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Producers' Grain Marketing Decisions: A Study in the Canadian Markets

by

Stefanie Fryza and Fabio Mattos

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Producers' Grain Marketing Decisions:

A Study in the Canadian Markets

Stefanie Fryza

and

Fabio Mattos*

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* Fabio Mattos (fabio_mattos@umanitoba.ca) is assistant professor and Stefanie Fryza is research assistant at the Department of Agribusiness and Agricultural Economics, University of Manitoba.

Producers' Grain Marketing Decisions: A Study in the Canadian Markets

This paper investigates the dynamics in the decision-making process of producers in Western Canada, where they must market their crop through the Canadian Wheat Board(CWB). The CWB offers several marketing alternatives to producers, which provide distinct combinations of return, risk, and cash flow. Pool pricing is the default alternative in which the CWB markets the grain for producers, while Producer Payment Options (PPO) represent instruments that producers can use to price their grain by themselves through the CWB. Preliminary analysis of 13,335 producers suggests that there is great heterogeneity in individuals marketing behaviour and that almost all producers who use PPO contracts deliver part of their crop to the pool accounts. This suggests that pool pricing is still largely used as the main marketing alternative, although producers seem to respond to price signals provided by the CWB and futures markets. Additionally, no clear evidence that producers who use PPO contracts are able to consistently outperform the pool was found. There also appears to be no direct relationship between PPO usage and pricing performance, implying that the adoption of PPO contracts appears not to be related to better or worse marketing performance. However, this point still needs further investigation with the complete data set and estimation of the regression models adopted in this study.

Keywords: wheat marketing, overconfidence, loss aversion, house-money effect, Canadian Wheat Board

INTRODUCTION

Standard economic theory assumes that people make decisions that are rational, consistent, and self-interested (Wilkinson 2008). Especially in grain marketing, it is traditionally assumed that producers should consider their preferences, weight all their marketing alternatives in terms of returns and risks, and choose the option that yields the best risk-return trade-off. However, empirical observations have shown that generally individuals are not so rational and consistent in their decisions. People have a tendency to undervalue the future compared to the past by placing more (less) weight on short-term (long-term) outcomes, hesitate to change long-held opinions, remember their successes and forget their failures, place more weight on available information, among other types of behaviour (De Bondt and Thaler 1995; Hirshleifer 2001; Barberis and Thaler 2003).

Insights from psychology suggests that economics should consider the motivations that are ignored by standard theory such as status, fairness, greed, fear, and allow for the possibility of mistakes. Behavioural economics was developed as an alternative that assumes bounded rationality, which suggests people have limited time and capacity to weigh all the benefits and costs of their choices, decisions are not fully rational, and people tend to make predictable and avoidable mistakes. Behavioural economics identifies that individuals are subject to biases and heuristics when making decisions, using rules of thumb, educated guesses, or even common sense when complex variables or incomplete information are involved (Shefrin 2002).

Empirical studies have investigated the decision-making process in different activities and industries. However, relatively little attention has been devoted to agricultural marketing. Studies focusing on agriculture suggest that producers generally deviate from the standard

definition of rationality. Some studies indicate that producers tend to overestimate prices and underestimate volatility (risk), thus allowing them to be overly optimistic about price expectations (Eales et al. 1990; Cruz Junior 2009; Riley and Anderson 2009). Collins et al. (1991) found that producers tend to take less risk after increases in income and more risk after losses in income.

The objective of this research, in the context of pricing alternatives and risk management, is to gather a better understanding of how producers make marketing decisions. Some questions addressed in this study are whether producers choose the same marketing strategy every year regardless of current market conditions, whether they could have made more profit with different strategies, whether results in the previous year lead producers to choose "safer" or "riskier" strategies in the following year, and what types of behaviours could explain producers' choices.

Agricultural economists have long been interested in how producers make marketing decisions under conditions of uncertainty. Some tools that producers have been using to cope with marketing risks include futures, options, and forward contracts. However, understanding how producers actually use these risk management strategies is challenging for economists, because obtaining data that corresponds to each producers choices and their marketing strategy is very difficult. The grain marketing system is Canada offers a unique opportunity to explore how producers make decisions. Since all producers have to market their grain through the Canadian Wheat Board (CWB) and the pricing alternatives are clearly defined, it is possible to follow exactly how they chose to market their grain, what market conditions were prevalent during the period they made their decisions, and what price they received at the end of the crop year. Overall, producers and the CWB can benefit from this research as its results may help improve the design and communication of marketing alternatives developed by the CWB for producers. Our findings can also be relevant for government agencies, extension programs and marketing advisory services which might be able to gather more insights about producers' decision-making process.

THE CANADIAN WHEAT BOARD (CWB)

The CWB is the largest grain marketing agency in Canada and the sole marketer for wheat, durum wheat, and barley produced in Western Canada. All wheat producers must market their crop through the CWB.[1] The CWB offers several different marketing alternatives which allow producers to choose a program that meets their own needs and preferences regarding return, risk, and cash flow. The oldest pricing alternative is pool pricing, which is the default program, meaning the CWB assumes producers will keep their wheat in the pool accounts unless otherwise indicated.

The pool accounts work by pooling together all the wheat sales made during the crop year and its goal is to guarantee that all producers receive the same final price regardless of when and to whom their grains is sold. With the pool accounts, producers receive an initial payment when deliveries are made to the grain handling facility, and additional payments as sales are completed throughout the crop year. During the crop year, the CWB also provides a projected price, the Pool Return Outlook (PRO) that is the best estimate of what the final pool price will be at the end

[1] That includes producers from Manitoba, Saskatchewan, Alberta, and the Pease River area of British Columbia, who are selling wheat for human consumption and export.

of the crop year. The PRO is often seen as the benchmark and can be used to alert famers as to whether to keep their wheat in the pool accounts or to sign up one of the other marketing alternatives offered by the CWB, known as Producer Payment Options (PPO) contracts.

PPO contracts have only been developed by the CWB in the last 10 years. They allow producers to price their own grain and provide them flexibility to manage their cash flow. With PPO contracts, producers can lock in their price or basis using futures contracts through the CWB. For all PPO contracts there is a marketing window during which producers need to let the CWB know about their marketing choices. Producers can also decide to use more than one alternative, in which case they need to tell the CWB what proportion of their grain will be marketed by each instrument. PPO contracts also differ from pool accounts in terms of payment schedule. Once producers make their initial delivery to the grain handling facility and receive that same initial payment as the pool accounts[2], they receive their final payment within 10 business days upon confirmation of delivery.

When producers use the pool accounts to price their grain it is often referred as a passive strategy since they do not actually price their own grain. Instead the CWB markets the grain on their behalf. On the other hand, when producers use PPO contracts to price their grain, they would have an active strategy since they are pricing their own grain. In addition, PPO contracts and pool accounts can be used simultaneously, but producers must let the CWB know how many tonnes they plan to market on their own with PPO contracts by indicating tonnage when signing up a contract.

THEORETICAL FRAMEWORK

The framework used to understand the marketing choices of individual producers is based on prospect theory and further developments in behavioural economics. Prospect theory was developed by Kahneman and Tversky (1979) and Tversky and Kahneman (1992) as an alternative to explain behaviour that deviates from expected utility theory. The decision model for prospect theory is based on the function $V(x_i)$, which has two components: the value function $v(x_i)$ and the probability weighting function $w(p_i)$, where x_i is the argument of the value function and p_i is the probability distribution of x. The function V assigns to each outcome x_i a number $v(x_i)$, which represents the value of the outcome. Each probability p_i is accompanied by a probability weight $w(p_i)$ which changes the overall value of the prospect. This can be expressed mathematically as follows:

$$V(x_i) = \sum_{i=1}^{n} v(x_i) \cdot w(p_i) \qquad (1)$$

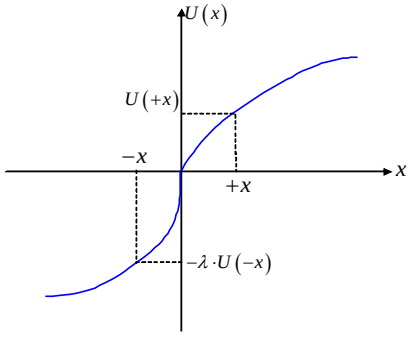
The value function $v(\cdot)$ in prospect theory indicates that individuals respond to changes in wealth rather than total wealth. These changes are measured with respect to a reference point, which is subjectively determined by individuals. Changes in wealth above the reference point are treated as gains and below it as losses. Prospect theory claims that individuals behave asymmetrically, exhibiting risk aversion in the gain domain and risk seeking in the loss domain.

[2] Producers using the pool pricing and PPO contracts receive the same initial payment upon delivery to the grain handling facility because the federal government guarantees the payment.

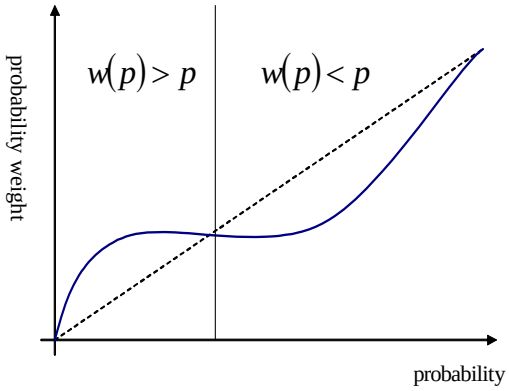
Therefore, the value function is concave over gains and convex over losses (Figure 1). Further, the value function incorporates the notion of loss aversion, which suggests that people exhibit a stronger impulse to avoid losses than to acquire gains. In Figure 1, loss aversion is represented by the parameter λ, which amplifies the impact of losses relative to gains of the same magnitude.

Figure 1. Value and Probability Weighting Functions

Value Function



Probability Weighting Function



The probability weighting function of prospect theory implies that probabilities are not treated linearly. Kahneman and Tversky (1979) found that people tend not to threat probabilities as they are stated. Instead, their decisions are often based on the individuals' perceived probability, which can be either larger or smaller than in reality. The value of an outcome is not weighted by its corresponding probability but rather probability weight $w(\cdot)$. Empirical evidence reveals that individuals are not accurate at estimating the probabilities of events occurring. In fact, many studies have indicated that people have a tendency to overweigh small probabilities and underweight moderate to large probabilities when making decisions (Serrao and Coelho 2004). This reveals an inverse s-shaped curve as shown in Figure 1.[3] Research suggests that over/underweighting of probabilities can be related to preferences for certain gambles, overconfidence, and optimism/pessimism.

One of the most common behaviour identified in empirical studies is loss aversion and framing. Research by Tversky and Kahneman (1992) found that losses have an impact of roughly twice that of a gain of the same magnitude.[4] Shefrin (2002) finds evidence strongly suggesting that if individuals were given an option of taking a sure loss or a gamble with a 50 per cent chance of a loss, most individuals' would opt for the gamble because they hate the idea of a sure loss. Equivalently, loss aversion can also be incorporated into the individual's notion that if they have an investment that is doing poorly, they will not sell it at a loss. They will rather hope that they will still make money or breakeven, although this can lead to the possibility of even more losses (Shefrin and Statman 1985; Odean 1998; Locke and Mann 2005). In addition, if the same choice is framed as a loss rather than as a gain an individual will choose a different decision.

Another behaviour that is often referred to as an implication of loss aversion is the status quo bias. When people are faced with more than one option, they tend to choose the one that ratifies or extends the existing condition because the disadvantages of leaving the status quo,

[3] However, other patterns of probability weighting also emerge in empirical studies.
[4] The actual value found by Tversky and Kahneman (1992) was 2.25.

looms larger than the advantages (Thaler 1992; Samuelson and Zeckhauser 1988). Generally, this is caused because people are predisposed to avoid change. Additionally, if more than one option is included, people's choices may be delayed or the number of people that adopt default alternatives (status quo) may increase.

Furthermore, the notion of overconfidence is perhaps one of the most common reoccurring errors found in the decision-making process. Overconfidence occurs when people believe they have superior abilities or skills, allowing them to outperform their peers. A study regarding financial markets suggests that overconfident investors tend to trade more often than other investors (Glaser and Weber 2007; Barber and Odean 2001; Odean 1999). Glaser and Weber (2007) surveyed approximately 3,000 online broker investors that answered a questionnaire that was designed to focus on overconfidence. The study looked at only 215of the 3,000 investors trading behaviour that answered at least one of the questionnaires and found that investors who believe they are above average trade more.

Many decisions are made in a dynamic context. Individuals are faced with the same choices repeatedly over time. In this context several studies have investigated whether outcomes from previous decisions affect current choices, but evidence has been mixed. Some research has found evidence that individuals tend to take more risk after prior losses and less risk after prior gains, which is consistent with the notion of loss aversion. Alternatively, other studies have found the opposite behaviour, which is known as house-money effect. In this case individuals take less risk after losses and more risk after gains (Thaler and Johnson 1990; Frino et al. 2007; Coval and Shumway 2005; Weber and Zuchel 2005).

The dimensions discussed above provide the background for the next sections, which present studies on producers' behaviour and their findings, and then the method that will be adopted to address marketing decisions in our study.

PREVIOUS STUDIES

There have been few studies using experiments or data on marketing decisions to investigate producers' behaviour, showing evidence of deviations from expected utility theory. Collins et al. (1991) conducted surveys with 37 Oregon grass seed producers in 1973 to 1975 and found that their risk preferences switched from risk averse to risk seeking and vice versa as their wealth changed in each period, which is consistent with prospect theory. They also found that these changes were due to changes in producers' reference points for gains and losses. Unlike expected utility theory which classifies producers as either risk averse or risk seeking, their findings imply that producers can exhibit both types of risk attitudes depending on whether they experience gains or losses. Serrao and Coelho (2004) focused on 9 wheat and cattle producers in Portugal when faced with a review of the Common Agricultural Policy (CAP), affecting the amount of subsidies they receive.[5] They investigated producers' decision-making process allowing for variations in levels of wealth and the ability to differentiate between gains and losses, and found that producers would behave in a more risk averse manner without the CAP. They also found that producers present a larger preference for risk in the negative part of the value function and larger aversion to risk in the positive part of the function, which is consistent with loss aversion. Lui

[5] The subsidy became independent from the volume of production, thus creating a new single farm payment.

(2008) also found evidence of loss aversion among Chinese cotton producers. Her survey with 320 producers indicated 90 per cent of them exhibited loss aversion.

Other studies investigated how producers' price expectations effect the decisions they make, which can influence their ability to market their production rationally. Eales et al. (1990) examined a sample of 237 corn and soybean producers in Illinois who were asked to forecast prices and volatility. Results showed that their price forecasts were close to the actual prices, but their volatility forecasts were consistently lower than actual volatility. This finding is in line with other studies which also found evidence that producers underestimate risk, Riley and Anderson (2009) studied 36 corn and soybean producers and 41 cotton producers in Mississippi and their results suggested that estimation of volatility was also lower than actual volatility. However, their forecasted prices were higher than actual prices. Cruz Junior (2009) examined a group of 90 corn producers in central-west and southern Brazil. Results were also consistent with Eales et al. (1990) and Riley and Anderson (2009) indicating that producers tend to underestimate risk as their prediction about volatility has a tendency to be lower than actual volatility.

A few recent studies illustrated the relevance of probability weighting when investigating how producers make their choices. Humphrey and Verschoor (2004) conducted experiments in farming communities in Uganda, Ethiopia, and India. They found evidence of probability weighting as producers tended to underestimate small probabilities and overestimate large probabilities. In addition, Lui (2008) looked at a sample of 320 cotton producers in China that were asked to make a series of risky choices. The results suggested that 90 per cent of those surveyed tended to overweigh small probabilities and underweight large probabilities, which is also consistent with the presence of probability weighting.

In addition, Cunningham et al. (2007) research of wheat producer transactions in Oklahoma from 1992 to 2001 reveal that activeness in futures and options markets was not necessarily related to successful marketing strategies. This finding suggests that producers are overconfident, because they believe to have superior skills to time the market and obtain higher prices even though the authors found no evidence linking derivatives usage and improved performance.

DATA

Data for this research was provided by the CWB and includes all producers growing Canada Western Red Spring (CWRS) wheat in the crop years 2003/04 through 2008/09 in Western Canada. The data set contains 67,798 producers that grew CWRS wheat in at least one of the six crop years provided and marketed their wheat in pool accounts, PPO contracts, or both. Even though PPO contracts were first available in 2000/01, the data set starts in 2003/04 because the initial three crop years had minimal PPO usage. The current crop year (2009/10) is not included because the final pool price has not yet been finalized, since the crop year will not end until July 31, 2010.

Data contains transactions made by each producer that indicates (i) what programs they marketed their wheat through, (ii) how many tonnes of wheat were delivered to each program, (iii) exact dates when producers signed up their PPO contracts, (iv) final price received by each producer for their wheat, (v) PRO, PPO and futures prices, (vi) seeded acres, and (vii) province/municipality. The programs include pool accounts and five types of PPO contract

(Fixed Price Contracts, Basis Payment Contracts, Early Payment Option, Daily Price Contract, and FlexPro).[6]

Choices of marketing programs and prices received will be used to identify strategies adopted by producers and their results in terms of price. PRO, PPO and futures prices will be used to understand market conditions during the sign up period when producers are making marketing decisions. The dates when producers signed up and priced PPO contracts will be used to understand what was happening in the markets to signal to producers whether they should sign up a PPO contract or stay in the pool accounts.

RESEARCH METHOD

Two models are used to explore producers' marketing decisions. In particular these models look for evidence of overconfidence, and current decisions being affected by previous year's marketing choices and performance. It is first investigated whether producers have better information or analytical skills to outperform the "pool." This would indicate whether producers are overconfident in their ability to market their own wheat outside of the pool accounts. A regression model based on Cabrini et al. (2007) and Cunningham et al. (2007) is estimated following equation (2).

$$perf_{i,t} = \alpha + \beta(\%PPO)_{i,t} + \gamma Active_{i,t} + \varepsilon_{i,t} \qquad (2)$$

where performance ($perf_{i,t}$) is the difference between the price received by producer *i* and the pool price in year *t*, $(\%PPO)_{i,t}$ is the percentage of crop delivered against PPO contracts by producer *i* in year *t*, and $Active_{i,t}$ is a measure of marketing activeness for producer *i* in year *t*.

Price received is just the final price received by each producer for their wheat at the end of the crop year. Producers can have multiple final prices that correspond to each PPO contract they can use, in addition to the pool price if they choose to use both PPO contracts and the pool. When a producer has multiple final prices, a single final price is calculated by averaging all prices weighted by the quantity of wheat delivered against each program. If producers choose to stay only in the pool accounts, their final price is simply the pool price. The pool price is determined at the end of each crop year after all CWB sales are made and administration costs deducted. If producers choose to remain in the pool accounts, meaning they choose to have the CWB market their wheat on their behalf, then all producers receive the same final price. Therefore, the pool price is often used as the benchmark price, and producers using PPO contracts try to price their wheat above it. If the final price received by producer *i* in year *t* is above (below) the pool price, $perf_{i,t}$ is positive (negative). The percentage of crop delivered against PPO contracts $(\%PPO)_{i,t}$ indicates how much of their own wheat producers try to market by themselves using futures contracts. It is calculated as the proportion of total tonnes delivered against PPO contracts divided by total tonnes delivered to the CWB (pool accounts and PPO contracts).

[6] Some programs were available since the beginning of the data set, while others were created later. For a complete description of the different types of PPO contracts please see the Canadian Wheat Board website at www.cwb.ca

The measure of marketing activeness (*Active*) comes from performance models used in Cabrini et al. (2007) and Cunningham et al. (2007). The starting point is to create a series with the amount of wheat marketed in each week of the crop year during the marketing window as a percentage of total production. The amount of wheat marketed in each week is based on the amount of wheat committed to delivery when the producer signs a PPO contract.[7] Marketing activeness is computed by calculating the standard deviation of this weekly series of marketing activity for each producer. The higher the standard deviation the more active the producer is (e.g. each year the producer prices their wheat in different weeks). However, if producers choose the same marketing strategy every crop year (i.e. prices wheat at the exact same week) they would have a standard deviation equal to zero. If there is a negative relationship between marketing activeness and performance, it would suggest that producers are overconfident in their ability to market their wheat above the pool price but their price is actually lower than the pool price. On the other hand, if marketing activeness has a positive relationship with performance, it would suggest that producers indeed have better information or analytical skills to outperform the pool price and they actually receive a higher price for their wheat.

The second model explores whether the previous year's marketing strategy and return affects the current year's strategy. This method is adapted from similar models used by Coval and Shumway (2005) and Frino et al. (2008), who investigate trading decisions of professional traders. The model used in this study is given by equation (3).

$$(\%PPO)_{i,t} = \alpha + \beta(\%PPO)_{i,t-1} + \gamma perf_{i,t-1} + \theta p^{S}_{i,t} + \varepsilon_t \qquad (3)$$

where $(\%PPO)_{i,t}$ and $(\%PPO)_{i,t-1}$ are the percentage of wheat delivered against PPO contracts by producer *i* in years *t* and *t-1*, performance $(perf_{i,t-1})$ is the difference between the price received by producer *i* and pool price in year *t-1*, and price signal $(p^{S}_{i,t})$ is the difference between futures price and PRO price in year *t*. The variables $(\%PPO)_{i,t}$ and $perf_{i,t}$ are defined as in equation (2).

The relationship between $(\%PPO)_{i,t}$ and $perf_{i,t-1}$ is used to discuss the presence of house-money effect and loss aversion in producers' decisions. Risk in this study refers to the amount of wheat producers chose to price through PPO contracts, which is not delivered to the pool accounts. Therefore, more (less) risk refers to more (less) grain delivered against PPO contracts. Alternatively, less risk refers to more grain delivered against the pool accounts. If there is a positive relationship $(\gamma > 0)$ between $(\%PPO)_{i,t}$ and $perf_{i,t-1}$ in equation (2), it would suggest the presence of house-money effect. Producers would take more risk after gains $(perf > 0)$ (i.e. as performance increases, percentage of PPO deliveries in the following crop year increases) and less risk after losses $(perf < 0)$ (i.e. as performance decreases, percentage of PPO deliveries in the following crop year decreases). On the other hand, if this relationship is negative $(\gamma < 0)$, it would suggest the presence of loss aversion. Producers would take less risk after gains (i.e. as performance increases, percentage of PPO deliveries in the following crop year decrease) and more risk after losses (i.e. as performance decreases, percentage of PPO deliveries in the following crop year increases).

[7] Note that producers remaining in the pool accounts do not have to market their wheat by themselves.

The variable $p^S_{i,t}$ in equation (2) is the difference between the futures price and the PRO price. The PRO price is considered a benchmark price by producers and is commonly used as a signal as to whether to sign up a PPO contract or stay in the pool accounts. Therefore, if the futures price is below the PRO price producers might want to keep their wheat in the pool account because the CWB expects to get a higher price than producers could on their own. If the futures price is above the PRO it would suggest to producers that they could get a higher price by pricing on their own using futures contracts rather than the pool. However, producers must be careful when determining whether to price their wheat using futures contracts or pool pricing because the PRO can also change over time as sales are completed throughout the crop year. Therefore, $p^S_{i,t}$ is calculated as an average of daily differences between futures price and PRO price between the beginning of the marketing window and the day the producer actually signed up the PPO contract. If there is more than one PPO contract signed up on different dates, the last contract signed up is used as the last day.

The relationship between $p^S_{i,t}$ and $perf_{i,t-1}$ is used to discuss how producers respond to current market prices. If the relationship between $p^S_{i,t}$ and $(\%PPO)_{i,t}$ is positive ($\theta < 0$), it would suggest that higher (smaller) price signals lead to larger(smaller) percentage of wheat against PPO contracts, indicating more (less) risk taken by producers, which is what is expected to happen. If the relationship between $p^S_{i,t}$ and $(\%PPO)_{i,t}$ is negative ($\theta > 0$) it would suggest that higher (smaller) price signals lead to smaller (larger) percent of PPO deliveries indicating less (more) risk taken by the producer.

PRELIMINARY RESULTS

Part of the data set, namely sign up dates, has not been obtained yet. Therefore equations (2) and (3) cannot be estimated, and only a preliminary analysis is conducted at this point. Due to the complexity and extensive number of producers received in the data set by the CWB, this study will initially focus on producers that grew CWRS wheat continuously between 2003/04 and 2008/09 crop years. This subgroup accounts for 13,355 producers. The preliminary analysis looks at producers in Western Canada that used PPO contracts, pool accounts, or both.

This sample reveals that pool pricing is still predominant even after the introduction of PPO contracts. However, the use of pool pricing has been decreasing over time. Figure 2 shows the percentage of producers who deliver their whole crop to the pool. In 2003/04 90 per cent of the producers used pool accounts only, but this number dropped steadily over time and reached 58 per cent in 2007/08 (Figure 2). This pattern changed in 2008/09, when the use of pool accounts increased again because of market conditions, as will be discussed later. A similar pattern is found for each province, as can be seen in Figure 3. Most noticeable in this figure is that the province of Manitoba has the smallest percentage of producers using the pool and the least amount of producers compared to the province of Saskatchewan, who has the largest number of producers and the highest usage of the pool accounts.[8] The total amount of producers

[8] The Pease River area of British Columbia was omitted since there were only 6 producers that grew CWRS continuously between 2003-04 and 2008-09 and all but one used only pool pricing every crop year.

each crop year by province was 2,886 for Manitoba, 6,626 for Saskatchewan, and 3,837 for Alberta.

Figure 2. Producers Who Delivered 100 per cent of Wheat to Pool, 2003/04 to 2008/09 Crop Years

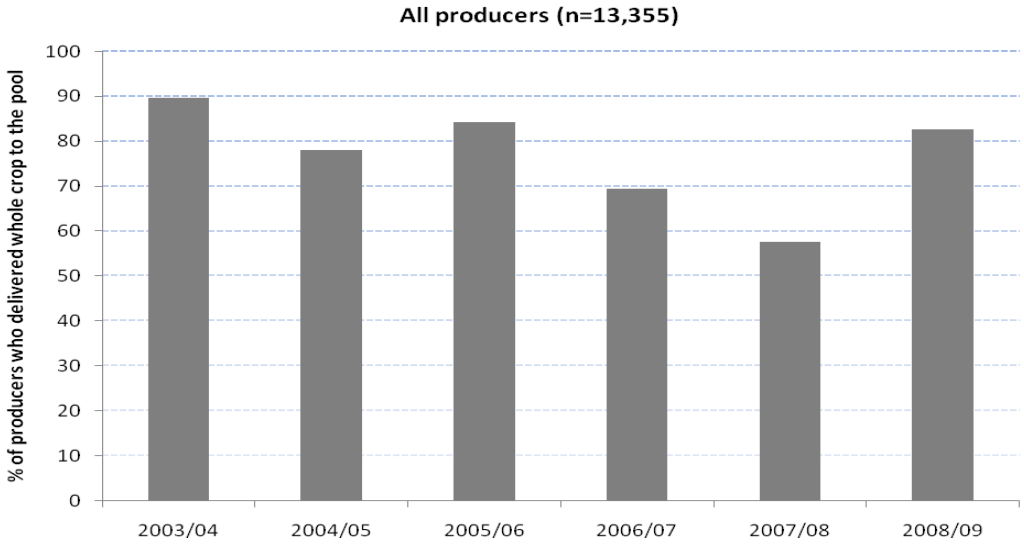
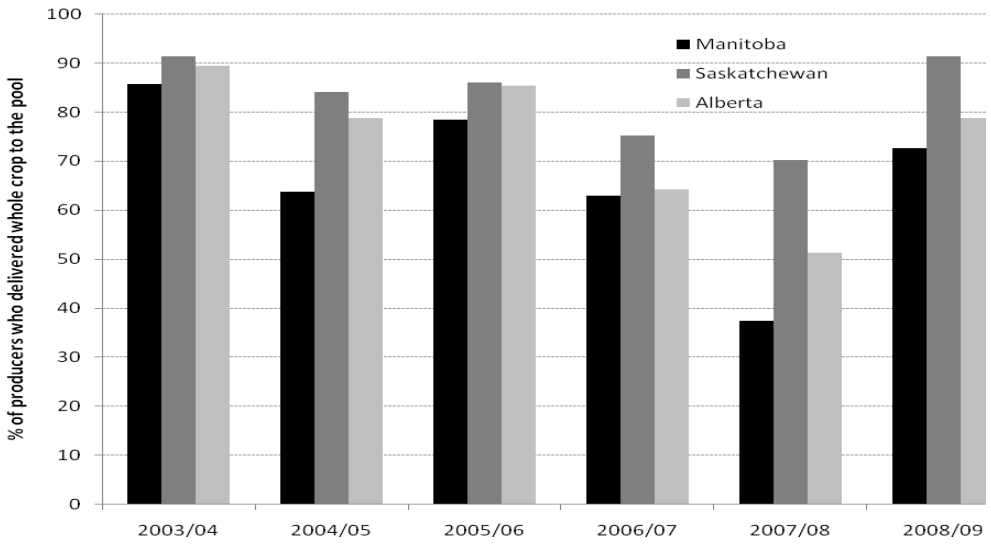


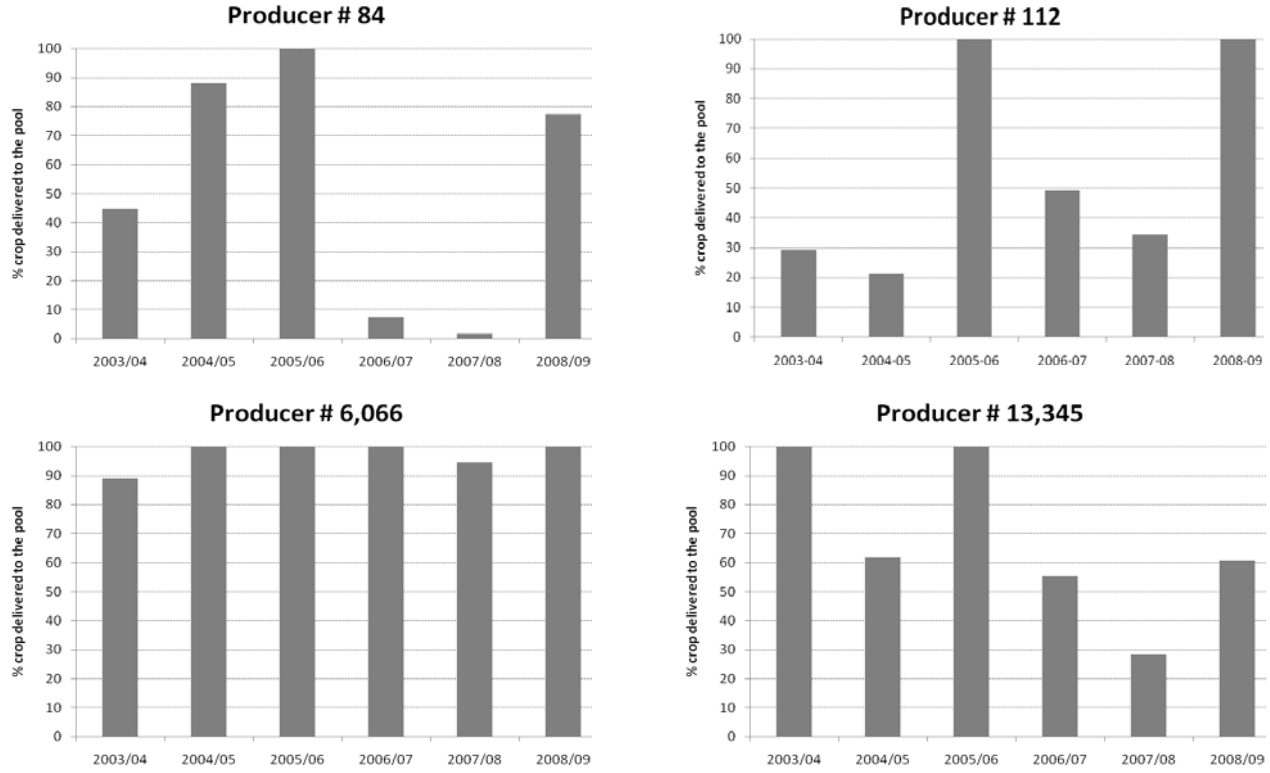
Figure 3. Producers Who Delivered 100 per cent of Wheat to Pool, 2003/04 to 2008/09 Crop Years by Province



The marketing decisions indicated by aggregate results do not reveal large heterogeneity in marketing strategies of individual producers (Figure 4). Even though many producers still deliver most of their crop to pool accounts (as producer 6,066 in Figure 4) and hence take on little risk, there is wide variety of strategies followed by other producers. For example, producer 84 roughly split his deliveries between pool accounts and PPO contracts in 2003/04, then chose to use mostly pool accounts in the next two years and subsequently delivered almost all his crop against PPO contracts in 2006 to 2008 (Figure 4). Results in Figure 4 suggest that there is large

heterogeneity in the marketing strategies and risk-taking behaviour across producers in Western Canada.

Figure 4. Marketing Strategies of Producers



One hypothesis of this research is that producers make marketing decisions based on current and expected prices. In Western Canada these prices are represented by the PRO price (projected pool price released by the CWB), FPC price (futures price offered by the CWB for the Fixed Price Contract, which is one type of PPO contract), and the December futures price (based on the Minneapolis Grain Exchange for Hard Red Spring wheat, which is used by the CWB to calculate their PPO prices). Figure 5 exhibits how these prices evolved during the PPO sign up period in each crop year, providing an illustration of the kind of information and price signals producers had when they decided how to market their grain. [9] For simplicity and without loss of generality, we focus on the FPC to represent PPO prices. When producers want to sign up a PPO contract such as the FPC they need to contact the CWB to communicate that they want to lock in the fixed price posted on the CWB website on that day. Then they will have to sign up a specific amount of tonnes for each PPO contract.[10] Producers choosing to remain in the pool do not have

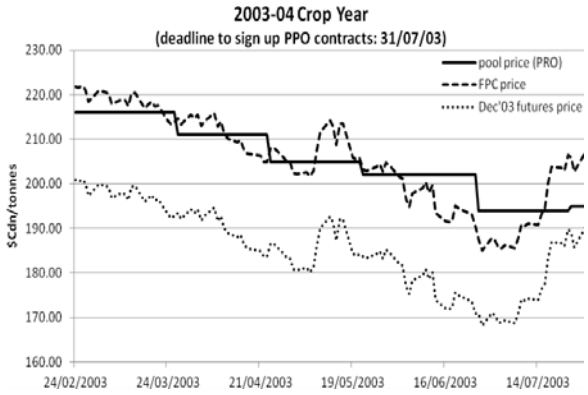
[9] Sign up periods can vary across crop years, but do not extend beyond October because the CWB preferred to be cautious and avoid getting caught in the markets as producers could arbitrage between PPO and pool prices. After recent adjustments to PPO contracts, the CWB decided to extend the deadline to January 31 for the BPC and FPC programs in the 2010-11 crop year (Pawlyk 2010).

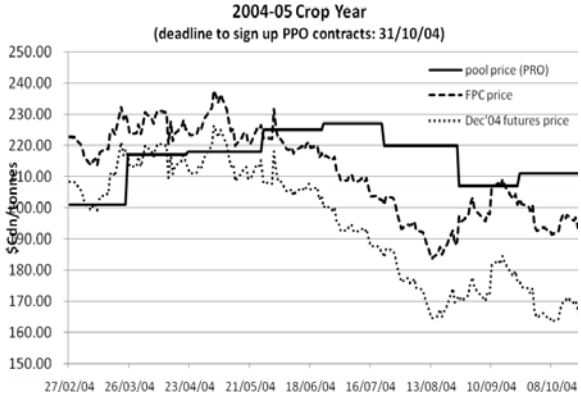
[10]BPC sign up is the same as the FPC but producers only lock in the basis price and tonnes by the deadline. Producers have until the month prior to the expiration of the futures contracts to lock in the futures price. EPO contract sign up begins at the start of the crop year and goes to the end of the crop year. The DPC and FlexPro sign up is before the beginning of the crop year. Producers have the entire crop year to price their grain.

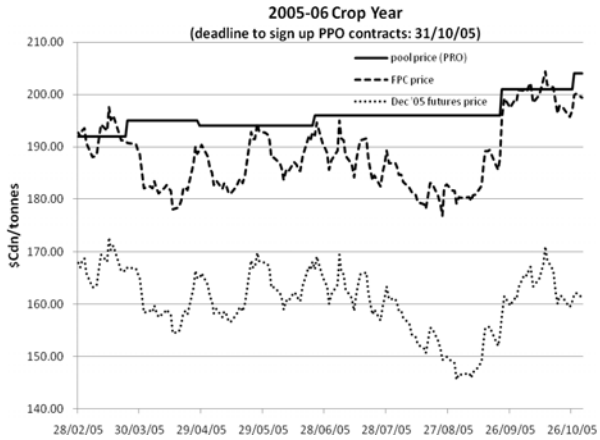
to sign up a contract. If the PRO price is used as the benchmark price by producers as to whether to stay in the pool or sign up a PPO contract, there should be more (less) producers signing up PPO contracts when the FPC price is above (below) the PRO price. The comparison between PRO and FPC prices in Figure 5 help explain the marketing choices in Figure 2, as crop years when FPC prices were above PRO prices for longer periods of time correspond to crop years with more PPO deliveries (or less pool deliveries).[11] For example, the pricing chart for 2005/06 crop year signals that producers should have stayed in the pool, while in 2007/08 they should have priced their grain using PPO contracts. Furthermore, this information may help understand why 2007/08 showed the highest participation in PPO contracts in the whole history, as shown in Figure 2. A further look into this question is provided in Table 1, which breaks up the number of producers who signed up PPO contracts by month. It can be seen that months with more concentration of PPO contracts signed up correspond to periods when the FPC price rises above the pool price (PRO), suggesting that these price signals play an important role in producers' choice of marketing strategy.

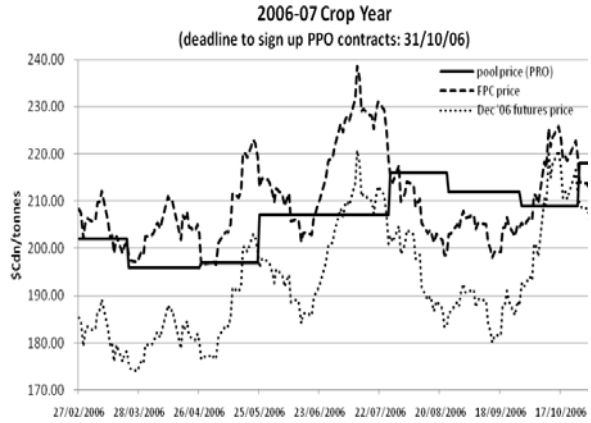
[11] PPO contracts are still relatively recent and thus their adoption may also be related to how fast producers become familiar with them.

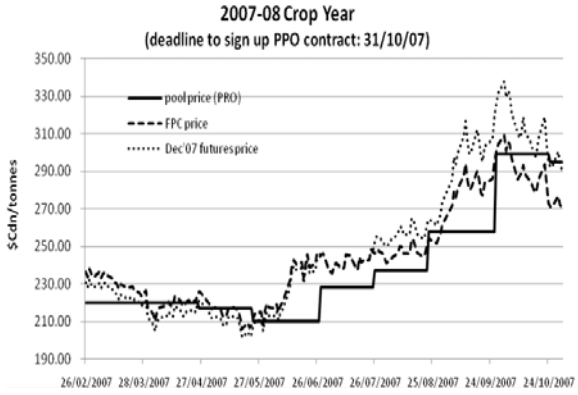
Figure 5. Pricing Charts During PPO Contract Sign Up, 2003/04 to 2008/09 Crop Years











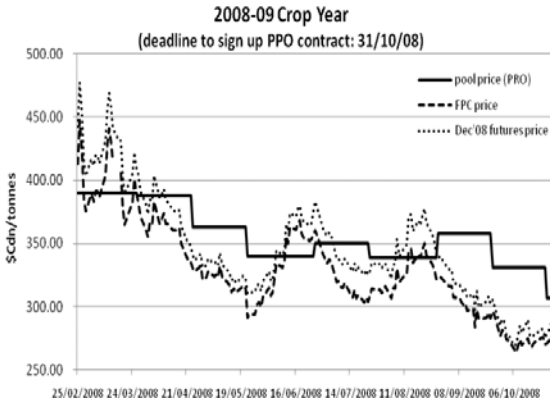


Table 1. Number of Producers Signing Up FPC by Month, 2003/04 to 2008/09 Crop Years

	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09
February				2	5	125
March	5	323	14	60	26	510
April	1	272		161	1	26
May	9	851		674	1	4
June		102		66	567	62
July	27	4	1	1,069	185	6
August	2		2	4	310	64
September		9	25	7	2,232	25
October		12	272	751	1,300	67

Preliminary investigation on prices received by producers show large variability in performance. Producers who choose to stay in the pool accounts will always receive the pool price, but they can get prices that are higher or lower than the pool price if they deliver at least part of their crop against PPO contracts. The average final price received by producers and descriptive statistics for each crop year are shown in Table 2, which includes all producers, as well as a breakdown of prices received for those producers that performed better and worse than the pool accounts. Results show that when all producers are considered, their final price was worse than the final pool price only in two crop years (2003/04 and 2007/08). So the average producer was able to outperform the pool in four out of the last six crop years. However, since most producers still deliver their grain against the pool accounts (Figure 2), the average final price received including all producers does give a complete picture of how much better or worse producers perform relative to the pool. In order to gather more insight on relative performance we can focus on the group of producers who delivered at least part of their crop against PPO contracts in Table 2, meaning that they received prices either better or worse than the pool price. For those producers that performed better than the pool, the differences from the final pool price between 2003/04 and 2008/09 were $2.61, $11.20, $3.96, $5.63, $23.15, and $20.91 per tonne, respectively. These numbers suggest that the average producer who used PPO contracts and performed better than the pool was able to outperform the pool accounts by a large margin in many years. On the other hand, looking at those producers that performed worse than the pool, the differences are relatively close for all the crop years, with the exception of the 2007/08 and 2008/09 crop years ($1.26, $2.59, $0.93, $1.29, $44.48, and $12.23 per tonne). Although these numbers may imply the possibility of outperforming the pool, standard deviations and maximum and minimum prices indicate large variability in performance in both groups of producers (better and worse than pool). Additionally, further investigation shows that no producer who used PPO contracts every crop year between 2003/04 and 2008/09 has consistently outperformed the pool in all six crop years, but fifteen producers performed worse than the pool in all six crop years. Even if we focus on five out of six years, there are more producers who consistently perform worse than producers who perform better than the pool.

Table 2. Summary Measures of Final Price Received by Producers, 2003/04 to 2008/09 Crop Years ($Cdn/tonne)

Variable	Observations	Average	Median	Minimum	Maximum	Standard deviation
All producers						
2003/04	13,355	211.03	211.14	195.67	220.75	0.56
2004/05	13,355	206.13	205.10	166.92	244.21	5.01
2005/06	13,355	195.23	195.14	176.61	227.50	1.50
2006/07	13,355	214.03	212.89	192.30	249.93	3.58
2007/08	13,355	353.87	372.06	209.43	641.40	30.42
2008/09	13,355	312.60	311.36	228.87	487.42	10.44
Better than pool (producers who delivered at least part of their crop against PPO contracts)						
2003/04	67	213.75	213.22	211.17	220.75	2.43
2004/05	1,550	216.30	213.69	205.18	244.21	8.47
2005/06	656	199.10	197.52	195.14	227.50	4.77
2006/07	2,953	218.52	216.93	212.90	249.93	5.47
2007/08	125	395.21	384.27	372.14	641.40	31.05
2008/09	1,371	331.97	325.49	311.36	487.42	20.55
Worse than pool (producers who delivered at least part of their crop against PPO contracts)						
2003/04	1,326	209.88	210.16	195.67	211.08	1.02
2004/05	1,371	202.51	203.72	166.92	205.09	5.05
2005/06	1,449	194.21	194.77	176.61	195.13	1.61
2006/07	1,134	211.60	212.20	192.30	212.88	1.99
2007/08	5,527	327.58	332.95	209.43	372.05	32.00
2008/09	934	298.84	303.12	228.87	311.36	13.46

Final Pool Prices: 2003/04 $211.14/tonne; 2004/05 $205.10/tonne; 2005/06 $195.14/tonne; 2006/07 $212.89/tonne; 2007/08 $372.06/tonne; 2008/09 $311.06/tonne.

It can be explored whether the adoption of PPO contracts affects marketing performance. Preliminary analysis suggests there is no apparent distinction between producers who perform better or worse than the pool in terms of pricing strategies. Table 3 exhibits the percentage of wheat that was allocated to PPO contracts for those producers whose final prices were better or worse than the pool accounts. In general, the data shows the average producer who performs better than the pool delivers approximately the same percentage of grain against PPO contracts than the average producer who performs worse than the pool. This suggests that marketing performance might not be related to pricing instruments, but rather to how and when they are used. This point will be further explored when the rest of the data set is obtained.

Table 3. Percentage of Wheat Delivered Against PPO contracts for Producers that Performed Better and Worse Than Pool, 2003/04 to 2008/09 Crop Years

	Better than pool			Worse than pool		
	Maximum	Average	Minimum	Maximum	Average	Minimum
2003/04	100.00	41.17	1.31	100.00	58.70	1.58
2004/05	100.00	56.89	1.30	100.00	74.70	1.47
2005/06	100.00	48.41	1.05	100.00	49.47	0.70
2006/07	100.00	45.78	1.87	100.00	47.30	1.62
2007/08	100.00	54.70	0.60	100.00	55.62	1.13
2008/09	100.00	31.28	0.70	100.00	37.46	0.00*

* It can happen that producers do not deliver all grain priced through their PPO contracts, in which case the CWB will assess pricing damages on all undelivered tonnes.

CONCLUSION

This study uses data from the Canadian Wheat Board (CWB) to investigate the marketing behaviour of Western Canadian producers. The subgroup for this study focuses on producers that grew Canada Western Red Spring wheat from 2003/04 to 2008/09. Analysis of the marketing strategies of 13,355 producers suggests that there is much heterogeneity in individual marketing behaviours. In particular, the paper considers producers ability to outperform the pool accounts using Producer Payment Option (PPO) contracts, degree of activeness in their marketing strategies, and how previous year's performance affects current year's marketing strategies.

Our results are still preliminary since part of the data set has not been obtained yet. They show that producers' predominant marketing strategy used is pool pricing. However, the total amount of producers using pool accounts appears to be decreasing over time. Perhaps more important, PPO prices (such as the Fixed Price Contract) are above the Pool Return Outlook (PRO), the projected pool price, producers in Western Canada tend to sign up more PPO contracts, suggesting that the PRO is used by producers as a benchmark as to whether they should sign up a PPO contract or remain in the pool accounts.

Additionally, preliminary analysis show no clear evidence that producers who use PPO contracts are able to consistently outperform the pool. There also appears to be no direct relationship between PPO usage and pricing performance, meaning that the adoption of PPO contracts appears not to be related to better or worse marketing performance. However, this point still needs further investigation with the complete data set and estimation of the regression models adopted in this study.

The next steps of this study are to collect the rest of the data and estimate the regression models. These models will provide more insights into producers' overconfidence in their abilities to market their wheat outside the pool accounts, and whether current decisions are influenced by previous year's marketing choices and performance. Findings will help understand how producers make marketing decisions within the CWB context.

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