

THE UNIVERSITY OF MANITOBA

AN ANALYSIS OF SLAUGHTER HOG PRICING MECHANISMS  
IN THE PRAIRIE PROVINCES, 1951-1980

by

CHARLES L. PEARSON

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## ABSTRACT

Major structural changes have occurred in the marketing mechanisms used to establish prices for Canadian slaughter hogs during the period 1951 through 1980. These changes were mainly the result of producer concerns about the ability of the market to establish slaughter hog prices which accurately reflect regional supply and demand conditions. The adoption of alternative marketing mechanisms such as the teletype Dutch auction, Dutch clock and formula pricing were due to swine producers attempts to improve the competitiveness of the slaughter hog market.

The overall objective of this thesis was to examine the influence of slaughter hog marketing mechanism changes in the provinces of Manitoba, Saskatchewan, Alberta and Ontario as to market performance. Univariate residual cross-correlation analysis was selected as the appropriate methodology. Average weekly slaughter hog prices established on the Winnipeg, Saskatoon, Edmonton and Toronto markets for the period 1951 through 1980 were used, as were average weekly slaughter hog prices for the seven central United States markets for the years 1973 through 1980. The analysis was conducted for two of the markets at a time with the data separated into appropriate time periods reflecting changes that had occurred in marketing mechanisms.

Results show changes have occurred in the lead lag relationships between markets during the study period. The strongest relationship between Canadian market price changes occurred at zero lag (less than one week) during all periods, indicating an efficient transfer of

pricing information. Toronto price changes tended to occur instantaneously with or lead price changes on the three western markets. The analysis, however, did not hold true for the Edmonton-Toronto markets during the time prior to Alberta establishing a compulsory marketing mechanism. During these two periods, the Edmonton and Toronto markets exhibited a feedback relationship. For the years 1973 through 1980, results indicated slaughter hog prices on the seven central United States markets changed instantaneously with Toronto and Winnipeg, while price changes on the Saskatoon and Edmonton markets tended to lag the United States.

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## Chapter 1

### 1. INTRODUCTION

Significant changes have occurred in the structure of the Canadian slaughter hog industry since the end of World War II.

Historically Western Canada has produced more hogs than it consumes and Eastern Canada has had to import pork to satisfy consumer demands. The trend in recent years has been a decrease in Western Canadian hog production relative to Eastern Canada<sup>1</sup> (see Table 1). These changes have altered the traditional patterns of pork movement in Canada. The province of Quebec has increased its share of total Canadian hog production in recent years due to the presence of provincial government subsidies and the vertical integration of swine producers with feed companies<sup>2</sup>. These shifts in production have meant that surplus pork produced in Western Canada has been exported on the international market.

The distribution of Canadian slaughter hog production has varied considerably over the study period of 1951-1980. These changes are illustrated by Table 1. Federally inspected hog slaughter in Canada ranged from a low of 4 488 007 head in 1951 to a high of 12 927 452

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<sup>1</sup>Western Canada refers to provinces west of the Manitoba-Ontario border, and Eastern Canada to provinces east of the Manitoba-Ontario border.

<sup>2</sup>W.H. Horner et al., Western Canadian Agriculture to 1990, (Calgary: Canada West Foundation, 1980), pp. 117-122.

Table 1. Federally Inspected Hog Slaughter in Western Canada in Relation to Total Canadian Federally Inspected Hog Slaughter

	Total Canadian Federally Inspected Hog Slaughter	Western Canadian Federally Inspected Hog Slaughter	Percentage Federally Inspected Hog Slaughter in Western Canada
	Head	Head	Percent
1951	4 488 007	1 601 138	35.7
1952	6 234 145	2 384 900	38.3
1953	4 611 312	2 181 193	47.3
1954	4 679 214	2 219 604	47.4
1955	5 543 787	2 671 868	48.2
1956	5 548 289	2 545 402	45.9
1957	4 971 477	2 298 452	46.2
1958	5 963 928	2 949 310	49.6
1959	8 020 766	3 841 574	47.9
1960	6 182 315	2 855 590	46.2
1961	5 849 875	2 741 574	46.8
1962	6 031 933	2 647 521	43.9
1963	5 909 506	2 158 676	36.5
1964	6 627 600	2 650 522	39.4
1965	6 421 226	2 724 516	42.4
1966	6 129 632	2 418 601	39.4
1967	7 336 912	2 939 701	40.1
1968	7 423 754	3 066 780	41.3
1969	6 973 190	2 765 029	39.7
1970	8 280 481	3 582 977	43.2
1971	9 742 759	4 631 047	47.5
1972	9 357 143	4 215 064	45.0
1973	8 721 921	4 024 695	46.1
1974	8 939 335	3 839 852	43.0
1975	7 656 334	2 751 472	35.9
1976	7 493 245	2 457 524	32.8
1977	8 007 341	2 578 973	32.2
1978	8 934 470	2 656 480	29.7
1979	11 030 840	3 155 835	28.6
1980	12 927 452	3 666 585	28.4

Source: Agriculture Canada, Livestock and Meat Review, (Ottawa: Annual, Various Issues).

head in 1980. Federally inspected slaughter in Western Canada varied from a low of 1 601 138 in 1951 to a high of 4 631 047 in 1971. Column 3 expresses federally inspected hog slaughter in Western Canada as a percentage of total Canadian federally inspected hog slaughter. This percentage has varied from a low of 28.4 percent of total federally inspected slaughter in 1980 to a high of 49.6 percent in 1958.

Changes have occurred in the mechanisms by which slaughter hogs are marketed and prices established. These changes have occurred as a result of hog producers concerns about the competitiveness of the marketing systems and the ability of prices established by these markets to accurately reflect supply and demand conditions. Originally, hog prices were established at major livestock terminal markets. There was a gradual decline in the proportion of hogs that were marketed through these terminal markets although they continued to serve, for a time, as the basis for pricing on alternative market channels. Hog producers felt they were in a weak bargaining position relative to the large packing companies and therefore, adopted alternative marketing mechanisms to improve this situation. At present, the provinces (included in this study) of Manitoba, Saskatchewan, Alberta and Ontario have compulsory marketing systems where all slaughter hogs are used in determining prices. The objective of these marketing systems is to encourage competitive bidding among the buyers and to establish the highest prices possible for hog producers.

Changes in the slaughter hog marketing mechanisms that would theoretically result in more competitive prices still did not reduce the level of controversy in the industry. This was particularly true in



Western Canada during the 1970's. A prime concern of Western Canadian hog producers during this period was the allegedly wide price differential between the prairie markets and that of Toronto. Prairie producers felt that the price differentials were wider than could be justified on the basis of transfer costs between two competitive markets. Table 2 illustrates the annual price differential between the Toronto, Winnipeg and Edmonton markets.

### 1.1 Justification for Study

A historical analysis of the changes in pricing mechanisms is warranted to gather evidence on the ability of electronic marketing systems to improve market performance. This analysis should include both a description of the theoretical improvements in the market and an evaluation of the results on measurable aspects of pricing efficiency.

The pricing mechanisms now in use by the major slaughter hog markets provide a working example of electronic marketing systems as applied to an agricultural commodity. Several other livestock markets and agricultural products are under study for possible adoption of these alternative marketing mechanisms. Recent papers published for the North Central Project Number 117 express concern about the non-competitive nature of the red meat pricing mechanisms currently in use in the United States<sup>3,4</sup>.

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<sup>3</sup>D.L. Hayenga, Formula Pricing and Price Reporting Problems in the Markets for Beef and Pork, Studies of the Organization and Control of the U.S. Food System, N.C. Project No. 117, Working Paper 32, May 1979.

<sup>4</sup>\_\_\_\_\_, Pork Pricing Systems: The Importance and Economic Impact of Formula Pricing, Studies of the Organization and Control of the U.S. Food System, N.C. Project No. 117, Working Paper 37, August 1979.

Table 2. Weighted Average Annual Prices for Slaughter Hogs on Toronto, Winnipeg and Edmonton Markets and Price Differentials

	Toronto <sup>1</sup>	Toronto- Winnipeg Price Differential	Winnipeg <sup>1</sup>	Winnipeg- Edmonton Price Differential	Edmonton <sup>1</sup>
Dollars per CWT					
1951	32.85	2.00	30.85	(-1.85)	32.70
1952	25.70	1.25	24.45	(-0.15)	24.60
1953	30.40	3.00	27.40	(-1.38)	28.78
1954	30.90	3.05	27.85	(-0.20)	28.05
1955	25.05	3.00	22.05	(-0.15)	22.20
1956	26.50	3.10	23.40	0.00	23.40
1957	30.05	1.85	28.20	0.65	27.55
1958	28.13	2.93	25.20	0.61	24.59
1959	23.80	2.50	21.30	0.84	20.46
1960	23.75	2.10	21.65	1.02	20.63
1961	27.30	2.45	24.85	1.05	23.80
1962	28.60	2.95	25.65	0.25	25.40
1963	27.80	2.00	25.80	(-0.60)	26.40
1964	27.30	2.75	24.55	0.70	23.85
1965	33.40	1.75	31.65	3.30	28.35
1966	35.90	1.45	34.45	1.35	33.10
1967	30.70	2.15	28.55	1.85	26.70
1968	30.80	1.70	29.10	1.60	27.50
1969	35.70	0.25	35.45	2.15	33.30
1970	32.20	3.00	29.20	0.80	28.40
1971	25.80	2.95	22.85	1.60	21.25
1972	37.39	3.39	34.00	1.99	32.01
1973	54.66	3.35	51.31	1.39	49.92
1974	50.29	4.17	46.12	1.26	44.86
1975	67.22	4.67	62.55	(-2.41)	64.96
1976	64.10	5.07	59.03	(-0.84)	59.87
1977	60.97	4.19	56.78	(-0.67)	57.45
1978	69.80	1.97	67.83	0.32	67.51
1979	64.15	0.00	64.15	(-0.20)	64.35
1980	59.08	2.41	56.67	(-0.55)	57.22

<sup>1</sup>Weighted average annual prices for: Grade B hogs, warm dressed weight prior to 1963; Grade A hogs from 1963 through 1968; Index 100 slaughter hogs from 1969.

Source: Agriculture Canada, Livestock and Meat Review, (Ottawa: Annual, Various Issues).

Henderson examined the applicability of electronic pricing mechanisms for pricing red meat products in the United States<sup>5</sup>. Other studies have examined alternative selling methods for slaughter cattle<sup>6,7</sup>.

Qualitative analyses have examined the effect of changes in marketing mechanisms on pricing efficiency. Quantitative measures of pricing efficiency need to be explored for evaluating marketing performance.

Alternative pricing and trading systems are being viewed as variables rather than constants in the marketing system. Decisions regarding pricing systems require quantification of various pricing efficiency dimensions.<sup>8</sup>

A historical review is needed relating changes in price relationships among the four Canadian livestock markets as to the alternative marketing mechanisms employed during the study period. This analysis will provide insight into the ability of alternative marketing mechanisms (i.e. a change in market structure) to influence or establish competitive prices. The implications of adopting similar marketing techniques for other agricultural commodities will be of considerable interest to producer groups.

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<sup>5</sup>D.R. Henderson, Some Considerations in the Application of Electronic Marketing to Meat, Studies of the Organization and Control of the U.S. Food System, N.C. Project No. 117, Working Paper 35, July 1979.

<sup>6</sup>R.D. Johnson, "An Economic Evaluation of Alternative Marketing Methods for Fed Cattle," (Ph.D. Dissertation, University of Nebraska, 1971).

<sup>7</sup>L. Martin, R.R. Richards and W.R. Usborne, An Economic Comparison of Alternative Selling Methods for Slaughter Cattle in Ontario, (Guelph: School of Agricultural Economics and Extension Education, University of Guelph, Publication No. AEEE/79/1, January 1979).

<sup>8</sup>D.G. Frahm and L.F. Schrader, "An Experimental Comparison of Pricing in Two Auction Systems," American Journal of Agricultural Economics, Vol. 52, No. 4 (November 1970), p. 528.

## 1.2 Objectives

The overall objective of this thesis is to examine the influence of slaughter hog marketing mechanism changes in the provinces of Manitoba, Saskatchewan, Alberta and Ontario as to market performance.

The specific objectives are:

- (1) review the historical changes which have occurred in the hog markets under study between 1951 and 1980;
- (2) review the literature to develop a theoretical basis for evaluating market performance;
- (3) descriptively evaluate the influence of slaughter hog marketing mechanism changes on market performance;
- (4) apply statistical tests to determine if marketing mechanism changes have altered the relationship between slaughter hog prices established on the above markets.

## 1.3 Data

Weekly slaughter hog price data was used in this analysis. The data was obtained from the Livestock and Meat Trade Report<sup>9</sup>. Winnipeg, Saskatoon, Edmonton and Toronto were the markets selected for analysis. These markets represent the major provinces which have implemented alternate marketing mechanisms during the study period.

Canadian slaughter hog prices are reported on a warm dressed weight basis. Prices are reported for grade B slaughter hogs from 1951 to 1962, grade A slaughter hogs from 1963 to 1968 and Index 100 slaughter

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<sup>9</sup> Agriculture Canada, Livestock and Meat Trade Report (Ottawa: Weekly, Various Issues).

hogs from 1969 to 1980. De Graff describes the slaughter hog grading system which has existed in Canada since 1969 in the following manner:

In 1969, the old grading system was replaced by the so called Index-100 system. The index reflects the predicted value from each carcass and is calculated by a complex formula. Basic to the formula are measurements of the maximum back fat thickness at the shoulder and the loin. These measurements are taken by federal graders at the packing plants. As the basis of each sale is the assumption that all hogs in a lot are Index 100, producers will receive more for grades indexed over 100 and less for those below. For instance, an animal which is graded at an index of 108 will receive an 8-percent premium over the Index-100 price.<sup>10</sup>

Average weekly slaughter hog price data for the seven central United States markets combined was obtained from the Livestock and Meat Trade Report for the period 1973-1980<sup>11,12</sup>. These prices are reported for barrows and gilts in the 200 and 220 pound weight range on a liveweight basis. For comparability the liveweight basis used in the United States was converted to the warm dressed weight basis used in Canada by dividing the average prices for the seven United States markets combined by the coefficient 0.77. As well, these slaughter hog prices were adjusted from United States dollars to Canadian dollars by using the prevailing exchange rates between the two countries.

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<sup>10</sup>J. de Graff, "Price Formation in Canadian Hog Marketing," Food Market Commentary, Vol. 3, No. 1 (March 1981), p. 21.

<sup>11</sup>Agriculture Canada, op. cit.

<sup>12</sup>The average price for the seven central United States markets combined includes the following markets; Sioux City, Iowa; St. Joseph, Missouri; St. Paul, Minnesota; Indianapolis, Indiana; Omaha, Nebraska; Kansas City, Kansas; and St. Louis, Illinois.

#### 1.4 Organization of the Study

Chapter 2 outlines the changes which have occurred in the mechanisms for marketing slaughter hogs in Manitoba, Saskatchewan, Alberta and Ontario over the period 1951 to 1980. Particular attention is paid to the situation which existed prior to the establishment of marketing commissions/boards and producer's justifications for adopting alternative organizational structures and marketing mechanisms. The time periods for which alternative marketing mechanisms were in use provide the time frames for the empirical analysis.

Chapter 3 provides the theoretical basis for the study. The concept of market structure and its influence on market performance is discussed. The concept of perfect competition is introduced as a paragon and suggestions are made as to why this goal may not be obtainable. Workable competition is presented as an alternative criteria. The market structure of the major participants in the Canadian slaughter hog industry is discussed. Market performance criteria are presented in this chapter and an indication of how market performance might be analyzed is outlined.

Chapter 4 descriptively evaluates the marketing mechanisms existing in Canada over the period 1951 to 1980 with regards to market performance. The purpose of this chapter is to identify the marketing mechanism which should theoretically result in the greatest market performance. The specific performance criteria examined in this chapter include operating and pricing efficiency.

Chapter 5 applies empirical analyses to determine the influence of marketing mechanism changes on the price relationships between the four

Canadian markets under study. Specifically, tests are performed to determine if adoption of teletype Dutch auction and formula pricing for slaughter hogs has improved the transfer of pricing information between the markets under study.

Chapter 6 summarizes the results of the thesis and presents the implications of this study for the hog industry in Canada and for other livestock sectors evaluating alternative marketing mechanisms. In addition, suggestions are made for possible further research.

## Chapter 2

### 2. HISTORICAL REVIEW

Significant changes have occurred in the marketing mechanisms used to establish prices on the major Canadian markets. These variations have influenced the market structure of the hog industry. The objective of this section is to review the marketing mechanism changes that have occurred over the study period. These changes provide the time periods for examining the price relationships between the four slaughter hog markets while the alternative marketing mechanisms were in use.

This chapter will be divided into two sections. The first section will examine the general conditions which existed in all markets prior to the establishment of a producer marketing board or commission. The justifications for introduction of a new marketing mechanism will be outlined. The next section will examine the marketing systems which have been implemented by the provincial marketing boards and commissions of Ontario, Manitoba, Saskatchewan and Alberta. Modifications to these marketing systems have occurred and will be reviewed.

#### 2.1 Initial Marketing Mechanisms

By the end of World War II major changes were occurring in the way hogs were being marketed. The primary difference was the declining importance of the terminal markets as a means of marketing hogs. Manning made the following comment about the pricing role of the terminal exchanges in Alberta:

The role of the terminal exchanges in establishing hog prices has declined substantially since the rail-grade-and-weight



system of selling was introduced, but other changes in the industry also have influenced the method of marketing. The terminal stockyards were originally established at rail transportation junctions between the producing areas and the major consuming centers. The shifts toward truck transportation, decentralization of the packing industry, urbanization of western Canada, and increasing specialization of hog producers have reduced the need for the terminal stockyards as centers for assembly and concentration of hog shipments. Thus the physical functions of the stockyards declined at the same time as the pricing functions of exchange declined, and although the declines were from different causes, they reinforced one another.<sup>1</sup>

The major marketing system used at this time was direct delivery from the producer's farm to the packing plant. This technique reduced marketing costs by eliminating the commission charges levied at the terminal markets. It also reduced handling of slaughter hogs, thereby reducing shrinkage and bruising of hog carcasses. The increase in the number of direct deliveries created a situation where prices were still established on the terminal markets but the actual percentage of hogs sold using this mechanism was relatively small. Manning makes the following comment about prices received on the terminal market:

Apparently the lowest prices were received by producers whose hogs were sold on the terminal exchanges. They received the base price less yardage and commission fees, while other producers received at least base price and often the higher of two or more alternative base prices and in some cases an incentive payment and/or absorption of some of the trucking costs. Thus, it would appear that producers who support the terminal market and help set the base prices pay a substantial penalty for the privilege. Such a situation cannot be defended on grounds of either efficiency or equity of treatment.<sup>2</sup>

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<sup>1</sup>T.W. Manning, Performance of the Hog Marketing System in Alberta, (Edmonton: Department of Extension, The University of Alberta, Agricultural Economics Research Bulletin 4, July 1967), p. 8.

<sup>2</sup>Ibid., p. 12.

Producers' major criticism of the marketing system at this time was their lack of bargaining power in the market place.

Most of the producer groups felt that producers were at a disadvantage in the bargaining process by which prices for livestock are established. ... The loss in producer bargaining power was attributed to the decline in the proportion of the stock marketed through the Public Markets and the increase in the volume sold directly to packing plants. It was felt that in the direct method of marketing, prices are negotiated in a less competitive manner, since there is only one buyer present and the seller is usually less well informed than the buyer and less skilled in price negotiation.<sup>3</sup>

Producers felt that it was in the packing companies' best interest to maintain terminal prices at levels lower than would be obtained if the market was of a more competitive nature.

In the case of hogs, the large processors buy few if any of their requirements at the public market. The result is that the major buyers secure their supplies without direct competitive bidding against other processors. It was argued that this system of marketing permits the processors to purchase livestock at a lower average price than would be obtained if all sales were made through a mechanism which would permit all buyers to bid on all lots sold. It was also felt by several producer groups that livestock producers would have a bargaining strength in price negotiation equal to that of processors and retailers only if all, or a large proportion of, livestock were sold by a single sales agency on behalf of the producers.<sup>4</sup>

These producer concerns about the competitiveness of the market resulted in the formation of provincial hog commissions or marketing boards and the development of alternative pricing mechanisms. The objective of the next section is to describe the evolution of hog marketing boards and pricing systems in the markets under study.

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<sup>3</sup>Select Committee of the Legislative Assembly of Manitoba, Live-stock Marketing in Manitoba, (Winnipeg: Queen's Printer of Manitoba, February 1964), pp. 47-48.

<sup>4</sup>Ibid.