The Effect of the Livestock Mandatory Reporting Act on Market Transparency and Grid Price Dispersion

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The Livestock Mandatory Reporting Act (MPR) of 1999 was implemented in April 2001. Empirical evidence indicates a significant change in intra-week price dispersion associated with publicly reported fed cattle grid premiums and discounts occurring after MPR implementation.

  The research objective is to evaluate the effect of increased market transparency resulting from implementation of MPR, on grid intra-week premium and discount dispersion levels. Empirical results suggest that increased transparency is compatible with intra-week dispersion levels increasing. Increased dispersion suggests that during the pre-MPR period weekly premium and discount data may have been drawn from a non-representative sample. From the empirical evidence, it is concluded that reform of the livestock price-reporting system appears to have been necessary in the case of publically reported grid premiums and discounts.

Key Words: fed cattle, grid pricing, market transparency, price dispersion, price volatility, mandatory livestock price reporting

The Livestock Mandatory Reporting Act (MPR) of 1999 was implemented in April 2001. Discussion in the fed cattle marketing literature suggests that increased industrial concentration in the packing and feedlot industries, and increased use of captive supply procurement methods, were the primary causes of the Voluntary Price Reporting (VPR) system's failure to provide accurate and timely market information to market participants, i.e., a lack of market transparency (e.g., Anderson et al. 1998, Wachenheim and DeVuyst 2001).

  In the literature discussing the economic implications of MPR, the inverse relationship between market transparency and transaction price dispersion is discussed within the context of price uncertainty for market participants (i.e., Azzam 2003). Azzam's discussion of declining price dispersion, as a result of MPR implementation, is equivalent to a decline in the variance of a random variable's probability density function. A decline in the variance of a random variable's probability density function is analogous to the neoclassical definition of a decrease in price uncertainty (e.g., Sandmo 1971). This view of the relationship between transparency and price dispersion is also consistent with the discussion by Tomek (1980) on the inverse relationship between transaction price variance and the proportion of transactions reported.

  The U.S. Department of Agriculture's Agricultural Marketing Service (AMS) has been providing weekly grid price reports for slaughter cattle since October 1996. These reports provide the market with information on weekly premiums and discounts being paid by packing firms for carcasses with specific quality grade, yield grade, and weight attributes (Fausti, Feuz, and Wagner 1998). In effect, individual packer reported grid premiums and discounts are equivalent to market prices because the firm's premium and discount schedule reflects the prices being paid for specific carcass attributes for a specific week. It is in this context that we are discussing price dispersion. Price dispersion, for our purpose, is defined as the intra-week price spread for a specific grid premium or discount between packing firms that are reporting their grid price schedules to the AMS.

Prior to implementation of MPR, grid price reports were based on information collected from meat packing companies under a voluntary price-reporting system. When the VPR system ended, six packing firms were providing weekly reports on premiums and discounts at the firm level. Under MPR, all firms slaughtering over 125,000 animals annually are now required to report price information for each plant they operate. As a result, market transparency has increased due to (i) an increased number of firms reporting, and (ii) an increase in the accuracy of information being reported by packing firms.

However, the AMS reports only the mean and statistical range for grid premiums and discounts for different categories on a weekly basis. The statistical range is a measure of dispersion. Time-series data for the weekly range of reported grid premiums and discounts illustrate that the range actually increased after MPR implementation for all quality grade categories depicted in Figure 1. Yield grade categories and carcass weight discount categories also display a similar pattern.

The empirical literature investigating the effect of structural reform of public price reporting of slaughter cattle prices on market transparency has focused on the cash markets with respect to live and dressed weight prices for finished cattle (Fausti and Diersen 2004, Pendell and Schroeder 2006, Fausti, Diersen, and Qasmi 2007). These authors found no supporting statistical evidence to corroborate the view that there was a lack of market transparency in the fed cattle cash market prior to the implementation of MPR.

The USDA's Economic Research Service (ERS) released a study (Perry et al. 2005) on the effect of MPR on the fed cattle market. Two conclusions reached by Perry et al. (2005) in the ERS study are germane to the issue we address: (i) they conclude that "the mandatory data seem to better represent market conditions" (p. 1), and (ii) they report increased price volatility in the post-MPR period and state that this is an unexpected result (pp. 27–30).

The increase in the statistical range for premiums and discounts, and the increase in cattle price volatility reported by the ERS, are not consistent with the predictions of the MPR literature related to the effect of increased transparency.[1] Neverthe-

less, increased transparency is the result of MPR. Therefore, an important question is raised: Is increased transparency compatible with increased price dispersion?

This empirical puzzle highlights the need for additional inquiry into the relationship between increased market transparency and price dispersion. A formal hypothesis is introduced, linking the presence of a sampling bias in the VPR system for collecting data on grid premiums and discounts to the unexpected presence of increased premium and discount dispersion in the post-MPR period. The conclusion drawn from this inquiry is that sample-selection bias in the pre-MPR period is a plausible explanation for the coexistence of increased market transparency and increased price dispersion in the post-MPR period.

Literature Review of Cattle Marketing Issues

Grid Pricing

The development of a value-based marketing system for fed cattle has been a priority issue for the beef industry since the publication of *The War on Fat* by the Value Based Marketing Taskforce (VBMTF) in 1990.[2] Today the most successful form of value-based marketing (VBM) for cattle is referred to as "grid pricing" (Fausti, Feuz, and Wagner 1998).[3]

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[1] Price dispersion refers to distribution of transaction prices being reported by firms at period t. Increased dispersion refers to an expansion of that distribution in period $t + 1$. The statistical range is a meas-

ure of dispersion. Price volatility refers to the fluctuation in the price level of a commodity. An increase in price volatility indicates an increase in price level variation at period $t + 1$ relative to period t. Azzam (2003) and Tomek (1980) both discuss transparency in the context of price dispersion, not price volatility. Changes in grid premium and discount volatility can be investigated by comparing the standard deviation of the weekly reported grid premium or discount mean ($\overline{\chi}$) for the pre-MPR period to the post-MPR period. Price volatility is not the issue being investigated in this paper, but increased price dispersion, if persistent over time, may result in increased price volatility.

[2] In the late 1980s, the National Cattlemen's Beef Association (NCBA) sanctioned the formation of the Valued Based Marketing Taskforce to study the competitive position of beef. The taskforce issued a white paper in 1990 titled *The War on Fat*. The taskforce identified average pricing of slaughter cattle in the cash market as a major barrier to the transmission of consumer preferences for leaner beef product with greater quality consistency back to the producer via the price mechanism. For an expanded discussion on the issue of value-based marketing for slaughter cattle, see Cross and Savell (1994) and Fausti, Feuz, and Wagner (1998).

[3] Grid pricing typically accesses carcass premiums and discounts based on carcass quality grade, carcass yield grade, and hot carcass weight. The concept of grid pricing evolved from the traditional grade and yield pricing system. The AMS weekly public report provides prices for quality grade (prime, select, standard), yield grade (Yg 1.0–2.0, Yg 2.0–2.5, Yg 2.5–3.0, Yg 3.0–3.5, Yg 3.5–4.0, Yg 4.0–5.0, Yg > 5), and weight discounts based on hot carcass weight (400–500, 500–550, 950–1000, and over 1,000 lbs).

Panel A: Premium ranges for Prime

Panel B: Discount ranges for Select

Panel C: Discount ranges for Standard
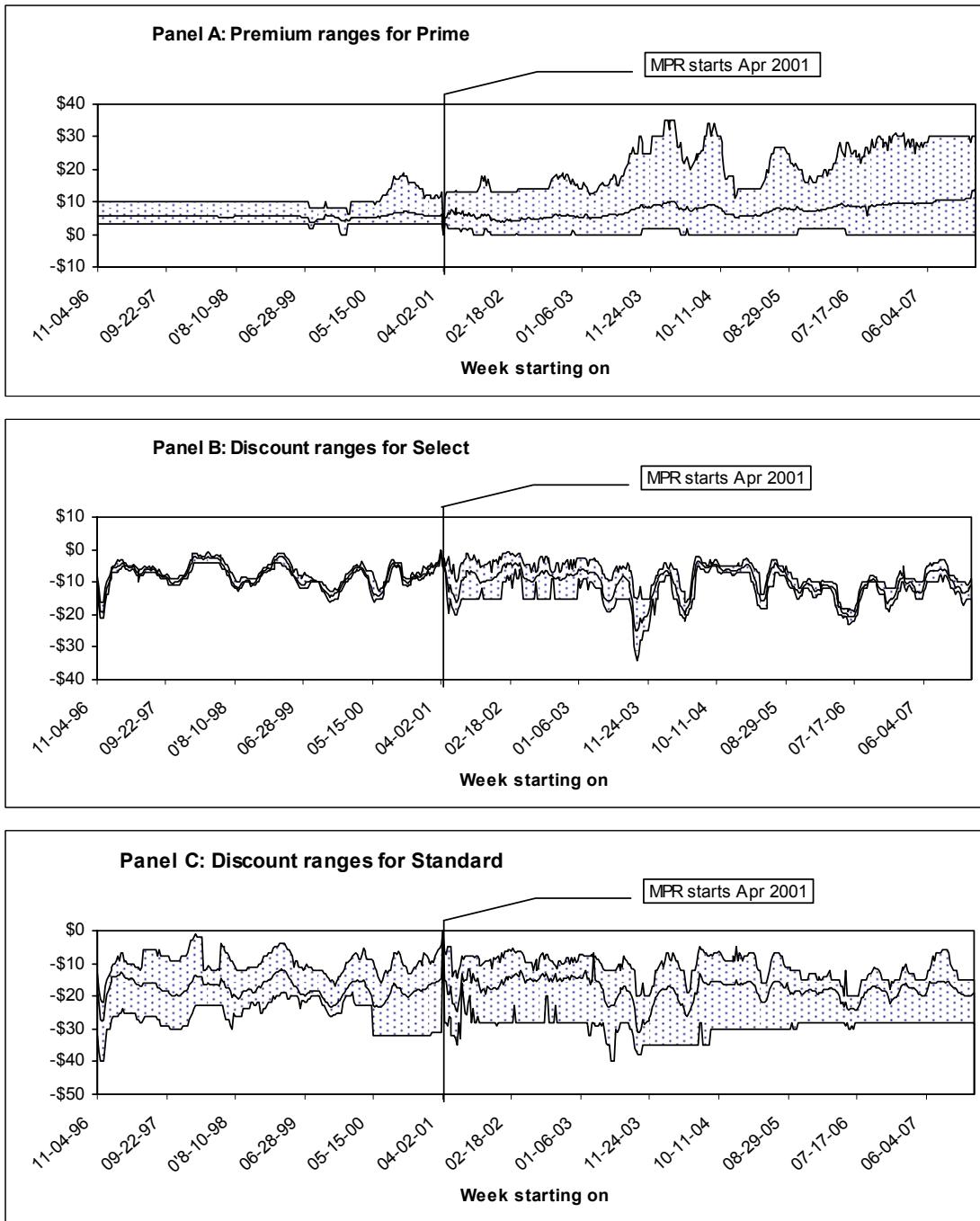
Figure 1. Changes in Premiums and Discounts for Quality Grades

Note: Time-series graphics reflect the maximum, average, and minimum values of the data, respectively.

The focus in the grid-pricing literature has been on the incentive structure of grid pricing relative to average pricing of slaughter cattle, and its po-tential success in supplanting the average pricing alternative (e.g., Johnson and Ward 2005, Fausti and Qasmi 2002, Feuz 1999, Fausti and Feuz

1995). Feuz (1999) estimated that there were at least 25 different price grids being used by the packing industry shortly after the AMS began issuing public grid price reports. He points out that packer premium and discount schedules vary across firms. He also discussed the practice of large packing firms adjusting their grid premium and discount schedules based on plant averages. His discussion of the differences across grid-pricing mechanisms indicates that premiums and discounts not only vary across firms but can also vary across plants within a firm. Feuz's discussion of packing industry pricing practices suggests that pre-MPR public reports of weekly grid prices may not have fully captured the market variation in premiums and discounts.

MPR Background

The impetus for imposing MPR in U.S. livestock markets was generated by beef industry interest groups (producer groups, livestock economists, and government officials) who believed that VPR had become an ineffective public information mechanism for providing transparency in livestock markets. Recent empirical studies, however, suggest that MPR has only marginally improved transparency in the fed cattle cash market (Grunewald, Schroeder, and Ward 2004, Fausti and Diersen 2004, Pendell and Schroeder 2006, Fausti, Diersen, and Qasmi 2007). Accordingly, these research findings suggest that the VPR system was not as inefficient as alluded to in the earlier literature, but the general consensus is that MPR has had a positive effect on the level of transparency in the slaughter cattle market (e.g., Perry et al. 2005, Ward 2006).

    Previous empirical studies examining the time-series behavior of grid price series (VPR and MPR) suggest that there is evidence of an increase in premium and discount variability after MPR implementation (Priebe 2004, Hogan and Ward 2005). Increased premium and discount volatility in the post-MPR period is contrary to the expectations for volatility prior to the implementation of MPR. Perry et al. (2005, pp. 28–30) provide a set of ad hoc possibilities for increased volatility in the post-MPR era, but conclude that "Current research is not able to identify the source of this increased volatility."

Public Livestock Price Reporting by the AMS

Each week the AMS reports the mean and the statistical range for each grid premium and discount category. The premiums or discounts revealed by the surveyed packers to the AMS under VPR, and the reporting packers under MPR, reflect what individual packers are going to pay for the coming week. This process holds true for both VPR and MPR.

Grid Price-Reporting Mechanism under VPR

Under the VPR system, on Monday morning the AMS office in Des Moines, Iowa, contacted each packer on its survey list and collected information on the packer's discount and premium schedule for the coming week. Packing firms reported firm-level premium and discount schedules. The voluntary nature of the reporting precluded any auditing or verification procedures. In the last year of VPR, six packing firms were voluntarily reporting premium and discount schedules to the AMS on a weekly basis.[4] In the year 2000, the four and eight largest packing firms accounted for 81 percent and 90 percent of total steer and heifer slaughter, respectively (USDA 2004, p. 44).

Grid Price-Reporting Mechanism under MPR

After MPR implementation, the St. Joseph, Missouri, office of the AMS was given the responsibility of collecting packer grid premium and discount data. The St. Joseph office considers its premium and discount reports to be distinctly different from the reports issued under the old reporting regime (VPR). Packers under MPR are required to submit a "Cattle Premiums and Discount Weekly Report" (form # LS-117) by 9 am central on the first reporting day of the week. This report must be filed for each plant operated by packers slaughtering over 125,000 animals annually and purchasing cattle on a grid. The St. Joseph office tabulates the reported data and issues a public report each Monday. The report contains essentially the same premium and discount categories and provides the weekly simple average

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[4] The AMS data collection procedure was verified by the authors via a personal phone call made on July 15, 2005, to the Des Moines, Iowa, office.

and range for each category.[5] The St. Joseph office is not responsible for conducting formal plant audits. The USDA ARC (Audit, Review and Compliance) office is responsible for conducting formal audits (there are several auditors stationed in St. Joseph).[6] The structure of the new reporting regime suggests that the packing industry will be more diligent in providing accurate weekly premium and discount reports to the St. Joseph office.

The passage of MPR regulations altered the institutional structure of public price-reporting of grid premiums and discounts for slaughter cattle in two ways. First, all firms slaughtering 125,000 cattle annually are mandated to report premiums and discounts for all grids on which they purchase cattle at each plant. Consequently, the weekly data observations reported to the AMS under MPR comprises approximately 90 percent of total U.S. steer and heifer slaughter (Perry et al. 2005, p. 10). Thus, MPR data covers a higher proportion of slaughter and is collected at the plant level as compared to VPR data collected at the firm level. Second, the ARC was given the right to audit the weekly reports submitted by firms. This is expected to change the behavior of reporting firms. Mandated packer reporting is expected to increase packer diligence in the reporting of data to the AMS and therefore increase the accuracy of information reported under MPR.[7]

Economic Implications of Regime Reform

The Economic Research Service (Perry et al. 2005) investigated the effect of MPR on the quality of market information and unexpectedly found that (i) fed cattle formula prices tracked negotiated prices (including grid) closely (pp. 16–20), (ii) negotiated slaughter volume stabilized and even improved (pp. 21–24), and (iii) cattle price volatility increased (pp. 27–30).

The ERS lists a number of sources of potential data anomalies that may have affected the statistical quality of public price reports in the pre-MPR period: (i) bargaining behavior of buyers and sellers varying from week to week, (ii) changes in animal quality from week to week, and (iii) the practice of AMS market reporters screening out transactions that appear to be outliers (Perry et al. 2005, pp. 27–28). However, the ERS did not provide any conclusive evidence to suggest that these practices did bias pre-MPR reports.

Changes in bargaining behavior or animal quality evolve over time. Therefore, weekly changes in bargaining behavior or animal quality appear to be an unlikely explanation for the sudden and dramatic increase in grid price dispersion that occurred after MPR implementation (Figure 1).

The third data anomaly raised by the ERS—the screening of outliers by market reporters—is unlikely, but possible, in the case of AMS grid premium and discount reports in the pre-MPR period. AMS pre-MPR weekly grid price reports contained only the mean and range for each grid category. These summary statistics were based on a data collection procedure that used a weekly phone survey of a small set of packing firms. Therefore, the potential for AMS reporters to screen pre-MPR grid price data seems to be remote given that (i) information being voluntarily provided to the AMS was already limited, and (ii) the sample size was already very small. The alternative possibility is that a type of self-selection reporting bias was introduced into the data collection process because packers voluntarily provide grid premium and discount information to the AMS that reflect firm-level data. As Feuz (1999) alluded to, packing firms adjust individual packing plant grid premium and discount schedules with respect to regional market conditions. The AMS weekly survey did not capture this intra-firm grid premium and discount dispersion. This type of sampling bias appears to be a function of the survey design.

The survey procedure used by the AMS to collect grid premium and discount data suggests an alternative and more tractable hypothesis than the data anomaly supposition proposed by the ERS. We propose that the AMS employed a sampling procedure under VPR that may have resulted in a non-representative sample of packer pricing intentions being used to provide data for weekly grid premium and discount reports. A non-repre-

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[5] This is true for the LM_CT155 national report but the AMS also releases a 5-area premium and discount report that is a weighted average of those plants located in the 5-area feeding region (LM_CT169).

[6] It is the view of the AMS that packing plants, post-MPR, are providing the actual premium and discount schedule they will be using for the coming week when the packers file their reports Monday morning. This statement is based on e-mail correspondence with an AMS market reporter.

[7] The U.S. Government Accountability Office (GAO) issued a report (2005) on the effectiveness of the USDA to improve livestock market reporting under MPR. The report details the actions taken by the AMS to enforce packer compliance (appendices 2–4, pp. 28–46).

sentative sampling mechanism is a plausible explanation for increased grid premium and discount dispersion in the post-MPR period. This supposition is hereafter referred to as "sample-selection bias." It is our view that sample-selection bias is the result of the institutional relationship between the AMS and the packing industry during the pre-MPR era that limited the AMS's ability to gain access to more detailed information.

Obviously, MPR removed any sample-selection bias that may have been present during the pre-MPR period.[8] Accordingly, it is safe to conclude that these reforms have enhanced the ability of the public price-reporting system to provide greater transparency under MPR.

Empirical Hypothesis

Implementation of MPR did increase the amount of transaction price information reported by each firm as well as the number of firms reporting transactions to the AMS. According to Azzam (2003), an increased level of transactions reported after implementation of MPR should reduce dispersion associated with weekly reports because of the inverse relationship between information flow and transaction price variability. Therefore, weekly grid premium and discount reports released by the AMS should provide greater market transparency under MPR because the standard deviation associated with the statistical average for grid premium and discount values being reported to the AMS will decrease as the number of packer grid price schedules being reported increases. Accordingly, a reduction in premium and discount uncertainty would be expected. This view is consistent with the literature on the thinning market (Tomek 1980).

The transparency discussion in the MPR literature implicitly assumes that the sample drawn from the population of transactions occurring in a week and reported to the AMS in the pre-MPR period is representative. Therefore, the introduction of MPR should lower dispersion levels associated with grid premiums and discounts relative to

VPR-era dispersion levels. However, if VPR dispersion estimators for weekly grid premium and discount values were affected by sample-selection bias, then it is possible that premium and discount dispersion levels would not decline or would possibly even increase as a result of MPR implementation. Hypothetically, a sampling technique that failed to capture the actual variation in actual premium and discounts being paid within and across firms could result in truncated dispersion measures being reported under VPR. This scenario was not considered in the MPR literature discussion.

Based on the discussion of transparency in the MPR literature, and assuming MPR did improve transparency, a proposition is proposed.

> PROPOSITION 1: Assuming that the sampling technique used during the pre-MPR period produced a representative sample upon which grid price reports were based, then reform of the livestock price-reporting system will result in a decline in grid premium and discount dispersion levels.

Rejection of proposition 1 provides support for the supposition that grid price reports released during the VPR era were affected by a non-representative sample selection procedure, i.e., a sample-selection bias. A series of statistical tests are conducted to determine if dispersion levels declined as a result of MPR implementation. If the statistical tests indicate that dispersion levels have not declined, then sample-selection bias is a plausible explanation for the coexistence of increased transparency and increased price dispersion.

It should be noted that the AMS never claimed that the weekly grid price reports released prior to MPR were statistically reliable. However, these reports were the only publically available information on grid prices provided on a weekly basis. Accordingly, it is reasonable to assume that sellers of fed cattle used these reports during their price discovery process.

Empirical Methodology

Let χ_{ti} denote a grid premium or discount reported by firm i (plant i after the implementation of MPR and assume n plants) for week t (assume m weeks). The weekly mean $\overline{\chi}_t$ and extreme values for each grid premium and discount categories, respectively, are defined as

$$(1) \qquad \overline{\chi}_t = n^{-1}\sum_{i=1}^{n}\chi_{ti} \, ,$$

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[8] The GAO report (2005) criticized the AMS reporting procedures. The GAO examined AMS data from April to June of 2005, the period just prior to MPR expiring due to the sunset clause in the original legislation. It found that AMS market reporters were still excluding transactions from official reports. The majority of the data screened were for live and dressed weight transactions associated with very small lots containing fewer than 10 head (appendices 2–4, pp. 28–46). The GAO did not report any evidence of grid premium or discount data being screened.

(2) $$\chi_t^{max} = \max_i \chi_{ti} \, ,$$

(3) $$\chi_t^{min} = \min_i \chi_{ti} \, .$$

Suppose MPR takes effect in the jth period and that $j + k = m$. The variable k represents the time interval in weeks after MPR implementation in period j. One measure of dispersion is the standard deviation (*Sd*). If χ_{ti} is available, the standard deviation before and after the implementation of MPR can be calculated using standard statistical procedures (e.g., Newbold 1995, p. 243).

However, only $\bar{\chi}_t$, χ_t^{max}, and χ_t^{min} are available, and χ_{ti} are unavailable. Therefore, the standard deviation is not derivable and thus cannot be used as a measure of intra-week price dispersion. However, this data limitation can be overcome. Three intra-week dispersion proxies can be extracted from the weekly AMS grid reports. These three dispersion proxies are described below.

In order to assess the dispersion difference before and after the implementation of MPR, we introduce the first proxy for dispersion. Define B_t as

(4) $$B_t = \max(\chi_t^{max} - \bar{\chi}_t, \bar{\chi}_t - \chi_t^{min}) \, ,$$

and the average of B_t before and after MPR as

(5) $$B^{before} = \frac{1}{j-1} \sum_{t=1}^{j-1} B_t \, ,$$

(6) $$B^{after} = \frac{1}{k+1} \sum_{t=j}^{m} B_t \, .$$

Simple algebra shows that

(7) $$B^{before} \geq Sd^{before} \, ,$$

and

(8) $$B^{after} \geq Sd^{after} \, .$$

In other words, we can use the average of B_t as an upper bound for the standard deviation. The dispersion before and after MPR is compared by the bound ratio of

(9) $$BR = \frac{B^{before}}{B^{after}} \, .$$

If *BR* is less than 1, this indicates that dispersion has increased after MPR takes effect, and vice versa. One drawback of this approach is that the distribution of the BR ratio is unknown, and therefore no significance value can be attached to the ratio.

The second and third proxies for dispersion are the statistical range [equation (10)] and an alternative version of the coefficient of variation [equation (11)]. The AMS provides the statistical range in its weekly reports. The coefficient of variation can be derived from the information provided in the AMS weekly reports.

Define the statistical range R_t and our proxy for the coefficient of variation C_t as

(10) $$R_t = \chi_t^{max} - \chi_t^{min} \, , \text{ and}$$

(11) $$C_t = \frac{R_t}{2\bar{\chi}_t} \, ,$$

respectively. A common approximation, found in most introductory statistics textbooks, for the standard deviation of a random variable is the statistical range divided by two. Equation (11) provides a rough approximation for the coefficient of variation associated with grid premium and discount categories during the VPR and MPR periods.

The test of equal dispersion can be conducted by using a regression procedure suggested by Wooldridge (2006). The following regression is fitted using the ordinary least squares method:

(12) $$Z_t = \beta_0 + \beta_1 D_t + \mu_t \, .$$

The variable D_t is a dummy shift variable, set to zero prior to MPR implementation, and set to one after MPR implementation. The variable Z_t denotes the dependent variable for three separate regressions. The dependent variables are (i) the range R_t, (ii) the coefficient of variation proxy C_t, and (iii) the upper-bound ratio B_t, defined previously. The focus is on the *t*-ratio of the coefficient β_1. A significant *t*-ratio indicates that Z_t changes substantially after the implementation of MPR.

These regression-based *t* tests are equivalent to the usual two-sample *t* test. Essentially, we are comparing the mean values of two samples separated by the date of MPR. The information in the sample data is the range, the coefficient of variation, and the bound ratio. These variables can provide approximations for the standard deviation of the original weekly price data (χ_{ti}) collected by the AMS.

Data

Data on national slaughter cattle grid premiums and discounts for three quality categories (prime, select, and standard), four yield grade categories (Yg 1.0–2.0, Yg 2.0–2.5, Yg 4.0–5.0, and Yg > 5.0), and four weight categories (Wt 400–500, Wt 500–550, Wt 950–1000, and Wt > 1000) were collected from a weekly AMS publication ("National Carcass Premiums and Discounts for Slaughter Steers and Heifers," issues 1-1-97 through 9-26-05). The VPR period is from November 4, 1996, through March 26, 2001. The MPR period runs from April 9, 2001, through September 26, 2005, which is when the MPR legislation expired due to a sunset clause.[9] With the exception of Wt 950–1000 and Wt > 1000, all of the grid category series consisted of 230 VPR observations and 234 MPR observations. Grid series Wt 950–1000 and Wt > 1000 consisted of 229 VPR observations and 234 MPR observations. Note that because yield grade categories Yg 2.5–3.0, Yg 3.0–3.5, and Yg 3.5–4.00 were essentially par categories during the sample period with no or very small premiums or discounts, these series were not analyzed.

Empirical Results

Table 1 contains the upper-bound weekly mean estimates for the standard deviations associated with VPR and MPR, and the corresponding bound ratio for weekly grid premium and discount reports. Bound ratios for all grid categories are less than 1, indicating that the mean value of the upper-bound proxy for intra-week post-MPR standard deviation increased for all categories analyzed relative to the pre-MPR period. Given that

the distribution of a bound ratio is unknown, no significance value can be attached to these ratios.

Table 2 provides the weekly mean estimates for the statistical range and coefficient of variation proxy for grid premium and discount categories for both price-reporting regimes. Tables 1 and 2 provide evidence that clearly demonstrates that all three of the statistical measures (statistical range, coefficient of variation, and upper bound for the standard deviation) indicate an increase in intra-week grid premium and discount dispersion levels in the period after MPR implementation.

Regression analysis is used to statistically test if regime change affected grid price dispersion levels. Results of two-sample tests based on the regression approach are reported in Table 3. The *t*-statistics associated with the shift variable in the regressions are significant for all three dispersion measures, for all grid categories, at the 99 percent level. This regression-based *t* test is equivalent to the usual two-sample *t* test, and a significant *t* ratio is analogous to rejecting the null hypothesis of equal dispersion measures.

Tables 2 and 3 provide empirical evidence indicating that for each of the grid categories analyzed, the MPR dispersion proxies are significantly higher relative to VPR levels. These results provide statistical evidence that the market information contained in the grid category premiums and discount data series for the post-MPR period are significantly different from the information contained in the pre-MPR series. Since we know that the MPR grid premium series contains more accurate data on meat packers' grid-pricing behavior, it can be reasonably concluded that grid premium and discount reports released during the VPR era lacked transparency. Furthermore, these results show that increased information flow and improved transparency due to the implementation of the MPR is compatible with higher premium and discount dispersion.

The discussion by Azzam (2003) and Perry et al. (2005) on the expected effect of MPR implementation on price dispersion clearly indicated that price dispersion was expected to decline. This expectation was based on the implicit assumption that weekly reports issued during the VPR era were based on data drawn from a representative sample. All of the statistical tests applied to dispersion proxies measuring absolute and relative dispersion levels suggest that dispersion increased for grid premiums and discounts.

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[9] See Fausti et al. (2007) for additional discussion on the expiration of MPR in 2005. The legislation was reauthorized in October 2006. Reimplementation of the reporting requirements began July 15, 2008. Due to loss of legal authority, data selected for the analysis covers only the period prior to deauthorization.

Table 1. Statistical Mean of the Weekly Upper Bound [a] and the Bound Ratio

Grid Category	Before Implementation of MPR	After Implementation of MPR	Bound Ratio (*BR*)
Prime	4.96	12.58	0.39
Select	1.52	4.62	0.33
Standard	10.14	12.66	0.80
Yg 1.0–2.0	2.35	5.08	0.46
Yg 2.0–2.5	1.15	2.82	0.41
Yg 4.0–5.0	6.34	7.92	0.80
Yg > 5.0	6.27	8.31	0.75
Wt 400–500	9.62	18.25	0.53
Wt 500–550	8.06	15.46	0.52
Wt 950–1000	7.79	10.55	0.74
Wt > 1000	9.68	12.96	0.75

[a] Upper-bound values are in US$ per hundredweight units.

Table 2. Mean Values for the Weekly Range and Coefficient of Variation

Grid Category	Statistical Range [a] VPR	Statistical Range MPR	Coefficient of Variation [b] (%) VPR	Coefficient of Variation (%) MPR
Prime	7.59	18.78	66.97	142.10
Select	2.44	7.67	-19.65	-44.72
Standard	16.59	20.35	-48.48	-60.21
Yg 1.0–2.0	3.93	7.91	101.15	141.16
Yg 2.0–2.5	2.01	4.41	113.41	134.25
Yg 4.0–5.0	10.699	14.37	-35.62	-57.09
Yg > 5.0	10.674	15.10	-26.27	-41.70
Wt 400–500	17.14	34.74	-39.97	-76.93
Wt 500–550	13.70	29.58	-39.61	-97.63
Wt 950–1000	13.90	17.75	-43.84	-123.54
Wt > 1000	17.10	23.51	-40.54	-68.33

[a] Statistical range values are in US$ per hundredweight units.
[b] Weekly average for coefficient of variation values were converted into percentage values.

This suggests that in the pre-MPR period, weekly grid premium and discount values publicly reported were based on a non-representative sample.

Is it possible that some other market influences are responsible for the statistical results we reported? It can be an issue only if such influences coincided with the implementation of MPR and remained effective throughout the MPR period

analyzed. Perry et al. (2005) looked at the bovine spongiform encephalopathy (BSE) scare and concluded that the BSE events in the United States and Canada do not explain the increase in price volatility. Accordingly, we conclude that the institutional change that occurred within the public livestock market reporting system under MPR eliminated sample-selection bias, and this institu-

Table 3. Two-Sample *T* Test

Grid Category	Statistical Range (R_t)	Coefficient of Variance (C_t)	Bound (B_t)
Prime	24.85*	11.94*	21.29*
Select	19.93*	-13.53*	19.34*
Standard	9.75*	-7.90*	11.23*
Yg 1.0–2.0	38.13*	21.62*	38.14*
Yg 2.0–2.5	32.23*	10.60*	31.22*
Yg 4.0–5.0	13.69*	-16.03*	10.04*
Yg > 5.0	20.71*	-23.76*	13.80*
Wt 400–500	88.79*	-59.92*	68.85*
Wt 500–550	65.93*	-68.41*	50.78*
Wt 950–1000	14.45*	-43.66*	15.94*
Wt > 1000	21.96*	-28.38*	20.52*

Note: All table values are "student *t*" test statistics, and "*" indicates the level of significance at the 99 percent level or greater. The negative values for C_t reflect grid discounts being negative.

tional change appears to be the compelling explanation for our empirical results.

Summary

An important question addressed in this paper is: Was the reform of the public price-reporting system for slaughter cattle sold on a grid necessary? The answer to this question, based on empirical evidence, is yes. This conclusion is drawn from a series of stylized facts that can be gleaned from our discussion:

- Implementation of MPR improved market transparency for publicly reported grid premiums and discounts.
- Implementation of MPR increased grid premium and discount volatility.
- Implementation of MPR increased grid premium and discount dispersion.
- A plausible explanation for increased grid price dispersion in the post-MPR period is that weekly premium and discount point estimators were derived from a non-representative sample prior to MPR implementation.
- MPR implementation was necessary for transparent public reporting of grid prices.

Our discussion and empirical analysis adds another dimension to the literature on the need for and the effectiveness of MPR regulations on the
public reporting system for fed cattle markets (Fausti and Diersen 2004, Pendell and Schroeder 2006, Fausti, Diersen, and Qasmi 2007). Prior to this study, there was a lack of robust statistical evidence indicating that the VPR system was in need of reform. Furthermore, increased price dispersion is a plausible explanation for the puzzling increase in price volatility reported by the ERS (Perry et al. 2005) in the live-weight and dressed-weight cash markets for fed cattle.

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