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J. Mark Ramseyer

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J. Mark Ramseyer[†]

In most antitrust accounts, cartels are as inscrutable as they are wrong. They are wrong because they are inefficient—they set prices above marginal costs and generate suboptimal consumption and production patterns.[1] They are inscrutable because as prisoners' dilemmas they should never work—rational firms thus should not spend resources forming and enforcing them.[2]

In this article, I use data from Japan to explore both issues. The data concern production-limitation agreements among the

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[1] To date, the most creative attempt to explain cartels as efficient is Lester G. Telser, *Cooperation, Competition, and Efficiency*, 28 J L & Econ 271, 290 (1985) (applying model originally discussed in Lester G. Telser, *Economic Theory and the Core* 106 (Chicago, 1978)). See also George Bittlingmayer, *Decreasing Average Cost and Competition: A New Look at the Addyston Pipe Case*, 25 J L & Econ 201 (1982) (applying Telser's model); Stephen Craig Pirrong, *An Application of Core Theory to the Analysis of Ocean Shipping Markets*, 35 J L & Econ 89 (1992) (same); Andrew R. Dick, *The Competitive Consequences of Japan's Export Cartel Associations*, 6 J Jap & Intl Econ 275 (1992) (finding that export cartels lower costs); Joseph Farrell and Carl Shapiro, *Horizontal Mergers: An Equilibrium Analysis*, 80 Am Econ Rev 107 (1990) (finding that horizontal mergers are efficiency enhancing). The best critique of Telser's model appears in John Shepard Wiley Jr., *Antitrust and Core Theory*, 54 U Chi L Rev 556 (1987). Telser's model does not apply to the spinning cartel described below for the same reason that the monopoly-rent-extracting model does not apply: the cotton spinning Japanese firms did not restrict capital investments and therefore did not effectively limit production. Telser's model applies only if cartel members *do* limit production. The Japanese cotton spinning cartel did not even try.

[2] In other words, cartels are bad because firms form them to earn monopoly rents, and toward that end hike prices. Once other members of a cartel have raised their prices, however, the remaining members gain by underselling the others and stealing customers. Since everyone has that incentive, cartels should be as unworkable as they are nefarious. The classic account is George Stigler, *A Theory of Oligopoly*, 72 J Pol Econ 44 (1964).

giant cotton spinning firms. Although these firms structured their agreements much like a classic cartel, I show that they did not (and did not try to) set prices at monopoly levels. Instead, they used the agreements to tie their hands and commit credibly to paying their workers "efficiency wages"—wages that were two or three times market clearing wages. More generally, therefore, I show that firms may agree to cut production for reasons that have nothing to do with earning monopoly rents, and in the process may form organizations that lack the prisoners' dilemma that dooms classic cartels. If true, agreements that we call cartels may sometimes be both socially efficient and individually rational.

Consider this logic in more detail. First, the Japanese cotton spinning firms paid their workers generously. By tradition, Japan specialists accuse the cotton spinning firms of much the same sins of which observers accused the Lancashire mills: that they exploited their workers by paying them a pittance and exploited consumers by fixing prices. The claims probably were not true of Lancashire. Neither were they true of Japan. The Japanese mills paid their workers double or triple the wage they could earn elsewhere and charged consumers market-clearing prices.

Second, as in the large Lancashire mills, these high wages constituted what economists call "efficiency wages"—supra-market wages that boosted productivity by at least the amount of the wage premium itself. Mill owners apparently paid these high wages because of the unfamiliar technology they used. At the turn of the century, they used foreign machines in a foreign factory system. They knew neither how much to expect from their workers, nor, given the team character to the production involved, how best to monitor those workers. Rather than hire many managers to supervise their workers closely, they tried to induce their employees to work hard with little monitoring. They did so by raising the penalty workers incurred if they lost their job, and they raised that penalty by paying double or triple the market-clearing wage.

Third, efficiency wages potentially compounded the agency slack between the mill owners and their managers. Although the managers left some control over major decisions (like large capital investments) with the owners, they themselves supervised the daily operations of the firm. Necessarily, however, they could give the owners only noisy information about the details of factory operations and only incomplete information about the

industry's demand curve. In turn, these informational problems created an environment where a manager sometimes jeopardized his tenure if he reduced his plant's production. As a result, short-term managers had an incentive to operate the plant at full capacity even when the reduced demand would have led the owners themselves to idle some machines.

This situation sometimes gave managers an incentive to respond to sudden drops in demand by cutting wages. Because the firm intentionally paid workers a steady premium over the workers' shadow wage, it needed managers who would respond to these demand shocks primarily by cutting production. If managers instead merely cut wages, workers would eventually shirk more, efficiency would eventually fall, and the firm's profits would eventually fall as well.

Finally, managers and investors solved this principle-agent problem through a cartel. In joining the cartel, the managers delegated decisions about production cuts to the cartel's officers—independent personnel outside the firm. In the process, they tied their own hands and credibly committed themselves to responding to demand shocks by cutting production. In the process, they also removed their own incentive to respond to demand shocks by cheating on the firm's efficiency wage premium. In effect, they thereby protected their firm's efficiency wage regime from themselves.

In the next section, I summarize the history of cotton spinning in Japan. In Section II, I outline why the cartel that the spinning firms established could not have earned them monopoly rents. I conclude, in Section III, by using their efficiency wage labor contracts to explain why they formed the cartel they did.

I. THE INDUSTRY

A. Cotton History

Cotton had already been in Japan a millennium when entrepreneurs began to import modern spinning machines in the mid-19th Century.[3] Not that it matters. Japanese farmers never did raise much raw cotton. In the middle of the 19th Century they grew 49 million pounds, and by 1887 they increased that amount to 67 million. They never grew more. They had no comparative

[3] Some of this introductory material will appear in Frances McCall Rosenbluth and J. Mark Ramseyer, *The Politics of Oligarchy: Institutional Choice in Imperial Japan* (forthcoming, 1995) (on file in the U Chi L Sch Roundtable office).

advantage in cotton production, and by 1887 spinners were already importing 10 million pounds. By the end of the century the spinners imported almost their entire supply, and the farmers had switched to other crops.[4]

Even if Japanese farmers could not grow raw cotton competitively, in the first decades of this century Japanese spinners and weavers came to dominate their sectors of the industry. Half a century earlier, English firms had been supreme. For decades, the Crown had punished anyone who exported textile machines; by some rumors, it had even hanged them.[5] Perhaps because such threats sometimes worked or perhaps for more mundane reasons, mid-19th century English firms still had some of the best machines and still dominated the field.

Things changed. At the turn of the century, Japanese firms adopted this British technology. By the 1920s and 30s, they consumed more raw cotton than their British competitors and spun more yarn. Domestically, they created enormous wealth. By 1930, textile firms produced over a quarter of all Japanese manufactured goods and employed over 40 percent of all factory workers.[6]

B. Cotton Crises

During the half-century before World War II, firms in the Japanese cotton textile industry weathered three major crises: one at the turn of the century, one in the early 1920s, and one in the mid-1930s. Toward the end of the 1890s, Japanese economic performance dipped badly. Where from 1886 to 1898 manufacturing volume had doubled, during the four years from 1898 to 1902 it fell. When the Boxer Rebellion broke out and Japanese firms could no longer sell to China, bad matters simply turned worse. In the textile industry, output fell 11 percent from 1898 to 1900

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[4] Takeshi Abe, *Men kogyo [The Cotton Industry]*, in Takeshi Abe and Shunsaku Nishikawa, eds, *Sangyoka no jidai [The Age of Industrialization]* 163, 170 (Iwanami shoten, 1990); Keizo Seki, *Nihon mengyo ron [A Theory of the Japanese Cotton Industry]* 13, 164, 436 (Tokyo daigaku shuppan kai, 1954) ("Japanese Cotton Industry Theory") (unless otherwise noted, all sources were translated by the author).

[5] E.J. Donnell, *History of Cotton* 12-13 (James Sutton & Co, 1872); Seki, *Japanese Cotton Industry Theory* at 20 (cited in note 4).

[6] Sanji Muto, *Bosekigyo [The Spinning Industry]*, in *Shakai keizai taikei [Overview of Social Economics]* 5 (no pub infor; cat'd in the U of Tokyo Dept Econ lib at 12/120P, 1927) (cotton consumption in 1927); Seki, *Japanese Cotton Industry Theory* at 60 (yarn production in 1935) and id at 435 (of all manufacturing workers, 42.5 percent were in one of the textile industries in 1934-36) (cited in note 4).

and another eight percent from 1900 to 1904.[7]

A second crisis hit the cotton spinning firms in 1920. As it had been to many firms in many countries, World War I was good to Japanese spinners. During the War, many Allied competitors joined the war effort and even those who did not found the sea lanes precarious and the Suez Canal closed. In East Asia, all of this dramatically raised cotton prices. From 1916 to 1919, the price of raw cotton rose 2.7 times, and that of cotton yarn 4.5 times. Given that raw cotton costs were four-fifths of the price of cotton yarn, this price differential gave entrepreneurial spinners a nice profit.[8]

Japanese spinners found themselves well placed to exploit these high international prices—but badly placed for the bust that followed. From 1915 to 1919, they watched real profits per spindle more than double. When the war ended and prices fell, they watched these profits plummet. Granted, they did not do as badly as observers claimed. Cotton yarn prices did fall, but so did raw cotton prices. Nonetheless, as with firms elsewhere that had tried to ride the war-time boom, the spectacular wartime profits disappeared.[9] From 1920 to 1926, real profits per spindle fell by two-thirds (Table 1).

The problems arose from two facts. First, not all firms had hedged themselves against price changes. Those that had agreed to buy raw cotton at the earlier high prices without agreeing to sell at fixed prices now lost badly. Second, even firms that had hedged sometimes found the protection worthless because their buyers could renege. Although those that had contracted to sell high should have done well, they did well only if their buyers did not default. Many buyers did. Where the price changes had eliminated the buyer's assets, even courts could not help.[10]

A third crisis hit the industry some ten years later. After the

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[7] Shozaburo Fujino, Shino Fujino and Akira Ono, *Choki keizai tokei: Sen'i kogyo [Long-Term Economic Statistics: The Textile Industry]* 244-45 (Toyo keizai shimpo sha, 1979) ("Long-term Textile Statistics"); Seisan chosa kai, ed, *Shuyo kogyo gairan [Survey of Major Industries]* 1 (Seisan chosa kai, 1912).

[8] Kusuhei Mihashi, ed, *Toyo boseki kabushiki gaisha yoran [A Survey of the Toyo Spinning Corporation]* 37-38 (Toyo boseki K.K., 1934) ("Toyo Spinning Corporation") (price changes); Nippon kangyo ginko chosaka, ed, *Menshi boseki gyo ni kansuru chosa [An Investigation into the Cotton Threat Spinning Industry]* 43-49 (Nihon kangyo ginko chosaka, 1928) ("Cotton Threat") (raw cotton cost fraction as of the late 1920s).

[9] William Lazonick and William Mass, *The Performance of the British Cotton Industry, 1870-1913*, 9 Res Econ Hist 1, 2 (1984); Mihashi, *Toyo Spinning Corporation* at 37-38 (cited in note 8) (price data).

[10] Seki, Japanese Cotton Industry Theory at 43-46 (cited in note 4).

general financial collapse of 1929-31, many governments began to adopt protectionist policies. Some of these policies were designed explicitly against Japanese products. Japanese firms, for example, particularly threatened British competitors. From 1928 to 1935, Japanese cotton fabric exports rose from 1.4 to 2.7 billion square yards, while British exports fell from 3.9 to 1.9 billion square yards.[11] To slow this competitive shift, Commonwealth countries adopted stringent tariffs, and many added quantity restraints to boot. By mid-1936, Japanese cotton weavers faced trade barriers in a majority of their markets: 56 countries had adopted barriers and over half were quotas. By one estimate, the barriers affected 67 percent of Japanese cotton fabric exports.[12]

Table 1: PROFITABILITY IN THE COTTON SPINNING INDUSTRY

	Profits/ Firm (¥1000)	Profits/ Spindle	Profits/ ¥1000 Capital
1907	629	17.14	354.3
1908	307	6.17	136.7
1909	515	8.18	181.8
1910	203	3.49	79.7
1911	368	5.77	139.6
1912	547	10.29	232.9
1913	646	11.77	243.7
1914	545	8.61	193.9
1915	741	10.81	249.2
1916	1431	19.91	415.4
1917	2201	30.93	543.2
1918	2225	27.43	443.7
1919	1730	26.78	330.1
1920	1756	25.78	228.5
1921	1154	16.92	150.2
1922	1213	17.18	152.5
1923	780	11.15	88.8
1924	956	10.99	97.2
1925	895	9.31	85.1
1926	862	8.44	78.5

Notes: Total capital is the sum of paid-in capital and accumulated profits. Profits are in constant 1934-36 yen.

Sources: Calculated from data found in Ryokichi Watanabe, *Nihon mengyo ron [The Theory of the Japanese Cotton Industry]* 340-41 (Nippon hyoron sha, 1931); Kazushi Ohkawa et al, *Choki keizai tokei: Bukka [Long-Term Economic Statistics: Prices]* 135-36 (Toyo keizai shimpo sha, 1967).

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[11] Hiroshi Nishikawa, *Nippon teikoku shugi to mengyo [Japanese Imperialism and the Cotton Industry]* 190 (Minerubwa shobo, 1987) ("Japanese Imperialism and Cotton"); Seki, *Japanese Cotton Industry Theory* at 436-41 (cited in note 4). For the debate over the cause of the British decline in cotton spinning, see Lazonick and Mass, 9 Res Econ Hist at 1 (cited in note 9).

[12] Fujino, Fujino and Ono, *Long-term Textile Statistics* at 244-45 (cited in note 7); Nishikawa, *Japanese Imperialism and Cotton* at 192 (cited in note 11); R. Robson, *The Cotton Industry in Britain* 268 (Macmillan, 1957); Seki, *Japanese Cotton Industry Theory* at 55 (cited in note 4).

II. THE COTTON CARTEL

A. Organization

These crises were not lean years the cotton spinning firms stoically endured for the sake of the years of plenty to come. Instead, the firms sought safety in numbers. Already in 1882, they had organized themselves into the "Great Japan Spinning Federation" (Dai-Nippon Boseki Rengo Kai, abbreviated "Boren"). By all accounts, the cotton spinning firms were the first in the textile industry to cartelize. By many accounts, they were among the first in *any* modern Japanese industry to cartelize.[13] To them, the Boren now became the focus for their efforts to respond to these crises.

The conventional story is simple enough. Initially, the spinning firms used the Boren to gain monopsonistic power in the labor market: to lower wages by not bidding for each others' workers.[14] Soon, they used it to gain monopolistic power in the product market: to raise profits by enforcing quantity restraints. By 1890 they were coordinating reduced operating hours, days, and machines (Table 2). Workers earned less and consumers paid more, so the story goes, but with no antitrust statute it was all legal.

Superficially, it was also plausible business strategy. *If* there had been large scale economies, perhaps new firms would have found it hard to enter the industry without access to substantial capital.[15] *If* capital markets were under-developed, perhaps new firms could not have obtained that access except from one of the large conglomerates (the *zaibatsu*).[16] Given the size of the globe, they arguably could not have entered the industry quickly even with the best financial connections. Japanese firms did not make competitive spinning machines, after all, until the late 1920s.[17]

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[13] Toshiyuki Shinomiya, *Karuteru to sono tokucho [Cartels and Their Characteristics]*, in Keiichiro Nakagawa, Hidemasa Morikawa and Tsunehiko Yui, eds, *Kindai Nihon keiei shi no kiso chishiki [Basic Information Regarding Early Modern Japanese Management History]* 193-94 (Yuhikaku, 1990) ("Japanese Management History").

[14] Takahiko Hashimoto, *Nippon menshiseki gyo shi nempo [A Time Line for the Japanese Cotton Yarn Spinning Industry]* 26 (Bunka shi nempyo seisaku kenkyu kai, 1935).

[15] In fact, there were some scale economies. See Table 9.

[16] In fact, capital markets *were* well-developed. See Rosenbluth and Ramseyer, *Politics of Oligarchy* (cited in note 3).

[17] Toshiaki Chokki, *Boshoku gyo to koo shita boshokki no hatten [The Development of Spinning and Weaving Machines in Response to the Spinning and Weaving Industry]*, in Nakagawa, Morikawa; Yui, *Japanese Management History* at 258 (cited in note 13).

Before then, a firm intent on undercutting the cartel would have had to import its equipment from Great Britain or the U.S.

During the five decades before the War, the spinning firms coordinated capacity cuts eleven times (Table 2). They launched the first in 1890, but disbanded it within a month. They launched the last in 1930, and continued it eight years.[18] All told, they maintained capacity restraints for twenty years. According to Table 3, moreover, production per unit of capital equipment did decline. On average, they mandated production cuts of about 20 percent. On average, production per spindle fell about 10 percent.

Table 2: QUANTITY RESTRAINTS IN THE COTTON SPINNING INDUSTRY, 1890-1930

	Beginning Date	Duration	Restraints
1.	1890 Jun	1 mo.	No work for 8 days & nights per mo.
2.	1899 Jan	1 mo.	No work for 4 days & nights per mo.
3.	1900 May	2 mo.	Same
	1900 Jul	3 mo.	Either no night work or a 40% reduction in machines used
	1900 Oct	3 mo.	Same
	1901 Jan	3 mo.	Same
4.	1902 Jul	6 mo.	No work for 4 days & nights per mo.
5.	1908 Jan	4 mo.	No work for 5 days & nights per mo.
	1908 May	6 mo.	Either no night work for 3 months or a 27.5% reduction in machines used for 6 months
	1908 Nov	18 mo.	20% reduction in machines used
6.	1910 Oct	6 mo.	Either (i) a 27.5% reduction in machines used or (ii) no night work for 4 days & nights per mo. plus 2 hour reduction per day plus a 12.5% reduction in machines used
	1911 Apr	6 mo.	Same
	1911 Oct	6 mo.	Either (i) a 10% reduction in machines used or (ii) no work for 5 days & nights per mo.
	1912 Apr	6 mo.	No work for 4 days & nights per mo.
7.	1914 Aug	4 mo.	No work for 4 days & nights per mo. and a 10% reduction in machines used
	1914 Dec	8 mo.	No work for 4 days & nights per mo. and a 20% reduction in machines used
	1915 Aug	6 mo.	No work for 4 days & nights per mo. and a 10% reduction in machines used
8.	1918 Jan	6 mo.	A 10% reduction either in the machines used or in the days worked

[18] Seki, *Japanese Cotton Industry Theory* at 110 (cited in note 4).

Table 2 (cont'd):

	1918 Jul	6 mo.	Same
9.	1920 May	1 mo.	No work for 6 days & nights per mo.
	1920 Jun	2 mo.	No work for 4 days & nights per mo., a 10% reduction in the machines used, and a reduction of 4 hrs/day
	1920 Aug	13 mo.	Same, but with a 20% machine cut
	1921 Sept	3 mo.	Same, but 10% machine cut
10.	1927 May	6 mo.	No work for 4 days & nights per mo., a 15% reduction in machines used, and a reduction of 4 hrs/day
	1927 Nov	20 mo.	No work for 4 days & nights per mo., a 23% reduction in machines used, and a reduction of 4 hrs/day
11.	1930 Feb	5 mo.	No work for 2 days & nights per mo., and a 10% reduction in machines used
	1930 Jun	5 mo.	No work for 2 days & nights per mo., and a 20% reduction in machines used
	1930 Nov	2 mo.	Same

Sources: Otokichi Shoji, *Boseki sogyo tanshuku shi [A History of the Spinning Operation Reductions]* (Nippon mengyo kurabu, 1930); Seisan chosa kai, ed, *Shuyo kogyo gairan [Survey of Major Industries]* (Seisan chosa kai, 1912); Shotaro Kojima, *Waga kuni shuyo sangyo ni okeru karuteru teki tosei [Cartel-Controls in the Major Industries in Our Country]* 407-18 (Yufukan shobo, 1932).

Table 3: Quantity Restraints and Spindle Productivity

	Mandated Reductions	Bales/ Spindle		Mandated Reductions	Bales/ Spindle
1899	0 %	578	1916	1.9 %	684
1900	9.9	475	1917	0	654
1901	3.8	499	1918	0	578
1902	7.2	570	1919	0	576
1903	0	581	1920	31.5	492
1904	0	515	1921	47.0	454
1905	0	657	1922	0	508
1906	0	699	1923	0	465
1907	0	663	1924	0	453
1908	16.8	545	1925	0	485
1909	20.0	556	1926	0	490
1910	12.4	566	1927	28.9	453
1911	19.7	521	1928	47.2	401
1912	9.7	626	1929	23.6	440
1913	0	664	1930	21.8	374
1914	7.6	646	1931	25.3	358
1915	27.9	620			

Mean bales/spindle, when restrictions in place: 506.
Mean bales/spindle, when no restrictions in place: 559.
Mean mandated reduction when restrictions in place: 21.2%.
Mean actual reduction: 9.5%.

Notes: Mandated reductions are calculated on the basis of 20 hour work days (two shifts), 28 work-day months, seven hour nights. 1916 is treated as an unrestricted year. Bales/spindle gives the number of cotton bales produced, divided by the number of spindles in place.

Sources: Calculated from data found in Table 2; Keizo Seki, *Nihon mengyo ron [A Theory of the Japanese Cotton Industry]* 446 (Tokyo daigaku shuppan kai, 1954).

B. Leaks

Nevertheless, as a long-term monopoly-pricing strategy this cartel never had a chance. First, the Japanese cotton spinning firms faced constant pressure from potential entrants. This simply was not an industry with large entry barriers. The most spectacularly successful late entrant was Nisshin boseki. Cotton merchant Hirazaemon Hibiya had launched the firm in 1907. By 1910 it was in the second quintile of firms; by 1930 it ranked sixth in a field of over sixty.[19] Smaller firms, however, continued to enter the industry throughout the pre-war period. Furthermore, the cartel never (1) incorporated all members (much less all potential members) of the industry, or (2) limited investments in new productive capacity.[20] I consider each of these issues in turn.

1. Incomplete membership.

The Boren never included all members of the industry. Most obviously, it excluded foreign competitors, this at a time when non-Japanese producers often joined cartels across national boundaries.[21] The Boren began as an organization of Japanese spinning firms and forever remained that. Nonetheless, those firms sold in what was always a global market. Despite variations in thread quality, many firms in many countries produced interchangeable thread. Granted, foreign spinners could not necessarily compete in the Japanese market. Tariffs on imported cotton products helped ensure that. Notwithstanding, Japanese firms competed abroad with many spinners from many countries—most prominently, firms in Great Britain, the U.S., France, Germany, and India.

Ultimately, spinners competed in this competitive international market. Even when they sold to domestic weavers, those weavers often exported the finished fabric.[22] Given these inter-

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[19] Nisshin boseki, K.K., ed, *Nisshin boseki 60 nen shi [A Sixty-Year History of Nisshin boseki]* (Nisshin boseki, K.K., 1969); Dai-Nippon boseki rengo kai, ed, *Dai-Nippon boseki rengo kai geppo [Great Japan Spinning Federation Monthly Newsletter]* (Dai-Nippon boseki rengo kai, various issues) (relative size of firms by number of spindles) ("Great Japan Spinning").

[20] In addition, note that the cartel did not take several obvious steps open to it. The firms could have tried to restrict output through their coordinated import scheme involving the N.Y.K. (see text accompanying notes 24-25), but did not. Indeed, they could have set prices, but did not.

[21] Terushi Hara and Akira Kudo, *International Cartels in Business History*, in Akira Kudo and Terushi Hara, eds, *International Cartels in Business History* 1-2 (Tokyo, 1992).

[22] Mihashi, *Toyo Spinning Corporation* at 7 (cited at note 8) (foreign competitors);

national fabric markets, Japanese spinners generally could not have charged monopoly yarn prices to domestic weavers: as long as a downstream product faces a competitive market, upstream cartels with fewer than all producers (for example, a spinning cartel that excludes foreign competitors) will seldom be able to raise prices. Indeed, because many of the largest Japanese spinners (like the large American spinners) ran integrated spinning and weaving operations, many Boren members sold fabric on the international market directly (Table 4).[23]

Until 1936, the Boren could not even convince all Japanese spinners to join.[24] To be sure, it tried to make membership worthwhile. It never made it indispensablee. In 1893 it negotiated a favorable shipping contract with the N.Y.K., the Mitsubishi shipping firm.[25] Under this agreement, the N.Y.K. agreed to pay large rebates to association members who used it for shipping their raw cotton. More specifically, the N.Y.K. charged shippers full price, but at the end of the accounting season rebated to Boren members a large portion of that price. Unfortunately for the Boren, the bulk shipping market remained a competitive market. As one scholar recently put it, "collusion among shippers has never survived" in this industry.[26] The Japanese shipping firms launched periodic price wars with the western firms, and were not always the low bidders. Yet the Boren could have made membership advantageous only (i) if the N.Y.K. charged prices below international competitive prices, and (ii) if no other international shipping firm were willing to match those prices.[27]

Okura sho zeikanbu, ed, *Kanzeiritsu enkaku [A History of Tariff Rates]* (Okura sho, 1968) (tariffs).

[23] Although these integrated firms operated fewer than 20 percent of all looms, they operated the most efficient ones. In 1936, they ran nearly three-fourths of the 46,000 automatic looms in use. With a fifth of the looms, they wove a third of the fabric. See Table 4; Shoko daijin kanbo tokei ka, ed, *Kojo tokei hyo [Census of Manufactures]* 413 (Tokyo tokei kyokai, 1936) (automatic loom use). On integrated spinning and weaving operations generally in the West, see John S. Lyons, *Vertical Integration in the British Cotton Industry, 1825-1850: A Revision*, 45 J Econ Hist 419 (1985); Peter Temin, *Product Quality and Vertical Integration in the Early Cotton Textile Industry*, 48 J Econ Hist 891 (1988) (discussing primarily American integrated spinning and weaving operations).

[24] As of September 1927, for instance, 11 spinning companies representing six percent of all cotton spindles were outside the Boren. Nippon kangyo, *Cotton Threat* at 55-58 (cited in note 8). These firms joined the Boren in May 1936. Zaisei keizai jiho sha, ed, *Nippon sen'i kogyo soran okutsuki [An Overview of the Japanese Textile Industry, with Appendix]* 210 (Zaisei keizai jiho sha, 1936) ("Japanese Textile Industry Overview").

[25] Reprinted in Seisan chosa kai, ed, *Shuyo kogyo gairan [Survey of Major Industries]* 26-29 (Seisan chosa kai, 1912). Other shipping firms later joined the N.Y.K.

[26] Pirrong, 35 J L & Econ at 128 (cited in note 1).

[27] Shotaro Kojima, *Waga kuni shuyo sangyo ni okeru karuteru teki tosei [Cartel-*

Renegade spinners simply did not need the N.Y.K. Although the Boren firms could together obtain bulk discounts, so could most other spinners. Major spinning firms would have qualified for equivalent discounts elsewhere. Whatever clout the Boren had, as the shipping arm of the Mitsubishi empire the N.Y.K. was not the sort of firm on which it likely could have imposed monopsonistic prices. Unless it was indeed extracting monopsonistic rents, though, renegade firms could have competed without joining it.[28]

2. Investment limits.

As Table 3 details, the Boren never tried to limit the total number of spindles. Instead, it mandated cuts only in either operating hours or the percentage of spindles used. This made for a bizarre cartel, for to earn its members monopoly rents the Boren had to cut the quantity produced. To do that, it could not just cut hours or furlough existing spindles. It needed also to limit the purchase of new spindles. That it never did. In letting firms buy new spindles while not letting them use them fully, it ensured only that its members invested inefficiently.

Even as the Boren mandated production cuts, spinning firms

Controls in the Major Industries in Our Country] 478-511 (Yufukan shobo, 1932) (shipping cartels) ("Cartel Controls"); Nihon keiei shi kenkyu sho, ed, *Nippon yusen kabushiki kaisha 100-nen shi [A 100-Year History of the N.Y.K.]* 7-74, 123-29 (Nippon yusen kabushiki kaisha, 1988) (competition between N.Y.K. and the western firms); William D. Wray, *Mitsubishi and the N.Y.K., 1870-1914: Business Strategy in the Japanese Shipping Industry* 289-308, 400-08 (Harv Council E Asian Stud Pub, 1984) (same); William D. Wray, *Kagami Kenkichi and the N.Y.K., 1929-1935: Vertical Control, Horizontal Strategy, and Company Autonomy*, in William D. Wray, ed, *Managing Industrial Enterprise: Cases from Japan's Prewar Experience* 182, 187 (Harvard, 1989) (existence of irregular "tramp shipping").

Indeed, *if* the Boren had been a price-fixing scheme and *if* the N.Y.K. had had a lock on cotton imports, one would expect the Boren to have enforced its quantity restraints through its control over raw cotton imports. Given that the spinners depended critically on cotton imports, that bottleneck offered the perfect monitoring device. The Boren did not do so—both because it was *not* a price-fixing scheme (see text accompanying notes 19-20), and because the N.Y.K. did *not* have a lock on the import trade.

[28] In addition, note two points. First, the Boren convinced the domestic raw cotton producers not to sell to non-Boren firms. Because domestic producers raised a small fraction of the cotton consumed, this was not a major barrier. Second, in 1930 the Boren convinced the cotton yarn sellers' association not to buy yarn from non-Boren firms. In return, Boren members agreed to sell only to members of the sellers' association. See Kojima, *Cartel Controls* at 413 (cited in note 27); Nippon kangyo, *Cotton Threat* at 54-55 (cited in note 8); Seki, *Japanese Cotton Industry* at 114-16 (cited in note 4). At this point, the only firms safely able to remain outside the Boren would have been those that *both* spun and wove. As Table 4 shows, however, the biggest Japanese firms operated integrated spinning and weaving factories.

continued to buy new equipment (Table 5). Despite the capacity restraints, they aggressively built new factories and installed new spindles. Indeed, they built more factories and installed more spindles while the restraints were in place than while they were not. Had they wanted to affect prices, they would not have agreed just to cut the stock used. They would also have agreed to idle any new equipment they bought. That they never did. Were this a production-restriction cartel, it was one that failed.

Table 4: Spinning Firms in the Weaving Industry

	(A) Total Looms	(B) Spinning Looms	(C) B/A	(D) Total Fabric	(E) Spinning Fabric	(F) E/D	(G) E/Firm Rev.
1905		6,077		715	154	21.5 %	11.9 %
1910		17,002		1222	332	27.2	18.5
1915		27,931		1824	710	38.9	27.3
1920		43,725		6936	2950	42.5	27.0
1925	365,369	61,918	16.9	7719	2732	35.4	22.5
1930	348,903	69,147	19.8	4933	1631	33.1	25.5
1935	385,980	83,308	21.6	8104	2466	30.4	21.7

Notes:
(A) Total number of cotton weaving looms in use.
(B) Total number of cotton weaving looms used by spinning firms.
(C) Percentage of cotton weaving looms used by spinning firms.
(D) Value in current prices (x ¥100,000) of total cotton fabric produced.
(E) Value in current prices (x ¥100,000) of cotton fabric produced by spinning firms.
(F) Percentage of total cotton fabric produced by spinning firms.
(G) Percentage of spinning firm revenues attributable to weaving operations.

Sources: Calculated from data found in Shozaburo Fujino, Shino Fujino and Akira Ono, *Choki keizai tokei: Sen'i kogyo [Long-Term Economic Statistics: Textile Industry]* 74-83, 242-43 (Toyo keizai shimpo sha, 1979); Miyohei Shinohara, *Choki keizai tokei: kokogyo [Long-term Economic Statistics: Mining and Manufacturing]* 194-95 (Toyo keizai shimpo sha, 1972); Shoko daijin kanbo tokei ka, ed, *Shoko sho tokei hyo [Statistical Tables for the Ministry of Commerce and Industry]* (Tokyo tokei kyokai, various years).

Table 5: Spinning Cartel Cheating

	A. Mandated Reductions	B. Spinning Factories	C. Spindles (x 1000)
1920	31.5 %	(40)	355
1921	47.0	89	299
1922	0	(159)	394
1923	0	(1)	284
1924	0	20	(91)
1925	0	(8)	451
1926	0	37	293
1927	28.9	22)	263
1928	47.2	6	531
1929	23.6	38	233
1930	21.8	18	595
1931	25.3	15	221

Table 5 (cont'd)

Mean new spindles while restrictions in place: 328,000.
Mean new spindles while no restrictions in place: 266,000.
Mean new spinning fact's while restrictions in place: 14.8.
Mean new spinning fact's while no restrictions in place: -22.2.

Notes:
(A) Cartel-mandated reductions.
(B) Net increase (or decrease) in number of spinning factories with five or more employees.
(C) Net increase (or decrease) in number of operating spindles.

Sources: Calculated from data found in Table 2; Shoko daijin kanbo tokei ka, ed, *Kojo tokei hyo [Census of Manufactures]* (Tokyo tokei kyokai, various years 1920-31); Tsusho sangyo daijin kanbo chosa tokei kyoku, ed, *Kogyo tokei 50 nenshi [A Fifty Year History of the Manufactures Census]* (Okura sho insatsu kyoku, 1961); Keizo Seki, *Nihon mengyo ron [A Theory of the Japanese Cotton Industry]* 446 (Tokyo daigaku shuppan kai, 1954).

C. Temporary Local Gains?

Even if the Boren firms could not have earned monopoly rents over the long-term, perhaps they hoped to exploit a temporary local monopoly.[29] Expansion in the industry did take time.

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[29] Consider the additional hypotheses. First, many Japanese historians suggest that the largest spinning firms used the restrictions to gain a competitive advantage over the smaller firms. See for example, Nishikawa, *Japanese Imperialism and Cotton* at 154 (cited in note 11); Naosuke Takamura, *Nihon boseki gyo shi josetsu [An Introduction to the History of the Japanese Spinning Industry]* 178-91 (Hanawa shobo, 1971) ("History of Japanese Spinning Industry"). Recall, however, that membership in the cartel was voluntary, that spinning firms imported raw cotton in a competitive international market, and that they sold yarn and fabric on a competitive international market. The large spinning firms could have induced the small firms to join the Boren (or to remain in the Boren) and suffer the exploitative consequences only if the small firms earned a net gain by doing so. Hence, the large firms would have had to compensate the smaller firms for any exploitation the small firms suffered. Because of the competitive market constraints, however, the large Boren firms had no way of using the Boren to generate sufficient monopoly rents to pay that compensation and still earn a profit.

Second, Tetsuji Okazaki, *1930-nen dai no Nihon ni okeru keiki junkan [Japanese Business Cycles and Capital Accumulation in the 1930s]*, 39 Shakai kagaku kenkyu 1 (1987), suggests an ingenious alternative: Small spinners were heavily invested in low-count thread, and large spinners were invested in high-count thread. Small spinners wanted to move into high-count thread, and used the cartel to give them breathing space to do so. Aside from the questions of whether the cartel would have given any breathing space without international market power and whether large firms would ever have agreed to such a plan, Okazaki's theory does not explain why small firms would find advantageous a scheme that disabled themselves as much as it disabled their competitors.

Because most firms already operated 25 to 28 days a month, 20 to 22 hours a day, non-Boren firms could not have dramatically expanded production without buying new machines. Yet until the 1920s, almost all machines came from either Great Britain or the United States. Even with a telegraphed order, expansion would have taken quite a while. Meanwhile, perhaps the Boren firms could have earned monopoly returns.[30]

As an explanation for the Boren, this could not have worked—short-term monopoly returns cannot explain the measures the Boren took, since it did not take short term measures. Rather, it took measures that lasted for months and years. Nor did the Boren ignore the measures once competition eroded any monopoly price. Instead, month after month, Boren firms regrouped to change the percentage of spindles furloughed, the number of days closed, or the number of hours per day worked. To the firms themselves, the cuts meant more than any short-term advantage. In any event, short term monopoly rents were an advantage they never earned. According to Gary Saxonhouse, the American economist who has most studied this industry, Boren firms did not "restrict industry output, even on a cyclical basis."[31]

III. COTTON LOGIC

The basic puzzle thus remains: if the Boren firms were not trying to earn monopoly rents, what did they think they were doing? The answer, I suggest, is that they were trying to solve

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Third, participants at one presentation of this paper offered another intriguing hypothesis: the Boren firms used capacity cuts to preserve their collective reputation for treating workers fairly. Absent a cartel, some firms would have tried to hire workers into their factory during times of peak demand, then fire them during slack demand. Unfortunately, the cartel neither limited expansion during boom times nor limited contraction during the busts.

[30] On the hours and days worked, see the tables at the end of any issue of Dai-Nippon, *Great Japan Spinning* (cited in note 19). On the source of spinning machines, see Mariko Tatsuki, *Mitsui Bussan no setsuritsu to hatten [The Establishment and Development of Mitsui Bussan]* ("Establishment and Development") in Nakagawa, *Japanese Management History* at 36, 40 (cited in note 13).

[31] Gary Saxonhouse, *Country Girls and Communication Among Competitors in the Japanese Cotton-Spinning Industry*, in Hugh Patrick and Larry Meisner, eds, *Japanese Industrialization and its Social Consequences* 97, 122 (University of California, 1976); Gary Saxonhouse, *Mechanisms for Technology Transfer in Japanese Economic History*, 12 Managerial & Dec Econ 83, 84 (1991). Note that this is consistent with the 9.5% fall in production during the cartel (Table 3). The cartels were in place during slack demand. Even if they had been completely ineffective, production would have fallen somewhat during their tenure—if only because consumers were less willing to buy the yarn.

two principal-agent problems at once: to pay workers enough to reduce their "shirking," and to enable their managers to commit credibly to keeping wages at levels that would mitigate that shirking.[32] I turn first to the wages in the industry (Section III.A. and B.), then to the managerial problems (Section III.C.).

A. Efficiency Wages

1. Monitoring and shirking.

Picture the problem that the owners of the new mills faced. In a society where almost all manufacturing occurred in small shops, they built massive factories. In a world where machines ran on muscle or water, they introduced steam and later electricity. In the new factories, they installed large, complicated, and expensive British-made machines.

To run these powerful new factories and machines, the owners needed managers and workers they did not have. They needed managers who could organize individual workers into teams suited to factory production. They needed managers who could structure incentives so that the workers individually would not free-ride on each other. They needed managers who could teach the workers how to run the new machines and to avoid breaking them. As of 1891, however, they had only one formally trained engineer for every six factories.[33]

The owners also needed workers who would work obediently, regularly, and carefully. As the new ring spindles were relatively easy to operate, they did not need workers who understood physics or chemistry, or workers with much physical strength. They did need workers who would not ignore instructions, who would not skip work on a whim, and who would not take breaks that

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[32] Readers may also ask why the Boren (like many trade associations) did not try to manipulate the political process to form a legally enforceable cartel. The reason, discussed in Rosenbluth & Ramseyer, *Politics of Oligarchy* (cited in note 3), is that the *zaibatsu* firms had the greatest political influence in pre-war Japan, and the *zaibatsu* firms had interests contrary to the Boren. The *zaibatsu* were not heavily invested in cotton spinning (Table 10). Yet the Mitsubishi, through the N.Y.K., shipped the bulk of the raw cotton to the spinners, while the Mitsui marketed the finished product abroad. Any contraction in the raw cotton consumed or the cotton yarn sold (even if international competitive market forces would have allowed this) would thus have directly harmed the politically powerful Mitsubishi and Mitsui.

[33] Saxonhouse, *Country Girls and Communication* at 109 (cited in note 31). See also Noshomu sho somukyoku tokeika, ed, *Noshomu tokei hyo [Agricultural and Commercial Statistics]* 63 (Noshomu sho somukyoku tokeika, 1903) (many factory supervisors did not understand the machines under their jurisdiction).

disrupted production at the entire plant. They needed, in short, workers with what we now call "basic work habits." Before the industrial revolution, few people considered such habits basic, for few people needed them in either agrarian or handicraft production. Eventually, school teachers did bring these habits to Japanese peasant children. As of 1891, though, only a quarter of the workers at the spinning plants had attended primary school.[34]

Somehow, the mill owners had to teach their workers to use the new machines safely and effectively, to convince them to work together as a team, and to induce them not to free-ride on each other. Fundamentally, this was largely a matter of incentives. Unfortunately, to use the optimal incentives the owners had to be able to monitor workers individually and to dispense appropriate penalties and rewards. Yet precisely because it involves joint production, team work is hard to meter. Precisely because cotton spinning involved team work, the owners found it hard to meter their workers—and hard, therefore, to reward and discipline them appropriately.

This is complicated enough where the technology is familiar; it is harder still where everything about the factory is strange.[35] With new machines, an owner often will have no idea how much he (the owners and managers of these factories were generally men) can expect of a recruit. Not knowing what to expect, he cannot set the proper piece rate. Predictably, many of the earliest Japanese factory owners produced nothing so much as chaos. Their workers did not know how to use the machines, their managers did not know how to structure incentives to motivate workers, and absent appropriate incentives the workers had little reason to learn to use the machines.

Contemporary observers chronicled the chaos. "If a supervisor can see the employees (particularly day laborers), they work attentively," reported one otherwise sympathetic man in 1899. "But as soon as he disappears, they gossip in groups of two or three."[36] "The day after payday," another observer wrote, "em-

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[34] Saxonhouse, *Country Girls and Communication* at 109 (cited in note 31).

[35] Given (a) the asymmetric distribution of information between workers and management regarding worker abilities and (b) the inability of management to commit credibly to a given wage structure, piece rate contracts never entirely solve the incentive problem. See Gary J. Miller, *Managerial Dilemmas: The Political Economy of Hierarchy* ch 5 (Cambridge, 1992); Bengt Holmstrom, *Moral Hazard in Teams*, 13 Bell J Econ 324 (1982).

[36] Gennosuke Yokoyama, *Nihon no kaso shakai [Japanese Lower-Class Society]* 179 (Kyobunkan, 1899) (cotton spinning workers).

ployees regularly skip work."[37] According to the oral histories of the workers themselves, they even slept on the job.[38]

2. Market-clearing wages.

Workers shirked in these early factories for the same reason workers everywhere liked to shirk: they preferred leisure to work and had no reason not to indulge that preference. Through their work, they earned the going rate—a wage that cleared the labor market. But when labor markets clear, workers who quit a job can easily find another. And if all firms pay the market-clearing wage, a worker will earn the same wage in her (most textile workers were women) new job as she earned in the old. Workers can safely work when they want, rest when they want. In agricultural and handicraft industries, such work habits seldom disrupt. In a modern factory, they wreak havoc.

If the spinning mill owners could have monitored their workers cheaply, they could have mitigated this problem. If their managers might have noticed and fired them when they shirked, workers would have shirked less profligately. Yet monitoring is not free, of course, and hence the problem. The more monitoring costs, the more cheaply workers can indulge their preference for leisure over work. If losing their job costs them little (as with market-clearing wages) and if monitoring is often ineffective (so they can often shirk unnoticed), rational workers may choose to shirk as they please.

3. Efficiency wages.

This situation generates the well-known paradox of "efficiency wages": the more monitoring costs, the more likely employers can lower labor costs by raising wages.[39] If workers shirk because they can easily earn equivalent wages elsewhere, a firm can sometimes save money by paying them more. For when it

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[37] Noshomu sho, *Shokko jijo [Circumstances of Factory Workers]* 235 (1903; reprinted, Koseikan, 1981) (steel workers).

[38] Shigemi Yamamoto, *Aa nomugi toge: aru seishi kojo aishi [Ah, the Nomugi Pass: A Tragic History of the Factory Women in the Silk Thread Industry]* 180 (Kadogawa shoten, 1977) ("Tragic History").

[39] See Eric Rasmusen, *Games and Information* 166-67 (Basil Blackwell, 1989); Carl Shapiro and Joseph E. Stiglitz, *Equilibrium Unemployment as a Worker Discipline Device*, 74 Am Econ Rev 433 (1984); Joseph E. Stiglitz, *The Causes and Consequences of the Dependence of Quality on Price*, 25 J Econ Lit 1 (1987); see also Eric Rasmusen, *An Income-Satiation Model of Efficiency Wages*, 80 Econ Inquiry 467, 475 (1992) (model applicable to low-wage workers).

does so, workers who lose their job lose income. Rather than lose their well-paying job (a risk they retain if the firm maintains even moderate levels of monitoring), they may now decide to reduce their shirking. Even if all equivalent firms pay the same high wages, workers who lose their job still lose—for wages above market-clearing levels necessarily generate unemployment. Given the higher unemployment levels, fired workers now spend longer finding their next job.

The classic example is Ford. In 1914, Henry Ford paid his workers $2.34 per day. The wage was the going rate and cleared the market. Because everyone else paid it as well, jobs were easy to find. Workers, observers recalled, could quit Ford in the morning and find another job by noon. As a result, Ford found himself with an annual turnover rate of 370 percent, and chaos in his assembly line. To solve this problem, he doubled wages. At $5 a day, workers now stood in line for a Ford job. At $5 a day, Ford himself boasted, "I have a thousand men who if I say 'Be at the northeast corner of the building at four a.m.,' will be there at four a.m."[40]

The large Lancashire cotton spinning mills in the 19th century similarly paid efficiency wages.[41] Because they regularly experimented with new technology, they regularly found it hard to monitor their employees. "In the heyday of industrialization, managerial methods of supervising workers and monitoring how much they could produce were unsophisticated," explains economic historian Michael Huberman.[42] Even though the larger Lancashire firms tried to mitigate these problems with piece-rate wages, they still "had difficulty in linking effort to output and setting piece rates." Accordingly, they chose not to rely exclusively on monitoring. Instead, they "paid efficiency wages to reduce the loss of productivity associated with shirking."[43]

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[40] Miller, *Managerial Dilemmas* at 65-71 (cited in note 35).

[41] Michael Huberman, *Invisible Handshakes in Lancashire: Cotton Spinning in the First Half of the Nineteenth Century*, 46 J Econ Hist 987 (1986); Michael Huberman, *How Did Labor Markets Work in Lancashire? More Evidence on Prices and Quantities in Cotton Spinning, 1822-1852*, 28 Expl Econ Hist 87 (1991); Michael Huberman, *Industrial Relations and the Industrial Revolution: Evidence from M'Connel and Kennedy, 1810-1840*, 65 Bus Hist Rev 345 (1991).

[42] Huberman, 28 Expl Econ Hist at 88 (cited in note 41).

[43] Id.

4. The Japanese mills.

Turn-of-the-century Japanese cotton spinning firms also paid efficiency wages. The giant Kanebo firm did so most extravagantly, advertising not just its wages but also the various other amenities as well. Many historians doubt whether it improved employee welfare as much as it claimed, but in doubting they miss the point. Kanebo did not adopt its scheme out of charity. Instead, the scheme served as a simple profit-maximizing efficiency wage strategy. Its wage premium was stark. Table 6 details (i) the mean daily wage paid by all Boren firms to their female workers as of the middle of each year, (ii) the comparable figure for Kanebo, and (iii) the resulting premium attributable to Kanebo employment. In the late 19th century, Kanebo paid close to a third more than its competitors. Although Kanebo's wage dominance faded, it faded only because other firms soon hiked their wages as well. As Table 7 shows, the larger firms did adopt efficiency wages before the smaller firms did; but as Table 8 shows, by 1910 the industry as a whole paid textile workers double what they could earn on the farm.

The Japanese story does not parallel early-19th century Lancashire completely. Where only the larger Lancashire firms paid high wages, by 1915 large and small Japanese firms alike paid similar rates (Table 7).[44] Because large and small firms used the same technology in Japan, similar wages and hours are exactly what one would expect. By the turn of the century, almost all Japanese mills used standard steam-powered Platt Brothers machines.[45] Whatever monitoring problems large firms experienced, small firms experienced them too. After large firms found it advantageous to pay high wages, small firms soon followed suit.

Table 6: The Kanebo Wage Premium

	Boren mean	Kanebo mean	Kanebo premium
1898	¥14.99	¥19.60	30.8 %
1908	24.89	29.00	16.5
1919	80.51	84.10	4.5

Source: Calculated from data found in Dai-Nippon boseki rengo kai, ed, *Dai-Nippon boseki rengo kai geppo [Great Japan Spinning Federation Monthly Newsletter]* (Dai-Nippon boseki rengo kai, 1898, 1908, 1919) (1918 data unavailable).

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[44] A point confirmed by separate calculations in Konosuke Odaka, "Niju kozoz" [Dual Structure] in Takafusa Nakamura and Konosuke Odaka, eds, *Niju kozo [Dual Structure]* 133, 161 (Iwanami shoten, 1989).

[45] Tatsuki, *Establishment and Development* at 37 (cited in note 30); Saxonhouse, 12 Managerial & Dec Econ at 86 (cited in note 31).

Table 7: MEAN HOURS AND WAGES IN THE SPINNING INDUSTRY, BY FIRM SIZE

A. Daily Hours

Quintile	1900	1905	1910	1915	1921	1925
First	19.4	22.7	22.9	22.3	19.8	19.7
Second	19.0	21.7	22.3	21.9	19.0	21.1
Third	18.8	23.3	20.6	23.0	20.1	19.6
Fourth	16.9	22.8	22.6	23.1	20.1	19.9
Fifth	18.1	22.4	21.4	22.8	19.5	20.2

B. Daily Wages

Quintile	1900	1905	1910	1915	1921	1925
First	¥0.193	¥0.239	¥0.298	¥0.319	¥1.109	¥1.323
Second	0.195	0.224	0.268	0.302	1.073	1.096
Third	0.175	0.217	0.284	0.310	1.201	1.222
Fourth	0.164	0.190	0.246	0.344	1.079	1.225
Fifth	0.153	0.192	0.236	0.305	1.060	1.260
Mandated cuts:	9.9 %	0.0	12.4	27.9	31.5	0.0

Notes: The firms are divided into quintiles on the basis of the number of spindles in each firm. Wages are daily wages for female workers in current yen. The data are for the months of July for each year except when July was unavailable (when nearest available month was used instead). Mandated production cuts are taken from Table 3. Hours are number of hours of operation of factories operated by firm. 1921 is substituted for 1920 because of the unavailability of 1920 data.

Sources: Calculated from data found in Dai-Nippon boseki rengo kai, ed, *Dai-Nippon boseki rengo kai geppo [Great Japan Spinning Federation Monthly Newsletter]* (Dai-Nippon boseki rengo kai, 1900, 1905, 1910, 1915, 1921, 1925).

5. The need to cut labor quantity.

Given their efficiency wage strategy, Japanese spinners had to take care not to respond to demand shocks by cutting the price they paid for the labor they hired. Instead, they had to respond in a way that preserved the wage premium they paid. To do so, they had to cut the *quantity* of labor they hired.[46] If they instead cut their wage premium, they increased shirking. In the long

[46] That cutting production would generally lower per-unit production costs is straightforward: on a short-term basis, cutting production quantity lowers marginal (and short-term average variable) production costs because the marginal cost curve cuts average cost curves from below, and because the short-term average variable cost curve lies below the average total cost curve. In a long-term equilibrium, of course, firms will sell at a price equal to long-term total average costs.

run, they thereby lowered profits. Japanese firms did just what we would expect—when demand fell, they cut the quantity of labor they hired (Table 8).

Note a complication: if spinning firms cut output by firing workers, they potentially vitiated their efficiency wage scheme, for workers would discount their higher wages by their higher probability of being fired. Rather than lay off existing workers, therefore, Japanese spinning firms cut production by delaying new hires. In most years, 1/4 to 1/3 of their workers quit voluntarily anyway. They quit because they had never planned to work a long time. They had come to the factory to work a few years and save. Having done exactly as they planned, they returned to their farm eventually to marry.[47] Because so many women quit each year, the spinning firms could adjust to demand shocks simply by deferring new hires.[48]

B. The Evidence of Efficiency Wages

Several aspects of the Japanese cotton spinning industry suggest (even if they do not prove) that the firms paid efficiency wages. Consider in this respect the price of labor, the stability of the wage premium, oral evidence from the women involved, and the use of performance bonds.

1. The price of labor.

Few facts about the spinning firms are more prominent than the high wages they paid their workers (Table 8). During much of the pre-war period, about 80 percent of the cotton spinning workers were women, and about 60 percent of these women came from the farm.[49] For an efficiency wage, the crucial premium for

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[47] But see E. Patricia Tsurumi, *Factory Girls: Women in the Thread Mills of Meiji: Japan* 172-73 (Princeton, 1990) (arguing that women returned for other reasons).

[48] Hosei daigaku keizai gaku bu, ed, *Keihin kogyo chitai o chushin to suru chingin chosa hokoku [Survey Report on Wages Paid Primarily in the Keihin Industrial Area]* 187-91 (Hosei daigaku keizai gaku bu, 1936)("Keihin Industrial Area Wages"); Riyuemon Uno, *Shokko kinzoku nen su cho (jo) [A Survey of Work Tenure Among Factory Workers (I)]* 14 (Kogyo kyoiku kai, 1915) (Shokko mondai shiryo, No. A163); Riyuemon Uno, *Shokko kinzoku nen su cho (ge) [A Survey of Work Tenure Among Factory Workers (II)]* 12 (Kogyo kyoiku kai, 1915) (Shokko mondai shiryo, No. A164).

[49] Chuo shokugyo shokai jimukyoku, ed, *Boseki rodo fujin chosa [An Investigation into Women Working in the Spinning Industry]* 5 (Chuo shokugyo shokai jimukyoku, 1929) ("Women in the Spinning Industry"); Takejiro Shindo, *Mengyo rodo sanko tokei [Reference Statistics Regarding Labor in the Cotton Industry]* 365 (Tokyo daigaku shuppan kai, 1958) ("Cotton Labor Statistics").

cotton spinning workers was the premium they received over the agricultural wage. By 1910, the spinning firms paid these women double their agricultural wage. They continued to pay at least double for most of the next three decades.[50]

Other data indirectly confirm these high wages. Take one 1927 survey of 3,966 workers at 12 cotton spinning factories. These women sent home each month mean amounts ranging from 5.2 percent of their wages at one factory to 60.5 percent at another. Unfortunately, the report does not give the number of respondents within each plant. Averaging the 12 factory means, however, gives a mean of 36.0 percent. In addition, these women every month saved another 7.0 to 52.1 percent of their pay. Averaging the factory means gives 24.3 percent. All told, the women saved or sent home an average of 59.9 percent of their wages: amounts ranging from a mean of 43.2 percent at the lowest factory to 67.5 percent at the highest.[51]

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[50] Shindo, *Cotton Labor Statistics* at 396 (cited in note 49), finds similar ratios for the early post-War years. I use mean *annual* wage rates for female agricultural workers rather than mean *daily* wage rates (as, for example, Takamura, 1 *History of Japanese Spinning Industry* at 302 (cited in note 29), does) for two reasons. First, agricultural work was highly seasonal where textile work was steadier. Thus, daily textile and agricultural rates do not give an accurate picture of the relative expected earnings of women in the two sectors. Second, spinning firms generally provided room (or at least provided heavily subsidized room) in addition to wages; yearly agricultural contracts probably did as well, though daily work did not. Note that most spinning firms did charge for board. According to one 1927 survey of 12 cotton spinning factories, the women paid the factory a mean food charge ranging from 10.8 percent of salary at one factory to 22.8 percent at another. The mean of the 12 factory means was 16.9 percent. Chuo, *Women in the Spinning Industry* at 69-70 (cited in note 49). See also, Hosei, *Keihini Industrial Area Wages* at 168 (cited in note 48). According to Riyuemon Uno, *Shoku hi teigaku no chosa [A Survey of Food Charges]* (Kogyo kyoiku kai, 1917) (Shokko mondai shiryo, No. B79), factories charged an average of 9.31 sen/day for board, and subsidized these meals with another 4.57 sen/day.

[51] Chuo, *Women in the Spinning Industry* at 69-70 (cited in note 49); Hosei, *Keihin Industrial Area Wages* at 140, 184 (cited in note 48) (corroborating data). Firms sometimes offered the woman (or her family) a sign-on loan of part of her future earnings. Unlike the cash advances in the sex industry, see J. Mark Ramseyer, *Indentured Prostitution in Imperial Japan: Credible Commitments in the Commercial Sex Industry*, 7 J L Econ & Org 89 (1991), these loans were relatively small. Of a sample of 8,926 workers hired by large Tokyo-area spinning factories in 1926, workers (or their families) received a mean sign-on loan of only ¥22.23—about 16 days' wages. See Chuo, *Women in the Spinning Industry* at 33; corroborated by data in Hosei, *Keihin Industrial Area Wages* at 99, 140. In comparison, the mean sign-on loans in the sex industry in the mid-1920s were ¥959 and ¥1194 for geisha and licensed prostitutes respectively. Ramseyer, 7 J L Econ & Org at 101-02.

2. The stable premium.

If the shadow wage for the workers was their wage in agricultural employment, the cotton spinning firms paid them a premium over that wage that held relatively steady (Table 8). Again, the point suggests (certainly it does not prove it, for agricultural and textile wages might well have moved in tandem even absent efficiency wages) that the firms considered it important to offer their workers a wage that stayed much higher than the wage those workers could have earned elsewhere. In general, the ratio of textile to agricultural wages held fairly constant: textile workers earned double or triple the agricultural wage. The firms paid these high wages even when they themselves faced dramatic cuts in demand: even when corporate profits fell, relative employee wages held firm.

3. Oral accounts.

According to the workers themselves, not only did the firms pay high wages, they supplied reasonable working conditions. High wages in themselves would not, of course, prove that the firms paid efficiency wages. Instead, the firms might have paid market-clearing wages that compensated for unusually harsh disamenities. The women themselves, however, generally found no such disamenities.

Sophisticated social historians continue to argue the contrary. Gail Lee Bernstein, for example, describes the lives of silk-reeling workers (a job with some technical differences from cotton spinning) as "deplorable." Workers sang, she adds, songs with titles like "Song of the Living Corpses."[52] Patricia Tsurumi describes the spinning mill dormitories as "prisons," the wash rooms as "appalling," and the food as "shoddy" and inadequate. Winter days in the factories were cold, and "the hot humid days of summer were hell."[53] Andrew Gordon assigns textile workers

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[52] Gail Lee Bernstein, *Women in the Silk-reeling Industry in Nineteenth-century Japan*, in Gail Lee Bernstein & Haruhiro Fukui, eds, *Japan and the World: Essays on Japanese History and Politics in Honour of Ishida Takeshi* 63 (St. Martin's, 1988). She rightly notes, though, that the women "may have been better off" than they had been at home. Id at 67. An English translation of the song appears at Tsurumi, *Factory Girls* 157-59 (cited in note 47).

[53] Tsurumi, *Factory Girls* at 132-35, 141 (cited in note 47). Elsewhere, she properly notes that the wages were higher than other employment opportunities for women, and that the "poorly prepared and spoiled food" that the women supposedly received "would have seemed a splendid feast" to starving peasants. Id at 134, 147-48, 162.

"the worst objective situation of any group of workers."[54] And Mikiso Hane concludes that "what frequently came to prevail was unrestrained exploitation."[55]

At root, the historians rely too heavily on the documents bourgeois journalists and social reformers left, for the women themselves told a radically different story.[56] According to them, not only did they earn high wages, they worked under almost pleasant conditions. That journalists and social reformers on the one hand, and the women workers on the other, reacted differently to factory conditions should not surprise us. The journalists were urban, educated white-collar professionals. The workers were daughters of poor tenant farmers. That the journalists would have thought the conditions harsh tells us little about what tenant farmers would have thought. And that social reformers thought them harsh tells us even less—what else, one might ask, would one expect a reformer to say?

Consider oral historian Shigemi Yamamoto's experience. Yamamoto interviewed 580 former textile workers for what he planned as their "tragic history." To his surprise, none of the women regretted having taken her factory job, none complained of the food she ate in the factory dormitories, none thought she had been underpaid, and only three percent of the women thought their work had been harsh. By contrast, 90 percent thought the food had been good, 70 percent thought their pay had been high, and most found the work "more fun than the work at

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[54] Andrew Gordon, *Labor and Imperial Democracy in Prewar Japan* 75 (University of California, 1991). The fact that some workers sometimes struck for higher pay or better working conditions is no evidence that pay was low or conditions bad. All else equal, even college professors prefer higher pay to lower, and better working conditions to worse. As a result, it would be curious if workers did *not* sometimes strike. Even in the modern U.S., the workers who strike are not disproportionately concentrated in the lowest paying or most unpleasant jobs.

[55] Mikiso Hane, *Modern Japan: A Historical Survey* 144 (Westview Press, 1986). See also, Barbara Molony, *Activism Among Women in the Taisho Cotton Textile Industry* in Gail Lee Bernstein, ed, *Recreating Japanese Women, 1600-1945* 217, 232 (California, 1991) ("Girls' salaries were extremely low."). However, Hane rightly notes that the women were pleased with their food. Mikiso Hane, *Peasant, Rebels, & Outcastes: The Underside of Modern Japan* 181 (Pantheon, 1982).

[56] A mistake scholars of Japanese history have made elsewhere as well, both when they write about women specifically, see Ramseyer, 7 J L Econ & Org at 92-93 (cited in note 51), and when they write about peasants generally, see Richard J. Smethurst, *Agricultural Development and Tenancy Disputes in Japan, 1870-1940* 21-22 (Princeton, 1986). A few historians cite diary evidence. But, even diaries are problematic given that the best-educated women (the workers with the best paying and most comfortable alternative jobs) would disproportionately have kept diaries.

home."[57]

"At least I got to eat rice," one former textile worker told Yamamoto. "It was better than staying home." The boys—who did stay home—had the reciprocal reaction.

> Just once, you should come see a farming or fishing village. You won't find a single girl. All you'll see are shrivelled old grannies. The girls are all gone, left the village for work. . . . We guys are left, but we're lonely. Real lonely. Even suppose I can take the loneliness. How am I going to find a wife? I want a wife so bad I'm going crazy. But no girl'll marry a poor farmer anymore. Even when they come back to the village from the factories, they've turned completely high-class. With their hair done up and perfumed and all, they won't even look at us.

It was a letter to the editor of a Tokyo daily newspaper, and it captured at least some of the economic impact of the textile industry.[58] Having made a minor fortune in the mills, the women had raised their sights. It is not what one reads in the tirades against the mills so popular in the fashionable histories. But the fashionable histories miss the industry's effect on female incomes. If some women sang Bernstein's "Song of the Living Corpses," others sang some very different songs—songs that echo more the notion that time flies when you're having fun:[59]

> Shall I fall in love with the boss,
> or shall I ignore the boss?
> Think about it,
> and before you know it you've finished the thread.
> Rather than fall for the boss and be hated,
> I think I'll head for the sunshine,
> I think I'll head for the young ones.
> I may have left home saying I'd reel thread,
> but now I'm reeling in guys instead.

"It was harder work at first than I had done before," recalled one old woman. As a young girl, she had left her hometown for a

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[57] Yamamoto, *Tragic History* at 332 (cited in note 38).

[58] Quoted in Yamamoto, *Tragic History* at 121 (cited in note 38). Of course, there may have been other reasons factory women would not give this man the time of day—there usually are. Of the 1,536 women in spinning factories surveyed in 1927, 801 said they hoped to marry a farmer. See Chuo, *Women in the Spinning Industry* at 22-23 (cited in note 49).

[59] Yamamoto, *Tragic History* at 50, 72 (cited in note 38).

silk-reeling factory. "But since there were lots of us and we all worked together, it was kind of fun. And besides, it paid better."[60] Had the workers earned market-clearing wages for harsh work, one suspects few would have remembered their factory years with the affection that Yamamoto found.

4. Performance bonds.

The textile firms offered labor contracts that in other ways corroborated how hard they tried to create incentives for their employees not to shirk. Most dramatically, many firms withheld part of their workers' wages as performance bonds. As it had been for many indentured servants in the Americas,[61] part of a textile worker's pay was contingent on her satisfactorily completing her contract.[62] If she shirked or quit, the firm kept the bond; if she worked well and completed her contract, it paid her the bond when she quit. As one might expect, workers hated these contractual provisions.[63] Only firms that found it unusually hard to monitor their workers would have demanded contracts that placed their workers in as disadvantageous a position as did these.

Table 8: THE PRICE AND QUANTITY OF LABOR IN COTTON SPINNING

	A. Daily (current ¥)	B. Hourly (constant sen)	C. Spin/ agri.	D. Quantity (person-days)
1890	.08	2.22		2,762
1892	.09	2.71	1.37	4,984
1894	.10	2.95	1.43	7,842
1896	.12	2.85	1.47	9,405
1898	.16	3.27	1.17	15,413
1900	.19	3.96	1.61	15,236
1902	.22	4.10	1.71	16,933
1904	.22	4.07	1.75	13,952
1906	.25	4.02	1.84	20,153
1908	.27	4.13	1.90	17,999
1910	.29	4.68	2.14	23,263
1912	.32	4.38	1.65	25,200
1914	.33	4.79	2.21	29,271
1916	.33	4.74	2.08	32,616
1918	.47	4.10	1.57	29,415
1920	1.31	8.95	2.74	34,103

[60] Quoted in Yamamoto, *Tragic History* at 336 (cited in note 38).

[61] Stanley L. Engerman, *Servants to Slaves to Servants: Contract Labour and European Expansion*, in P.C. Emmer, ed, *Colonialism and Migration; Indentured Labour Before and After Slavery* 263, 268-69 (M. Nijhoff, 1986).

[62] See Chuo, *Women in the Spinning Industry* at 67-68 (cited in note 49); Nobuhiko Murakami, *Meiji josei shi [A History of Meiji Women]* 135 (Riron sha, 1971).

[63] See Noshomu sho, ed, *Menshi boseki shokko jijo [Conditions of Factory Workers in Cotton Spinning]* 99 (Noshomu sho, 1903).

Table 8 (cont'd):

1922	1.30	9.49	2.38	41,885
1924	1.29	10.26	2.38	35,627
1926	1.30	10.70	2.38	45,118
1928	1.35	11.76	2.83	38,720
1930	1.16	13.97	2.56	33,710
1932	.85	11.16	2.79	33,197
1934	.77	9.62	2.43	38,830
1936	.73	8.76	2.01	40,158

Notes:
(A) Mean daily wage in yen for female workers in cotton spinning sector, current prices.
(B) Mean hourly wage in sen (¥1/100) for female workers in cotton spinning sector, constant 1934-36 prices.
(C) Mean annual wage for female workers in cotton spinning sector, divided by mean annual wage for female workers in agricultural industry.
(D) 1000 person-days worked by female laborers in spinning sector.

Sources: Calculated on the basis of data from Shozaburo Fujino, Shino Fujino and Akira Ono, *Choki keizai tokei: Sen'i kogyo [Long-Term Economic Statistics: The Textile Industry]* 27, 256-77 (Toyo keizai shimpo sha, 1979); Takahiko Hashimoto, *Nippon menshiseki gyo shi nempo [A Time Line for the Japanese Cotton Yarn Spinning Industry]* (Bunka shi nempyo seisaku kenkyu kai, 1935); Noshomu sho somukyoku tokeika, ed, *Noshomu tokei hyo [Agricultural and Commercial Statistics]* (Noshomu sho somukyoku tokeika, years listed in table); Kazushi Ohkawa, et al *Choki keizai tokei: Bukka [Long-Term Economic Statistics: Prices]* 134-36 (Toyo keizai shimpo sha, 1967); Takejiro Shindo, *Mengyo rodo sanko tokei [Reference Statistics Regarding Labor in the Cotton Industry]* 500-03 (Tokyo daigaku shuppan kai, 1958); Matsuji Umemura, et al, *Choki keizai tokei: Norin gyo [Long-term Economic Statistics: Agriculture and Forestry]* 220-21 (Toyo keizai shimpo sha, 1966).

C. Cartels as a Corporate Governance Mechanism

Return, then, to the basic question: if the Boren firms could not earn monopoly rents, why did they coordinate production cuts? The answer, I suggest, derives from the principal-agent slack in corporate governance: absent a cartel, managers would have found it difficult credibly to commit to keeping the firm's efficiency wage regime. In turn, that difficulty derived from four constraints on the contractual structure of the pre-war cotton spinning firms:

1. The firm's managers often needed to raise funds from a broad range of investors.
2. The firm needed to respond to demand shocks by cutting production, and by *not* cutting its efficiency wage premium.
3. Investors could obtain only noisy information (a) about the wages that their managers paid laborers, and (b) about the demand curve that the industry faced.
4. Managers hesitated to run the plant at less than full capacity.

Take each of these constraints in turn.

1. Dispersed ownership.

Because cotton spinning firms faced significant economies of scale,[64] many could raise the large amounts of capital they needed only by issuing stock to a wide spectrum of investors. Together, these firms accounted for a major part of the trades on the Tokyo and the Osaka stock exchanges.[65] Had they been able to attract money from the large conglomerates (the *zaibatsu*), perhaps they could have avoided widely dispersed stock holdings. Whatever the reason, however, those conglomerates chose not to invest heavily in cotton spinning (Table 10). The firms thus often had little choice but to build publicly held firms.

2. Demand shock responses.

For reasons explained above,[66] spinning firms needed to ensure that the managers did not respond to demand shocks by cutting the firm's efficiency wage premium. Necessarily, this meant they had to reduce production.

3. Noisy information.

a) Wages. Public investors in the spinning firms had only noisy information about their firm's wage scales. Had the firm paid its workers a straight daily wage, a straight seniority based wage, or a straight piece-rate contract, the investors would have had clean information. Their managers could have reported the scale they paid, and they could then have hired an independent auditor to verify the report.

Most cotton spinning firms, however, blended seniority wages with piece-rate wages.[67] Pure fixed or seniority-based contracts created incentive problems: workers had less reason to

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[64] Seki, *Japanese Cotton Industry Theory* at 204, 473 (cited in note 4).

[65] See generally Osaka kabushiki torihiki sho, ed, *Okabu 50-nenshi [50-Year History of the OSE]* (Osaka kabushiki torihiki sho, 1928) ("50-Year History"); Tokyo kabushiki torihiki sho, ed, *Tokyo kabushiki torihiki sho [The Tokyo Stock Exchange]* (Keizai shimbun sha, 1916) ("Tokyo Stock Exchange").

[66] See text accompanying note 46.

[67] Riyuemon Uno, *Shokko chingin shiharai no shin hoho [A New Means of Paying Factory Workers]* (Kogyo kyoiku kai, 1913); Hosei, *Keihin Industrial Area Wages* at 160-89 (cited in note 48). Tsurumi, *Factory Girls* at 148 (cited in note 47), claims that firms generally used pure piece-rate contracts for women, but this claim is belied by her own account of the many discretionary adjustments made.

work hard, and more reason to shirk. Pure piece-rate contracts created metering and quality problems: (i) cotton spinning involved too much team production to permit a manager to meter individual output cleanly and readily, and (ii) piece-rate contracts induced workers to lower the quality of the output they produced. To mitigate these problems, most cotton spinning firms blended the two contractual forms: they paid a worker by her team's output, but on an individualized per-unit scale that depended on how the manager generally appraised the pace and quality of her work. As a result, a manager rated each worker's skill and diligence. He gauged the quality and quantity of her output, and adjusted his estimate from time to time as warranted. In turn, she could increase her pay both by inducing her team to increase its production (thereby increasing her own units of output), and by impressing her supervisor (thereby increasing her per-unit wage).

Investors received only noisy information about all this for two reasons: the factory hired new workers regularly, and the investors could not readily gauge whether a manager promoted his workers on the per-unit scale at the optimal pace. To create the right incentives for their workers, the investors had to delegate discretion to their manager. In the process, they necessarily left themselves vulnerable. If a manager wanted to cheat on the firm's efficiency wages, he could promote his workers too slowly; if he wanted to waste firm resources, he could promote them too generously. Should he promote workers either too quickly or too slowly, investors would learn that fact only much later, if at all. Eventually, they might discover that they were paying higher wages than they needed to pay, or that they were incurring higher monitoring costs because their spartan wages had raised employee shirking. Alternatively, though, they might never know. Firms fail for a myriad of reasons, and many investors never learn why; ex post, investors often have trouble disentangling why a firm did so poorly. The managers responsible may have long since left anyway.

b) Demand curve. While investors lacked clean information about their own wage scales, they also lacked clean information about the industry's demand curve. Granted, they knew their own firm's sales. Yet, with only that information they could not distinguish between (i) a fall in industry-wide demand and (ii) a fall in demand specific to their firm. These two problems, however, dictated radically different responses: the former dictated production cuts, while the latter required a

product change to meet consumer tastes. Absent industry-wide information, investors could not distinguish the two.[68]

4. Managerial reluctance to cut production.

Even where investors would have wanted their manager to cut production, a manager sometimes had an incentive not to do so. To see why, suppose first that he had short-term horizons. Many probably did, for the shortage of well-trained managers enabled people who wanted to switch jobs to do so easily. For them, pre-war Japan was not the Japan of "lifetime employment." Suppose too that a manager discovered that industry-wide demand had fallen. If he either operated the plant at a loss or idled part of it, investors would notice. If he kept the plant at full capacity and kept it in the black by cutting wages, investors would not notice—at least for some time. To cut the short-term wage bill, he needed only to slow the rate at which he promoted his workers. In the long run, by lowering the efficiency wage premium the firm paid, he would increase shirking and raise the firm's wage bill. In the short run, he could avoid an investigation of his managerial activities—and the short run can often last a long time.

The manager's incentive to cut wages and operate the plant at full capacity stemmed from the noisy information and collective action problems the firm's investors faced. Assume—counterfactually—that a single investor with perfect information owned each cotton spinning firm. If industry-wide demand fell, the investor could order his manager to cut capacity. If the manager instead cut wages, he could fire him. Now assume—more realistically—that investors had noisy and incomplete information, and that each owned only a small share of the firm. Two problems would ensue. First, because of their coarse information sets, investors could not distinguish industry-wide slumps from firm-specific declines. Second, because of their collective-action problems, investors had little incentive to intervene in their firm unless they received strong signals that their managers might have misbehaved.[69]

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[68] Price information on yarns would not yield this information because of the broad fluctuations in prices during these years. See Kazushi Ohkawa, et al, *Choki keizai tokei: Bukka [Long-Term Economic Statistics: Prices]* 134-36 (Toyo keizai shimpo sha, 1967).

[69] True, because the stock was listed on the national exchanges, they could easily sell their interests even if they received only weak signals that their managers had misbehaved. Given that their sale price would have incorporated those signals, though, they

To protect his tenure at a firm, a manager had somehow to insure that investors received no strong signals that he may have mismanaged it. If he either ran the plant in the red or idled part of it, he sent just such a signal. He then ran the risk that investors would find it cost-effective to intervene and investigate. If the manager had idled the plant, he might have done so either (a) because of an industry-wide slump, or (b) because of his own poor performance. If he could be sure investors would obtain perfect information, then he would not worry whether he had done a good job. The investors would absolve him and leave. If investors could obtain only noisy and incomplete information, however, then even an honest and able manager faced a nontrivial risk of discharge or demotion. In such a world, a manager often did better by sending no signals that investors might interpret unfavorably.

5. The solution.

Firms in the Japanese cotton spinning industry solved these problems through the Boren. They did so in two steps. First, they pooled information about industry-wide demand. By contributing information about their own firms, they together generated the data that let them gauge the extent they suffered from industry-wide demand shocks. They could then forward that information to their investors, and—if their investors faced no collective-action problems—those investors could determine whether the firm should cut capacity. Absent collective-action problems, the firms needed the Boren for information pooling and for nothing more.

Yet the investors in many cotton spinning firms did face collective action problems, and it was to mitigate those problems that the Boren not only pooled information but also ordered capacity cuts. Just as privately held firms could trust their owner to decide whether to cut production, publicly traded firms could replicate that result by delegating the decision about production cuts to a third party, the Boren. In giving Boren officers the authority over production cuts during demand shocks, managers committed themselves credibly to reducing output during slack times. In the process, they lowered their firm's marginal costs, increased the odds that the firm would stay in the black, and thereby mitigated their own incentive to cut the firm's wage scale.[70] In the process, they helped commit themselves to the

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would have found the sale small consolation.

[70] Obviously, managers still had an incentive to cut wages in order to keep the firm

firm's efficiency wage strategy, and reduced their investors' cost of verifying that they adhered to that strategy. In effect, managers and owners assigned to the Boren the task not just of pooling information, but of interpreting it, of enforcing that interpretation, and of (indirectly) protecting wage levels.[71]

The Boren membership patterns loosely corroborate this hypothesis. During the early decades of the century, not all cotton spinning firms joined the Boren. However, nearly all firms that listed their shares on either the Tokyo or Osaka stock exchange did. All such firms faced the principal-agent and collective-action problems described above, and most mitigated them through the Boren. Only privately held firms faced less of a problem, and primarily only they avoided the Boren.[72]

Note that this hypothesis for the Boren's cartel solves two puzzles posed earlier. First, it explains why the firms formed this cartel despite the prisoners' dilemma that cartels are said to face. Cartels face a prisoners' dilemma only if the firms hope to earn monopoly rents. If—as here—they are not trying to earn such rents, they face no dilemma. In the case of the Boren, the firms joined the cartel to solve an *internal* monitoring problem. As a result, they found it profitable to obey the cartel's mandate regardless of what other firms did.

Second, this hypothesis explains why the Boren did not need to limit investments in new capacity during the times it mandated production cuts. Recall that the Boren often required firms to

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in the black if the firm was losing money for other reasons. The Boren did not solve the problem of credible commitments for all purposes—it mitigated it for one of the most common situations in which managers would have had an incentive to cheat on the efficiency wage.

[71] Note that this was a low-risk strategy. In a world without antitrust laws, firms did not incur legal risks in fixing quantities. Moreover, in an internationally competitive industry with many spinners from many countries, the firms did not incur many technological risks by sharing information. See Saxonhouse, 12 Managerial & Dec Econ at 2 (cited in note 31).

[72] Of the 11 non-Boren cotton spinning firms listed in Zaisei, *Japanese Textile Industry Overview* at 210 (cited in note 24), none had listed stock. Although Nippon kangyo, *Cotton Threat* at 58 (cited in note 8), lists two muslin firms outside the Boren and both had publicly traded stock, Shigeru Kano, ed, *Tokyo kabushiki torihiki jo [Tokyo Stock Exchange]* 125 (Hideshi Kano, 1933), lists these firms as not being cotton spinning firms. It is difficult to differentiate cotton spinning firms on the basis of name alone. If we eliminate firms that seem to have specialized in flax and wool, however, as of 1925 the only non-Boren cotton spinning firm on either the Tokyo Stock Exchange or the Osaka Stock Exchange was one Naniwa boshoku. On Boren membership, see Dai-Nippon, *Great Japan Spinning* (cited in note 19). On the stock listings, see Osaka, *50-Year History* (cited in note 65); Tokyo, *Tokyo Stock Exchange* (cited in note 65); Kano, *Tokyo Stock Exchange* (cited in this note).

idle specified percentages of their capacity, but never banned them from augmenting that capacity (Table 2). If Boren members hoped to raise prices, this made no sense. Without a way to limit new capacity, they could not have cut production and could not have raised prices. By contrast, suppose that the Boren firms negotiated their agreement only to mitigate the agency slack between investors and their managers. The firms now did not need to use the Boren to ban investments in new capacity because most of them had already removed that decision from the prerogative of the managers and assigned it to the investors directly. They did so by regularly draining the firm of cash.[73] Through high dividend policies, they insured that they often could build new plants only by raising new capital—only by subjecting their new project to the discipline of the capital market.[74] The Boren's cartel was a way for managers better to align their incentives with those of their shareholders on those matters entrusted to the managers; decisions about new investments were decisions that the shareholders never entrusted to the managers.

6. Limitations.

I began this article by suggesting this analysis might—potentially—explain a variety of cartels anywhere. As noted above, however, this analysis depends on several assumptions that do limit its applicability. In the interests of full disclosure, I repeat those assumptions here. First and most obviously, this hypothesis explains cartels only where firms find it profitable to pay efficiency wages. If they prefer to pay market-clearing wages, this analysis will not apply.

Second, the more closely shareholders can monitor managers, the less likely this hypothesis applies. In this paper, I assume that shareholders could not readily monitor what their managers did. They could not easily verify the wages managers paid workers. They could not even intervene in corporate affairs routinely. Instead, they often saw the results of mismanagement only after it had taken its toll on the firm, and they intervened in the firm only when their manager sent relatively strong signals that he might have mismanaged. For turn-of-the-century Japan, these

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[73] For evidence of high dividend rates in the spinning industry, see Dai-Nippon boseki rengo kai, *Menshi boseki jijo sanko sho [Reference Regarding Cotton Yarn Spinning Matters]* (Dai-Nippon boseki rengo kai, various years).

[74] See Frank H. Easterbrook, *Two Agency-Cost Explanations of Dividends*, 74 Am Econ Rev 650, 654 (1984).

are not unreasonable assumptions: economic historians regularly remind us that managing a large factory requires institutions and technologies we have only recently acquired.[75] For modern industries, however, these institutional and technological constraints may bind less.

Third, the more often firms in the industry face different cost curves, the less likely this hypothesis applies. Firms will find it advantageous to assign to a third party the right to order uniform reductions in the machines they operate only if they face relatively similar costs. The greater the dispersion in those costs, the less likely they will find such an arrangement advantageous.

Table 9: Scale Economies in Cotton Spinning

A. Relative Costs:

Spindles/ Factory	Materials	Wages (labor)	Amenities (labor)	Operating Costs	Total
5,000	21.77	104.14	16.92	22.37	165.20
10,000	21.77	73.59	11.95	19.34	126.65
20,000	21.77	57.66	9.35	18.84	107.64
30,000	21.77	51.53	8.37	18.33	100.00
40,000	21.77	49.25	8.00	18.09	97.11
50,000	21.77	47.97	7.79	17.93	95.46
60,000	21.77	47.14	7.66	17.83	94.40

B. Firm Size:

Number of Spindles	No. of Firms	(%)	Total Spindles	(%)
Under 10,000	10	(12.5)	51,268	(0.4)
10,000- 49,999	25	(31.3)	614,820	(5.0)
50,000- 99,999	14	(17.5)	932,828	(7.5)
100,000-299,999	20	(25.0)	3,040,996	(24.6)
300,000-499,999	3	(3.7)	1,050,604	(8.5)
500,000 and over	8	(10.0)	6,668,248	(54.0)

Note: In A, costs are indexed by expenses for 30,000-spindle factories, and are for No. 20 yarn. In B, firm size is as of 1937.

Source: Keizo Seki, *Nihon mengyo ron [A Theory of the Japanese Cotton Industry]* 204, 473 (Tokyo daigaku shuppan kai, 1954).

Table 10: Zaibatsu Investments in Cotton Spinning

A. Zaibatsu Holdings in Spinning Firms

The Mitsui Zaibatsu

Textile firm	Mitsui shareholding	Firm spindles	Mitsui share of spindles
Kanebo	6.71 %	615,192	41,279
Kinka boseki	41.36	144,624	59,816
Toyoda boshoku	5.97	79,824	4,765
Tenma boshoku	48.58	65,792	31,962
Utsumi boshoku	48.97	72,500	35,503
Tokyo mosurin	48.52	79,128	38,393
Kikui boshoku	1.43	62,428	768

[75] See generally, Alfred D. Chandler, Jr., *The Visible Hand: The Managerial Revolution in American Business* (Belknap, 1977); Peter Temin, ed, *Inside the Business Enterprise: Historical Perspectives on the Use of Information* (Chicago, 1991).

Table 10 (cont'd):

The Mitsubishi Zaibatsu

	Mitsubishi s/g	Firm spindles	Mitsubishi share
Nagasaki boshoku	2.79	98,656	2,753
Fuji gasu boseki 1.43	502,104	7,180	

The Sumitomo Zaibatsu

	Sumitomo s/g	Firm spindles	Sumitomo share
Osaka godo boseki	0.67	427,524	2,864

The Yasuda Zaibatsu

	Yasuda s/g	Firm spindles	Yasuda share
Osaka godo boseki 0.86	427,524	3,677	

B. Zaibatsu Share of Total Industry Spindles (6,529,394)

Spindles	Percent	
Mitsui	212,486	3.25
Mitsubishi	9,933	0.15
Sumitomo	2,864	0.04
Yasuda	3,677	0.06
TOTAL	228,960	3.50

Notes: Figures are from Takahashi (cited below) where available, and from stockholder lists in company semi-annual reports where not. Mitsui ownership in Kinka and Tokyo mosurin are Takahashi's estimates. Stock classes are combined on an equal basis. Figures are as of approximately 1928.

Sources: Kamekichi Takahashi, *Nippon zaibatsu no kaibo [An Analysis of the Japanese Zaibatsu]* (Chuo koron sha, 1930); (Kikui boshoku, Semi-annual Company Reports (1928); Tenma boshoku, Semi-annual Company Reports (1928); and Osaka bodo, Semi-annual Company Reports (1928)).

CONCLUSION

Peasants may be poor, Donald McCloskey reminds us, but they are not fools.[76] They respond to market incentives, and they respond rationally. To induce them to work in the new cotton spinning factories, the owners had to make it worth their while; to induce them to work hard in the new mills, they had to make it lucrative. The owners did so by paying peasant women double or triple their market-clearing wage. Largely, their scheme worked. Rather than lose such a well-paying job, the young women worked hard.

Within the firm, that which promoted the welfare of its managers did not always promote the welfare of its investors. In particular, given the noisy information and the diversified ownership

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[76] Donald N. McCloskey, *The Prudent Peasant: New Findings in Open Fields*, 51 J Econ Hist 343 (1991).

patterns in the industry, managers sometimes had an incentive to respond to demand shocks suboptimally—to cheat on the firm's high wage strategy rather than to cut plant capacity. To commit credibly to cutting capacity rather than wages, the managers placed the firm in the Boren. By joining a production-limitation cartel, they tied their hands—they assigned the decision about wage and production cuts to a third party, and removed their own incentive to lower the wage premium the firm paid to its workers during slack demand.

Although the Boren adopted the appearance of a cartel, it accomplished something radically different. The spinning firms used a cartel to coordinate production cutbacks, but they did not use it to earn monopoly rents. Instead, they used it to lower operating costs. Whether in Japan or elsewhere, scholars too readily conclude that if it looks like a monopoly rent and quacks like a monopoly rent, it must be a monopoly rent. Like ducks, like rents: the Japanese spinning firms illustrate again how wrong that approach can be.