EFFECT OF THE PROPORTION OF HOGS SOLD THROUGH TELETYPE ON REALIZED HOG PRICES

A Thesis

Presented to

the Faculty of Graduate Studies and Research

University of Manitoba

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

THE UNIVERSITY OF MANITOBA ELIZABETH DAFOE LIBRARY

by

Ley-Cheng Chen

February 1970

c Ley-Cheng Chen 1970

ACKNOWLEDGEMENTS

The author is deeply indebted to Dr. A. W. Wood, under whose supervision the research for this thesis was conducted. His excellent advice and encouragement throughout the study is most appreciated.

Appreciation is also expressed to Dr. E. W. Tyrchniewicz and Dr. A. M. C. Waterman for the invaluable suggestions and criticisms. Special thanks are due to Mr. Neil Longmuir for his assistance with computer programs and to Mr. R. L. Sedgwick, Manitoba Hog Marketing Commission, for making necessary data and information available to the author. Thanks also to Mrs. Marilyn Cameron for careful typing of the final manuscript.

Finally, the author wishes to express his appreciation to the Canada Department of Agriculture for the financial assistance which made this study possible.

EFFECT OF THE PROPORTION OF HOGS SOLD THROUGH TELETYPE ON REALIZED HOG PRICES

Ley-Cheng Chen
University of Manitoba, 1970

Manitoba producers may market their hogs in one of two ways: sell their hogs through the Manitoba Hog Marketing Commission where price is established by a teletype mechanism or direct to the packing plant where price is negotiated by private treaty. This study examined the producers' behavior in choosing a market outlet and the effect of this behavior on hog prices. The major objective was to reveal the effect of the proportion of hogs sold through the teletype system on realized hog prices.

The period of study was the calendar year 1967. The primary data were obtained from the Manitoba Hog Marketing Commission and Ontario Hog Producers Marketing Board. Secondary data were obtained from reports of the Canadian Department of Agriculture and Dominion Bureau of Statistics.

The modal percentage of hogs sold through teletype in the trading days of 1967 was between 60 and 65. The weighted average price per hundredweight in this range

was found to be relatively higher than in the other ranges. Prices of hogs realized by those producers who sell directly to the packing plant are generally identical to the daily average of prices established by the teletype selling system. Those who patronize the teletype system have, on average, smaller swine enterprises than those who sell directly to the packing plant; producers who choose to sell directly to the packing plant on Friday are relatively larger in size of hog enterprise than those who sell direct on the other days of the week.

The technique of multiple regression analysis was adopted to examine the impact of proportion of hogs sold through the teletype system on realized hog prices. Both daily and weekly data were analyzed. Using daily data, the price of hogs was found to be more responsive to the percentage of hogs sold through teletype when data for Friday were excluded than when they were included in the analysis. Price was more systematically and significantly responsive to the variations in the proportion of hogs sold through teletype on a weekly than on a daily basis.

Regarding the price pattern for each trading day, Monday through Thursday, the percentage of hogs sold by the Commission had no effect on hog prices when the mean of the percentage sales in 1967 fell in the observed modal range of 60 to 65 per cent or above. The Friday price was inversely associated with the percentage of hogs sold

TABLE OF CONTENTS

CHAPTER		PAGE
I.	INTRODUCTION.	1
	Operational Characteristics of the Teletype System	3
	Evaluation of the System.	4
	Compulsory and Voluntary System	8
	Objectives of the Study	12
II.	PROBLEMATIC SITUATION AND HYPOTHESES.	14
	Market Information as a Basis for Choosing a Market Outlet.	14
	Decision-Making in Choosing a Market Outlet for Livestock	16
	Problematic Situation	19
	Hypotheses Respecting Effect of Proportion Sold by Teletype	29
	Assumptions	31
III.	ANALYSIS OF HOG PRODUCERS CONDUCT	33
	Data and Time Period of the Study	33
	Percentage Distribution of Hogs Sold Through Teletype on Each Trading Day. . . .	34
	The Level of Commission Patronage	36
	Effect of Saskatchewan Hogs on the Manitoba System	40
IV.	ANALYSIS OF BEHAVIOR OF PACKER BUYERS	46
	Packers Buying Conduct and Its Impact on Hog Prices Before the Establishment of the Teletype System.	46

CHAPTER PAGE

Implications of the Institutional Intervention for Packers. 52

V. THE MODEL AND METHOD OF ANALYSIS. 58

Choice of Variables 58

Time Interval of Observations Used. 60

The Model 61

The Validity of the Method of Analysis. . . 64

Econometric Considerations. 66

Limitation of the Analysis. 68

VI. THE INTERPRETATION AND EVALUATION OF STATISTICAL RESULTS. 71

Daily Analysis. 72

Weekly Analysis 78

Analysis for each Trading Day of the Week 82

VII. SUMMARY AND CONCLUSION. 88

Summary and Conclusion. 88

Recommendations 95

A SELECTED BIBLIOGRAPHY. 97

APPENDIX 101

LIST OF TABLES

TABLE		PAGE
I.	Comparison of Teletype and Direct Sales, by Month, St. Boniface, 1967	20
II.	Comparison of Teletype and Direct Sales, by Month, Brandon, 1967.	26
III.	The Proportion of Hogs Sold and the Price Realized by Teletype, by Days of the Week, St. Boniface, 1967	28
IV.	The Proportion of Hogs Sold and the Price Realized by Teletype, by Days of the Week, Brandon, 1967.	28
V.	Hog Price and Frequency Distribution of Days by Proportion of Hogs Sold by Teletype, St. Boniface, 1967.	35
VI.	Level of Commission Patronage by Days of the Week, St. Boniface, 1967	37
VII.	Volume of Direct Sales by Days of the Week, St. Boniface, 1967.	38
VIII.	Number of Hogs Imported into Manitoba from other Provinces, Weekly, 1967.	43
IX.	Results of Multiple Regression Analysis, From Daily Data (Including Fridays), St. Boniface, 1967	76
X.	Results of Multiple Regression Analysis, From Daily Data (Excluding Fridays), St. Boniface, 1967.	77
XI.	Results of Multiple Regression Analysis, From Weekly Average Data, St. Boniface, 1967 . .	80
XII.	Results of Multiple Regression Analysis, By Each Trading Day of the Week, St. Boniface, 1967.	83

CHAPTER I

INTRODUCTION

Prior to 1965, there were many alternative marketing channels through which Manitoba producers could market their hogs.[1] In general, the statistics classify them into two main outlets: "direct to packers" where prices are negotiated between the packer buyer and the producer on a private treaty basis; and "to public stockyards" where producers consign their hogs to a certain commission firm which acts on behalf of the producers.[2] The price negotiated for hogs is based on rail graded carcass. In 1956, approximately 25 per cent went through the public stockyard; by 1961, this proportion had declined to 17.3 per cent.[3] The factors affecting this trend are adequately described by Kenyon.[4] These were: (1) development of the trucking industry; (2)

---

[1] Producers could deliver their hogs directly to a packing plant or to the public stockyards in St. Boniface, to a community auction sale, to a packer buying station or directly to a buyer from the United States. See Livestock Marketing in Manitoba, Report of the Select Committee of Legislative Assembly of Manitoba, February 1964, p. 75.

[2] Ibid.

[3] Ibid., p. 77.

[4] N. L. Kenyon, The Marketing of Hogs in Ontario, Department of Agricultural Economics, Ontario Agricultural College, Guelph, 1958, pp. 25-27.

the establishment of rail grading by government inspectors; (3) the absence of marketing charges for direct sales; and (4) the encouragement of truckers, through the payment of "bonuses" by the packer, to ship producers' hogs to his plant directly.

Due to the decreasing proportion of hogs sold through the public stockyards, the public market was unable to establish a general price level for hogs. The price quoted as a basis for other sales represented only a minority of hogs which were sold through the public market. Most producer groups felt that the price which producers received was unduly low because they were at a disadvantage in the bargaining process by which prices for their livestock were established. This disadvantage is largely due to the fact that producers are not as well informed as the packer buyer and are less skilled in price negotiation.

Regulation of the sale of hogs by a producer marketing board and a new workable selling mechanism were developed in Ontario during the period 1955 to 1961.[5] On May 8, 1961, the teletype system was put into operation in Ontario. Four years later, the same mechanism was

---

[5]The legislative background, economic setting and the development of the system is presented in W. F. Lu, "Effect on Regional Price Level of Selling Hogs by Teletype," an unpublished Master's Thesis, Department of Agricultural Economics, University of Manitoba, August, 1968, Chapter I, pp. 1-21.

established on a voluntary basis in Manitoba on February 25, 1965. The system is a highly mechanized form of auction in which the buyers do not assemble before an auctioneer.

Operational Characteristics of the Teletype System

The teletype system consists of a central selling unit--a master teletype machine plus specially designed receiving and recording equipment--connected to buying teletype machines which are located in processing plants. When hogs arrive at an assembly yard and are ready for sale, the manager teletypes the sales office indicating the number of hogs ready for sale. When the mechanism is put into operation, the operator types out the date and time, the assembly yard from which hogs are being offered, the lot number and the number of hogs in the lot. The operator then starts a price tape on the teletype machine.[6] The tapes are punched to provide for 5 cent changes in price per hundredweight within a one dollar range. The selection of the price tape is based on market intelligence and current market situations. The master machine automatically sends out the prices to all buying machines simultaneously on a descending scale. A buyer anywhere on the network who wants to buy the lot can stop the system by pushing a

---

[6]An example of the message is as follows: "28/5/67 --10.40---Hooter---lot 7---38 hogs and 5 sows---Approx. 300 lbs each---32.00 31.95 31.90 31.85 ..... 31.00" Manitoba Hog Marketing Commission records.

special "buying button" when he sees the price appear at which he is prepared to buy. Once he pushes the button, if he is the first one to do so, the tape stops and his code letters appear beside the price both on his machine and the master machine. None of the other buyers know who purchased the hogs. Then the master machine broadcasts the buying price to all buying machines without reporting the successful buyer's name. A very important feature of the teletype system is that each lot of hogs is offered to all potential buyers simultaneously. All buyers have an equal opportunity to buy a particular lot of hogs at the current market price. The identity of a buyer is not revealed to another bidder. The unsuccessful bidder knows only that the sale has been made and the sale price. As a result, collusion and retaliation, if any, among the big buyers would be reduced to a slight degree if not eliminated completely.

Evaluation of the Teletype System[7]

"There are at least five characteristics on which the performance of a livestock marketing channel can be judged. These are competitiveness, cost, speed, equity, and convenience."[8] The following discussion is based on a study

---

[7]Lu, op. cit., pp. 41-64. The evaluation of the system was elaborated in Lu's thesis. Here only a brief review of the characteristics of the system is attempted.

[8]Report of the Select Committee of the Legislative Assembly of Manitoba, op. cit., p. 159.

by a Select Committee of the Manitoba Legislature.[9]

"The competitiveness of a selling method is of first importance because it has potentially the greatest effect on net returns to the producers."[10] The teletype method seems to be more competitive in bidding than all other methods. One advantage is that the identity of the buyer of each lot is not revealed. In an auction ring, however, buyers are influenced by the bidding of other firms. If a small firm bids a higher price in an effort to increase the volume of its purchase beyond its customary share, it has to consider possible retaliation by the larger firms. In the teletype method, the large firm does not know whether an advance in bidding is initiated by one of its major rivals or by a smaller buyer seeking to expand.

"The costs of marketing through different channels are mainly a reflection of the physical efficiency."[11] The selling and buying functions can be performed at considerably less cost by the teletype method than at the public market, since fewer physical facilities and less labor are required to negotiate sales and to distribute payment to producers. However, the cost of marketing in terms of operational efficiency and the effect of the change on the market's

---

[9] Ibid.

[10] Ibid., p. 160.

[11] Ibid.

competitiveness. Any higher cost could be offset by the advantage of a more competitive selling mechanism.

"The speed with which livestock move through a marketing channel from producer to the packing plant influences the carcass yield of animals, their value to the packer, and the amounts the packer is willing to pay for live animals."[12] The more quickly livestock arrive at the plant, the less bruising and shrinkage there is likely to be. The Manitoba Hog Marketing Commission now sells approximately 45 per cent of all sales "on truck en route" or "on car en route".[13] Moreover, the selling of hogs "on truck" eliminates unnecessary unloading and reloading of hogs, thus minimizing bruising and shrinkage and increasing the speed of delivery.

"Equity in livestock pricing requires that all producers receive equal returns for livestock of equal quality and yield."[14] "Equity is partly dependent upon the degree of competition that exists in a marketing channel."[15] In this respect, pricing should be more equitable in teletype selling than in all other methods except, perhaps,

---

[12] Ibid.

[13] Annual Report, Manitoba Hog Marketing Commission, March, 1968, p. 4.

[14] Report of the Select Committee of the Legislative Assembly of Manitoba, op. cit., p. 160.

[15] Ibid.

public auction. In teletype selling, prices vary for successive lots. According to the finding of a concurrent research project,[16] in the very short tun, between days and within the day, the price of hogs sold by teletype is more variable than it is by the private treaty system. This weakness could be overcome, from the producer's standpoint, by pooling prices on a daily term basis. This has apparently not been desired by producers. Besides, the pooling method is not technically and administratively simple and would add to the costs of marketing of hogs, thus reducing the net returns to the producer.

"The convenience of a marketing channel has several implications. To the producer it may mean a saving in time that is worth more to him than the extra cost that may be involved in the provision of more convenient service."[17] It may also consist of immediate payment for livestock if the seller wishes to have cash quickly. There is no evidence that the new marketing system affects significantly the convenience to the producer. It might be more convenient for both producer and buyer if payment for hogs were made by the Commission rather than by the buyer.

Of all the marketing channels, the teletype selling

---

[16]Chang Mei Lu, "Effect of Teletype Auction on Price Variation Over Time," Unpublished Master's thesis, Department of Agricultural Economics, University of Manitoba, August, 1969.

[17]Report of the Select Committee of the Legislative Assembly of Manitoba, op. cit., p. 160.

system seems to be the most effective mechanism for establishing the general price for livestock. But the evaluation of the teletype method of selling hogs would be incomplete without a consideration of the question of compulsion if the teletype method should replace all the other methods and become the only available method for selling hogs. When the teletype method is compulsory, some of the advantages mentioned above would be maximized, including the degree of competitiveness. The lowest cost per animal marketed would probably also be achieved. On the other hand, the producer would lose his freedom of choosing the channel through which to market his livestock. Nevertheless, the loss of freedom of choice would not appear to be a serious loss so long as the producer can get reasonable compensation in the form of a more competitive mechanism and realize a higher price for the livestock.[18]

Compulsory and Voluntary Teletype Systems

In order to maximize the degree of competition among the packers and to increase the returns to hog producers, the teletype auction system was adopted on a compulsory basis in Ontario. All slaughter hogs of Ontario origin must be sold through the Ontario Hog Producer's Co-operative, the selling agent of the Ontario Hog Producer's Marketing

---

[18] Ibid., p. 170.

Board. The board levies 45 cents per hog on all hogs of Ontario origin. The board consists of eleven directors who must be hog producers elected by producers. Although a number of advantages have been realized by the majority of producers, there are still some controversies between the Marketing Board and a few producers and the Co-operative Packing Company of Ontario.[19] Some producers, especially those located near packing plants, claim that they are placed in a less advantageous position under the compulsory marketing system as compared with the previous method of marketing.[20] They claim that they used to deliver their hogs direct to a nearby packing plant and were able to obtain top yields and prices for their hogs because they could minimize the costs of handling. Under the new compulsory system of marketing, they have to deliver their hogs to the assembly yard where they are unloaded and mixed with other hogs, then reloaded, sometimes after a long waiting period in the yard, and shipped to a packer who may, in some instances, be considerably farther away than the plant to which they used to ship. They complain that

---

[19]Co-operative Packing Company of Ontario has now gone out of business. This might be an indication that the teletype selling system induces such intensive competition that only firms which have plants in less competitive areas or operate at a lower cost can survive.

[20]Report of the Select Committee of the Legislative Assembly of Manitoba, op. cit., pp. 86-95.

additional handling causes unnecessary shrinkage[21] and bruising and that, as a result, they are now receiving lower yields than they formerly did.[22] There were also conflicts, which were not definitely settled, between the Marketing Board and the Co-operative. Under the compulsory system no direct delivery to the packing plant is permitted. On the other hand, the members of the Co-operative felt that they, as a group of producers, had the right to maintain a processing and selling organization of their own by voluntary co-operative effort.[23]

Realizing the advantages and limitations from Ontario's experience, a voluntary teletype auction was established to market Manitoba hogs under the administration of the Manitoba Hog Marketing Commission. The Commission consists of five members appointed by the Manitoba government. Of four current members, two are presently engaged in

---

[21]Rate of shrinkage--tissue shrinkage and excretory shrinkage--tends to increase as time in transit increases. Hogs weighing 180 to 199 pounds had an average tissue shrinkage of 2.4 per cent of their live weight when in transit for 36 hours and 3.4 per cent when in transit for 60 hours. Gross shrinkage for the same weight category is on the average around 4 per cent in transit 6 hours or less, and more than twice as great in transit over 60 hours. See Stewart H. Fowler, The Marketing of Livestock and Meat, (Danville, Illinois: The Interstates Printers and Publishers, Inc., 1957), p. 422.

[22]Report of the Select Committee of the Legislative Assembly of Manitoba, op. cit., p. 93.

[23]Ibid., p. 94.

producing hogs.[24] There is no provision for a direct voice or vote of hog producers in the administration of the system. It is operated on a voluntary basis and in order to insure sufficient income to permit it to operate without dependence on volume and to avoid inhibiting producer patronage by charging operating costs only to the voluntary users, the cost of the system is borne by a levy of 30 cents per hog on all hogs of Manitoba origin. The 30 cents, compared with 45 cents levied in Ontario, has been more than sufficient to cover the costs of the operation.

Being voluntary, the Manitoba hog producers can opt to deliver their hogs to the Union Stock Yards in St. Boniface, to the Co-operative Stock Yards in Brandon, where hogs are sold through the teletype auction system, or sell directly to the packing plant. To sell direct, the producer must complete a Direct Sale Form. The form is provided by the Hog Commission. Those producers who intend to sell direct to the packer have to make applications in person or by mail to one of the two offices of the Commission,[25] and no packer can buy hogs unless the shipment is covered by a Direct Sale Form. If a considerable proportion of hogs for slaughter is offered for sale by teletype and every

---

[24] A. W. Wood, "Teletype Hog Marketing," Spotlight, June 1968, pp. 13-14. At the time of writing there is one vacancy on the Commission.

[25] Annual Report, Manitoba Hog Marketing Commission, 1967, p. 4.

interested packer has an equal opportunity to bid on all lots of hogs, there will be no processor who can be assured of his entire supply of hogs without buying some from the Commission. Since the teletype system operates on a voluntary basis, the prices generated by the system may vary significantly according to the proportion of hogs sold through teletype auction--i.e., a smaller proportion of hogs sold through the system may generate a lower price for the producer.[26] Because the proportion of hogs sold through the mechanism varies from day to day, therefore, the price level discovered by the teletype system may vary significantly from one day to another.

Objectives of the Study

The Manitoba Hog Marketing Commission sells about 60 per cent of all hogs of Manitoba origin. In the 1965-66 period, about 62.1 per cent of hog sales were through teletype auction. In 1966-67, the percentage of sales dropped to 60.2, and in 1967-68, further dropped to 57.3 per cent. The percentage of sales through this system has varied on a daily basis--running from about 60 to 70 per cent Monday through Thursday and then falling off sharply to below 50 per cent on Friday.

The initial objectives of this study are, to

---

[26] Ibid., p. 7. This point will be discussed later.

estimate the effect of the proportion of hogs sold through the teletype marketing system on realized hog prices in Manitoba, and to examine the producers' behavior in choosing the market channel and to analyze the impact of this behavior on hog prices. In addition, an attempt is made to provide information for hog producers and organizations interested in adopting teletype systems for marketing hogs in other provinces.

CHAPTER II

PROBLEMATIC SITUATION AND HYPOTHESES

Various objectives may be pursued by a producer in marketing his livestock. Generally, his primary objective is to realize the highest possible net returns. The producer desires a marketing system which, he believes, will bring him the highest net income. If this is the case, then market information is a vital consideration.[1] In the case of marketing slaughter hogs, in Canada, the net return to the producer is the price paid by the packer at the door of the packing plant less the total transfer costs which include all the expenses of delivering hogs from the farm to the packing plant.[2]

Market Information as a Basis for Choosing a Market Outlet

Once hogs have reached market weight, they can be

---

[1]Market information is usually defined as all facts and their interpretation bearing on the present or prospective market value of commodities. See F. L. Thomsen, Agricultural Marketing (New York: McGraw-Hill Book Company, Inc., 1951), p. 281.

[2]In Canada, the value of hogs is based on the carcass grading system. Total transfer costs may include transportation costs, yardage charge, loading and unloading expenses, bruising and shrinkage, and all possible losses during the shipment. Costs of transfer are usually positively correlated with distance.

held off the market only for a very short length of time. Although they still gain weight after reaching this point, they begin to lose value per unit of weight. Usually the discount rate per hundredweight and the loss of quality premiums are greater than the value of the added weight.[3] Furthermore, once the live hogs are marketed at the stockyard or the door of the packing plant, the producer has to accept the aggregate value based on the price offered by the packer buyer, no matter what that value is. Ordinarily, he accepts the price offered if he has already delivered his hogs. It is very unlikely that the producer will ship his hogs back to the farm to hold for later sale when the offered prices are low. Consequently, the producer ordinarily decides when, where, and to whom his hogs will be sold before the hogs are ready for sale. In general, the producer makes those choices and decisions in light of the market information and his own desires, knowledge, and judgement.

If it is assumed that all producers are economically rational, then the dissemination of frequent and accurate market information is very important, especially information about price movement trends and inter-market spreads. After the Commission was established, market information with respect to hog sales and prices was more extensively

---

[3]Theodore C. Byerly, Livestock and Livestock Products, (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1964), p. 344.

disseminated. "Daily and weekly hog market reports are supplied to three dailies, two weekly farm papers and four radio and T. V. Stations."[4]

Decision-Making in Choosing a Market Outlet for Livestock

A variety of studies has been made to determine producer preferences in choosing a market outlet. A study of livestock activities in the Northeast region of the United States revealed that the highest price was not the primary concern by the producers in choosing a market outlet for their livestock.[5] The highest gross price does not necessarily imply the highest net price. Actually, "Convenience" was listed as the most important factor affecting the producers choice of market for their livestock. "Highest price" was indicated as the second and "convenience and highest price" was ranked as the third factor desired by the producers in assessing a market channel. If we look more closely at the "convenience" factor, it seems to imply a location or time convenience, such as the distance from farm to the packing plant, money received immediately, costs of handling and shrinkage, etc. Another important element included in factors affecting the choice of market outlet is

---

[4] Annual Report, Manitoba Hog Marketing Commission, 1968, p. 8.

[5] Kenneth D. McIntosh, Marketing Practices and Procedures of Northeastern Livestock Producers, West Virginia University, Agricultural Experiment Station Bulletin 457, June 1961, pp. 38-46.

"habit". It is obvious that many producers are strongly influenced by habit and custom. Once a practice or marketing channel has been used in a certain way for a long period of time, it seems natural to continue using it in a similar manner.

Another study,[6] analyzing the marketing preference of Oklahoma livestock producers, reported that about 40 per cent of the producers interviewed liked the auction market because of its closeness and convenience to their farms; 25 per cent preferred the terminal market because the producers believed they would receive a higher price for their livestock; 18 per cent liked the country market because of convenience, which implied less cost in terms of time and transportation expenses. It was also found that the market outlets and services provided by the market were of greater concern to producers when they have a bigger size of livestock enterprise.

It is generally believed that, if the producer is economically rational, he would attempt to obtain the highest possible net returns for his livestock. If he is not doing so, it is presumably because of the imperfection of market information. The producer would eventually change to a more economically advantageous market if his market knowledge

---

[6]Adlowe L. Larson and Gene Crosby, Marketing Preferences of Oklahoma Livestock Producers, Oklahoma Agricultural Experiment Station Bulletin B-556, June 1966.

were improved and market news were correctly and effectively disseminated. Along the line of Fowler's prescription, a producer should take the following most important factors into consideration:

> . . . (1) the price most likely to be received for the livestock; (2) the total costs of marketing; (3) the producer's services rendered for the livestock; and (4) the producer's ability to perform some or all of the marketing service.[7]

In order to maximize net returns, if the producer's choice of market channel is based on expected net returns, a producer, in the first place, should consider at which market his livestock will likely bring him the highest price, and this should be balanced against the other three factors--the transportation costs, the estimated shrinkage and bruising, and the handling and selling expenditures at all alternative markets. However, Kohls and Gifford take a different approach toward the analysis of the producer's choice of hog market outlets.[8] They challenge the traditional assumption that the producer wants to maximize the net returns on the ground that decision-making by the producer is "part economical, part psychological, and part sociological".[9] They further propose that, in order to gain

---

[7]Stewart H. Fowler, The Marketing of Livestock and Meat, (Danville, Illinois: The Interstates Printers and Publishers, Inc., 1957), p. 180.

[8]R. L. Kohls and John Gifford, "Farmer's Choice of Hog Markets," Journal of Farm Economics, Vol. 39, Feb., 1957, pp. 67-74.

[9]Ibid., p. 67.

insight into producer behavior, one has to look into the farm enterprise characteristics, socio-economic status characteristics, market attitudes and opinion.

Up to the present, there have been few studies undertaken to examine the Canadian livestock producer's behavior and preferences in choosing market outlets. Studies in this area would be desirable and helpful for market researchers in exploring further details of livestock marketing. However, it is probable that information relating to United States livestock producers would apply also to Canadian producers.

Problematic Situations

Beginning with these indications it is feasible to explore further how the hog producers in Manitoba choose the marketing channel for their hogs. At the present time, there are two alternative types of market outlet open to hog producers; direct delivery to the packing plant by the producer himself or by a trucker who acts on his behalf; and consignment to the Manitoba Hog Marketing Commission which sells by the teletype selling mechanism.

During 1967, the period chosen for this study, about 715 thousand head of hogs of Manitoba origin were slaughtered within the province. A total of 592,902 head, 84 per cent of the total, were marketed at St. Boniface (Table I). About 348,624 head were delivered to the Union Stockyard in St. Boniface, and in turn were sold by the Commission, i.e.,

TABLE I

COMPARISON OF TELETYPE AND DIRECT SALES, BY MONTH, 1967, ST. BONIFACE

Month	Number of hogs sold			Percentage of sales		Prices a/		
	By Teletype	Direct	Total	By Teletype	Direct	Teletype	Direct	Difference
Jan.	33,447	18,606	52,053	64.26	35.74	29.53	29.61	-.08
Feb.	28.154	18,522	46,676	60.32	39.68	30.33	30.35	-.02
March	31,694	20.736	52,430	60.45	39.55	28.82	28.81	.01
April	28,432	19,351	47,783	59.50	40.50	27.63	27.68	-.05
May	32,051	20.328	52,379	61.19	38.81	30.68	30.60	.08
June	26,587	19,182	45,769	58.09	41.91	29.61	29.52	.09
July	22,546	17,693	40.239	56.03	43.97	27.84	27.93	.09
Aug.	26,996	20.833	47,829	56.44	43.56	28.58	28.61	-.03
Sept.	25,243	19,567	44,810	56.33	43.67	28.57	28.53	.04
Oct.	31,405	22,765	54,170	57.97	42.03	27.85	27.91	-.06
Nov.	34,283	23,929	58,212	58.89	41.11	26.52	26.58	-.06
Dec.	27,786	22,766	50,552	54.97	45.03	26.75	26.87	-.12
Total	348,624	244,278	592,902	58.80	41.20	28.56	28.58	-.02

Source: Manitoba Hog Marketing Commission records

a/ Weighted average hog price per hundredweight of grade A dressed.

about 58.8 per cent of hogs sold in St. Boniface were sold through the teletype selling system. During the same period, the price of hogs per hundred weight paid by the packer to those who sold direct to the packing plant was two cents higher than the price realized by those who sold through the teletype system. This evidence suggests that the price paid by the packer to the producers is strongly dependent upon and approximately equal to the prices discovered by the teletype selling system. The slightly higher price received by those producers who sold direct could indicate packer efforts to draw away the producer from patronizing the teletype selling system. It also could be due to minor errors in calculation or reporting of data on direct purchase of hogs by packing plants as transmitted to the Commission. However, the difference is not significant in any event (see Appendix, Table XXI).

To gain an insight into the question of how producers choose their market outlet, one would have to probe deeply into the economic factors as well as social and psychological elements as suggested by Kohls. The Commission levies 30 cents per hog on all the slaughter hogs of Manitoba origin and provides the facilities available for all producers without any additional charges. Since the prices received were not significantly different between the two outlets, to determine the economic rationality of the producer's behavior it is necessary to consider the total

transfer costs. It is obvious that the transportation costs are positively correlated to the distance from the individual farm to the market place. It is safe to assume that the transportation costs from the individual farm to the Commission and the packing plants are essentially the same. This assumption rests on the fact that all packing plants are clustered in St. Boniface. Because farms are located at widely varying distances from the central market there is no unique transportation cost for all farms. However, so long as a producer decides to market his hogs in St. Boniface, the transportation costs are the same whether he delivers to the Union Stockyard or to the packing plant. If this assumption is valid, the differences can be narrowed down to the comparisons of handling and selling costs, and the estimation of possible losses in terms of bruising, shrinkage and death.

If the hogs are sold direct, the handling costs and possible losses are minimized. If it were decided to patronize the Commission, the producer might deliver his hogs to the Union Stockyard, or he might telephone and inform the office of the Commission of the number of hogs on the load (minimum of 12 head)[10] and the estimated time of arrival and then offer the hogs "on truck or on car en route". This latter procedure for selling hogs retains the advantages of

---

[10] Annual Report, Manitoba Hog Marketing Commission March, 1968, p. 4.

competitive bidding and minimizes the handling costs and possible losses as well as direct selling does. In 1967, approximately 45 per cent of the total sales were handled by the Commission in this manner.[11] Assuming that the other 55 per cent were unloaded and reloaded and mixed with other hogs in the stockyard in order to make up a sufficient size of lot to be offered for sale, the producer would encounter an additional cost which is important to him. There may also be an additional expense, in terms of time involved in the negotiation of price between the individual producer or trucker and the packer when hogs are delivered at the door of the packing plant for direct sale. The numerical comparison of these sets of values is presently impossible, for the costs of time involved in selling cannot be readily evaluated in money terms since they are affected by the individual's ideas of value and attitude toward money and time.

In the absence of any basis for a contrary conclusion, it would be possible to assume that the two sets of values are equal for a producer. On the basis of the foregoing arguments it is assumed that there is no difference, in terms of economic considerations, between the direct and teletype sales for the individual producer who intends to market his hogs at the St. Boniface market.

The social and psychological characteristics

---

[11] Ibid.

involved in the producer decision-making process are rather complicated and beyond the scope of this study. However, the age of the producer, the number of years the producer has been in the business and the level of his education may have a significant influence on his decision-making. Perhaps those producers who choose to sell direct feel they are qualified to bargain on prices with the packer using the prices established by teletype as a basis. However, according to Fowler, the percentage of qualified producers is not very high;

> . . . a survey of farmers in 14 Corn Belt States indicated the percentage of producers who felt they were qualified to sell their own livestock was not very high. Fifty-seven per cent of the farmers felt qualified to sell cattle, 59 per cent to sell calves, 62 per cent to sell sheep and lambs, and 63 per cent to sell hogs.[12]

Undoubtedly, the individual producer has his own opinions concerning market information. One cannot judge producer behavior strictly on price and cost grounds. This belief leads us to hypothesize that those producers who patronize the teletype selling system are those who believe they are not qualified to negotiate the price with the packer and they believe that the teletype system will ensure them a fair market value for their hogs if they use it rather than the alternative outlet. It is also possible that the

---

[12]Fowler, op. cit., p. 181. The confidence might be considerably higher if there were a local competitive public market price to be used as a guide to the general price level for hogs.

smaller producers support the Commission in greater proportion than do large producers. The smaller producers are usually not aware of, or are less informed, concerning market information and are less skilled in the price bargaining process than are those producers who have a larger size of hog enterprise.

About 16 per cent, or 122 thousand head of Manitoba hogs were slaughtered in Brandon in 1967 (Table II). The proportion of hogs sold through the teletype system was about 10 per cent lower than in St. Boniface. One reason for this is that the only packing plant in Brandon, Pool Packer Ltd., is owned by the producers.[13] It is reasonable to assume that the members of the co-operative firm will deliver their hogs direct in order to patronize their own packing plant. The price difference between St. Boniface and Brandon was 50 cents per hundredweight of carcass during the period studied. In the same period, the freight rate per hundredweight for transporting live hogs between the two markets was about 71 cents, including insurance charges. The St. Boniface livestock market presumably is the main immediate factor determining prices in the Brandon market.

The Manitoba Hog Marketing Commission operates its teletype circuit from 10 a.m. to 12 noon and 1 p.m. to 2 p.m. each week day. It is further observed that the

---

[13]The plant was recently sold to Burns Foods Ltd..

TABLE II

COMPARISON OF TELETYPE AND DIRECT SALES, BY MONTH, 1967, BRANDON

Month	Number of hogs sold			Percentage of sales		Prices a/		
	By Teletype	Direct	Total	By Teletype	Direct	Teletype	Direct	Difference
Jan.	5,275	4,981	10,256	51.43	48.57	28.99	29.08	-.09
Feb.	4,657	4,719	9,376	49.67	50.33	29.78	29.86	-.08
March	5,362	5,272	10,634	50.42	49.58	28.33	28.27	.06
April	5,197	5,165	10,362	50.15	49.85	27.11	27.21	-.10
May	5,250	5,131	10,381	50.75	49.25	29.95	30.00	-.05
June	4,242	4,784	9,026	47.00	53.00	29.20	29.12	.08
July	3,928	4,367	8,295	47.35	52.65	27.49	27.47	.02
Aug.	4,542	4,826	9,368	48.48	51.52	28.09	28.12	-.03
Sept.	4,436	5,043	9,497	46.80	53.20	28.27	28.10	.17
Oct.	5,876	6,351	12,217	48.10	51.90	27.46	27.37	.09
Nov.	6,094	6,936	13,030	46.77	53.23	25.99	26.02	-.03
Dec.	4,147	5,465	9,612	43.14	56.86	26.41	26.37	.04
Total	59,007	63,029	122,036	48.35	51.65	28.09	28.08	-.01

Source: Manitoba Hog Marketing Commission records

a/ Weighted average hog price per hundredweight of grade A dressed.

prices received for initial sales each day are lower than those for subsequent sales. The producers in Brandon usually deliver their hogs later in the day than is the case at St. Boniface. They thereby get the advantage of the higher range of prices after 11 a.m. The timing decisions made by the hog producers in Brandon may result in a higher monthly average price for their hogs.

There are many outlets to which Brandon producers may deliver their hogs: to the Union Stockyards or to any of the packing plants located in St. Boniface; to the Co-operative Stockyards; or to Pool Packers Ltd. in Brandon. However, no data are available to indicate the number of hogs shipped directly to Winnipeg plants or to the St. Boniface market.

When available data on teletype operations are examined, certain trends and characteristics become evident. The proportion of Manitoba hogs sold by teletype has varied from year to year, from month to month and from day to day. It may be noted that the sales percentage has varied by days of the week, fairly consistently running from 60 to 70 per cent Monday through Thursday, and then falling off sharply on Friday to below 40 per cent of the hogs of Manitoba origin marketed in St. Boniface (Table III). The percentage of patronage on Friday in Brandon has been as low as 10 per cent, i.e., more than 20 per cent percentage points lower than in St. Boniface (Table IV).

TABLE III

THE PROPORTION OF HOGS SOLD AND PRICE REALIZED BY TELETYPE BY DAYS OF THE WEEK, 1967, ST. BONIFACE

Day	No. of hogs sold by Tele.	Total No. of hogs sold	% of hogs sold by Tele.	Price a/
Monday	66,815	107,581	62.11	28.55
Tuesday	79,248	137,243	57.74	28.44
Wednesday	96,725	139,689	69.24	28.52
Thursday	74,925	116,625	64.24	28.64
Friday	30,911	91,764	33.69	28.63

Source: Manitoba Hog Marketing Commission records

a/ Weighted average price per hundredweight of dressed grade A hogs.

TABLE IV

THE PROPORTION OF HOGS SOLD AND PRICE REALIZED BY TELETYPE BY DAYS OF THE WEEK, 1967, BRANDON

Day	No. of hogs sold by Tele.	Total No. of hogs sold	% of hogs sold by Tele.	Price a/
Monday	16,748	28,609	58.54	28.04
Tuesday	17,142	31,528	54.37	28.02
Wednesday	9,044	19,082	47.40	28.09
Thursday	14,492	27,700	52.32	28.15
Friday	1,581	15,117	10.46	27.95

Source: Manitoba Hog Marketing Commission records

a/ Weighted average price per hundredweight of dressed grade A hogs.

Hog prices, as discovered by teletype, are largely determined by the number of hogs marketed and the demand for hogs during each day. Prices realized on Friday are not significantly different than on the other days despite a strikingly lower percentage of hogs sold by the Commission. This does not indicate that the proportion sold by teletype has no effect on hog prices. The relatively lower quantity marketed on Friday may have some effect on the price level and this may offset or obscure the effect of the proportion sold by teletype.

Hypotheses Respecting Effect of Proportion Sold by Teletype

In order to portray a workable dimension for the study, it is necessary and important to formulate appropriate hypotheses. These should be helpful and meaningful in interpretation of the results, and assumptions made should be reasonable and subject to realistic qualification.

It is hypothesized that the high proportion of direct sales on Friday is due primarily to an inverse delivery pattern by a small number of large producers. The teletype system has been adopted on a voluntary basis; the producer has the privilege of exercising an option with respect to method of sale. The bigger producers are probably more conscious of price, competition and convenience. Their managerial abilities and knowledge of market information are usually superior to that of small producers. These qualities

of entrepreneurship differ among producers and may have an influence on individual decision-making. To explore this hypothesis, data were collected on the number of producers who market their hogs on each trading day of the week for a three week period, total number of hogs marketed and the average number of hogs per consignment on each day of the same period. The comparison between Friday and other days of the week may shed some light on this hypothesis.

It is also hypothesized that maximum returns may be realized, if about 60-65 per cent of hogs are marketed through the teletype system Monday through Thursday and that as the proportion of sales declines from this range its ability to establish a competitive price also declines. Lu,[14] using a technique of intermarket analysis, compared the price spread between Toronto and Winnipeg during the period 1958 to 1968. He reported that after the teletype was adopted in Manitoba, the price paid by packers was increased by 55.5 cents per hundredweight. A similar conclusion was reached by Lowe.[15] However, it is possible to discover more about the effect of the teletype selling system by further examination of the variations in the proportion sold by teletype. An investigation into the

---

[14]Lu, op. cit., p. 86.

[15]J. C. Lowe, "An Economic Analysis of the Teletype Hog Marketing System in Manitoba Canada," Unpublished Master's Thesis, University of Wisconsin, 1968.

percentage distribution on each trading day would be necessary to explore the price effect of the teletype system in Manitoba.

If it is postulated that sale of about two-thirds of the hogs by teletype will maximize the returns for the producers, then it would be evident that the Manitoba teletype system is not significantly different from the Ontario system in its effect on prices. However, the comparison of the voluntary and compulsory characteristics of a marketing system has many intricacies.

Assumptions

Traditional price theory tells us that the prices are determined by the interaction of supply and demand forces within a market area. Any price and market analysis must be consistent with the law of supply and demand. Supply of a commodity is largely determined by the production of that commodity, especially when changes of stocks and net trade are rather small. The production of hogs within a year is assumed to be predetermined. This assumption rests on the fact that it requires 10 to 13 months from breeding to market weight in addition to the decision-making interval before actual breeding begins. On the other hand, demand for a commodity is largely determined by consumer disposable income, preferences and tastes, prices of all other substitutable commodities, and growth of population. However, Fox states:

> . . . consumption of pork could have been expressed directly as a function of the variables used to explain production of pork. When this was done, 90 per cent of the variation in consumption of pork was associated with the known predetermined factors affecting production. In this instance, the bias that may result from treating consumption as a predetermined variable and using the single equation approach is probably small.[16]

In light of Fox's evaluation, it is assumed that the demand for slaughter hogs, which is derived from the consumer demand for pork, is predetermined for the period studied.

However, short run price variations might be expected to initiate interregional trade within a broad market area. About one-fourth of the total number of Manitoba slaughter hogs are imported from Saskatchewan and these presumably have a significant effect on hog prices in the Manitoba market. Therefore, the activities exercised by Saskatchewan producers in shipping hogs into the Manitoba market will be included in this study.

---

[16] Karl A. Fox, The Analysis of Demand for Farm Products, U. S. D. A. Technical Bulletin No. 1081, 1953, p. 31.

CHAPTER III

ANALYSIS OF HOG PRODUCERS CONDUCT

The purpose of this chapter is to present a description of producers decision-making in choice of market outlet. The following discussions are based on the available data in the St. Boniface market; namely, data and time period of study, the percentage distribution of hogs sold through the teletype system on each trading day, the level of Commission support as a proportion of the number of producers, and the possible impact on the Manitoba system of hogs shipped into Manitoba by Saskatchewan producers.

Data and Time Period of Study

The original data required for this study were obtained from the Manitoba Hog Marketing Commission and the Ontario Hog Producers Marketing Board records.[1] Other data were obtained from statistical publications and periodical government reports. There is a slight discrepancy between the calculated results from the original data and the official published statistics. The reliability of the data may be a factor affecting the analysis. Discrepancies may

---

[1]The unpublished data are recorded in Appendix Table XXI.

originate from inaccurate reporting or computational errors. Therefore, original data rather than the official statistics will be used in this study. This decision was based on the belief that errors in the official statistics may have a critical effect on the analysis.

The period of analysis is the calendar year 1967. There are two reasons for the selection of this period. When the study was begun the latest data available were those for the 1967 calendar year. Secondly, variation in patronage of teletype between shorter time periods than a year are similar for all years even though a declining trend existed between years. The period selected is believed to fit the criterion: "the period chosen should be long enough to average out the effect of irregular or unmeasurable factors and short enough to insure that a relatively heterogeneous set of factors are operating".[2]

Percentage Distribution of Hogs Sold Through Teletype on Each Trading Day

Respecting the percentage distribution of hogs marketed through the teletype system in 1967, on about two-thirds of the trading days the proportion ranged between 55 and 75 per cent (Table V). The mode of the distribution is between 60 to 65 per cent. The weighted average price

---

[2]Richard J. Foote, Analytical Tools for Studing Demand and Prices, U. S. D. A. Agricultural Marketing Service, Agricultural Handbook No. 146, August 1958, p. 20.

TABLE V

HOG PRICES AND FREQUENCY DISTRIBUTION OF DAYS BY PROPORTION OF HOGS SOLD BY TELETYPE ST. BONIFACE, 1967

Percentage sold by teletype	Number of days	Percent of days	Weighted price per cwt.
15-19.99	2	1	29.13
20-24.99	4	2	27.66
25-29.99	10	4	27.89
30-34.99	17	7	28.61
35-39.99	12	5	28.75
40-44.99	3	1	29.96
45-49.99	6	2	27.78
50-54.99	19	8	28.30
55-59.99	42	17	28.12
60-64.99	48	19	29.02
65-69.99	46	18	28.91
70-74.99	37	15	28.49
75 & above	6	2	28.05

Source: Manitoba Hog Marketing Commission records.

realized in this range is relatively higher than for the range 55 to 75. This may indicate that if the proportion of hogs sold through the Commission falls within this range on each trading day, the maximum prices for hogs will be realized. The occurrence of days when patronage was less

than 50 per cent was mainly on Friday when several large producers deliver their hogs direct to the packing plant and when deliveries to the Commission are low. This will be examined further later. The higher price realized over the range of 40 to 45 per cent could be due to the unusually high price realized on three Fridays.

The Level of Commission Patronage

A detailed analysis of all producers who sold their hogs in St. Boniface during three full weeks:[3] namely, the weeks ending October 7, November 24, and December 15, 1967, indicates the level of Commission patronage. During the weeks studied, 5,202 Manitoba producers marketed 37,862 head of hogs at the St. Boniface market. Among these, about 4,235 producers consigned 23,830 head of hogs to the Commission (Table VI), i.e., 81.39 per cent of all producers in this period marketed 62.93 per cent of all Manitoba hogs through the teletype system. The number of producers who marketed their hogs on Friday was relatively low compared with the number who marketed on other trading days of the week, but the average number of hogs per consignment on each trading day was not significantly different. This suggests that the producers who patronize the teletype system on each

---

[3]These three weeks were arbitrarily selected from the available records from the Manitoba Hog Marketing Commission. It is believed that these three full weeks study will give a good indication of the level of Commission patronage.

trading day of the week are homogeneous with respect to the size of their hog enterprise.

TABLE VI

LEVEL OF COMMISSION PATRONAGE BY DAYS OF THE WEEK, ST. BONIFACE, 1967 a/

	Producers		Hogs Sold		Average no. of hogs per consignment
Day b/	Number	% of Total	Number	% of Total	
Monday	939	72.85	5,858	56.97	6.24
Tuesday	1,018	83.22	4,796	61.67	4.71
Wednesday	985	88.26	5,752	73.79	5.84
Thursday	959	88.86	5,458	76.96	5.69
Friday	334	67.71	1,965	39.98	5.88
Total or Average	4,235	81.39	23,830	62.93	5.62

a/ Manitoba Hog Marketing Commission records

b/ Average for weeks ending October 7, November 24 and December 15.

In the same period, 967 producers marketed 14,032 head of hogs direct to the packing palnt, i.e., 18.61 per cent of the producers in the period marketed 37.07 per cent of hogs direct (Table VII). The average number of hogs per consignment was 14.50 head compared with 5.6 head per consignment for teletype selling. This indicates that the producers who sell direct to the packing plant operate hog enterprises more than twice as large, on the average, as

those who sell through the teletype system. Furthermore, on Fridays, the proportion of the producers marketing direct, the proportion of hogs sold direct, and the average number of hogs per direct consignment were all at the highest level of all the trading days of the week. The average number of hogs per direct consignment on Friday was 18.44 head, as compared with the average of 14.50 head for the week; or about 4 head higher.

TABLE VII

VOLUME OF DIRECT SALES BY DAYS OF THE WEEK, ST. BONIFACE, 1967 a/

	Producers		Hogs Sold		
Day b/	Number	% of Total	Number	% of Total	Average no. of hogs per Consignment
Monday	350	27.15	4,424	43.03	12.64
Tuesday	205	16.78	2,981	38.33	14.05
Wednesday	131	11.74	2,043	26.21	15.60
Thursday	121	11.20	1,634	23.04	13.50
Friday	160	32.29	2,950	60.02	18.44
Total or Average	967	18.61	14,032	37.07	14.50

a/ Source: Manitoba Hog Marketing Commission records

b/ Average for weeks ending October 7, November 24 and December 15.

The conclusion is drawn from the foregoing analysis that the producers who choose to sell through the Commission

are relatively smaller in their size of enterprise compared with those who sell directly to the packing plant, and that the producers who choose to sell direct to plant on Friday are relatively larger in size of hog enterprise than those producers who sell direct on the other days of the week. These findings support the hypotheses that the smaller producers support the Commission in greater proportion than do large producers, and that the high proportion of direct sales on Friday is a consequence of restricted deliveries on Friday of those who tend to patronize the Commission.

There is evidence that the packer-buyers encourage producers to deliver directly to the packing plant by providing different kinds of services.[4] Some producers consistently deliver their hogs to the same packing plant; perhaps because of habit or tradition. It is possible that packer buyers are reluctant to bid up the teletype selling prices because this would result in higher base prices for hogs purchased on direct delivery from the producers. The heavier delivery by large producers on Friday does not result in lower prices. This delivery pattern may be a result of the following factors:

1. The packer encourages large producers to deliver on Friday by paying them a higher price or by offering additional services.

---

[4]The packer provides lunch and washing facilities for trucks to the producers who deliver directly to the plant.

2. The Commission does not encourage producers to deliver their hogs to the Commission on Friday. The Commission terminates the operation of the teletype at 12 noon on Friday. A heavy consignment on that day could result in sharply lower prices since the packer's demand for hogs would presumably have been largely satisfied by direct deliveries.
3. The producers desire their hogs to be slaughtered on the day of sale to avoid unnecessary shrinkage, due to delayed killing, and therefore to be assured of a better yield.[5] The packer may discriminate against the hogs received from the Commission and postpone killing them until the following Monday, giving priority to hogs delivered direct.
4. Hog prices on Friday may be somewhat higher because of the generally smaller quantity marketed on that day.

Effect of Saskatchewan Hogs on the Manitoba System

The Manitoba Hog Marketing Commission has no power to restrict the movement of hogs into Manitoba from other provinces. Manitoba produces fewer hogs for slaughter than

---

[5]The packer is required to pay a penalty of one per cent of the hog value if there is a delay of more than two days in killing hogs obtained from the Commission.

are processed in the province while Saskatchewan produces more hogs than are processed in that province. Assuming that competition exists in the entire market area, producers are free to take advantage of shipping their hogs to one market or another to maximize returns and interregional movement of hogs will occur when the difference in shipping costs to the alternative points is less than the price differential. An examination of the hog industry and its prices characteristics in Manitoba must include the activities of Saskatchewan producer who ship their hogs into the province.

During the period from 1965 to 1968, the price spread between Saskatoon and St. Boniface was not significantly different from the total transfer costs of transporting live hogs.[6] Historically, Saskatchewan producers ship about one-third of their total market hogs into Manitoba for sale. In the ten year period ending 1966, an average of approximately 27 per cent of hogs slaughtered in Manitoba was shipped from Saskatchewan.[7] In 1967, about 135,751 head of hogs other than of Manitoba origin were slaughtered in Manitoba, among which 134,560 head were of Saskatchewan origin.[8] This accounts for 99 per cent of the

---

[6] Lu, op. cit., p. 31.

[7] Ibid.

[8] Livestock Market Review, 1967, C.D.A. Ottawa, p. 64.

total imports. Negligible amounts are shipped from Alberta and Ontario. In 1967, they accounted for 999 and 182 head, respectively.[9]

In the 1967 period, about 843 thousand head of hogs were slaughtered in Manitoba. Approximately 15 per cent of the total Manitoba slaughtered hogs were imported from Saskatchewan in most weeks (Table VIII). Of the Saskatchewan imported hogs, some are sold through the Commission and immediately realize the prices established by the teletype selling system.[10] If this is the case, they are subject to a 30 cent service charge per hog levied by the Commission. However, the majority of Saskatchewan hogs marketed in Manitoba are delivered directly to the packing plants. There are no data available to show the proportion sold through either outlet. If the Manitoba Hog Marketing Commission had jurisdiction over the hogs marketed in the province from other areas then, presumably, the proportion of hogs sold through the Commission would be higher and the packer buyers demand for hogs from the Commission would be greater than in the present situation. The packing plant needs a steady supply to assure the regular utilization of packing facilities in order to realize a low unit cost per animal. Therefore, the necessity to compete on teletype

---

[9] Ibid.

[10] This information is provided by the managing director of the Manitoba Hog Marketing Commission.

TABLE VIII

NUMBER OF HOGS IMPORTED INTO MANITOBA FROM OTHER PROVINCES, WEEKLY, 1967

Week Ending	No. of Hogs Imported	% of Man. Slaughter	Week Ending	No. of Hogs Imported	% of Man. Slaughter
Jan. 7	2,944	15.84	July 8	1,853	13.21
14	3,194	16.97	15	2,264	15.07
21	1,926	13.58	22	2,181	14.23
28	3,070	16.35	29	1,175	7.86
Feb. 4	2,654	14.53	Aug. 5	1,942	13.08
11	2,950	17.67	12	2,264	15.20
18	2,173	14.01	19	1,416	9.23
25	2,317	13.84	26	1,948	13.70
March 4	3,023	16.21	Sept. 2	1,324	10.08
11	2,371	14.30	9	1,600	12.42
18	1,934	12.13	16	2,276	13.25
25	2,375	14.56	23	2,433	14.60
April 1	2,775	15.29	30	1,840	10.95
8	2,578	13.23	Oct. 7	3,100	16.78
15	3,145	16.75	14	2,896	17.84
22	2,474	16	21	891	4.50
29	3,280	17.40	28	6,808	33.24
May 6	2,566	15.17	Nov. 4	3,588	16.81
13	2,998	16.56	11	3,505	16.97
20	2,122	12.42	18	3,135	15.48
27	1,525	10.52	25	4,267	18.97
June 3	2,225	14.19	Dec. 2	3,819	17.54
10	2,981	17.68	9	4,035	17.96
17	2,628	15.69	16	3,998	18.97
24	2,693	17.43	23	2,900	15.83
July 1	2,218	14.71	30	1,154	9.40
Total				135,751	15.18

Source: Livestock and Meat Trade Report, C. D. A. Ottawa.

may ensure a competitive price for all hogs sold by teletype as well as those sold direct of both Manitoba and Saskatchewan origin.

In light of the successful operation of the teletype selling system for hogs in Ontario and Manitoba, an inquiry into the feasibility of adopting a teletype system was initiated by hog producers both in Saskatchewan and Alberta.[11] Manitoba is a deficit market for live hogs and a negligible amount of live hogs is shipped to Ontario. In 1967, only 167 head of hogs were exported from Manitoba to Ontario. The one-direction movement of hogs from Saskatchewan to Manitoba is of much greater significance. Furthermore, a reciprocal movement of hogs occurs between Saskatchewan and Alberta. In 1967, about 14 thousand head of hogs were shipped from Saskatchewan to Alberta, and about 17 thousand head were shipped from the latter to the former province. Therefore, the hog market in the prairie provinces may be regarded as a single market area.[12] A joint teletype system including the three prairie provinces would probably be quite feasible and might be profitable for the hog producers

---

[11] J. A. Brown, et al., Hog Marketing in Saskatchewan, A preliminary report prepared for the Saskatchewan Advisory Swine Council, June 1966. See also T. W. Manning, Performance of the Hog Marketing System in Alberta, Agricultrual Economics Research Bulletin No. 4, The University of Alberta, Edmonton, July 1967.

[12] Freight rates in carload lots (minimum of 16,000 lbs) from Calgary, Edmonton, Saskatoon and Regina to Winnipeg were 136¢, 133¢, 98¢ and 83¢ per hundredweight of live hogs, respectively, in 1967. Source: Livestock and Animal Products Statistics, D.B.S. # 23-203, Ottawa, Queen's Printer, 1967, p. 79.

in this area. The possibility of establishing such a joint system would merit serious consideration. Furthermore, after a joint system was established, a working arrangement with the Ontario system might be attempted.

CHAPTER IV

ANALYSIS OF BEHAVIOR OF PACKER BUYERS

This chapter discusses the buying behavior of packers before and after the inception of the teletype system for selling hogs. The meat packing industry in Canada is concentrated to a substantial degree in the hands of three large national packing companies. In the absence of public intervention, a high degree of concentration in an industry may result in unsatisfactory conduct and performance. The teletype system is designed to affect the competitive relations among packers.

Packers Buying Conduct and its Impact on Hog Prices Before the Establishment of the Teletype System

Before the introduction of the teletype selling system, packer buyers could procure their slaughter hogs from the following channels: (1) from individual farms; (2) through packer's buying stations at country points; (3) by buying at the door of the plant; and (4) from the public market. Of these channels, (3) and (4) were of greatest importance. However, the prices of hogs bought through all channels were negotiated on a private treaty basis. That is, prices were negotiated between the individual packer or his buying agent and an individual producer,

drover or trucker, or a selling agent representing a commission firm acting on behalf of producers.

Buyers of hog products in the retail market are large in number, but the numer of packer buyers of hogs at the farm level is very small as compared with the number of hog producers. There were only eight packing companies engaged in hog processing in Manitoba in 1967.[1] Among them, three were large national firms; namely, Canada Packers Ltd., Swift Canadian Co. Ltd., and Burns Foods Ltd. In 1966, Bronson reported "in Canadian meat packing, the three firms handle just over one half of the total commercial output of red meats."[2] It would be difficult to separate their joint shares of hog products from their total red meat shares and to calculate their respective shares of the live hog market in Manitoba. However, it is observed that they purchase about 60 to 70 per cent of total Manitoba hog marketings. The existing market situation may fit Bain's description of a "market with a significant degree of buyer concentration and many small sellers--simple oligoposony."[3]

---

[1]The Pool Packers Ltd. plant in Brandon was purchased by Burns Foods Ltd. in April 1969, thus reducing the number of companies by one.

[2]Harold E. Bronson, Canadian Meat Packing and Farmer Organization, University of Saskatchewan, October 1967, p. 5.

[3]Joe S. Bain, Industrial Organization, Second edition, (New York: John Wiley and Sons, Inc., 1968), p. 151.

In the absence of institutional intervention, a group of large packer buyers in an oligopsonistic market purchasing a significantly large fraction of the supply of hogs may recognize their interdependence and restrain their tendency to compete for supplies. They may attempt to act collectively to exercise their "monopsonistic power" to depress buying prices and increase their own profits. This may be achieved by the largest firm's acting as a price leader to establish a price policy for the other firms to follow.

There is considerable evidence that price competition among the processors was lacking in the hog market before the inception of the teletype system. Among others, the following elements were noted in the report of the Select Committee of the Legislative Assembly of Manitoba as the most important evidence that the large packers were able to avoid strong price competition.[4] (1) Sales through the public stockyard had declined to a low level and were replaced by deliveries to the door of the plant. Though the prices paid at the plant door were based on the prices established in the public market, the divergence of the bulk of supplies from the public market probably had an influence on prices established on that market. According to the Legislative Committee, producer groups felt that

---

[4] Livestock Marketing In Manitoba, op. cit., pp. 47-50.

"the large buyers are able to obtain the bulk of their requirements by direct purchases and then refrain from bidding as aggressively for supplies delivered to the public yards."[5] Furthermore, they claim that, as a matter of fact, the large processors buy few of their requirements at the public market.[6] Therefore, the large processors procure their supplies without direct competitive bidding with other large processors. It is generally recognized that the absence of large buyers from the public market would lessen the degree of competition to some extent. It is probable that the action of large buyers in promoting direct deliveries would depress the prices paid at the public market and consequently a lower price would also be paid to the producers who sell their hogs direct to the plant.

(2) The trend toward direct marketing lessened competition among packers in still another way. In contrast to the large buyer behavior, the small processors were unable to send agents to buy hogs in the country or to solicit the producers to deliver hogs to their plants. Therefore, they depended almost entirely upon the public market for their hog supplies. The volume delivered to the public market were not always adequate to supply the small

---

[5] Ibid., p. 48.

[6] Ibid.

with their usual share of hogs but these plants were reluctant to bid the public market price a level higher than the plant door price and were not able to bid on the bulk of hogs which were marketed direct to the large plants. In these circumstances the small processors were in danger of being squeezed out of the industry owing to recuring difficulties of securing enough supplies to survive. Failure of small processing firms would result in further concentration among the few large firms.[7]

(3) Direct marketing generally refers to hogs sold at the door of the plant where the negotiator on the selling side is the producer or a trucker, an intermediary who is not hired, as such, by the producer.[8] If the producer hauled his own hogs to a certain plant, he did not commit himself to accept the price the buyer offered but could take the load to another plant or to the public market. If the producer's hogs were hauled by the trucker, the producer might or might not give instructions to the trucker to deliver his hogs to a particular plant or market. There are no data available to indicate what proportion of Manitoba producers give explicit instruction to the trucker. However, in Ontario, more than 80 per cent of hog producers did not instruct the trucker to deliver their hogs to a

---

[7] Ibid., p. 49.

[8] Ibid., p. 164.

particular plant or public market.[9] If the producer did not give instructions, the trucker had discretion to deliver hogs to any plant or to the public market whichever was most convenient or most profitable to himself. If this was the case, he might be induced to deliver hogs to any plant which offered a bonus. Such bonuses "might come out of shipper's receipts through a lower price for the livestock delivered."[10] The degree of competition is limited when a producer himself delivers hogs directly to a plant because he is generally less informed and less skilled in price negotiation than is the buyer. "The lack of competition may be even greater when the trucker negotiates the sale. His experience will be greater than that of the average producer but his interest is divided if he has discretion and is offered a bonus."[11]

From the foregoing observations it may be concluded that price competition was lacking among the packers in the hog market before the establishment of the teletype marketing system. The Legislative Committee suggested that a marketing mechanism which would initiate more competitive bidding among the packers would be desireable.

---

[9] T. S. Rackham, Hog Marketing In Gray, Ontario, (Department of Agriculture, Ottawa, April 1950), p. 13.

[10] Livestock Marketing In Manitoba, op. cit., p. 164.

[11] Ibid.

Implications of Institutional Intervention for Packers

The objective of the Manitoba Hog Marketing Commission is to promote competitive bidding among the packers and to prevent retaliation against aggressive bidders and collusion among the big buyers. There is no attempt to create monopolistic power on behalf of producers since the Commission has no power to control either price or quantity.

Competitiveness is one of the most important characteristics of a selling system because of its potential effect on the net returns to the producers. The teletype selling method for hogs is more competitive than the conventional private treaty method in at least three ways; firstly, in teletype selling,[12] any lot of hogs available for sale is offered to all the potential buyers simultaneously. All the packer buyers in the market who wish to buy hogs have an equal opportunity to bid on each lot of hogs. Initial asking prices for each lot, determined by the selling agency, are adjusted downward by successive five cent intervals to a maximum range of one dollar. The first bidder who presses the "buying button" stops the operation of the pricing mechanism. After confirmation by the bidder, the sale is completed. The unsuccessful bidder knows at what price the particular lot of hogs was sold, but he does not know the identity of the successful bidder.

---

[12]The operational characteristics are described on p. 3, supra.

On the other hand, in Ontario, before the establishment of teletype selling,[13] when a lot was available for sale, the selling agency solicited and received bids from individual packers by telephone.[14] During the course of negotiations, the selling agency attempted to force buyers to bid against each other without being informed as to the level of competing bids.[15] There was no assurance that all the buyers participated in the process nor that the highest bidder actually received the hogs. A problem of allocation occurred repeatedly since identical bids were often received.

Secondly, teletype selling creates a more competitive atmosphere among buyers through a condition of uncertainty arising from the teletype mechanism. For illustration, the packer has to decide how much, more or less, he is going to pay for hogs today than he did yesterday when he buys hogs by teletype. If he is the first to push the "buying button", the particular lot of hogs is his. He cannot reconsider and refuse to accept the hogs if he thinks he is paying more than his rival. Consider packer A who decides to bid $28 per hundredweight for hogs

---

[13] Public auction is not used for selling hogs. See Report of the Select Committee of the Legislative of Manitoba, op. cit., p. 167.

[14] Ibid., p. 88.

[15] Ibid.

on a certain day. After two hours of selling, all sales have been made at prices higher than $28. The crucial question is whether he should raise his bidding price and compete with his rivals or stick at $28 and risk buying no hogs that day. The outcome for either of these courses of action is uncertain. If he raises his bidding price to compete with his rivals, the price may be pushed even higher because all the buyers are represented in the market and are competing for the available hogs. If he maintains his bidding price at $28, he may procure all hogs he needs for slaughter, or he may not be able to buy any hogs at all and risk leaving his plant idle. It appears highly likely that he will raise his bidding price to compete with others in order to obtain enough hogs for slaughter if this appears necessary, rather than go without hogs for a day. Uncertainty of this type may generate a higher price for hogs.

Thirdly, in teletype selling, each actual sale involves only the selling agency and the successful buyer. A small buyer can act on his own decision to bid a higher price without fear of reprisals from other bidders because after the sale is completed his identity is not revealed. In contrast, in a public market auction ring, the big buyers, with or without prior collusion, may realize their interdependency and bid in line with each other in order to seek their joint maximum profits. If the small buyer

bids a higher price in order to expand his business beyond his customary share of the market, the big buyers can oblige him to pay a still higher price.[16] This outcome would discourage the small buyer from attempts to bid aggressively. In teletype selling, this kind of retaliation is virtually impossible because the larger buyers do not know whether the higher bidding is originated by one of their major rivals or by a small buyer seeking to expand. Even if they knew after the sale, they still could not squeeze the small aggressive bidder out of the market unless they bought all lots of hogs.

It is concluded that teletype selling for hogs tends to be more competitive than the private treaty method. It is obvious that the teletype system does establish a general price level for hogs. Actually, when hogs are delivered by a trucker or producer to the door of a plant in Manitoba, the price paid to the producer is the average of the prices generated in the teletype system.

It is clear that free competition among all the packers and on each lot of hogs allows a continuous adjustment to changes in the prevailing demand and supply conditions. The bidding price for available supplies is largely based upon the packer's appraisal of the market.

---

[16] The cost to a major buyer of getting stuck with a few high priced lots is smaller than that of the small buyer when it is spread over their respective total volumes.

It is the packer's general practice to consider the following factors:[17] (1) the total quantity of hogs to be marketed that day; (2) the absolute quantity to be sold by the Commission; (3) prices on the previous day in the local market; (4) prices of hogs in the Toronto market; and (5) the price of cattle. The consideration of hog prices in Toronto is based on the close relationship between the Toronto and Winnipeg markets. In the period from 1957 to 1966, on the average, about 61 per cent of hogs slaughtered in Manitoba were moved eastward in carcass form. A substantial proportion of this volume was exported to Toronto.[18] Pork and beef are competitive commodities in the consumer budget. This implies a relationship between the prices of hogs and cattle. It is reasonable to assume that the price and supply of cattle have an influence on the buying price of hogs.

Summary

Excess profits of firms involved in packing can exist only if the industry is not highly price competitive. This is most likely to be the case if processing is concentrated in the hands of a relatively small number of large

---

[17] From a discussion with Mr. D. F. Rose, the Chairman of the Manitoba Hog Marketing Commission. In his opinion, the packers should, and actually do, consider these factors.

[18] Lu, op. cit., p. 65.

firms as, in fact, it is. In this case, these firms may not compete strongly on a price basis for fear that this would start a price war in which all could lose and none might gain. However, if collusion among these large firms is absent and if various conditions[19] of market structure exist which are conducive to competition, ceteris paribus, the high degree of concentration would not significantly affect hog prices.

---

[19] Products are homogeneous, sellers and buyers compete freely, and no artifical or institutional barriers to entry exist.

CHAPTER V

THE MODEL AND METHOD OF ANALYSIS

There are many analytical tools available for researchers to analyze economic phenomena quantitatively. Economic theory, however, does not tell the researcher which type of technique or which form of equation can be used in his specific study. Furthermore, there are always some limitations involved in the specific technique which is chosen. In this study, least squares multiple regression analysis using the single equation approach is adopted to investigate the empirical phenomena of hog prices in Manitoba. Multicollinearity and autocorrelation are common problems when time series data are used to fit regression lines.

In this chapter, the discussion will be presented in the following order; namely, choice of variables, time interval of observations used, the statistical model, the validity of the method of analysis, econometric considerations, and the limitations of the analysis in this study.

Choice of Variables

There are many variables which affect the price of a commodity. "In order to isolate price-quantity relationships or demand curves by statistical means, variables that

cause such curves to shift back and forth must be included in the analysis".[1] In general, only a few variables which are believed to be most clearly related to the dependent variable are selected in almost all quantitative analyses. In this study, prices of hogs are the focus of interest and therefore price is selected as the dependent variable. The selection of independent variables is based on availability of data and the belief that the variables selected have the greatest influence on the independent variable in the short run. The following variables are chosen as independent or predetermined: (1) Absolute quantity of hogs sold by teletype; (2) Total quantity of hogs purchased in the market in question; (3) Percentage of total hogs sold through teletype; (4) Price of hogs in the Toronto market; (5) Price of cattle, which is represented by the price of choice slaughter steers; (6) price of hogs in the previous period in the market.

In livestock marketing, different marketing systems presumably have different influences on the prices realized by the producer. Therefore, the absolute quantity and/or percentage of hogs sold by teletype are assumed to have some effect on the price of hogs in Manitoba. Price of hogs in Toronto is an exogeneous variable which is determined by factors outside of the system. It is assumed that the prices in Toronto have an important impact on the price in St. Boniface in the short run because of the close

---

[1]Foote, op. cit., p. 27.

relationship between these two markets. Pork and beef are competitive commodities in the consumer budget. Therefore, presumably, there is a relationship between the prices of cattle and hogs. In the teletype system of marketing, before the packer buyer pushes the "buying button", he has to determine how much more, or less, he is willing to pay for hogs today than he did yesterday. It is assumed that prices in the previous period provide guidelines for the packer buyer in bidding for hogs in the current period.

These variables selected as being pertinent in analysing hog prices are suggested by economic theory. Many other variables are not included in the model because they are relatively constant over the time period studied or data are not available. Where it appeared that advantages might be obtained by decreasing or increasing the number of variables, or by changing a specific independent variable, the analysis was varied to permit this.

Time Interval of Observations Used

Daily and weekly average data are used in this analysis. In addition an attempt was made to establish the price pattern for hogs for each trading day of the week.

"As the time interval is shortened, more and more variables change from simultaneously determined to predetermined . . . and invalidate the assumption of serially

independent random disturbance."[2] However, it is expected that the price pattern for hogs in the short run will be affected by changes in the percentage of hogs sold through teletype and that the effects can best be identified by utilizing daily and weekly average data.

The Model

It is generally assumed that equilibrium prices are determined by the interaction of supply and demand forces. Letting S denote quantities supplied, the supply function of a commodity can be expressed as follows;

$$S = f\ (p,\ s_1,\ s_2,\ s_3,\ \ldots .) \qquad (1)$$

Where f represents the functional relationship, p represents the price of the commodity in question, and s_1, s_2, s_3 . . . . denote the other factors affecting supply. By the same token, the demand function of a commodity can be expressed as follows;

$$D = g\ (p,\ d_1,\ d_2,\ d_3,\ \ldots .) \qquad (2)$$

Where D denotes quantities demanded, p denotes the price of the commodity, and d_1, d_2, d_3, ... represent other factors influencing demand.

By equating the supply and demand functions, a new equation is obtained;

---

[2] S. Valavanis, Econometrics, (New York: McGraw-Hill Book Company, 1959), p. 167.

$$f\ (p,\ s_1,\ s_2,\ s_3,\ \ldots) = g\ (p,\ d_1,\ d_2,\ d_3,\ \ldots) \quad (3)$$

From equation (3), a price function can be formulated as;

$$p = h\ (s_1,\ s_2,\ s_3,\ \ldots\ d_1,\ d_2,\ d_3,\ \ldots) \quad (4)$$

Equation (4) indicates that the price of a commodity is a function of many potential supply and demand factors. Actual market prices are generated by a market mechanism. If a marketing system is so designed as to influence the way in which some of the demand or supply factors affect prices, the system can be said to have some impact on the price of the commodity in question. Therefore, equation (4) becomes;

$$p = h\ (s_1,\ s_2,\ s_3,\ \ldots\ d_1,\ d_2,\ d_3,\ \ldots\ MS) \quad (5)$$

Where MS denotes the marketing system.

Economic theory offers little guidance in choosing the appropriate form of equation to be used. In this study, the selection of the Cobb-Douglas formulation was made after many experiments.[3] Those experiments supported Foote's observation that, "In many analyses . . . based on undeflated data, logarithmic equations appear to fit the data better than do arithmetic equations."[4] Furthermore, one of the important justifications for using the logarithmic form of equation is that the coefficients of the independent variables

---

[3]Linear, quadratic, and first difference equations based on both arithmetic and logarithmic forms were tried to determine the form which would give the "best fit".

[4]Foote, op. cit., p.37.

are behaviour parameters which can be taken to forecast human behavior in behavior equations.

The basic algebraic form of the model was;

$$P_{wt} = Q_t^{\beta_1} W_t^{\beta_2} P_{Tt}^{\beta_3} P_{ct}^{\beta_4} P_{wt-1}^{\beta_5} \ldots \varepsilon \qquad (6)$$

Expressed in logarithmic form this model becomes;

$$\text{Model 1 } \log P_{wt} = \log \alpha + \beta_1 \log Q_t + \beta_2 \log W_t + \beta_3 \log P_{Tt} + \beta_5 \log P_{wt-1} + \log \varepsilon \qquad (7)$$

or

$$\log P_{wt} = \log a + b_1 \log Q_t + b_2 \log W_t + b_3 \log P_{Tt} + b_5 \log P_{wt-1} \qquad (8)$$

Equation (8) is derived from equation (7) on the basis of the assumption that a and the b's are the estimates of the α and β coefficients.

Variables in equation (8) are expressed as follows;

P_{wt} = Price of hogs discovered by teletype in the St. Boniface market at time t

Q_t = Total quantity sold (Q_{1t}) or absolute quantity sold through teletype (Q_{ot}) in St. Boniface at time t

W_t = Percentage of hogs sold through teletype in St. Boniface at time t

P_{Tt} = Price of hogs in Toronto market at time t

P_{wt-1} = Price of hogs realized by teletype in St. Boniface at time t-1

a is the constant term, b_1, b_2, b_3, and b_5 are regression coefficients with respect to Q_t, W_t, P_{Tt}, and P_{wt-1}.

$$\text{Model 2} \quad \log P_{wt} = \log \gamma + \rho_1 \log Q_t + \rho_2 \log W_t + \rho_3 \log P_{Tt} + \rho_4 \log P_{ct} + \rho_5 \log P_{wt-1} + \log \varepsilon \qquad (9)$$

or

$$\log P_{wt} = \log c + d_1 \log Q_t + d_2 \log W_t + d_3 \log P_{Tt} + d_4 \log P_{ct} + d_5 \log P_{wt-1} \qquad (10)$$

Equation (10) differs from equation (8) by the added variable P_{ct}, which denotes prices of cattle in St. Boniface at time t. Model 1 is used to fit the daily data and to establish the price pattern of each trading day of the week. Model 2 is used to analyze the weekly average data.

Validity of the Method of Analysis

Multiple regression analysis based on the least squares method postulates that a regression line is fitted to the observations of variables and the squared sum of the deviation of the observations to the line is minimized. In other words, there is a functional relationship and the dependent variables are explained by the observable independent variables and unobservable disturbances. In analyzing

economic phenomena, it is believed that there are "causes and effects" between the events. The systematic study between economic quantities was based on the correlation coefficient and regression coefficients.

Some economists, after considerable testing, have concluded that the method of least squares is invalid and have emphasized that the entire system of equations has to be considered to determine the economic relationship simultaneously. Others feel that the simultaneous equations approach is too complicated and too computationally expensive.[5] Because the controversies are far from settled, many agricultural economists claim that the single equation approach is still a useful technique for analyzing agricultural prices. Fox reported that "there are certain cases, particularly analysis of agricultural prices, in which simultaneity is of limited importance."[6]

The simultaneous equations approach is justified when several endogenous variables are determined simultaneously by all the relations of the model. An analysis of the system of moving equilibrium should be performed by the simultaneous relationship in a complete model. But, in addition to laborious computation involved in this method, there are problems of identification. A unique solution can be ensured only when it is just identified.

---

[5] Ibid., p. 53.

[6] Fox, op. cit., p. 8.

" . . . if we are interested only in equations designated for forecasting (estimating) a single variable, then least squares analysis under certain circumstances may result in smaller errors of estimate than are obtained from equations fitted by methods that allow for the simultaneity implied by the model."[7] However, a regression line may be unsuitable for depicting a demand curve, especially when shifts of demand and supply are intercorrelated, but a curve which is fitted to the points of the intersection of the demand and supply curves will be useful for the purpose of price forecasting or estimating, if no new factors are introduced to influence the price after the period of study.[8]

Some Econometric Considerations

If all the assumptions are satisfied, the least squares method yields maximum likelihood, unbiased, consistent, efficient, and sufficient estimates of the parameters in the single equation approach.[9] When analysis is based on time series data, however, problems of autocorrelation and multicollinearity usually occur.

---

[7]Foote, op. cit., p. 52.

[8]Elmer Working, "What Do Statistical Demand Curve Show?", Readings in Price Theory, Selected by a Committee of the American Economic Association, Edited by J. Stigler and K. E. Boulding, (Chicago: American Economic Association, 1952), p. 227.

[9]Valavanis, op. cit., p. 47.

Autocorrelation occurs when the assumption of a serially independent error term is not valid. The main explanations of the non-independent disturbances are as follows:[10] (1) Incorrect specification of the form of relation between economic variables. (2) The omission of variables, both economic and noneconomic, from the analysis. (3) Errors in the observations on variables included in the analysis. A commonly used statistic to detect autocorrelation is the Durbin-Watson d statistic test.[11] Durbin-Watson have tabulated upper and lower limits for the test for different numbers of observations and explanatory variables.[12] However, a pervasive weakness of the test involving the Durbin-Watson tables is the inconclusive range. When the calculated statistic value falls within this range, further observations would ideally be required. It is critical to interpret the statistical results when autocorrelation is present in the analysis.[13]

Multicollinearity problem arises when some or all

---

[10] Foote, op. cit., p. 148.

[11] J. Johnston, Econometric Methods, (New York: McGraw-Hill Company, 1963), p. 192.

[12] J. Durbin and C. S. Watson, "Testing for Serial Correlation in Least Squares Regression," Biometrika, Vol. 38, 1951, pp. 159-178.

[13] The presence of autocorrelation results in a smaller standard error than exists in the population, underestimation of the variance, causing the student t to be overestimated. Therefore, the application of t and F tests to the coefficients cannot be made precisely. See Johnston, op. cit., pp. 177-99.

of the explanatory variables are intercorrelated one with another so that it becomes very difficult to separate their individual influences and obtain reasonably precise estimates of their relative effects. A less extreme and much more likely case is that the values of the independent variables are highly correlated but not perfectly correlated. In this case, the standard error of the estimated coefficients will increase and bear to the greater indeterminancy of estimates.[14] For example, in demand analysis, there is usually intercorrelation between prices and disposable income in time series data. The problem of multicollinearity is usually met by omitting one of the variables which is highly correlated.

Failure to adjust the data for both problems may lead to untenable conclusions. The test of autocorrelation and multicollinearity with respect to the model will be discussed in the following chapter when the statistical results are interpreted.

Limitation of the Analysis

Although economic theory does not tell a research worker what form of the equations should be used in his specific study, there are some criteria which can be used to select an appropriate algebraic form of equation in any study. "Best fit" is usually stated as a desirable

---

[14] Ibid., pp. 201-07.

characteristic in the choosing of forms. Quantitative restrictions such as diminishing returns are commonly used in selecting a production function.[15]

At first, an attempt was made to determine the optimal percentage of hogs sold through the teletype marketing system in order to achieve the maximum impact on hog prices. First, the quadratic form of equations was used to obtain the defined maximum. Second, first difference equations utilizing logarithmic forms were tried to eliminate autocorrelation problems which existed in some equations. However, the results of these experiments were undesirable in terms of "best fit". "Wrong sign" or magnitudes from statistical analyses may occasionally lead to a revamping of the underlying theory, but they are most likely to indicate the need for a different statistical approach in the analysis".[16]

The original logarithmic form of equation was used in this study from the statistical consideration of best fit. However, the properties of the Cobb-Douglas function do not permit the determination of a defined maximum price. In practice, most of the observations of percentage of hogs sold through the commission fall in the range of 55 to 75 per cent. It would be difficult to extrapolate its impact

---

[15]E. O. Heady and J. L. Dillon, Agricultural Production Functions, (Iowa State University Press, 1961), pp. 102-07; p. 203.

[16]Foote, op. cit., p. 171.

on prices beyond this observed range and to determine a defined maximum price. However the utilization of the logarithmic form of equation permits the identification of a price pattern for hogs in the short run with respect to the crucial variable within the observed range.

CHAPTER VI

THE INTERPRETATION AND EVALUATION OF STATISTICAL RESULTS

This chapter presents and evaluates the statistical results of the multiple regression analysis utilizing the least squares method. The intercorrelations among the independent variables in each equation are pre-tested. It is concluded that there is a high degree of correlation between two variables when the simple correlation coefficient is greater than $|0.7|$. This criterion is chosen on a statistical basis. It is based on the fact that, if the simple correlation coefficient between two variables is $|0.7|$ or less, the coefficient of determination is less than 0.5. Thus, from the probability standpoint, this leaves more than 50 per cent of the observations between two variables uncorrelated. Correlation matrices of the variables for each equation are included in the appendixes. The Durbin-Watson d statistic was attached to each equation to allow for the test of autocorrelation.[1] If the calculated

[1] In theory, the test proposed by Durbin and Watson applies only to the models which do not contain a lagged endogeneous variable. But it is often used to test the models which contain lagged endogeneous variables because of the lack of any other test. However, the test is less powerful in such models. See E. Malinvaud, Statistical Methods of Econometrics, (Paris, France, 1966), p. 465.

d statistic is greater than the upper limit of the critical value from the table, the null hypothesis of no autocorrelation in the error term was accepted. On the other hand, if the calculated d value is less than the lower limit of the critical value, the null hypothesis was rejected because of positive autocorrelation. When the d statistic lies between the lower and upper limits, the test for autocorrelation is inconclusive.[2] The one per cent significance level of testing the randomness of the error term was used in the sense that, when the null hypothesis of randomness was accepted or rejected, the probability of the result occuring by chance was only 0.01.

Empirical analysis was performed on daily, weekly, and day of the week data for the period of 1967.

Daily Analysis

In using daily data, including the observations for Friday,[3] in equations 1.1 and 1.2, the absolute quantity of hogs sold through teletype is omitted from the analysis

---

[2]When the calculated d statistic falls within the inconclusive range, further observations may be made. When the Durbin-Watson ratio approaches the upper limit of the critical value, it might be said that there is no autocorrelation in the error term. On the other hand, when the calculated statistic approaches the lower limit, it might indicate that positive autocorrelation exists.

[3]Proportions sold by teletype are significantly lower on Friday than on other days. Hence, analysis was undertaken to test the difference between all days and all days except Friday.

because the high correlation between this variable and the percentage of hogs sold through teletype makes it impossible to separate the effects of other variables on hog prices. Prices of hogs in Toronto and prices in the previous period were selected as independent variables. Other potential variables are not included because the data are not available. The results of analyses are presented in equations 1.1 and 1.2 of Table IX. Standard deviations of the individual regression coefficients are given in parentheses.

Equation 1.1 shows that the regression coefficient for total quantity sold is -0.0089 and significantly different from zero at the 10 per cent level. This indicates that with one per cent increases in the total quantity of hogs sold in the market, other things being equal, hog prices per hundredweight will decrease by 0.0089 per cent. The rather small magnitude of the regression coefficient of 0.0026 for the percentage of hogs sold through teletype, accompanied by a relatively large standard error, shows that there is no effect at even a moderate level of significance. This may indicate that the economic relation between the price of hogs and the percentage of hogs sold through teletype is indeterminate.

There is an indication that prices of hogs in St. Boniface are associated with price changes in Toronto. The positive sign preceding the regression coefficient of 0.36 for prices of hogs in Toronto suggests that one per cent

increases in prices of hogs in Toronto will be accompanied by increases of 0.36 per cent in prices of hogs in St. Boniface.

Statistical evidence suggests that prices of hogs are closely related to prices of hogs in the same market on the previous day. This expectation is borne out by the positive sign of the regression coefficient of 0.56 and its highly significant level. This indicates that a one per cent change in the price of hogs in the previous day is positively associated with a 0.56 per cent change on the following day. The coefficient of determination for equation 1.1 is 0.8873, and statistically significant at the one per cent level. This indicates the changes in the prices of hogs from day to day are largely explained by the selected independent variables. The "good fit" of the regression line is indicated by the small standard error of estimate of 0.0077. The Durbin-Watson d statistic shows that there is no autocorrelation in the disturbance. However, there is evidence that the price of hogs in Toronto is highly correlated with the price in St. Boniface in the previous period (Appendix, Table XIII). Therefore, equation 1.2 is designed to eliminate the multicollinearity between these two variables. From the statistical stand-point, equation 1.2 produces a more positive result than does equation 1.1. It suggests that a one per cent increase in the percentage of hogs sold through teletype will initiate 0.009 per cent

increases in the price of hogs.

It was indicated in a previous chapter that the percentage of hogs sold through teletype on Friday is unusually low, compared with the other trading days of the week, and that prices realized on that day are not significantly different from those on other days. Table X presents the same statistical analysis excluding observations for Friday throughout the year. The fitting procedures were the same as in the foregoing analysis except that the absolute quantity of hogs sold through teletype entered into the fitting of equation 2.1. This equation suggests that one per cent change in the absolute quantity of hogs sold by the Commission is negatively associated with a 0.0099 per cent change in hog prices and one per cent increases in the percentages of hogs sold by the Commission will initiate a 0.027 per cent increase in the price of hogs per hundredweight.

With the assumption of other things being equal, further observations may be made from Tables IX and X; (1) All of the signs of the regression coefficients are compatible and consistent with economic theory which postulates the economic relationship between dependent and independent variables. (2) Changes in the absolute quantity of hogs sold by the Commission and the total quantity sold in the whole market from day to day have the same influence on hog prices. (3) The magnitude of regression coefficients

TABLE IX

RESULTS OF MULTIPLE REGRESSION ANALYSIS[a/]

FROM DAILY DATA (INCLUDING FRIDAY), 1967, ST. BONIFACE

Equation	Hog Prices P_{wt}	Constant	Total Q of Hogs Sold in St. Bon. Q_{1t}	% of Total Hogs Sold thru Teletype W_t	Price of Hogs in Toronto P_{Tt}	Price of Hogs in Previous Period P_{wt-1}	Coefficient of Determination R^2	Standard Deviation of Estimate S	Durbin-Watson Statistic[b/] d
1.1	P_{wt}	0.1134	-0.0089 $\Delta\Delta$	0.0026	0.3618**	0.5695**	0.8873**	0.0077	1.8076 ⊗
			(.0048)	(.0045)	(.0400)	(.0443)			
1.2	P_{wt}	0.1796	-0.0227**	0.0090 $\Delta\Delta$		0.9179**	0.8485**	0.0089	2.1709 ⊗
			(.0053)	(.0051)		(.0254)			

a/ The following significance levels were used: ** = 1 per cent, * = 5 per cent, $\Delta\Delta$ = 10 per cent, Δ = 20 per cent

b/ Test of autocorrelation; One per cent significance was used:

⊗ = no autocorrelation

\# = inconclusive

† = positive autocorrelation

TABLE X

RESULTS OF MULTIPLE REGRESSION ANALYSIS[a/]

FROM DAILY DATA (EXCLUDING FRIDAY), 1967, ST. BONIFACE

Equ$n	Hog Prices	Constant	Absolute Q of Hogs Sold thru Teletype	Total Q of Hogs Sold in St. Boniface	% of hogs Sold thru Teletype	Price of Hogs in Toronto	Price of Hogs in Previous	Coefficient of Determination	Standard Deviation of Estimate	Durbin-Watson Statistic[b/]
	P_{wt}		Q_{Ot}	Q_{1t}	W_t	P_{Tt}	P_{wt-1}	R^2	S	d
2.1	P_{wt}	0.0498	-0.0099$^{\Delta\Delta}$		0.0271*	0.3615**	0.5842**	0.8822**	0.0080	1.7772$^{\textcircled{x}}$
			(.0055)		(.0131)	(.0449)	(.0508)			
2.2	P_{wt}	0.0700		-0.0100$^{\Delta}$	0.0172$^{\Delta}$	0.3612**	0.5845**	0.8822**	0.0080	1.7773$^{\textcircled{x}}$
				(.0055)	(.0122)	(.0449)	(.0508)			
2.3	P_{wt}	0.0964		-0.0199**	0.0337*		0.9380**	0.8429**	0.0093	2.2152$^{\textcircled{x}}$
				(.0062)	(.0139)		(.0293)			

a/ The following significance levels were used: ** = 1 per cent; * = 5 per cent; $\Delta\Delta$ = 10 per cent; Δ = 20 per cent

b/ Test of autocorrelation: One per cent significance level was used:

$\textcircled{x}$ = nonautocorrelation

$\#$ = inconclusive

$\dagger$ = positive autocorrelation

for percentage of hogs sold through teletype are small and only significant at moderate levels when Friday is included in the analysis. The fitting of equations when observations of Friday were excluded results in a slightly higher magnitude and at higher levels of significance for the regression coefficient than when Friday is included. This may indicate that changes in the price of hogs are more responsive to the percentage of hogs sold through teletype on the days of the week other than Friday. (4) Price changes from day to day in the Toronto market have a significant effect on the price of hogs in St. Boniface. (5) The highly significant level of the regression coefficient for prices of hogs in the previous period in the equations of Table X suggests that decision-making by the packer buyer respecting prices bid on that day is strongly influenced by the prices they paid in the previous day. (6) Price of hogs in Toronto and on the previous day in the local market have a combined effect on hog prices in the current day and it is difficult to separate their individual effects by statistical means.

Weekly Analysis

In the weekly analysis, weekly average data were used, prices being weighted by quantity sold. Prices of cattle, represented by the prices of choice slaughter steers, become available to enter the analysis. The

absolute quantity and percentage of hogs sold through teletype are highly correlated (Appendix, Table XIV). Therefore, the absolute quantity of hogs sold by the Commission is excluded from the analysis because the percentage of total hogs sold through teletype is the focus of interest in this analysis. Statistical results are presented in Table XI.

Equation 3.1 shows that one per cent changes in the total quantity sold in the market in a week are associated with -0.056 per cent changes in the weekly average hog prices. The negative sign preceding the regression coefficient indicates that the changes are in inverse directions. The statistical significance at one per cent level and the positive sign for the regression coefficient of percentage of hogs sold through teletype suggests that one per cent increases in the average percentage sale for the week by the Commission are associated with 0.22 per cent increases in the weekly average price of hogs per hundredweight. There is a strong indication, in weekly average data, that the price of hogs in Toronto is an important determinant of price in the St. Boniface market. The highly significant and positive relationship of 0.81 between the prices in St. Boniface and Toronto is indicative of the closeness of these two markets. However, in spite of great responsiveness to the price changes in Toronto, the coefficient for the price of hogs in Toronto is less than unity. The positive sign preceding the regression

TABLE XI

RESULTS OF MULTIPLE REGRESSION ANALYSIS[a]/

FROM WEEKLY DATA, 1967, ST. BONIFACE

Equ'n	Hog Prices P_{wt}	Constant	Total Q of hogs sold in St. Boniface Q_{1t}	% of hogs sold thru Teletype W_t	Price of hogs in Toronto P_{Tt}	Price of Cattle in St. Boniface [b]/ P_{ct}	Price of Hogs in Previous Period P_{wt-1}	Coefficient of Determination R^2	Standard Deviation of Estimate S	Durbin-Watson Statistic[c]/ d
3.1	P_{wt}	-0.2744	-0.0563 ΔΔ (.0308)	0.2245** (.0659)	0.8184** (.0661)	0.2395** (.0718)		0.8726**	0.0083	1.3157 #
3.2	P_{wt}	-0.2620	-0.0436 ΔΔ (.0310)	0.1908** (.0672)	0.6769** (.1030)	0.1940* (.0748)	0.1867 Δ (.1058)	0.8806**	0.0081	1.5142 #
3.3	P_{wt}	-0.4851		0.1550** (.0550)	0.8767** (.0593)	0.2519** (.0732)		0.8636**	0.0085	1.3326 #
3.4	P_{wt}	0.4492	-0.0672 Δ (.0424)	0.1890* (.0926)		-0.0783 (.0858)	0.7275** (.0915)	0.7699**	0.0112	1.6016 ⊗
3.5	P_{wt}	0.2692	-0.0699 Δ (.0422)	0.2216* (.0852)			0.7414** (.0990)	0.7647**	0.0112	1.6062 ⊗

a/ The following significance levels were used: ** = 1 per cent * = 5 per cent

ΔΔ = 10 per cent Δ = 20 per cent

b/ Prices of cattle are represented by the price of choice slaughter steers per hundredweight.

c/ Test of autocorrelations; one per cent significance level was used:

⊗ = nonautocorrelation

= inconclusive

+ = positive autocorrelation.

coefficient of prices of cattle and its statistical significance conforms to the conventional assumption that hog and cattle products are substitutes in demand. However, the interpretation of equation 3.1 is somewhat critical for the Durbin-Watson d statistic falls in the lower level of the inconclusive range.

Economic theory states that as the number of independent variables in an analysis is increased, the resulting coefficients become more realistic, since real market situations are more closely approximated. In light of this argument, equation 3.2 was so devised by adding the price of hogs in the previous period as an independent variable. The inclusion of this variable in the analysis gives a better fit of the regression line, which is indicated by a higher coefficient of determination (R^2), a smaller standard error of estimate (S) and a higher coefficient of the Durbin-Watson statistic (d). However, the high correlation between the price of hogs in Toronto and in the previous period in the local market makes it impossible to separate their effects on hog prices.

Observations to be drawn from Table XI are as follows: (1) The effect of the percentage of hogs sold by the Commission is highly significant statistically and the magnitude of the regression coefficient is ten times greater than that determined from an analysis of daily prices. This may indicate that, in the very short run as from day

to day, the price variations are largely due to irregular factors, such as weather conditions and psychological elements. As the interval of the observations is widened, the changes in hog prices are more systematically and stably responsive to the variations in the independent variables. (2) The regression coefficients for prices of cattle are all positive and significant, except in equation 3.4, suggesting that price changes in the cattle market have a significant effect on hog prices. (3) the elimination of the price of hogs in Toronto from the analysis, in equations 3.4 and 3.5, reduces the coefficient of determination (R^2) to some extent. This indicates that the price of hogs in Toronto is an important factor affecting the price of hogs in St. Boniface.

Analysis for Each Trading Day of the Week

The original intention of this analysis was to determine the price pattern for each trading day of the week. Different days of the week have varied to some extent with respect to the percentage of hogs sold through teletype (see Table III). The results of the analysis are presented in Table XII. A brief summary of each trading day of the week is given as follows:

Monday: Equation 4 in Table XII shows that the absolute quantity and percentage of hogs sold through teletype on Monday have no significant effect on hog prices on that day. This observation is borne out by the nonsignificant regression coefficients for these two variables

TABLE XII

RESULTS OF MULTIPLE REGRESSION ANALYSIS[a/]

BY EACH TRADING DAY OF THE WEEK, 1967, ST. BONIFACE

ation		Hog Prices P_{wt}	Constant	Absolute Q of Hogs Sold thru Teletype Q_{Ot}	% of Total Hogs Sold thru Teletype W_t	Price of Hogs in Toronto P_{Tt}	Price of Hogs in Previous Period[b/] P_{wt-1}	Coefficient of Determination R^2	Standard Deviation of estimate S	Durbin-Watson Statistic[b/] d
day	4	P_{wt}	0.4831	-0.0104 (.0108)	0.0046 (.0308)	0.7747** (.0909)	-0.1059 (.1020)	0.8382**	0.0085	2,2928ⓧ
sday	5	P_{wt}	0.1346	-0.0259Δ (.0163)	0.0999ΔΔ (.0550)	0.6286** (.0844)	0.2007* (.0871)	0.8444**	0.0097	1.4862#
nesday	6	P_{wt}	0.1675	0.0003 (.0203)	-0.0589 (.0591)	0.6341** (.0868)	0.3105** (.0899)	0.8496**	0.0102	1.9560ⓧ
rsday	7	P_{wt}	0.1678	0.0374* (.0161)	-0.0389 (.0386)	0.6170** (.0851)	0.2210* (.0939)	0.8239**	0.0108	1.6765ⓧ
day	8	P_{wt}	0.1373	0.0446** (.0131)	-0.0322Δ (.0233)	0.8346** (.0524)	0.0024 (.0025)	0.8914**	0.0074	1.9503ⓧ

a/ The following significance levels were used: ** = 1 per cent * = 5 per cent

ΔΔ = 10 per cent Δ = 20 per cent

b/ Price of hogs in St. Boniface lagged by one week.

c/ Test of autocorrelation: one per cent significance level was used:

ⓧ = noneutocorrelation

although the signs are in conformance with expectations. The acceptance of the null hypothesis of no difference from zero suggests that hog prices on Monday are independent of the changes in the percentage of hogs sold through teletype on that day. This finding may be associated with the fact that the mean of the percentage of hogs sold by the Commission on Monday in 1967 was 62.11, which falls in the range of 60 to 65 per cent. Presumably, changes of percentage of hogs sold through teletype within this observed modal range may not have a significant effect on hog prices. Statistical evidence shows that the price of hogs on Monday in St. Boniface is closely related to price changes in the Toronto market.

Tuesday: Results in equation 5 indicate that the sign of all regression coefficients are consistent with expectations and are statistically significant at either high or moderate levels. They suggest that one per cent changes in absolute quantity sold by the Commission on Tuesday are negatively associated with 0.025 per cent changes in hog prices on the same day and a one per cent increase in the percentage of hogs sold through teletype will increase hog prices by 0.09 per cent. The significant effect of the percentage of hogs sold through teletype on hog prices may be related to the fact that the mean of percentage sale by the Commission is lower than the observed modal range of 60 to 65 per cent in 1967. It was shown in

Table III that the average percentage of hogs sold by the Commission on Tuesday in 1967 was 57.74 per cent and the weighted average price for the same day was the lowest among the days of the week in 1967. This suggests that had the percentage of hogs sold by the Commission on each Tuesday been higher, the average price for Tuesday throughout the year would be higher than it was.

Wednesday: With respect to hog marketing, Wednesday is the heaviest marketing day of the week. The absolute number of hogs sold by the Commission, total number of hogs sold in the market and the average percentage of hogs sold through teletype on Wednesday were the highest among the days of the week in 1967. Statistical result in equation 6 indicates that the regression coefficients for absolute quantity and percentage of hogs sold by the Commission are nonsignificant. This may suggest that the variations from one Wednesday to the following Wednesday are too small to detect the impact of the variations on hog prices. The negative sign preceding the regression coefficient for the percentage of hogs sold through teletype may imply that there is a negative correlation between hog prices and percentage sale when it is beyond the observed modal range of 60 to 65 per cent.

Thursday: Equation 7 indicates that the regression coefficient for the absolute quantity of hogs sold by the Commission is statistically significant at the 5 per cent

level and is preceded by a positive sign. This indicates that a one per cent increase in absolute quantity sold by the Commission on Thursday will increase hog prices by 0.037 per cent on the same day. The finding of the positive correlation between the absolute quantity marketed and price of hogs is in contradiction to the traditional law of demand. This contradiction may conceivably be due to errors in the observations, although it seems very unlikely that this will be the case. However, the present study was unable to answer this question. The regression coefficient for percentage of hogs sold through teletype is nonsignificant and preceded by a negative sign. The acceptance of the null hypothesis of no significant difference from zero suggests that hog prices on Thursday are independent of the percentage of hogs sold by the Commission on that day. The average percentage of hogs sold through teletype was 64.24 on Thursday in 1967. Again, it may suggest that so long as the percentage sale on the day falls within the observed modal range of 60 to 65 per cent, the effect of changes in percentage of hogs sold through teletype is not statistically significant.

Friday: The price pattern on Friday is obscured by the inconsistent sign preceding the regression coefficient of absolute quantity of hogs sold by the Commission. Equation 8 suggests that one per cent increase in the absolute quantity of hogs sold through the Commission on

Friday will increase hog prices by 0.04 per cent on that day. Statistical evidence also shows that a one per cent increase in the percentage of hogs sold through the Commission on Friday will decrease hog prices by 0.03 per cent on that day. The finding is consistent with the argument presented in Chapter III that a heavy consignment to the Commission on Friday will result in sharply lower prices, since the packer's demand for hogs have been largely satisfied by direct deliveries. Prices of hogs on Friday in St. Boniface are highly responsive to price changes in Toronto on the same day and are not dependent on the price of the preceding Friday. This observation is based on the highly significant regression coefficient for the hog prices in Toronto and the non-significance for the price of hogs in the previous period.

CHAPTER VII

SUMMARY AND CONCLUSION

Summary and Conclusion

The teletype marketing system was adopted on a voluntary basis in Manitoba on May 8, 1965. From that day on, hog producers in Manitoba have had the option of selling their hogs either through the teletype mechanism or direct to a packing plant. In order to avoid inhibiting producer patronage by charging operating costs only to the voluntary users, 30 cents service charge per hog on all hogs of Manitoba origin is levied by the Manitoba Hog Marketing Commission. The original objective of this new mechanism was to promote competitive bidding on hogs among the packer buyers and to prevent retaliation against agressive bidders or collusion among the big buyers. The ultimate goal of this new marketing system is to benefit Manitoba hog producers through a higher net price for hogs.

Whether the introduction of a new marketing system affects the price in the short run depends upon the characteristics of the old and new systems. Assuming that a relationship exists between the effectiveness of a marketing system and its characteristics, this study was undertaken to explore some aspects of the nature of the new

system.

More specifically, the objectives of this study were to examine the effect of the proportion of hogs sold through the teletype marketing system on realized hog prices, and to examine the producer's behavior in choosing a marketing channel and to analyze the influence of this behavior on hog prices.

The price of hogs has been more variable in the short run since the inception of the new marketing system. The proportion of hogs sold through teletype has varied from day to day, week to week, and even from year to year. By days of the week, the percentage sold through this mechanism runs fairly consistently from 60 to 70 per cent Monday through Thursday, and then falls off sharply on Friday to below 40 per cent. Although the percentage of hogs sold by the Commission is unusually low on Friday, prices realized on that day are not significantly different from those on other days of the week.

It was hypothesized that the high proportion of hogs sold by direct delivery on Friday is largely due to producers who have a larger than average size of hog enterprise delivering their hogs direct to the packing plant on that day in larger quantities relative to total hog deliveries than occurs on other days of the week. It was also hypothesized that the proportion of hogs sold through the teletype system from Monday through Thursday has a significant

effect on realized hog prices.

In order to test the hypotheses, original data used in the analysis were obtained from the Manitoba Hog Marketing Commission and the Ontario Hog Producers Marketing Board records. Other minor data were obtained from secondary sources, mainly from Canadian Department of Agriculture and Dominion Bureau of Statistics publications.

It was found that with respect to the percentage distribution of hogs marketed through the teletype marketing system in 1967, on about two-thirds of the trading days the proportion ranged between 55 and 75 per cent. The mode of the distribution is between 60 to 65 per cent. The weighted average price realized in this range is relatively higher than the average price realized over the ranges between 55 and 75 per cent. Perhaps the price of hogs will be increased if the percentage of hogs sold through teletype falls within the narrower range.

Prices paid by the packer to those producers who deliver their hogs directly to the packing plant are generally identical to the daily average of the prices discovered by the teletype selling mechanism. Therefore producer choice between market outlets for hogs is largely based on noneconomic factors. The detailed study of data for selected weeks presented in Chapter III indicates that the producers who choose to patronize the Commission are those who have a relatively small size of hog enterprise.

During the three weeks selected for study, the producers who patronized the Commission on each trading day of the week are rather homogeneous with respect to the size of their hog enterprise. This observation was based on the fact that the average number of hogs per consignment to the Commission was not significantly different among the days of the week. The comparison of the average number of hogs per direct consignment and for teletype sales shows that the producers who sell their hogs direct to the packing plant operate hog enterprises more than twice as large, on the average, as those who sell their hogs through the Commission. In addition, the average number of hogs per direct consignment on Friday was 18.44 head, or about 4 head higher than the average for other days. It is concluded that the producers who patronize the Commission are relatively smaller in their size of enterprise, compared with those who sell their hogs directly to the packing plant, and the producers who choose to sell directly to the plant on Friday are relatively larger in size of hog enterprise than those who sell direct on the other days of the week .

Multiple regression analysis was employed as the operational technique to analyze the data in order to examine the effect of the changes of proportion of hogs sold through teletype on the realized hog prices. The basic form of the model was the Cobb-Douglas type of function. The

least squares method was utilized to estimate the regression coefficients for the selected independent variables. The analysis was designed to investigate price changes in the short run, such as from day to day and from week to week. Production of hogs and consumer disposable income were treated as constant during the period studied.

In examining the price pattern by using correlation analysis, it was assumed that there are "cause and effect" relationships between prices and the percentage of hogs sold through teletype and other selected independent variables. The results of the analysis were presented in Chapter VI. From those results, the following observations were made:

(1) The absolute quantity of hogs sold through teletype and/or total quantity sold in the market have moderate inverse influences on hog prices.

(2) Positive relationships between prices of hogs and cattle suggests that increases in the price of cattle will result in an increase in the price of hogs. This supports the assumption that hog and cattle products are substitutes in Canadian consumption.

(3) There is a high correlation between the prices of hogs in St. Boniface and Toronto and between prices of hogs in the current and previous periods. Prices in Toronto and in the previous period have a combined effect on hog prices in the St. Boniface market. Statistically the packer's bid prices for hogs are based on price changes in Toronto and

on the prices paid in the preceding period.

(4) When daily data, excluding Friday, were analyzed, prices of hogs were found to be more responsive to the percentage of hogs sold through teletype than when Friday data were included in the analysis. However, the effects of percentage sale by teletype on hog prices from day to day are only of moderate degree. One per cent change in the percentage sale accounted for less than 0.04 per cent changes in hog prices in every case. Presumably, price fluctuations in the very short run, such as from day to day, are largely due to irregular factors.

(5) Prices of hogs were more systematically and significantly responsive to the variations in the proportion of hogs sold by the Commission when weekly average data were analyzed. One per cent change in the average percentage of sale by teletype in a week is associated with 0.2 per cent change in the weekly average hog price. Probably, the more significant effect of the weekly average percentage sale on the weekly average hog price is due to the irregular factors which influence price change from day to day are averaged out when the weekly average data were used.

(6) The analysis for each trading day of the week shows that, from Monday through Thursday, when the mean of the percentage of hogs sold through the Commission fell in the observed modal range of 60 to 65 per cent or above, the effect of the percentage sale on hog prices are

non-significant. It seems probable that, if the percentage of hogs sold through the Commission falls in the observed modal range or above on each trading day of the week, other than Friday, the effect of variation in percentage sold by teletype on hog prices may not be significant.

(7) Prices of hogs in St. Boniface on Friday are highly responsive to price changes in Toronto and have an inverse relationship with the percentage of hogs sold through teletype on the same day. The packer's demand for hogs on Friday are largely satisfied from the direct delivery by producers who have large hog enterprises. Heavy consignment of hogs to the Commission on Friday would depress the price of hogs to a greater extent than it would on other days.

Recommendations

The successful operation of the voluntary marketing system for selling hogs in Manitoba depends upon the following implicitly administrative regulations: (1) the Commission levies 30 cents per hog on all slaughter hogs of Manitoba origin, and provides the mechanism available to all the Manitoba producers who wish to utilize the system without any additional charge; (2) producers who intend to sell their hogs direct to the packing plant have to apply, by mail or in person, to the Commission and fill out a "Direct Sale Form"; and (3) the Commission has the authority to impose a penalty on packers for a significant delay in the killing of hogs obtained from the Commission. These three factors have been important elements that help ensure a larger proportion of hogs are sold through teletype. From the findings of this study, it is concluded that if the proportion of hogs sold through the teletype system falls in the range of 60 to 65 per cent, approximately, the returns to the producers will be maximized. Therefore, it is recommended that, if a voluntary teletype system for selling hogs be adopted in other provinces, similar administrative regulations would be necessary.

Two areas are suggested for further study to expand upon and check the findings of the present study:

(1) To expand the number of years of time series data for further analysis of the declining trend in the

percentage of hogs sold by teletype over the years. This would possibly remedy the shortcomings of the present study, in which some coefficients were not statistically significant, for some the reliability was very low, and for some the signs of the coefficients were contradictory to conventional theory. Therefore, it is concluded that a greater number of sets of observations are needed to further test the findings. It is expected that use of time series data for a longer period may improve the reliability of the findings.

(2) To investigate the possibility of establishing a joint teletype system for selling hogs in the prairie provinces, and also to examine the effects of Saskatchewan hogs imported into Manitoba on the present Manitoba system. The hypothesis is that a joint system would be practicable and beneficial to the producers in this area. Particular attention should be given to a study of the relationship among markets in the three provinces and the effects of inter-provincial movement of hogs on the existing system. This was not analyzed in the present study because data were not available for periods shorter than one month.

A SELECTED BIBLIOGRAPHY

A SELECTED BIBLIOGRAPHY

Annual Report, Manitoba Hog Marketing Commission, 1966, 1967, 1968.

Bain, Joe S. Industrial Organization. Second Edition. New York: John Wiley and Sons, Inc., 1968.

Bronson, Harold E. Canadian Meat Packing and Farmer Organization. University of Saskatchewan, October 1967.

Brown, J. A. et al. Hog Marketing in Saskatchewan, A Preliminary Report Prepared for the Saskatchewan Advisory Swine Council, June 1966.

Bowring, James R., et al. Marketing Policy for Agriculture. New Jersey: Prentice-Hall Inc., 1960.

Durbin, J. and Watson, C. S. "Testing for Serial Correlation in Least Squares Regression," Biometrika, Vol. 38, 1951.

Foote, Richard J. Analytical Tools for Studying Demand and Price. U.S.D.A. Agricultural Marketing Service. Agricultural Handbook No. 146, August 1958.

Fowler, Stewart H. The Marketing of Livestock and Meat. Danville, Illinois: The Interstates Printers and Publishers, Inc., 1957.

Fox, Karl A., The Analysis of Demand for Farm Products. U.S.D.A. Technical Bulletin, No. 1081, 1953.

Heady, E. O. and Dillon, John L. Agricultural Production Functions, Ames, Iowa: Iowa State University Press, 1961.

Johnston, J. Econometric Methods. New York: McGraw-Hill Book Company, Inc., 1963.

Kenyon, N. L. The Marketing of Hogs in Ontario. Dept. of Agric. Econ. Ontario Agricultural College, Guelph, 1958.

Kohls, R. L. and Gifford, John. "Farmer's Choice of Hog Markets," Journal of Farm Economics. Vol. 39, February 1957.

Livestock Market Review. C. D. A., Ottawa, 1967.

Larson, Adlowe L. and Crosby, Gene. Marketing Preferences of Oklahoma Livestock Producers, Oklahoma Agricultural Experiment Station Bulletin B-556, June 1966.

Livestock and Animal Products Statistics. D. B. S. #23-203. Ottawa: Queen's Printer, 1967.

Livestock and Meat Trade Report, C. D. A., Ottawa, 1967.

Livestock Marketing in Manitoba. Report of the Select Committee of Legislative Assembly of Manitoba. February, 1964.

Lowe, J. C. "An Economic Analysis of the Teletype Hog Marketing System in Manitoba Canada," Unpublished Master's Thesis. University of Wisconsin, 1968.

Lu, Chang Mei. "Effect of Teletype Auction on Price Variation Over Time," Unpublished Master's Thesis. University of Manitoba, 1969.

Lu, W. F. "Effect on Regional Price Level of Selling Hogs by Teletype," Unpublished Master's Thesis. University of Manitoba, 1968.

Manning, T. W. Performance of the Hog Marketing System in Alberta. Agricultural Economic Research Bulletin No. 4. University of Alberta, Edmonton, July 1967.

Malinvaud, E. Statistical Methods of Econometrics. Paris, France, 1964.

McIntosh, Kenneth D. Marketing Practices and Procedures of Northeastern Producers. Western Virginia University Agricultural Experiment Station Bulletin No. 457, June 1961.

Sorenson, V. L., ed. Agricultural Market Analysis. MUS Business Studies. Michigan States University, 1964.

Theodore C. Byerly, Livestock and Livestock Products. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1964.

Tinbergen, J. Econometrics. Philadelphia: The Blakiston Company, 1951.

Thomson, F. L. Agricultural Marketing. New York: McGraw-Hill Book Company, Inc., 1951.

Valavanis, S. Econometrics. New York: McGraw-Hill Book Company, Inc., 1959.

Wood, A. W. "Teletype Hog Marketing," Spotlight, June 1968.

Working, Elmer. "What Do Statistical Demand Curves Show?" Readings in Price Theory, Selected by a Committee of the American Economic Association, edited by J. Stigler and K. E. Boulding, Chicago, 1952.

APPENDIX

TABLE XIII

CORRELATION MATRIX

EQUATION I, FROM DAILY DATA (INCLUDING FRIDAY), ST. BONIFACE, 1967

Variable	Absolute Q of Hogs Sold thru Teletype	% of Hogs Sold thru Teletype	Hog Prices in Winnipeg	Price of Hogs in Previous Period	Total Q of Hogs Sold in Winnipeg	Price of hogs in Toronto
	Q_{Ot}	W_t	P_{wt}	P_{wt-1}	Q_{1t}	P_{Tt}
Q_{Ot}	1.0000					
W_t	0.7415	1.0000				
P_{wt}	-0.0597	0.0353	1.0000			
P_{wt-1}	-0.0063	0.0216	0.9149	1.0000		
Q_{1t}	0.8531	0.3086	-0.1321	-0.0387	1.0000	
P_{Tt}	-0.0629	0.0524	0.8964	0.8566	-0.1640	1.0000

TABLE XIV

CORRELATION MATRIX

EQUATION 2, FROM DAILY DATA (ECLUDING FRIDAY), ST. BONFIACE, 1967

Variable	Absolute Q of Hogs Sold Thru Teletype	% of Hogs Sold thru Teletype	Hog Prices in Winnipeg	Price of Hogs in Previous Period	Total Q of Hogs Sold in Winnipeg	Price of hogs in Toronto
	Q_{Ot}	W_t	P_{wt}	P_{wt-1}	Q_{1t}	P_{Tt}
Q_{Ot}	1.0000					
W_t	0.3151	1.0000				
P_{wt}	-0.0601	0.0902	1.0000			
P_{wt-1}	-0.0067	0.0108	0.9105	1.0000		
Q_{1t}	0.8906	-0.1381	-0.1175	-0.0230	1.0000	
P_{Tt}	-0.0664	0.1059	0.8922	0.8540	-0.1351	1.0000

TABLE XV

CORRELATION MATRIX

EQUATION 3, FROM WEEKLY DATA, ST. BONIFACE, 1967

Variable	Hog Prices in Wpg. P_{wt}	Absolute Q of Hogs sold thru teletype Q_{Ot}	% of hogs Sold thru Teletype W_t	Hog prices in Toronto P_{Tt}	Total Q of hogs in Wpg. Q_{lt}	Price of cattle in Wpg. P_{ct}	Price of hogs in previous period P_{wt-1}
P_{wt}	1.0000						
P_{Ot}	-0.0367	1.0000					
W_t	0.4201	0.7166	1.0000				
P_{Tt}	0.9070	-0.0221	0.3892	1.0000			
Q_{lt}	-0.2520	0.9376	0.4584	-0.2406	1.0000		
P_{ct}	-0.4315	-0.2852	-0.5128	-0.5973	-0.0731	1.0000	
P_{wt-1}	0.8564	-0.0973	0.3424	0.8437	-0.2966	-0.3671	1.0000

TABLE XVI

CORRELATION MATRIX

EQUATION 4, (MONDAY), ST. BONIFACE, 1967

VARIABLE	Absolute Q of Hogs Sold thru Teletype Q_{Ot}	% of hogs Sold thru Teletype W_t	Hog Prices in Winnipeg P_{wt}	Total Q of Hogs Sold in Winnipeg Q_{1t}	Price of Hogs in Toronto P_{Tt}	Price of Hogs in Previous Period P_{wt-1}
Q_{Ot}	1.0000					
W_t	-0.0051	1.0000				
P_{wt}	-0.4348	0.3656	1.0000			
Q_{1t}	0.9334	-0.3549	-0.5403	1.0000		
P_{Tt}	-0.3951	0.3781	0.9079	-0.5127	1.0000	
P_{wt-1}	-0.3028	0.1804	0.8820	-0.3663	0.7814	1.0000

TABLE XVII

CORRELATION MATRIX

EQUATION 5 (TUESDAY), ST. BONIFACE, 1967

Variable	Absolute Q of Hogs sold thru Teletype	% of hogs Sold thru Teletype	Hog Prices in Winnipeg	Total Q of Hogs Sold in Winnipeg	Price of Hogs in Toronto	Price of Hogs in Previous Period
	Q_{Ot}	W_t	P_{wt}	Q_{1t}	P_{Tt}	P_{wt-1}
Q_{Ot}	1.0000					
W_t	0.2318	1.0000				
P_{wt}	-0.1548	0.4569	1.0000			
Q_{1t}	0.9476	-0.0848	-0.3028	1.0000		
P_{Tt}	-0.0960	0.4303	0.8960	-0.2356	1.0000	
P_{wt-1}	-0.1694	0.2473	0.7588	-0.2391	0.7403	1.0000

TABLE XVIII

CORRELATION MATRIX

EQUATION 6, (WEDNESDAY), ST. BONIFACE, 1967

Variable	Absolute Q of Hogs Sold thru Teletype Q_{Ot}	% of Hogs Sold thru Teletype W_t	Hog Prices in Winnipeg P_{wt}	Total Q of Hogs Sold in Winnipeg Q_{lt}	Price of Hogs in Toronto P_{Tt}	Price of Hogs in Previous Period P_{wt-1}
Q_{Ot}	1.0000					
W_t	-0.0605	1.0000				
P_{wt}	0.0622	0.0104	1.0000			
Q_{lt}	0.9461	-0.3690	0.0482	1.0000		
P_{Tt}	0.1088	0.0719	0.8955	0.0655	1.0000	
P_{wt-1}	-0.0236	0.0629	0.8203	-0.0507	0.7706	1.0000

TABLE XIX

CORRELATION MATRIX

EQUATION 7.(THURSDAY), ST. BONIFACE, 1967

Variable	Absolute Q of Hogs sold thru Teletype	% of hogs Sold thru Teleteyp	Hog prices in Winnipeg	Total Q of Hogs Sold in Winnipeg	Price of Hogs in Toronto	Price of Hogs in Previous Period
	Q_{Ot}	W_t	P_{wt}	Q_{lt}	P_{Tt}	P_{wt-1}
Q_{Ot}	1.0000					
W_t	0.5044	1.0000				
P_{wt}	0.2732	-0.1425	1.0000			
Q_{lt}	0.8886	0.0678	0.3765	1.0000		
P_{Tt}	0.1634	-0.1577	0.8797	0.2568	1.0000	
P_{wt-1}	0.1059	-0.1936	0.7633	0.2386	0.7431	1.0000

TABLE XX

CORRELATION MATRIX

EQUATION 8, (FRIDAY), ST. BONIFACE, 1967

Variable	Absolute Q of Hogs Sold thru Teletype Q_{Ot}	% of Hogs sold thru Teletype W_t	Hog Prices in Winnipeg P_{wt}	Total Q of Hogs Sold in Winnipeg Q_{lt}	Price of Hogs in Toronto P_{Tt}	Price of Hogs in Previous Period P_{wt-1}
Q_{Ot}	1.0000					
W_t	0.6835	1.0000				
P_{wt}	-0.0022	0.2645	1.0000			
Q_{lt}	0.8243	0.1931	-0.2218	1.0000		
P_{Tt}	-0.2080	0.1785	0.9199	-0.4297	1.0000	
P_{wt-1}	-0.2797	-0.0597	0.4500	-0.3041	0.4621	1.0000

TABLE XXI

QUANTITY OF HOGS SOLD IN ST. BONIFACE AND PRICES OF HOGS IN ST.BONIFACE AND TORONTO 1967

MONTH	DATE	NO. OF HOGS SOLD			PRICES OF HOGS A/		
		TOTAL	BY TELE	% SALE BY TEL	ST.BONIFACE TELE	ST.BONIFACE DIRECT	TORONTO
JAN	3	3905	2479	63.48	29.19	29.20	32.30
JAN	4	3966	2958	74.60	27.93	27.99	30.96
JAN	5	3246	2240	69.01	28.45	28.45	31.28
JAN	6	1201	628	52.29	28.13	28.15	31.55
JAN	9	1790	1250	69.83	29.28	29.25	32.01
JAN	10	3412	2160	63.31	29.43	29.45	31.80
JAN	11	2568	1736	67.60	29.46	29.43	32.25
JAN	12	3123	2240	71.73	29.50	29.48	31.99
JAN	13	1837	862	46.92	29.66	29.65	31.97
JAN	16	1104	667	60.42	30.12	30.10	32.25
JAN	17	2585	1655	64.02	30.95	30.95	32.43
JAN	18	2022	1476	73.00	30.60	30.60	32.74
JAN	19	2719	1787	65.72	31.25	31.25	32.91
JAN	20	1436	279	19.43	29.99	30.00	32.93
JAN	23	2840	1866	65.70	29.42	29.40	33.24
JAN	24	2620	1610	61.45	29.29	29.30	32.81
JAN	25	2742	2046	74.62	29.25	29.25	33.10
JAN	26	2391	1823	76.24	29.50	29.50	33.03
JAN	27	1713	563	32.87	29.77	29.75	32.50
JAN	30	2103	1534	72.94	30.55	30.55	33.06
JAN	31	2731	1588	58.15	30.50	30.50	32.62
FEB	1	3633	2459	67.69	30.48	30.50	33.49
FEB	2	2730	1745	63.92	30.43	30.45	34.07
FEB	3	1377	433	31.45	30.63	30.63	33.43
FEB	6	1588	985	62.03	29.83	29.85	34.29
FEB	7	2713	1493	55.03	29.71	29.70	34.79
FEB	8	2877	1948	64.23	29.97	29.95	33.97
FEB	9	2271	1474	64.91	30.40	30.40	33.28
FEB	10	1391	607	43.64	30.61	30.60	32.75
FEB	13	2588	1837	70.98	30.36	30.35	33.05
FEB	14	1944	1297	66.72	30.63	30.63	32.82
FEB	15	2173	1532	70.33	30.79	30.79	32.79
FEB	16	2314	1466	63.35	30.24	30.25	33.37
FEB	17	1688	522	30.92	30.93	30.95	33.93

CONTINUED

FEB	20	2313	1518	65.63	31.32	31.30	33.74
FEB	21	2299	1333	57.98	30.44	30.45	32.60
FEB	22	3338	2372	71.06	30.32	30.35	32.86
FEB	23	2063	1245	60.35	30.40	30.40	33.76
FEB	24	1729	731	42.28	31.00	31.00	33.69
FEB	27	2557	1407	55.03	29.75	29.75	33.67
FEB	28	3085	1750	56.73	29.43	29.40	33.63
MAR	1	2202	1671	75.89	30.07	30.04	33.98
MAR	2	2403	1581	65.79	30.26	30.25	33.78
MAR	3	1851	636	34.36	30.26	30.27	33.30
MAR	6	1489	1111	74.61	30.52	30.50	32.97
MAR	7	3054	1705	55.83	30.18	30.15	32.13
MAR	8	2907	1968	67.70	30.53	30.50	32.10
MAR	9	2488	1466	60.13	29.12	29.10	32.29
MAR	10	1484	441	29.72	28.99	29.00	32.00
MAR	13	2528	1552	61.39	29.01	29.00	31.72
MAR	14	2577	1409	54.68	28.59	28.61	31.03
MAR	15	2248	1672	74.38	28.23	28.19	30.98
MAR	16	2102	1433	68.17	28.40	28.40	30.89
MAR	17	1651	581	35.19	28.57	28.55	30.98
MAR	20	2511	1772	70.57	28.52	28.55	30.85
MAR	21	3634	2136	58.78	28.09	28.06	31.24
MAR	22	3552	2357	66.36	28.20	28.20	31.14
MAR	23	1803	749	41.54	28.27	28.28	-
MAR	27	1636	1270	77.63	28.03	28.04	30.08
MAR	28	2972	1840	61.91	27.65	27.65	30.21
MAR	29	3270	2239	68.47	27.74	27.75	30.34
MAR	30	2327	1527	65.62	27.77	27.75	30.23
MAR	31	2327	578	32.27	28.02	28.00	30.20
APR	3	3084	1852	60.05	28.00	28.00	30.34
APR	4	2723	1652	60.67	27.63	27.60	30.52
APR	5	2891	1949	67.42	27.95	27.95	29.81
APR	6	2258	1634	72.36	28.02	28.00	29.88
APR	7	2473	801	32.39	28.06	28.05	29.62
APR	10	2634	1710	64.92	28.00	28.00	29.99
APR	11	2614	1537	58.80	28.06	28.05	30.03
APR	12	2954	2175	73.63	27.97	27.95	29.69
APR	13	2290	1387	60.57	28.13	28.15	29.90
APR	14	1585	478	30.16	28.54	28.55	29.38
APR	17	2334	1589	68.08	28.10	28.10	29.75
APR	18	3010	1680	55.81	27.03	27.00	29.23
APR	19	2402	1709	71.15	26.76	26.75	29.30
APR	20	1459	893	61.21	26.87	26.85	29.79
APR	21	1210	326	26.94	27.17	27.15	30.20
APR	24	3111	2018	64.87	27.25	27.25	29.87
APR	25	2719	1485	54.62	26.74	26.75	29.61
APR	26	2173	1484	68.29	26.84	26.85	30.57

CONTINUED

APR	27	1940	1398	72.06	27.45	27.45	30.97
APR	28	1919	675	35.17	28.41	28.40	30.51
MAY	1	1543	1004	65.07	28.20	28.20	30.35
MAY	2	2455	1416	57.68	28.05	28.05	31.07
MAY	3	2900	1948	67.17	29.01	29.00	31.62
MAY	4	2074	1488	71.75	28.80	28.80	31.27
MAY	5	2330	911	39.10	28.32	28.32	30.75
MAY	8	2243	1423	63.44	28.77	28.80	31.44
MAY	9	2484	1499	60.35	29.29	29.30	32.02
MAY	10	2893	1981	68.88	30.01	29.97	32.65
MAY	11	2654	1661	62.58	29.93	29.95	32.45
MAY	12	1782	710	39.84	30.52	30.50	32.43
MAY	15	1987	1413	71.11	30.29	30.30	31.69
MAY	16	2393	1468	61.35	31.10	31.10	33.33
MAY	17	2786	1870	67.12	32.19	32.16	34.48
MAY	18	2649	1744	65.88	32.93	32.95	34.54
MAY	19	2167	778	35.90	31.70	31.71	33.42
MAY	23	2345	1450	61.83	32.34	32.35	33.43
MAY	24	3210	2031	63.27	32.19	32.19	33.64
MAY	25	3000	1754	58.47	31.93	31.95	33.02
MAY	26	1970	954	48.43	31.07	31.05	32.90
MAY	29	1932	1403	72.62	31.63	31.60	33.81
MAY	30	2045	1385	67.73	32.14	32.15	34.05
MAY	31	2537	1760	69.37	32.33	32.36	32.95
JUN	1	2177	1280	58.80	30.04	30.05	32.60
JUN	2	1551	612	39.46	29.91	29.90	32.70
JUN	5	1905	1244	65.30	30.32	30.30	33.53
JUN	6	2550	1621	63.57	31.54	31.55	33.72
JUN	7	2696	1954	72.48	31.64	31.65	32.73
JUN	8	2644	1415	53.52	30.12	30.15	32.67
JUN	9	1445	673	46.57	29.92	29.90	32.60
JUN	12	2003	1289	64.35	30.58	30.60	32.97
JUN	13	2799	1529	54.63	29.76	29.75	32.57
JUN	14	2979	1965	65.96	29.26	29.25	32.18
JUN	15	1939	1355	69.88	28.77	28.79	32.18
JUN	16	1260	331	26.27	28.93	28.93	32.15
JUN	19	1654	963	58.22	29.09	29.10	32.33
JUN	20	2176	1367	62.82	28.95	28.95	31.70
JUN	21	2218	1549	69.84	28.93	28.95	32.08
JUN	22	1866	1225	65.65	29.43	29.41	32.03
JUN	23	1715	474	27.64	29.28	29.30	31.50
JUN	26	2145	1267	59.07	29.28	29.30	31.68
JUN	27	2933	1572	53.60	28.78	28.80	31.23
JUN	28	1939	1430	73.75	28.28	28.30	30.48
JUN	29	2071	1279	61.76	27.83	27.86	30.56
JUN	30	1104	193	17.48	28.26	28.25	-
JUL	3	883	521	59.00	28.70	28.70	31.10

CONTINUED

JUL	4	2535	1423	56.13	28.51	28.50	30.82
JUL	5	2799	1963	70.13	27.85	27.85	30.36
JUL	6	2057	1208	58.73	27.77	27.80	30.81
JUL	7	1054	257	24.38	28.30	28.30	31.25
JUL	10	2782	1438	51.69	28.33	28.35	30.77
JUL	11	2558	1425	55.71	27.33	27.35	29.92
JUL	12	2139	1583	74.01	26.90	26.90	29.73
JUL	13	1244	840	67.52	26.95	26.95	30.08
JUL	14	1200	271	22.58	27.57	27.55	29.95
JUL	17	2507	1257	50.14	28.93	28.90	29.84
JUL	18	2660	1485	55.83	27.29	27.30	30.26
JUL	19	2071	1371	66.20	27.35	27.35	30.56
JUL	20	1423	643	45.19	27.66	27.65	30.99
JUL	21	1710	503	29.42	28.19	28.20	-
JUL	24	2334	1623	69.54	27.95	27.95	30.60
JUL	25	2473	1398	56.53	28.05	28.05	30.60
JUL	26	2459	1786	72.63	27.93	27.92	30.58
JUL	27	1931	1163	60.23	28.12	28.10	30.81
JUL	28	1420	388	27.32	27.94	27.95	30.50
AUG	1	3483	2008	57.65	27.83	27.85	30.13
AUG	2	3072	1979	64.42	27.43	27.45	29.89
AUG	3	1793	1042	58.11	27.86	27.85	30.57
AUG	4	1518	479	31.55	28.61	28.60	-
AUG	7	2161	1322	61.18	28.20	28.20	-
AUG	8	1850	1036	56.00	28.21	28.19	29.99
AUG	9	2131	1577	74.00	27.86	27.85	29.58
AUG	10	1758	979	55.69	28.61	28.60	30.09
AUG	11	1782	577	33.31	29.31	29.30	29.95
AUG	14	1916	1113	58.09	27.76	27.75	29.75
AUG	15	2022	975	48.22	27.79	27.80	30.18
AUG	16	2041	1475	72.27	28.85	28.85	30.77
AUG	17	2539	1357	53.45	29.35	29.34	30.74
AUG	18	2618	874	33.38	28.73	28.75	30.25
AUG	21	1650	1045	63.33	28.89	28.90	30.28
AUG	22	1680	900	53.57	29.23	29.25	30.41
AUG	23	2078	1395	67.13	29.73	29.75	30.82
AUG	24	2251	1395	61.97	28.91	28.90	30.89
AUG	25	1787	554	31.00	28.72	28.73	30.63
AUG	28	1623	1030	63.46	29.32	29.30	30.52
AUG	29	1691	894	52.87	29.11	29.10	29.96
AUG	30	2313	1683	72.76	29.13	29.10	29.90
AUG	31	2122	1307	61.59	29.29	29.30	29.48
SEP	1	1485	384	25.86	29.61	29.40	-
SEP	5	2462	1294	52.56	27.91	27.90	29.24
SEP	6	2043	1363	66.72	28.32	28.30	29.67
SEP	7	2244	1487	66.27	29.22	29.19	30.59
SEP	8	2576	924	35.87	29.33	29.32	30.47

CONTINUED

SEP	11	2181	1139	52.22	28.55	28.55	29.85
SEP	12	1488	862	57.93	28.31	28.30	30.54
SEP	13	2832	1950	68.86	29.48	29.50	30.55
SEP	14	2894	1665	57.53	28.47	28.47	29.68
SEP	15	2423	921	38.01	27.43	27.45	29.67
SEP	18	1729	1241	71.78	27.81	27.79	30.46
SEP	19	2051	1253	61.09	28.75	28.75	30.96
SEP	20	3135	2133	68.02	27.94	27.95	30.04
SEP	21	1841	1208	65.62	27.92	27.95	29.78
SEP	22	1853	421	22.72	27.96	27.95	29.85
SEP	25	2123	1315	61.94	29.40	29.40	30.60
SEP	26	2837	1647	58.05	28.68	28.72	30.78
SEP	27	2556	1922	75.20	28.68	28.70	29.99
SEP	28	2118	1371	64.73	29.13	29.15	29.86
SEP	29	1938	743	38.34	28.24	28.20	30.17
OCT	2	2389	1445	60.49	29.43	29.45	30.70
OCT	3	3025	1518	50.17	29.03	29.04	30.24
OCT	4	2367	1632	68.95	27.73	27.70	29.84
OCT	5	2312	1679	72.62	29.21	29.13	30.17
OCT	6	1573	508	32.29	29.36	29.35	-
OCT	10	4127	2328	56.41	28.86	28.87	30.10
OCT	11	2840	1960	69.01	27.63	27.65	29.14
OCT	12	2305	1464	63.51	27.18	27.19	29.19
OCT	13	1677	636	37.92	27.71	27.70	29.10
OCT	16	1923	1185	61.62	27.05	27.05	29.78
OCT	17	2547	1340	52.61	27.70	27.70	29.01
OCT	18	2424	1485	61.26	26.76	26.75	28.55
OCT	19	2623	1703	64.93	28.26	28.25	28.64
OCT	20	2659	1011	38.02	28.17	28.15	28.50
OCT	23	2730	1829	67.00	27.61	27.60	28.55
OCT	24	2791	1679	60.16	27.24	27.25	28.53
OCT	25	2565	1759	68.58	27.65	27.65	28.46
OCT	26	2626	1857	70.72	27.06	27.05	28.34
OCT	27	2412	819	33.96	27.19	27.20	28.27
OCT	30	3142	1743	55.47	27.32	27.28	28.39
OCT	31	3112	1825	58.64	27.17	27.20	28.03
NOV	1	2595	1659	63.93	26.14	26.21	27.54
NOV	2	2180	1453	66.65	25.71	25.71	27.50
NOV	3	1791	601	33.56	26.04	26.01	27.50
NOV	6	2727	1766	64.76	26.25	26.25	27.59
NOV	7	3079	1790	58.14	26.09	26.11	27.22
NOV	8	2635	1740	66.03	25.85	25.85	26.91
NOV	9	2233	1582	70.85	25.61	25.62	26.95
NOV	10	2111	622	29.46	25.85	25.84	27.80
NOV	13	3005	1493	49.68	26.56	26.55	27.77
NOV	14	3226	1794	55.61	25.86	25.86	27.26
NOV	15	2478	1793	72.50	25.87	25.85	27.50

CONTINUED

NOV	16	1856	1411	76.02	26.28	26.22	27.92
NOV	17	2377	826	34.75	26.51	26.50	27.63
NOV	20	4047	2313	57.15	26.68	26.70	28.06
NOV	21	2581	1474	58.24	26.32	26.31	27.95
NOV	22	2367	1972	68.79	26.61	26.59	28.58
NOV	23	2418	1801	74.48	27.20	27.20	28.62
NOV	24	2521	994	39.43	26.56	26.55	28.05
NOV	27	2783	1456	52.32	27.23	27.21	28.39
NOV	28	2977	1627	54.65	27.29	27.33	28.41
NOV	29	3135	2196	70.05	27.70	27.70	29.50
NOV	30	2645	1920	72.59	27.87	27.87	30.04
DEC	1	2298	744	32.45	28.54	28.55	30.96
DEC	4	3527	2025	57.41	28.42	28.40	30.10
DEC	5	3208	1800	56.11	27.58	27.60	29.50
DEC	6	2881	2032	70.53	26.83	26.85	29.54
DEC	7	2136	1460	68.35	26.83	26.85	29.54
DEC	8	1914	570	29.78	27.06	27.05	29.27
DEC	11	3394	1934	56.98	27.86	27.85	29.92
DEC	12	3089	1655	53.58	27.00	27.00	28.70
DEC	13	3114	2212	71.03	26.36	26.35	27.96
DEC	14	1837	1377	74.96	26.54	26.55	28.03
DEC	15	1701	557	32.75	27.19	27.17	28.40
DEC	18	4408	2638	59.91	25.76	25.75	27.62
DEC	19	2963	1702	57.44	25.09	25.10	27.24
DEC	20	2120	1607	75.80	25.72	25.70	27.84
DEC	21	1065	604	56.71	26.85	26.85	28.52
DEC	22	1570	327	20.83	26.81	26.80	-
DEC	27	3923	2259	57.58	26.85	26.85	28.10
DEC	28	3223	1660	51.50	25.97	26.00	28.68
DEC	29	2191	623	28.43	26.12	26.10	-

SOURCES: MANITOBA HOG MARKETING COMMISSION AND ONTARIO HOG PRODUCERS MARKETING BOARD RECORDS.

A/ WEIGHTED AVERAGE PRICE PER HUNDREDWEIGHT OF GRADE A DRESSED.