-enhancing effects of these policies offset, at least in part, any deadweight losses arising from their anticompetitive effects.

D. Property Rights Creation and Enforcement: Theft, Fraud, and Policing

The cotton trades in New Orleans and New York faced considerable problems with theft and fraud and sloppy handling of the bales by rail-

[25] Telser, *supra* note 3.

[26] Avner Greif, Paul Milgrom, & Barry Weingast, Coordination, Commitment, and Enforcement: The Case of the Merchant Guild, 102 J. Pol. Econ. 745 (1994), argue that medieval trade guilds, such as the Hanseatic League, used boycotts in a similar fashion in order to promote internal discipline and adherence to rules.

roads and steamboat operators. For example, those who graded cotton for buyers and sellers frequently took samples that were significantly larger than those required to establish quality and sold the excess. Similarly, cotton from the ragged edges of bales was systematically pilfered, and thieves regularly broke bales open in order to steal loose cotton. Shady characters operated "pickeries" and "junk shops" in the warehouse and wharf districts where the illicit cotton was bought, sold, and processed. According to the president of the New Orleans Cotton Exchange, the losses from theft exceeded $750,000 in 1875 alone.[27]

Members of the exchanges were convinced that these problems were contributing to a decline in shipments to their markets. Consequently, they responded aggressively to this problem. Both exchanges promulgated rules for sampling and licensed the samplers. The exchanges retained all samples and divided the proceeds from periodic sales of this loose cotton among those using the service on a pro rata basis. The licensing system led to as much as a 90 percent decline in pilferage from sampling. Moreover, the exchanges posted guards on the wharves and levees. These "supervisors" (who were deputized and could make arrests) helped to reduce theft significantly and largely drove the junk shops out of business. In addition, the supervisors at New Orleans monitored the handling of cotton bales by stevedores, railroads, and steamboatmen. By recording the covering, handling, and loading of cotton, the supervisors helped cotton shippers collect damages from transporters that mishandled cotton. Finally, the New Orleans Exchange formed a Harbor Protection Police force that both reduced theft and losses from fire, including losses from arson. As a result of these efforts, insurance premia on cotton stored in the city fell by 50 percent in the year after the formation of the force.[28] The New York and New Orleans exchanges financed these efforts with levies on cotton bales handled in their respective cities. Eventually, smaller cotton exchanges in other Southern centers (such as Memphis and Savannah) imitated the New Orleans exchange's initiatives. In sum, the cotton exchanges provided a variety of police services to protect property rights.

E. Information Production and Collection

There are two strong motives for exchanges or other trade organizations to collect and disseminate information. First, information has important public goods attributes. As a result, centralized production and

[27] Robert Bouilly, The Development of American Cotton Exchanges (unpublished Ph.D. dissertation, Univ. Missouri 1975).

[28] *Id.*

distribution of information economizes on costs. Second, private information reduces market liquidity and efficiency because of the lemons problem. Widespread dissemination of information reduces the transactions costs attributable to asymmetric information.

Given these advantages, it is unsurprising that there is a long history of centralized information provision in commodity markets. In the very early days of long-distance commodity trade, traders congregated in British "coffee houses." One of the most important functions of these houses (and one of the ways that they attracted customers) was to provide information relevant to the trade and to provide merchants a forum where they could share information.

Following in this tradition, commodity exchanges performed an important information-provision function. For instance, the Cotton Brokers Association, a precursor of the Liverpool Cotton Trade Association, was established "due to the need for an improved system of market intelligence as cotton imports grew in importance."[29] Similarly, the Liverpool Corn Trade Association established the Atlantic Newsroom to provide information on shipping movements, crop reports, and other information of interest to the trade.[30] American exchanges also provided considerable amounts of information to their members. The types of information collected included (1) commodity production, (2) exports, (3) supplies afloat or en route to market, (4) arrivals in primary markets, (5) visible supply, (6) stock disappearance, and (7) supplies in exchange-registered warehouses.[31] These expenditures on information were financed out of the general revenues of the exchanges and transactions fees and were frequently large; the New Orleans Cotton Exchange, for instance, spent over 50 percent of its budget on market information during its early years.[32]

F. Summary and Conclusions

Commodity exchanges have historically provided a wide variety of services intended to reduce transactions costs. These services include the measurement of commodities and the adjudication of disputes over quality, the enforcement of contracts and the design of mechanisms to increase the probability of contractual performance, the provision of market information, and even (in the case of the U.S. cotton exchanges) the

[29] Rees, *supra* note 16, at 84.

[30] *Id.* at 130.

[31] Julius Baer & George Woodruff, Commodity Exchanges 149 (1935).

[32] James Boyle, Cotton and the New Orleans Cotton Exchange 95 (1934).

supply of traditional policing services. Thus, it is clear from this brief description of these functions that commodity exchanges are private institutions that evolved to facilitate trade by creating and enforcing property rights and governing contractual relationships between commodity buyers and sellers. Moreover, exchanges were very successful in executing these functions.

III. The Limits of Cooperation: The Case of the Chicago Board of Trade

A. *Introduction*

The foregoing analysis shows clearly that commodity exchanges performed many of the functions commonly assigned to the state. In fact, it is fair to ask whether private institutions alone suffice to create and enforce property rights in these commodity markets. When contrasted to the evidence contained in the previous section, the history of the Chicago Board of Trade's attempts to create grading and reporting standards immediately after the Civil War reveals that such private solutions face difficulties when the creation of efficient property rights has acute distributive effects. Under these circumstances, inducing cooperation by those that lose from the change in rules requires compensation or punishment. It is far costlier to negotiate side payments and coordinated penalties (that are expensive to those that implement them) than it is to negotiate a cooperative agreement in a "win-win" situation where all parties gain simultaneously. When rules that increase aggregate wealth also have pronounced effects on its distribution, private order without law is problematic. Under these circumstances, the state may be able to coordinate side payments at lower cost or employ its coercive power to implement more efficient rules without the need of compensating all parties.[33]

B. *The Elevator Problem at the Chicago Board of Trade*

The rise of a long-distance grain trade centering on Chicago in the 1850s and 1860s was hastened by the development of new storage and transportation technologies. Most important, there were pronounced economies to storing grain in large quantities.[34] Bulk storage in ware-

[33] Libecap, *supra* note 1, makes a similar argument. He also notes that distributional considerations influence the form of state-created property rights. Specifically, asymmetric distributional effects can also impede state creation of efficient rights.

[34] See Cronon, *supra* note 14, at 109–47, for an informative and entertaining discussion of this issue.

houses (as opposed to handling and storing grain in sacks) dramatically increased handling rates. This speeded significantly the loading of boats and railroad cars, thereby reducing the cost of transportation. Moreover, bulk storage improved quality control and loss from spillage as the grain was out of the weather and handled less often.

Bulk storage presented five major challenges to the trade. First, elevator operators mostly stored grain for others but could also deal in grain if they chose. This placed a tremendous burden on the grading and weighing system that the CBT was attempting to implement. For instance, consider a shipper of grain who consigned several cars for delivery to a Chicago warehouse for storage before shipment to the East. This grain was graded on arrival at the elevator and then stored with other grain in common bins. For concreteness, assume that the grain was graded as no. 2. It was impossible to return the original consignment of grain to the shipper. On presenting his receipt to reclaim his grain from the elevator, he obtained an equivalent quantity of grain that was graded at no. 2. Because of the prohibitive cost of grading each attribute of this consignment, however, the grain returned was almost always of lower quality than the grain tendered. This occurred because the elevator operator could purchase grain that was of lower quality (such as no. 3) than that owned by the consignor and mix it with the consignor's grain. Mixing improved the quality of the warehouseman's grain and decreased that of the consignor's to the point that it barely graded out as no. 2.

Mixing involved both a transfer and a deadweight cost. Those storing grain near the top of a given quality category suffered a loss as the so-called blend earning was transferred to the elevator. This anticipated transfer reduced the storer's demand for the warehouseman's services and caused the supply of storage services to shift out. Since the warehousemen used real resources to mix, however, the shift in the demand curve was greater than the shift in the supply curve. Therefore, mixing caused a fall in the quantity of grain stored below its optimal level. The use of resources to obtain a transfer was also wasteful. Moreover, consignors realized that they could not capture the value of attributes above the minimal level in one grade but lower than the minimal level in the next higher grade. This diminished their incentives to care for grain in shipment. It similarly reduced the incentives of farmers to improve the quality of the grain during growing or harvest. Finally, consignors also expended resources to evaluate and mix grain to the bottom of the grade in order to reduce the size of their loss to the elevators.

Second, there were numerous allegations of outright fraud in inspection and weighing. For instance, under pressure from elevator operators or other sellers of grain, inspectors would sometimes purposely overgrade

grain (such as certify no. 2 wheat as no. 1) on load out from the elevator, thereby defrauding those that had purchased by grade in Eastern markets.[35] According to the CBT's historian, as a result of this practice, "so much inferior wheat found its way to eastern markets that the reputation of Chicago wheat was seriously injured," and virtually all Chicago wheat was sold at discount prices.[36] That is, buyers essentially ceased to rely on the grading system to price Chicago wheat and considered all this wheat to be "lemons." Frauds were also perpetrated on the loading of grain into elevators; systematic undergrading was the problem here. In addition, there were repeated allegations of "short-weight" cargoes; vessels and cars consistently arrived at their destinations with less grain than the elevators certified had been loaded in Chicago. Some elevators had facilities designed specifically to siphon grain from just loaded carriers and redirect it to the warehouse, where it would be resold.[37] Moreover, inadequacies in bills of lading facilitated theft of grain from railcars en route to consumption points.

Third, elevator operators faced imperfect incentives to care for grain owned by others. Improperly stored grain "heats" (that is, grows fungi and bacteria which give off heat as a part of the respiration process). Heating problems occurred regularly, and shippers and receivers that stored grain in Chicago consistently accused the elevators of inadequate care of grain.[38] The elevator operators disclaimed responsibility for heating by asserting that it was caused by the failure of consignors to dry grain adequately before storage. Indeed, it appears that the elevators had an incentive to let grain get out of condition periodically. In at least one instance, warehousemen sold receipts for grain which they did not own in a system akin to fractional reserve banking in grain. They subsequently announced that the grain was "heating." This announcement immediately depressed the price of grain in store, and the warehousemen were able to repurchase the receipts that they had floated at a discount.[39]

Fourth, there is considerable evidence that the warehousemen colluded to establish prices for storage. Five partnerships controlled all of the 17 elevators in the city, and there was considerable overlap in membership among the partnerships. They raised prices simultaneously. Moreover,

[35] 1 Taylor, *supra* note 14, at 292, 328–29, 349–54; Arthur Andreas, 2 A History of Chicago 342, 366 (1887).

[36] 1 Taylor, *supra* note 14, at 242.

[37] *Id.* at 362–64; 2 Andreas, *supra* note 35, at 361–62; Secretary of the Chicago Board of Trade, Annual Report (1870).

[38] 1 Taylor, *supra* note 14, at 382.

[39] *Id.*

the elevators entered into agreements with railroads that divided the market geographically. Under the agreements, the railroads, rather than the shippers, determined which elevator would receive the grain. Each railroad, in turn, consigned the grain only to the elevator located on its line. Thus, it appears that the elevators cooperated to exercise market power, with its attendant welfare and distributive effects.[40]

Last, as storers of virtually all grain in the city, warehousemen possessed considerable information about supply and demand conditions. They knew the amount of grain in store, and its quality and condition, and could monitor inflows and outflows of grain. This gave them considerable information advantages over other traders in the market, which they effectively exploited. According to one historian: "Under the prevalent warehouse practice only the insiders knew the actual amount of grain on hand, and this furnished them an ideal set-up for a bull or bear market to the detriment of the general trade. These . . . market manipulations had already aroused a great deal of resentment throughout the grain area tributary to Chicago, and dealers were shunning the market whenever possible."[41]

Although it could be argued that the rights to this information properly belonged to the warehouseman, a very strong case can be made that disclosure of this information to the market would have enhanced efficiency. The primary advantage of assigning property rights to information is to give individuals an incentive to produce it. The primary disadvantage of private information is that information asymmetries discourage trade due to the lemons problem. The efficient set of rights to information must balance these two effects. If information collection is nearly costless, however, the favorable incentive effects of establishing a property right are trivial and the adverse selection effect must dominate. Since warehousemen collected supply and demand information in the course of their normal business, the marginal costs of doing so were very low. Therefore, a regime of mandatory disclosure may have improved market performance.[42]

[40] For evidence on collusion between elevators, see Cronon, *supra* note 14, at 135–36; Benjamin F. Goldstein, Marketing: A Farmer's Problem, 28–29 (1928); 1 Taylor, *supra* note 14, at 397, 403; and Guy Lee, History of the Chicago Elevator Industry, 1840–1890, at 113–28 (unpublished Ph.D. dissertation, Harvard Univ. 1938).

[41] Wyatt Belcher, The Economic Rivalry between St. Louis and Chicago, 1850–1880, at 188 (1947).

[42] Lawrence M. Benveniste, Alan J. Marcus, & William J. Wilhelm, What's So Special about the Specialist? 32 J. Fin. Econ. 61 (1992), argue that stock exchange specialists provide traders with incentives to disclose the information content of a particular trade and that this improves efficiency by mitigating the adverse selection problem. This is consistent

In sum, the bulk storage of grain presented numerous opportunities for theft, fraud, manipulation of measurement systems, and asymmetrically informed trading. Elevator operators expended resources to capture wealth on each of these margins. Market participants and observers claimed that this activity impaired the efficiency of the Chicago grain market.[43] Most important, it was commonly asserted that it encouraged the diversion of trade to other locations and stymied the development of Chicago as a milling center; millers desired little variation in quality, but the vagaries of Chicago grading and warehouse caused considerable variability, thus increasing their costs.[44]

The dramatic increase in the grain trade during the Civil War greatly exacerbated these problems. During the war and the years immediately after, the membership of the Chicago Board of Trade made numerous attempts to induce the warehousemen to address these problems, but with no success. At various times, the board presented proposals to the elevators to reform the systems of inspection and weighing, to implement a system of registering and canceling warehouse receipts, and to provide regular statements of the amount and condition of grain in store. Although these negotiations sometimes resulted in temporary agreements with the

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with the notion that the costs of secrecy can exceed the benefits and that mandated information disclosure can be efficient.

[43] There were other sources of conflict between the parties. Most important, the CBT members also objected strenuously to the level of storage charges levied by the warehousemen. There is considerable evidence that an elevator cartel was in operation during this period. Although the 1871 Warehouse Act regulated storage rates, Edmund W. Kitch & Clara Ann Bowler, The Facts of Munn v. Illinois, Supreme Court Review 313 (1978), argue that the regulated rate was approximately equal to the unregulated rate and thus did not impose a significant burden on the elevators. In this regard, however, it must be noted that if the Act simultaneously reduced the elevator's blend earnings, the marginal cost of providing storage for a fee would have increased, and the elevators would have liked to raise prices above their pre-Act level. If the combination of rate regulation and reduction in blend earnings imposed a significant cost on elevators, elevators would have been more likely to exit the public warehousing business and enter the private warehousing business (that is, store and merchandise their own grain rather than store for others). Thomas Ulen, The Regulation of Grain Warehousing and Its Economic Effects: The Competitive Position of Chicago in the 1870's and 1880's, 56 Ag. Hist. 194 (1982), finds no evidence of such a trend in the years following the passage of the Act or the *Munn* decision. Other data show a dramatic increase in private warehousing much later than *Munn,* but this was probably due to the effects of the Interstate Commerce Commission Act and a very restrictive interpretation of the Warehouse Act in the 1896 Central Elevator v. People case. See Richard Zerbe, The Origin and Effect of Grain Trade Regulations in the Late Nineteenth Century, 56 Ag. Hist. 172 (1982). Thus, there is no strong evidence that the 1871 Act reduced market efficiency by imposing undue regulatory restrictions on the actions of elevators.

[44] Chicago Tribune's Annual Review of the Trade and Commerce of Chicago for the Year December 31, 1870, at 7; Chicago Tribune's Annual Review of the Trade and Commerce of Chicago for the Year December 31, 1871, at 22.

elevators, the deals never lasted. In other instances, elevators refused altogether to cooperate with the board's initiatives. The most important example of this intransigence occurred in 1870, when the elevators categorically refused to adopt measures to reduce fraud in warehouse receipts for grain. They also declined to make detailed statements of either the amount of grain in store (by grade, type, and condition), or the amount of grain loaded in or loaded out from their houses. According to the historian Andreas: "The elevators, during this year, became more antagonistic than ever before to the grain interest, which was mainly represented through the Board of Trade, of which nearly all the receivers, shippers and dealers in grain were members. The quarrel between the conflicting interests which were found to be incapable of settlement, proved to the great commercial public that the time had come to put under the paternal care of the state, which had outgrown the control of all private industry."[45]

This struggle between the board and the warehousemen was incessant from the end of the Civil War into the 1870s. Despairing of private resolution of its difficulties with the elevators, in the period 1865–72 the board was at the forefront in pressing for legislative relief. Specifically, the exchange was instrumental in securing passage of a variety of Illinois laws regulating the transport and storage of grain.[46] These laws passed despite the heated opposition of the warehouse and railroad interests.[47]

The inability of the warehousemen and the members of the board to reach a cooperative solution to the problems in the Chicago market contrasts sharply with its success in other areas and the success of other exchanges in addressing similar issues. The board implemented viable inspection and weighing procedures for other commodities, especially flour, provisions (such as pork and spareribs), fish, and lumber. More-

[45] 2 Andreas, *supra* note 35, at 332.

[46] These include "An Act in Relation to the Transportation of Grain and Other Produce" (1865 Ill. Pub. L. No. 75), "An Act Regulating Warehousemen, and Authorizing Connections of Railroads with Warehouses, and for Other Purposes" (1867 Ill. Pub. L. No. 177), Article XIII of the Illinois Constitution of 1870, "An Act to Regulate Public Warehouses, and the Warehousing and Inspection of Grain, and to give effect to Article Thirteen of the Constitution of this State" (1871–72 Ill. Pub. L. No. 762). The 1871 Act also regulated the prices elevators could charge for their services.

[47] There is some dispute over the effectiveness of the Illinois warehousing laws. It is clear that after some initial difficulties, the measurement and reporting restrictions were effective. For example, by 1875 Chicago inspection was so well respected that its decisions were accepted in *tale quale* terms in all major markets. Similarly, after a scandal in 1872, the warehousemen voluntarily reformed the system for reporting the amount of grain in store. See Ulen, *supra* note 43. As indicated in note 43 *supra*, scholars have taken contrary positions on the effects of the price and mixing regulations. The evidence seems to favor the proposition that these restrictions had little measurable impact.

over, as noted earlier, other exchanges created robust grading and arbitration systems that operated smoothly for decades. It is therefore clear that commodity measurement problems are not insuperable to private institutions in all instances. Furthermore, other exchanges (notably, the New York and New Orleans Cotton Exchanges) largely eliminated theft and fraud, while virtually all other exchanges provided large amounts of information on market fundamentals to their members. This again illustrates that the types of difficulties facing the CBT were not uniformly resistant to resolution by private action. Thus the question: why did private action work so well in most instances, but not in the case of the Board of Trade and the warehousemen?

An analysis of the foregoing record of commodity exchanges as creators and enforcers of property rights reveals that they succeeded when all members benefited from the promulgation of particular rules but failed (in the instance of the CBT) when these rules worked to the disadvantage of a class of traders necessary for their implementation.

Consider, for instance, the distribution of costs and benefits arising from the creation and enforcement of rules disciplining exchange members for failing to perform on contracts. Virtually all members of exchanges benefited from such rules, as all were potential victims of a default. Similarly, the loss of market liquidity arising from asymmetric information imposed costs on all traders. In many commodity trades (such as the cotton market), information about supply and demand conditions was extremely diffuse. As a result, no single trader or group of traders had a large, persistent information advantage over others. Instead, all reaped benefits (in the form of lower information production costs and improved liquidity) from the cooperative collection, consolidation, and dissemination of this market intelligence. Analogous conditions facilitated the implementation of improved measurement systems at other exchanges. Most important, it was fairly easy to maintain the identity and integrity of individual parcels of cotton, or metal, or wheat imported from Argentina to the United Kingdom. Thus, there were few problems with mixing or substituting poorer quality merchandise than was contracted for.

Contrast these circumstances with those that prevailed in Chicago in the 1860s. Although there were clear inefficiencies arising from theft, fraud, and adverse selection, an important group of agents—the warehousemen—actually benefited from these activities. Moreover, their cooperation was necessary for the elimination of these abuses. Therefore, in order to obtain the warehousemen's approval of any attempt to define a more efficient set of rules, it was necessary for the CBT members either to compensate them or impose a credible penalty on them. This would

have required the negotiation of a cost-sharing agreement among the beneficiaries of the alternative rules.

In an environment where bargaining is costly, the necessity of negotiating side payments dramatically increases the costs of implementing a cooperative agreement to revise market rules and property rights. Indeed, given that (i) private information was almost certainly prevalent (for example, each party knew how much it valued the alternative set of rules), (ii) free-rider problems would have plagued any attempt of the board to negotiate member contributions to the public good of buying off the elevators, and (iii) the elevators could have reneged on any agreement, it is clear that the CBT faced substantial hurdles in its efforts to induce cooperation from the warehousemen. In particular, the articles of Mailath and Postlewaite,[48] Rob,[49] and Roberts[50] demonstrate that when the number of individuals who benefit from the provision of a public good is large, and information about individuals' valuations of the public good is private, it will frequently prove impossible to reach agreement among them to provide the public good. Indeed, these theories imply that the probability of reaching an agreement approaches zero as the number of agents who must participate grows arbitrarily large. In the period in question, CBT membership exceeded 1,000. These large numbers, and the fact that changes in property rights regarding elevator operations had disparate impacts on individual members, created the conditions in which private negotiations among the members to raise funds to "bribe" warehousemen were likely to break down. Since the CBT needed to compensate the warehousemen in order to reform the inspection and reporting systems, it is by no means surprising that the exchange failed in this endeavor and called on the state to intervene instead.[51]

A historical comparison bolsters this conclusion. In the period immediately following the CBT's dispute with the warehousemen, the New York Produce Exchange and the railroads cooperated to implement a grading system for grain shipped to New York for export to Europe. Under the system in place prior to 1874, if a particular carload of grain was consigned to an exporter, the railroad was obligated to deliver that very same car to the pier where his ship was loading. This caused innumerable

[48] George J. Mailath & Andrew Postlewaite, Asymmetric Information Bargaining Problems with Many Agents, 57 Rev. Econ. Stud. 351 (1990).

[49] Rafael Rob, Pollution Claim Settlements under Private Information, 47 J. Econ. Theory 307 (1989).

[50] John Roberts, The Incentives for Correct Revelation of Preferences and the Number of Consumers, 6 J. Pub. Econ. 359 (1976).

[51] Epstein, *supra* note 9, emphasizes the role of bargaining costs in determining the optimal division between private and public creation and enforcement of property rights.

delays and increased the costs of handling the grain. Both the railroads and grain traders had an interest in reducing these costs and jointly created and implemented a streamlined inspection system. This system graded each railcar of grain entering the city, issued a grading certificate, and allowed the railroad to substitute grain of equivalent quality for the shipment actually consigned to the exporter. According to a member of the exchange, this innovation significantly reduced railroad grain handling charges. Moreover, there is no historical evidence of conflict between the exchange and the railroads, and the system worked smoothly for decades.[52]

The contrast between this episode and the CBT's experience is revealing. Both the railroads and the grain men benefited from reductions in handling costs. The railroads were able to operate their lines more efficiently, and the grain traders benefited from the lower transport charges. The reciprocal nature of the gains from creating the new measurement system allowed it to endure. Conversely, the pronounced asymmetry of interests in the Chicago trade stymied cooperation.

Nor could the board make credible threats to penalize the warehousemen in order to induce their cooperation. In a matter such as failure to perform on a grain contract, the exchange's members could penalize a defaulter by simply shunning him. Given the large number of traders (there were over 800 grain trade participants in the CBT in 1870), the cost to any single member of refusing to trade with the defaulter was small, while the cost to the latter was large. Since shunning had strong deterrent effects and imposed relatively small costs on those exacting the punishment, it was an effective and credible penalty. In contrast, a boycott of the elevators aimed at securing their cooperation would have imposed very large costs on the participating board members; the shippers, receivers, and commission men would have essentially sacrificed their income in such an effort because warehouses were essential to the process of storing and transshipping grain. As a result, each member would have had a strong incentive to defect from the boycott, particularly inasmuch as it would create exceptionally remunerative opportunities. Although the board could have threatened to discharge any defectors, it is unlikely that this threat would have been credible because the warehousemen had both the inclination and ability to conceal the identity of any defecting shippers or receivers. This would have made detection all

[52] Baer & Woodruff, *supra* note 31, at 168–70. The lack of conflict is unsurprising. Most important, since (*a*) grain was typically sold in carload lots, (*b*) each car was inspected, and (*c*) it was very difficult to transfer grain between individual cars, the railroads could not readily mix grain in order to exploit the grading system.

but impossible. Thus, the board could not use punishment threats to induce cooperation by the warehousemen. Similarly, if the board had bribed the warehousemen to cooperate, it was powerless to stop them from taking the bribe and then reneging on the agreement.

An examination of a later confrontation between the CBT and the warehousemen reveals the importance of the ability of the exchange to punish in order to obtain compliance. In the late 1880s, Interstate Commerce Commission regulation of railroad rates provided a strong incentive for the elevators to buy and sell grain in competition with shippers and receivers. As large buyers, the warehousemen could negotiate more easily with the railroads in order to obtain illicit rebates from the cartelized, regulated pricing schedule. Moreover, the warehousemen possessed nonpublic information concerning demand and supply conditions. In order to protect this information, the warehousemen did not bid for cash grain in the open market on the floor of the exchange. Instead, after the CBT closed for the day, they bid directly via telegraph to the country elevators that sold grain for delivery to Chicago. These after-hours bids were not public information. As a result of these transactions in a relatively opaque market, the open-market cash price was less informative. The lack of information raised the costs of shippers and receivers. This reduced the competition the warehousemen faced from the traditional buyers and sellers of grain. The diminished competition facilitated the formation of a monopsonistic cartel among the warehousemen that depressed the country price of grain.[53]

The CBT reacted by implementing the "Call Rule" in 1906. This rule established an auction for cash grain at the close of the open market and required all exchange members who bought grain after exchange hours to pay the auction price. Zerbe shows that this new rule dramatically increased activity in the open cash grain market and improved the informational content of the open-market price.[54] Carstensen also argues that the rule enhanced efficiency.[55] The U.S. government filed an antitrust suit against the exchange, asserting that the rule restrained trade. Writing for the majority in the case *Chicago Board of Trade v. United States,* Justice Brandeis decided that the Call Rule improved market efficiency and thus asserted that a rule of reason legitimized the exchange action.[56]

[53] Richard Zerbe, The Chicago Board of Trade Case, 1918, 5 Res. L. & Econ. 17 (1983).

[54] *Id.*

[55] Peter Carstensen, The Content of the Hollow Core of Antitrust: The Chicago Board of Trade Case and the Meaning of the "Rule of Reason" in Restraint of Trade Analysis, 15 Res. L. & Econ. 1 (1992).

[56] The efficiency of the Call Rule depends on the costs elevator operators incurred to acquire information, for reasons similar to those discussed earlier. If making the information public (by forcing the warehousemen to reveal it through their bidding behavior) made the grain intermediation market more competitive, and if the warehousemen acquired the

The elevators complied with the Call Rule even though it imposed costs on them because expulsion from the board for violating it would have been even more costly. After 1901 the CBT enforced a commission schedule that discriminated between members and nonmembers.[57] Zerbe notes that the warehousemen hedged their grain purchases in the futures market as a matter of financial necessity. Warehousemen expelled for violating the rule would have paid higher, nonmember transactions costs to hedge their grain. Thus, in this case the board succeeded in adopting a new rule that harmed elevators (but benefited the overall membership) in the early 1900s because it had the ability to impose credible penalties on the warehousemen. Similar efforts failed in the earlier era because the CBT possessed no such leverage.[58]

C. Summary

The nature of interactions between the grain traders and the elevator operators doomed the Chicago Board of Trade's efforts to reform inspection and reporting to failure. The lack of symmetry between the grain traders and the grain storers necessitated side payments, rather than mere reciprocity, to achieve cooperation. Moreover, the board could not penalize warehousemen for failing to cooperate, primarily because it could not credibly commit its members to boycott them due to the extreme difficulty of monitoring member compliance. Thus, the warehousemen and

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information as a by-product of their normal activities, the rule would have enhanced efficiency. To the extent that it impaired the incentives of warehousemen to acquire information (because the information was costly to produce), however, the rule would have reduced the informational efficiency of prices. Even if this effect were acute, though, the rule still could have improved the informational value of open-market cash grain prices because its effect of forcing the warehousemen to reveal what information they possessed could have more than offset the effect of any reduction in the amount of information the latter collected. Finally, the Call Rule enhanced efficiency by undermining the grain buyers' cartel.

[57] Jonathan Lurie, The Chicago Board of Trade, 1859–1905: The Dynamics of Self-Regulation 170 (1979).

[58] Lurie, *id.*, notes that the fixed commission rules included no enforcement provisions between 1862 and 1900. One could of course argue that the board could have enforced the commission rules in the late 1860s and early 1870s in order to raise the cost of expulsion to warehousemen during the struggle over grading and information issues. The relevance of this argument is limited, however. The necessity of devoting resources to this effort raised the costs of negotiating with the warehousemen. Moreover, acceptance of the argument requires a tremendous faith in the ability of board members to link two very subtly related issues. The exchange undertook the decision to enforce the commission rules more aggressively in 1901 for reasons completely unrelated to the Call Rule (obviously, since it did not even discuss the latter rule until 1904). It just so happened that this previous decision serendipitously assisted the CBT in its later effort. Finally, during the earlier period elevators were not extensively involved as marketers of grain. As a result, they had little need to hedge grain, and expulsion would have imposed a smaller cost on them in this period.

grain traders remained at loggerheads, and the latter appealed to the state for redress.

The evidence presented here strongly suggests that distributive effects determine whether private institutions can successfully create and enforce efficiency-enhancing rules. The notable failure of commodity exchanges to deter corners and squeezes provides further testimony to the difficulties that private institutions face in creating and enforcing rules that enhance efficiency but acutely affect the distribution of rents.[59] Corners and squeezes—"market manipulations"—reduce the informativeness of prices and create traditional monopoly-power welfare losses. They also create huge gains for those on the right side of the market and impose potentially ruinous losses on those on the wrong side. Historically, these distributive effects uniformly thwarted the efforts of exchanges to curb corners in order to improve market efficiency. Thus, this evidence, when combined with the analysis of the present article, demonstrates that private institutions may well fail to adopt wealth-increasing rules when the distributive effects of these rules are pronounced.

IV. Summary and Conclusions

Recent theoretical and empirical work clearly demonstrates that private cooperation can dramatically enhance economic efficiency by reducing transactions costs. This literature emphasizes the importance of repeated interactions in supporting private cooperation. The historical experience of commodity exchanges in addressing a wide variety of transacting problems provides further strong evidence in support of this view but also illustrates that repeated interaction is not enough. Commodity exchanges successfully implemented transactions-cost-reducing rules when these rules benefited all of their members. The most conspicuous failure of an exchange to rationalize a trade occurred when the Chicago Board of Trade attempted to adopt reforms that would have almost certainly improved overall efficiency but which imposed large costs on parties whose cooperation was essential to the success of these reforms. Given that the board is by all relevant measures the most successful of all commodity exchanges in history, one cannot attribute this failure to incompetence or some other fixed effect. Instead, it is evident that the necessity of compensating losers so increased the costs of achieving cooperation that the reforms failed. Thus, this example suggests that private

[59] See Pirrong, *supra* note 5, for a detailed recounting and analysis of the board's inability to deter market power manipulation.

institutions are most likely to implement efficiency-enhancing rules when the resulting gains are evenly distributed among the affected interests.

The state provides an alternative source of property rights and contractual enforcement. As is true for other goods and services, the demand for the property rights creating and enforcing services of the state should be larger, the higher the cost of substitutes. The foregoing discussion implies that the costs of private property rights creation and enforcement—the primary substitute for the state—are very high when the gains from the implementation of new rules are not spread evenly, so ceteris paribus one would expect to observe state intervention to be more likely when this condition holds. Conversely, even distribution of the gains should encourage private institutions. The observed historical pattern in commodity markets is broadly consistent with this hypothesis.[60]

If the experience of the Chicago grain trade with the elevator operators provides insights on the limits of private cooperation, the legal effects of the regulation of the warehousemen plainly demonstrates the problems inherent in state action. The warehouse laws that resulted from the struggle between the CBT and the elevators led to the Supreme Court's landmark *Munn v. Illinois* decision, which in turn opened the constitutional door for much wasteful government regulation. Thus, although the effects of warehouse regulations were probably efficient, one should of course not interpret the foregoing paragraph to imply the Panglossian propositions that all observed regulation is wealth enhancing or that public regulation of a trade necessarily dominates regulation by private institutions such as commodity exchanges.

[60] This analysis raises the question: why did the state succeed when the private institution failed? Libecap, *supra* note 1, at 10–28, argues that the state is likely to act when existing arrangements lead to a very "skewed" distribution of wealth, because politicians can generate considerable net political support by increasing the wealth of a large number of individuals in exchange for decreasing the wealth of a small number. This argument is analogous to that of Sam Peltzman, Toward a More General Theory of Regulation, 19 J. Law & Econ. 211 (1976); his model argues that the political support for regulation tends to be strong when the existing state of affairs has highly disparate effects on the affected parties. These arguments explain the Illinois legislature's actions in the 1860s and 1870s because the warehouse laws benefited relatively numerous groups—middlemen and producers in the grain trade—and harmed a relatively small group—the warehousemen. Put another way, private institutions failed to create property rights in the Chicago grain because the warehousemen could form a blocking coalition by withholding their cooperation. The legislature succeeded in doing so because the elevators could not block the state's efforts to create and enforce new property rights, although they attempted unsuccessfully to do so.