How Do Canadian Wheat Producers' Make Marketing Decisions?

by

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The purpose of this paper is to investigate how Western Canadian wheat producers' make their marketing decisions. In Canada wheat must be marketed through the Canadian Wheat Board (CWB), which offers several marketing contracts providing 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) represents instruments that producers can use to price their wheat outside the pool. Results indicate that previous use of a PPO contract tends to reduce its use in the current year. Previous performance is also found to be an important variable, with higher performance in previous year leading to more use of PPO contracts in the current year. In addition, producers seem to follow price signals to choose marketing contracts, specially the difference between the futures price and the expected pool price.

INTRODUCTION

Grain marketing studies have traditionally relied on standard economic theory in which producers make decisions that are logical and out of self-interest. However, empirical studies show that individual producer's behavior does not necessarily follow the standard rationality assumption. These studies find evidence that producers exhibit loss aversion and probability weighting, and tend to sometimes overestimate price and underestimate risk (Eales et al., 1990; Collins et al., 1991; Humphrey and Verschoor, 2004; Cruz Junior, 2008; Lui, 2008; and Riley and Anderson, 2009). Further, Dorfman et al. (2005) and Dorfman and Karali (2010) also find evidence of a habit effect in that previous hedge ratios are an important factor in current marketing decisions. More generally, Hagedorn et al. (2005) claims that, despite the importance of marketing in farm management, it is alarming to realize that prevalent ideas about marketing decisions and performance still do not rely on a large body of evidence.

The objective of this research is to explore how Western Canadian wheat producers make marketing decisions. Some questions that are addressed in this study are whether producers use the same strategy every year, whether pricing performance in the previous year affects current year's strategy, and whether current price signals affect marketing decisions.

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 in Canada offers a unique opportunity to explore how producers make decisions. All wheat produced in Western Canada and sold for human consumption and export must be marketed through the Canadian Wheat Board (CWB), which is the largest grain marketing agency in Canada. Since producers have to execute all wheat sales through a single agency, the CWB has data showing exactly how all producers chose to market their wheat 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. As well, our findings may 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. Figure 1 illustrates the wheat growing area in Western Canada, highlighting the region of Western Canada that must market wheat through the CWB. The geographical area encompasses mainly three provinces, Manitoba, Saskatchewan, and Alberta, and corresponds to approximately 90% of all wheat produced in Canada.[1]

Figure 1. Region that Markets Wheat through Canadian Wheat Board (CWB)

The CWB offers different marketing contracts that allow producers to choose a program that meets their own needs and preferences regarding risk, return, and cash flow. The most traditional program is pool pricing, which is the default program in that the CWB assumes producers will keep wheat in pool accounts unless otherwise indicated. Pool pricing was designed to guarantee all producers receive the same final price for their wheat by pooling together all the wheat sales during the crop year. During the crop year, the CWB releases a projected price–the Pool Return Outlook (PRO)–which is their estimate of what the final pool price will be at the end of the crop year. The PRO can be used by producers as a price signal as it reflects the price they are expected to receive at the end of the crop year. Until 2000 pool pricing was the only marketing program offered by the CWB and hence the only marketing contract available to producers in Western Canada.

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[1] There is also a small area in British Columbia

After 2000 the CWB introduced other pricing alternatives−generally known as Producer Payment Options (PPO) that were developed to accommodate producers' demand for more flexibility to manage risk and cash flow. PPOs include the Fixed Price Contract (FPC), Basis Price Contract (BPC), Daily Price Contract (DPC), FlexPRO, and Early Payment Option (EPO). These contracts have distinct characteristics but essentially allow producers to use futures markets to price their grain. For example, the BPC allows producers to lock in the futures price and basis at different times during the marketing window, while with the FPC both the futures price and basis are locked in simultaneously. As for the DPC and FlexPRO producers have the entire crop year to price their contract, however tonnage must be signed prior to the beginning of the crop year. The FPC, BPC, DPC, and FlexPRO were designed to give producers the opportunity to get prices above the pool. Alternatively, the EPO was designed to help producers manage their cash flow and thus only allows producers to lock in a percentage of the expected pool price (PRO). Another difference between pool accounts and PPOs is their payment schedule. Unlike pool pricing where producers do not receive final payment until after the end of the crop year, producers using PPOs receive their final payment within 10 business days of delivering grain to elevators.[2]

PPOs and pool pricing can be used simultaneously during a crop year. The majority of producers in Western Canada still choose to use the pool over PPOs. Those producers who use PPOs also tend to leave part of their crop in the pool. The slow adoption of PPOs might be explained by the fact that they are relatively recent and thus producers are still learning and getting used to them, while they have been familiar with pool accounts for a long time. In addition, the CWB has made some adjustments to PPOs over the years, which might have slowed down the process of producers getting used to the new marketing contracts.

The choice of marketing contracts can rely on several factors. Price signals can be important variables in this process. The PRO is often seen as a benchmark and can be used by producers as a pricing signal as to whether to remain in the pool accounts or sign a PPO contract. It is an open question which price signal producers actually use in their marketing decisions, but anecdotal evidence suggests producers only look at futures prices to make pricing decisions.

PREVIOUS STUDIES

The decision making process in agricultural marketing has been investigated in many studies. Meulenberg and Pennings (2002) and McNew and Musser (2002) explore how producers respond to price signals in a marketing context. Meulenberg and Pennings (2002) focus on marketing strategies of Dutch hog producers. They administered personal computer-guided interviews to 418 producers to examine how their hedging decisions are influenced by characteristics such as risk attitude, risk perception, level of understanding of futures markets, market orientation, and demographic variables (e.g. age and farm size). They find that risk attitude and demographic variables do not help discriminate between producers who use and those who do not use futures markets, but other factors are important to discriminate between the two groups. In particular, they find evidence that producers' perceived performance and

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[2] Final payment for PPOs are sent to producers after a cash ticket is printed by the elevator and sent electronically to the CWB.

reference price affect their marketing decisions.[3] Meulenberg and Pennings (2002) define reference price as producers' benchmark to judge other prices. When futures prices surpass the reference price the futures position becomes more attractive to producers. Their findings suggest that as perceived performance of futures positions increase producers' use of futures markets also increase. They also indicate that producers tend to use futures contracts when the difference between the futures price and producer's reference price is positive, and usage of futures markets increase as this price spread becomes larger. However, they find large variety in producers' reference prices and note that a given futures price is not equally attractive to all producers.

McNew and Musser (2002) follow the pricing decisions of grain marketing clubs in Maryland between 1994 and 1998. Their findings suggest that producers tend to hedge less in the spring and more in the summer, adjust their pricing strategies as market conditions change, vary the amount of grain hedged across years (which they interpret as attempts to time the market), and generally respond to price signals when making marketing decisions. Response to price signals comes in the form of less hedging when the current price is above previous year's price, and more hedging when the futures price is higher than the fundamental price.[4]

A recent study by Dorfman and Karali (2010) investigated Georgia producers hedging strategies between 1999-2002 for corn, soybeans, wheat, and cotton and the role that habit plays in terms of their hedging decisions. They explored factors that could affect producers' marketing decisions–such as education levels, percent of income from farming, information sources, and commodity mix–and used lagged hedge ratios to incorporate habit in their model. Results reveal that producers with more education and more diversified commodity mix tend to hedge more, while producers whose income comes mainly from farming tend to hedge less than those who earn only a small portion of their income from farming. Furthermore, they find that coefficients on lagged hedge ratios are positive, implying that habit is important in producers' hedging decisions.

Isengildina and Hudson (2001) conducted a survey with cotton producers in the U.S. and find that farm characteristics can also have a large impact on producers' hedging decisions. They find a positive relationship between farm size and cotton producers' decisions to use indirect hedging or direct hedging compared to base scenario of selling in cash markets.[5] They argue that larger farms have more hired labour, which provides farm managers with more time to invest in marketing. Their results also indicate that producers agree with the statement "A marketing pool nets me a higher price than I can get myself" tend to choose indirect hedging over cash sales. This finding suggests that producers believe their marketing skills do not allow them to outperform marketing pools and therefore they would prefer to purchase marketing services from pools.

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[3] Reference prices were identified through Puto's question format where producers identify prices as being above (below) the point where profit (loss) is perceived.

[4] McNew and Musser (2002) estimate what they call a fundamental price based on a simple regression model with futures price as a function of stocks-to-use ratio.

[5] Indirect hedging encompasses marketing through the use of pools and forward contracting and direct hedging considers those producers who take positions in the futures and/or options markets (Isengildina and Hudson, 2001).

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 for this study contains 20,371 producers who used PPOs between 2003/04 through 2008/09. Even though PPOs were first available in 2000/01, the data set starts in 2003/04 because the initial three crop years had minimal PPO usage. The more current crop years (2009/10 and 2010/11) are not included because final prices were not yet available.

Data contains transactions made by each producer that indicates (i) what contracts they used to market their wheat, (ii) how many tonnes of wheat were delivered to each contract, (iii) exact dates when producers signed PPO contracts, (iv) final price received by each producer in each marketing contract used to sell wheat, (v) PRO, PPO and futures prices, (vi) seeded acres, and (vii) province. The final price received by each producer is calculated as a weighted average of all prices received under each contract used by the producer. The weights are the amount of tonnes priced under each contract. Therefore, their final price received represents the average dollar per tonne they received for their wheat.

RESEARCH METHOD

Marketing decisions are investigated for each PPO contract individually, so one equation is estimated for each contract. Equation (1) presents the model for the FPC. Equations for the other contracts follow the same structure and are presented in the Appendix.

$$
\begin{aligned}
(FPC)_{i,t} = {} & \alpha + \beta_F (FPC)_{i,t-1} + \chi_E (EPO)_{i,t} + \chi_D (DPC)_{i,t} + \chi_B (BPC)_{i,t} + \gamma_P Performance_{i,t-1} + \\
& \tau_A Wheat\,Acres_{i,t} + \rho_S Harvest\,\Pr ogress\,at\,Signing_{i,t} + \theta_1 10\,Day\,\Pr ice\,Signal_{i,t} + \\
& \theta_2 Historical\,Futures\,\Pr ice_{i,t} + \lambda_1 FPC_{i,t-1}*Performance_{i,t-1} + \varepsilon_t
\end{aligned} \tag{1}
$$

The variables $(FPC)_{i,t}$, $(EPO)_{i,t}$, $(DPC)_{i,t}$, $(BPC)_{i,t}$, and $(FPC)_{i,t-1}$ are the percentages of wheat delivered against each PPO contract by producer i in years t and t-1, $Performance_{i,t-1}$ is the pricing performance of producer i in year t-1, $Wheat\,Acres_{i,t}$ measures how many acres were seeded by producer i in year t, $Harvest\,\Pr ogress\,at\,Signing_{i,t}$ is a measure of harvest progress for producer i on the day he/she signed a FPC in year t, $10\,Day\,\Pr ice\,Signal_{i,t}$ is a 10-day average price spread for producer i based on the day he/she signed a FPC in year t, $Historical\,Futures\,\Pr ice_{i,t}$ is a measure of a 12-month average of nearby futures price when producer i signed a FPC in year t, and $FPC_{i,t-1}*Performance_{i,t-1}$ is an interaction term between FPC usage and performance in the previous year.

The key variables in equation (1) are performance in previous year, PPO usage in previous year, and price signals in current year. $Performance_{i,t-1}$ is calculated as the difference between the actual price producers received and a benchmark price as shown by equation (2), where price received is the weighted average of prices from all marketing contracts used by the producer.

$$Performance_{i,t-1} = (price\,received_{i,t-1} - benchmark_{t-1}) \qquad (2)$$

Two types of benchmarks are adopted, as in previous studies on marketing performance (e.g., Hagedorn et al. 2005; Cabrini et al. 2007; and Dietz et al. 2009). One is the final CWB pool price, which is a farmer benchmark. Producers can simply choose to stay in the pool and let the CWB market their wheat for them, in which case they will simply receive the pool price at the end of the crop year. Other benchmarks are based on historical averages of futures prices, which are market benchmarks. Many producers follow futures prices and use them as a reference to evaluate their marketing performance. In this study market benchmarks are calculated as 24-, 20-, and 12-month averages based off Minneapolis Grain Exchange for Hard Red Spring wheat converted to Canadian dollars using the Bank of Canada noon exchange rate. The 24-month market benchmark is calculated by taking the average of the nearby futures price over the last two crop years. For example, the 24-month benchmark for the 2007/08 crop year is the average of the nearby futures price between August 2005 and July 2007. The other two market benchmarks are shorter versions of the 24-month benchmark. The 20-month benchmark removes the first 4 months of the 24-month benchmark, while the 12-month benchmark is only the previous crop year from August to July.

A positive relationship $(\gamma > 0)$ between $(FPC)_{i,t}$ and $Performance_{i,t-1}$ suggests that positive (negative) performance in the previous year leads to more (less) FPC usage in the current year. On the other hand, if this relationship is negative $(\gamma < 0)$, positive (negative) performance in the previous year leads to less (more) FPC usage in the current year.

Two variables in equation (1) are used as price signals. One is the price spread between the CWB futures price and the PRO, which is taken as a 10-day average based on the day the producer signed a FPC.[6,7] It represents how much futures price is above or below the expected pool price and is assumed to provide an indication of whether producers can price their grain above or below the pool. A positive relationship $(\theta_1 > 0)$ between this price signal and FPC usage suggests that producers will use more FPCs when the difference between the CWB futures price and the PRO becomes large and positive, and use less FPCs when this difference becomes large and negative.

Figure 2 shows the CWB futures price and the PRO in 2006/07 and provides an illustration of how this price signal can affect marketing decisions. The futures price was below the PRO during most of the marketing window for the FPC, so the price signal was mainly negative. This situation would suggest that producers who locked in the futures price would be expected to receive a price below the pool price.

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[6] The EPO and FlexPRO use 10-day moving average of the CWB DPC/FlexPRO price minus the PRO.

[7] The CWB futures price is based off U.S. futures prices and more specifically CWRS wheat is based off futures prices from Minneapolis Grain Exchange for Hard Red Spring wheat converted to Canadian dollars. The CWB futures price is the futures price component used for the BPC and FPC.

Figure 2. 2006/07 Marketing Window for Fixed Price Contract (FPC)

(deadlline to sign FPC: October 31, 2007)
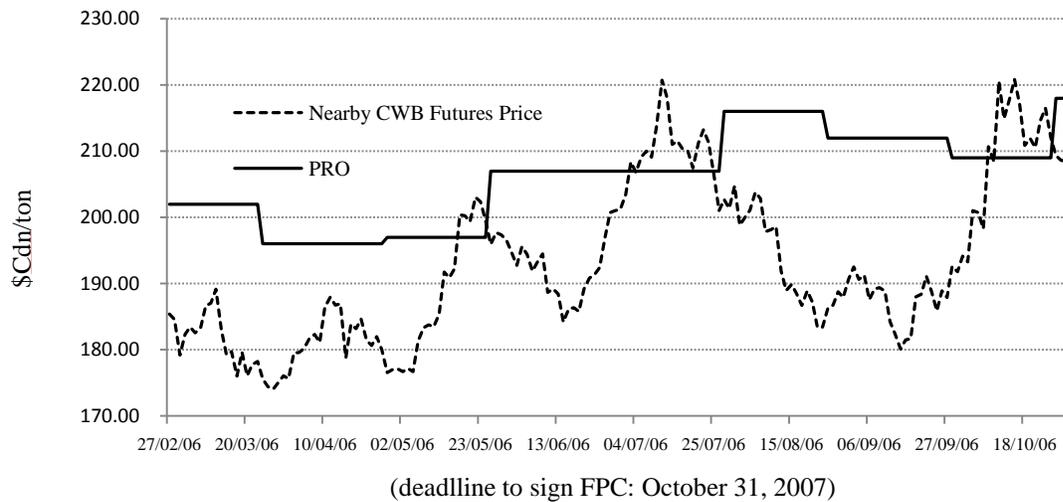
The second price signal is *Historical Futures* $\Pr ice_{i,t}$ and is a 12-month average of the nearby futures price based off the Minneapolis futures markets. This variable is calculated as a 12-month average from the day producer signed the PPO contract. A positive relationship $(\theta_2 > 0)$ between historical futures price and FPC usage suggests producers tend to market more (less) grain with FPCs when the futures price is higher (lower). A negative relationship $(\theta_2 < 0)$ suggests producers would market less (more) grain with FPCs when the futures price is higher (lower).

The relationship between current FPC usage and previous year's FPC usage is also explored, and can shed light on whether habit plays a role in marketing decision. In addition, variables on current usage of other PPO contracts are also included in the model. Since there is a limited quantity of wheat that can be marketed by each producer, usage of other contracts should reduce the usage of FPCs. The model also considers wheat acreage, which shows how many acres of wheat each producer seeded on a given year. Seeded acres are used as a proxy to identify if larger wheat producers chose a different marketing strategy than smaller wheat producers.

Finally, the measure for *Harvest* $\Pr ogress\, at\, Signing_{i,t}$ shows how much crop was harvested weekly for each province. It is important to control for this variable since it is an indicator of how certain the producer was about the quantity and quality of grain that would be available to market. Therefore, the more wheat the producer has harvested the more certain about the amount of grain to price.

RESULTS

Table 1 shows descriptive statistics on PPO usage and performance for the 5 crop years used in this research. PPO usage had been increasing over time until 2007/08, both in terms of number of producers using these contracts and portion of crop priced with them. However, both indicators dropped dramatically in 2008/09. The number of producers using PPOs had reached about

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11,000 in 2007/08 and then dropped to 2,590 in 2008/09. The portion of wheat crop priced with PPOs decreased from around 60% to 36% in 2008/09. This is probably related to the poor pricing performance of PPOs in 2007/08. In that crop year producers who used PPOs received, on average, $45/ton below the pool price, while some received prices as low as $173/ton below the pool price. In addition, 2007/08 was an unusual year also because a very large number of producers who used PPOs performed below the pool. The final price received by 98% of producers in 2007/08 was below the pool price (Table 1).

Table 1. Pricing Performance: Difference between price received and pool price* ($Cdn/ton)

	Producers using PPOs	Avg. % Crop Priced w/ PPOs	# Producers Positive Performance	# Producers Negative Performance	Pricing Performance		
					Avg.	Min.	Max.
2004/05	5,606	68.235	2,741	2,865	4.4734	-49.5827	39.1100
2005/06	5,340	57.0429	1,483	3,857	0.5965	-18.5300	43.4800
2006/07	10,429	56.7716	6,945	3,481	4.0952	-28.2400	41.1563
2007/08	11,319	62.2498	243	11,076	-45.5249	-173.4700	269.3432
2008/09	2,590	36.7594	1,358	1,232	7.3849	-78.9600	140.1200

(*) Pool prices were $205.10/ton in 2004/05, $195.14/ton in 2005/06, $212.89/ton in 2006/07, $372.06/ton in 2007/08, and $311.03/ton in 2008/09.

A panel regression with fixed effects and robust estimators were used to estimate the models for the FPC in equation (1) as well as the BPC, DPC, and EPO (Appendix). It was determined fixed effects was the most appropriate method given the content of the model compared to random effects method using the Hausman test. The null hypothesis that heteroskedasticity and serial correlation was not present could not be rejected, therefore robust estimators were used. The regression contains unbalanced data for 5 crop years and a number of producers observations that vary across crop years (as can be seen in the first column of Table 1). Results are presented in Table 2, which shows point estimates and standard errors of all parameters in the four equations explaining usage of FPC, BPC, DPC, and EPO.

Table 2. Estimated Panel Regression Models

	Fixed Price Contract (FPC) (2004/05-2008/09) (a)		Basis Price Contract (BPC) (2004/05-2008/09) (a)		Daily Price Contract (DPC) (2005/06-2008/09) (a)		Early Payment Option (EPO) (2004/05-2008/09) (a)	
	coefficient	std. error	coefficient	std. error	coefficient	std. error	coefficient	std. error
constant	45.7776	2.1896***	61.4696	3.6336***	28.0154	7.1922***	63.3998	2.8241***
Same contract$_{t-1}$	-0.1520	0.0125***	-0.1173	0.0173***	-0.1374	0.0322***	-0.1662	0.0104***
EPO$_t$	-0.3805	0.0166***	-0.5025	0.0355***	-0.7034	0.0725***		
DPC$_t$	-0.3441	0.0232***	-0.3966	0.0298***			-0.5508	0.0502***
FPC$_t$			-0.5525	0.0257***	-0.3670	0.0527***	-0.5051	0.0274***
BPC$_t$	-0.4598	0.0225***			-0.5026	0.0605***	-0.4970	0.0446***
Performance$_{t-1}$ (b)	0.4322	0.0422***	0.2372	0.0448***	0.2848	0.0911***	0.1751	0.0486***
PPO$_{t-1}$*Performance$_{t-1}$	-0.0008	0.0005	-0.0008	0.0008	-0.0004	0.0013	0.0019	0.0024
Harvest Progress at Signing	0.0749	0.0086***	-0.0059	0.0201	-0.0083	0.0397	0.0685	0.0175***
10-Day Price Spread	0.1896	0.0164***	0.0798	0.0135***	0.2114	0.0224***	-0.0191	0.0084**
Historical Futures Price	0.0261	0.0109**	-0.0102	0.0143	0.1234	0.0293***	0.0053	0.0108
Wheat Acres	-0.0053	0.0010***	-0.0022	0.0013*	-0.0042	0.0019**	-0.0083	0.0018***
R^2 within	0.2395		0.3408		0.3137		0.2019	
between	0.0703		0.1454		0.1150		0.0889	
overall	0.0930		0.1803		0.1337		0.1011	
Number of observations	20,543		5,150		3,189		13,122	
Number of producers	14,074		3,695		2,421		9,477	

(a) Dependent variable in each equation is the percentage of crop priced with a given marketing contract (FPC, BPC, DPC, and EPO).
(b) Marketing performance is measured against a farmer benchmark (pool price)
*** statistically significant at 1%, ** statistically significant at 5%, * statistically significant at 10%

In all equations estimated coefficients for the variable related to usage of the same marketing contract in the previous year have negative signs and are all statistically distinguishable from zero. For example, in the FPC equation the estimated coefficient for the percentage of the crop priced with FPC in the previous year is –0.1520 (Table 2). This result shows a negative relationship between FPC usage in the current year and FPC usage in the previous year, suggesting the more producers use FPC in *t-1* the less they will use it in *t*. The same result is found for all other marketing contracts. A possible explanation for this finding is that the contracts are still relatively new instruments and in general no producer has consistently used them over the last 6 years. As for the other marketing contracts used in the current year, all coefficients are negative and statistically significant. This result is expected since there is a given quantity of wheat to be priced each year. If more wheat is priced under one contract, less wheat is left to be priced under other contracts.

In Table 2 marketing performance is measured against the pool price. The estimated coefficients related to previous year's performance are all positive and statistically distinguishable from zero (Table 2). This result indicates that producers who achieved positive marketing performance in the previous year tend to use more PPOs in the current year, and the better the previous performance the more they will use PPOs. Since performance is measured against the pool price, positive performance means the producer received a price above the pool price. The more positive the performance is, the higher the price received by the producer is relative to the pool price. Therefore this result is showing that producers who obtained prices above the pool price in the previous year (which can only happen through the use of PPOs) are likely to price their crop with PPOs in the current year. The interaction term between the use of specific PPO and performance in previous year have negative coefficients but are not statistically distinguishable from zero. This variable was supposed to capture whether PPO usage and performance in previous year had a combined effect on the decision to use PPO in the current year. Current findings suggest there is no combined effect, but it might be influenced by the fact that performance is measured considering all PPOs used by a producer and not only the PPO considered in the interaction term.

The estimated coefficients for harvest progress on the day marketing contracts were signed show a combination of positive and negative signs, but it is statistically distinguishable from zero–and positive–only in the FPC and EPO equations (Table 2). This positive relationship between harvest progress and FPC and EPO usage indicates producers tend to wait until a portion of their harvest is complete before committing to a marketing contract. It was expected that this variable would be significant in the EPO model because of the characteristics of this contract. The price producers receive when they sign an EPO is based on the PRO price, which is updated regularly by the CWB. Therefore, when producers chose to use EPOs they only sign the contract close to the time they plan to deliver the grain. In this context they need to be sure they will have grain to deliver, hence it is important for EPO users to follow their harvest pace to make marketing decisions.

Looking at the price signals, coefficients for the 10-day average price spread (futures price minus PRO price) are all statistically distinguishable from zero, being positive for all equations but the EPO (Table 2). These findings suggest producers tend to use more FPCs, BPCs and DPCs and less EPOs as the futures price rises above the PRO price. This finding is consistent with the characteristics of the marketing contracts. FPCs, BPCs and DPCs are based on futures prices and are mainly used by producers who want to obtain higher prices. Therefore they are expected to be used more heavily as producers see the futures price is above the PRO

price, which represents the expected pool price. As for the EPO, it is based on the PRO price and essentially used for cash flow management. Thus higher futures prices would be unlikely to drive producers to use EPOs. For the other pricing signal (12-month average futures price), it is positive and statistically distinguishable from zero only for the FPC and DPC. It is again not significant for the EPO, which is expected because of its characteristics as discussed previously. Additionally, it is also not significant for the BPC, which makes sense due to its pricing setup. When producers sign a BPC they can lock in the futures price and basis at different times in the marketing window. In practice they typically lock in the basis first and then wait longer to lock in the futures price. This strategy can lead to two possible reasons why the historical futures price seems not to be relevant in the decision to use BPCs. It is possible that producers are more concerned with the basis, and once they lock in a favourable basis they do not worry much about the futures price component of the contract. Alternatively, it is possible that producers wait too long to lock in the futures price and miss opportunities to guarantee a good price, which our model would capture as an indication that futures prices are not relevant.

Finally, for wheat acres, all estimated coefficients are negative and statistically distinguishable from zero for all PPOs. This result suggests producers who grow more acres with wheat would be less likely to price their crop with PPOs. However, this finding should be taken with caution because our data contains acreage for wheat but does not provide information about other crops grown by producers. Hence wheat acreage cannot necessarily be used as a proxy for farm acreage here and this finding does not automatically mean that larger producers tend to use PPOs less intensively.

The models were also estimated using different benchmarks for the performance variable, namely historical futures price over 24-, 20-, and 12-month windows. In those cases marketing performance is positive (negative) if the final price received by a producer is above (below) the historical futures price. Overall results are qualitatively the same as the ones reported in this section and are presented in Tables 3 through 5 in the Appendix. The main exception seems to be the negative and statistically significant coefficients on previous performance in the equations for the FPC (Table 3 and Table 4) and the DPC (Table 4 and Table 5). These results indicate that better performance in the previous year would lead producers to use less PPOs in the current year, contrasting to findings discussed in this section using the pool price as the benchmark.

CONCLUSION

This study uses data from the CWB to investigate the marketing decisions of Western Canadian wheat producers. The sub group for this study focuses on producers that grew CWRS wheat and used PPO contracts at least once between the 2003/04 and 2008/09 crop years. In particular the paper investigates whether previous year's strategies, previous year's marketing performance, and current market price signals affect producers marketing decisions.

Results do not support the notion that producers use the same pricing strategy every year. In fact, the findings indicate that previous use of a certain marketing contract leads to smaller use of the same contract in the current year. A reason for this may be that these programs are still relatively new instruments and the programs are still undergoing change.

Performance for the farmer benchmark suggests that positive performance in previous year leads to more PPO usage. If producers outperformed the benchmark they are more willing to use PPOs again in current marketing strategies. One implication of this finding is that as

producers outperform the benchmark and then choose to use more PPOs, they are less exposed to risk because they are locking in a price before the pool, reducing price uncertainty.

In addition, we also find that price signals are positively related to PPO usage, indicating producers follow current market movements and respond to the possibility of locking in higher prices. There is more evidence suggesting that producers pay attention to the spreads between the futures price and PRO price, and not as much to historical futures prices (either the 24-, 20-, or 12-month horizon). The final point is that wheat acreage is negatively related to PPO usage, which appears to contradict the general idea that large farms would use more specialized tools. However, this finding should be taken with caution because acreage in our data refers only to wheat, not the whole farm.

This research contributes to the ongoing concern regarding how producers' make their marketing decisions. Further research might look at how the results might be influenced by the 2007/08 crop year, which experienced extreme price movements and resulted in almost all producers who used PPO contracts to underperform the pool (Table 1). Another dimension for further research is to explore whether producers' decision-making might vary depending on the magnitude of PPO usage. In other words, relevant variables affecting the decision to use marketing contracts might differ between producers who price large portions of their grain with those contracts and producers who price only small amounts with them.

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APPENDIX

Models adopted to investigate the usage of BPC, DPC, and EPO contracts are presented in equations (3) through (5).

$$(BPC)_{i,t} = \alpha + \beta_F(BPC)_{i,t-1} + \chi_E(EPO)_{i,t} + \chi_D(DPC)_{i,t} + \chi_F(FPC)_{i,t} + \gamma_P Performance_{i,t-1} +$$
$$\tau_A Wheat\,Acres_{i,t} + \rho_S Harvest\,\Pr ogress\,at\,Signing_{i,t} + \theta_1 10\,Day\,\Pr ice\,Signal_{i,t} + \qquad (3)$$
$$\theta_2 Historical\,Futures\,\Pr ice_{i,t} + \lambda_1 BPC_{i,t-1}*Performance_{i,t-1} + \varepsilon_t$$

$$(DPC)_{i,t} = \alpha + \beta_D(DPC)_{i,t-1} + \chi_E(EPO)_{i,t} + \chi_F(FPC)_{i,t} + \chi_B(BPC)_{i,t} + \gamma_P Performance_{i,t-1} +$$
$$\tau_A Wheat\,Acres_{i,t} + \rho_S Harvest\,\Pr ogress\,at\,Signing_{i,t} + \theta_1 10\,Day\,\Pr ice\,Signal_{i,t} + \qquad (4)$$
$$\theta_2 Historical\,Futures\,\Pr ice_{i,t} + \lambda_1 DPC_{i,t-1}*Performance_{i,t-1} + \varepsilon_t$$

$$(EPO)_{i,t} = \alpha + \beta_E(EPO)_{i,t-1} + \chi_D(DPC)_{i,t} + \chi_F(FPC)_{i,t} + \chi_B(BPC)_{i,t} + \gamma_P Performance_{i,t-1} +$$
$$\tau_A Wheat\,Acres_{i,t} + \rho_S Harvest\,\Pr ogress\,at\,Signing_{i,t} + \theta_1 10\,Day\,\Pr ice\,Signal_{i,t} + \qquad (5)$$
$$\theta_2 Historical\,Futures\,\Pr ice_{i,t} + \lambda_1 EPO_{i,t-1}*Performance_{i,t-1} + \varepsilon_t$$

Note that the DPC and FlexPRO are combined together into one equation since these contracts have very similar characteristics and pricing periods. Additionally, they were never offered to producers at the same time (the FlexPRO actually replaced the DPC in the 2007/08 crop year).

Table 3. Estimated Panel Regression Models

	Fixed Price Contract (FPC) (2004/05-2008/09) (a)		Basis Price Contract (BPC) (2004/05-2008/09) (a)		Daily Price Contract (DPC) (2005/06-2008/09) (a)		Early Payment Option (EPO) (2004/05-2008/09) (a)	
	coefficient	std. error	coefficient	std. error	coefficient	std. error	coefficient	std. error
constant	63.8820	1.7364***	70.6426	3.4215***	39.2755	7.0144***	64.2752	2.7193***
Same contract$_{t-1}$	-0.2664	0.0163***	-0.1675	0.0289***	-0.0288	0.0478	0.0316	0.0188*
EPO$_t$	-0.3832	0.0173***	-0.4885	0.0376***	-0.6961	0.0682***		
DPC$_t$	-0.2950	0.0227***	-0.3666	0.0295***			-0.4952	0.0485***
FPC$_t$			-0.5144	0.0248***	-0.3189	0.0525***	-0.5030	0.0260***
BPC$_t$	-0.4569	0.0231***			-0.5061	0.0621***	-0.4384	0.0417***
Performance$_{t-1}$ (b)	-0.0900	0.0255***	0.0885	0.0406**	0.1359	0.0777*	-0.0617	0.0392
PPO$_{t-1}$*Performance$_{t-1}$	0.0055	0.0005***	0.0014	0.0008*	-0.0015	0.0011	-0.0079	0.0008***
Harvest Progress at Signing	0.1103	0.0085***	-0.0101	0.2000	-0.0178	0.0408	0.0559	0.0170***
10-Day Price Spread	0.2645	0.0162***	0.1129	0.0152***	0.2495	0.0249***	-0.0128	0.0077*
Historical Futures Price	-0.0651	0.0079***	-0.0632	0.0119***	0.0570	0.0258**	0.0039	0.0097
Wheat Acres	-0.0058	0.0010***	-0.0029	0.0013**	-0.0055	0.0020***	-0.0069	0.0017***
R^2 within	0.2104		0.3256		0.2804		0.2465	
between	0.0816		0.1327		0.1165		0.1143	
overall	0.0953		0.1652		0.1321		0.1292	
Number of observations	20,543		5,150		3,189		13,122	
Number of producers	14,074		3,695		2,421		9,477	

(a) Dependent variable in each equation is the percentage of crop priced with a given marketing contract (FPC, BPC, DPC, and EPO).
(b) Marketing performance is measured against a market benchmark (24-month historical futures price)
*** statistically significant at 1%, ** statistically significant at 5%, * statistically significant at 10%

Table 4. Estimated Panel Regression Models

	Fixed Price Contract (FPC) (2004/05-2008/09) (a)		Basis Price Contract (BPC) (2004/05-2008/09) (a)		Daily Price Contract (DPC) (2005/06-2008/09) (a)		Early Payment Option (EPO) (2004/05-2008/09) (a)	
	coefficient	std. error	coefficient	std. error	coefficient	std. error	coefficient	std. error
constant	63.7412	1.9265***	66.1592	3.6381***	42.1064	7.4659***	64.7468	2.7700***
Same contract$_{t-1}$	-0.2396	0.0141***	-0.1630	0.0278***	-0.1190	0.0439***	0.1359	0.0244***
EPO$_t$	-0.3801	0.0168***	-0.4884	0.0369***	-0.7125	0.0710***		
DPC$_t$	-0.2952	0.0228***	-0.3700	0.0293***			-0.5144	0.0500***
FPC$_t$			-0.5196	0.0247***	-0.3245	0.0527***	-0.5037	0.0268***
BPC$_t$	-0.4588	0.0231***			-0.5149	0.0622***	-0.4472	0.0421***
Performance$_{t-1}$ (b)	-0.1482	0.0303***	0.1215	0.0428**	-0.0185	0.0799	0.1175	0.0402***
PPO$_{t-1}$*Performance$_{t-1}$	0.0058	0.0005***	0.0014	0.0008*	0.0016	0.0012	-0.0130	0.0010***
Harvest Progress at Signing	0.1017	0.0084***	-0.0105	0.0200	-0.0210	0.0407	0.0614	0.0169***
10-Day Price Spread	0.2418	0.0166***	0.1094	0.0146***	0.2446	0.0242***	-0.0214	0.0078***
Historical Futures Price	-0.0576	0.0084***	-0.0433	0.0123***	0.0635	0.0270**	-0.0138	0.0098
Wheat Acres	-0.0057	0.0010***	-0.0030	0.0013**	-0.0053	0.0020***	-0.0070	0.0017***
R^2 within	0.2165		0.3310		0.2808		0.2379	
between	0.0824		0.1300		0.1216		0.0913	
overall	0.0971		0.1643		0.1358		0.1104	
Number of observations	20,543		5,150		3,189		13,122	
Number of producers	14,074		3,695		2,421		9,477	

(a) Dependent variable in each equation is the percentage of crop priced with a given marketing contract (FPC, BPC, DPC, and EPO).
(b) Marketing performance is measured against a market benchmark (20-month historical futures price)
*** statistically significant at 1%, ** statistically significant at 5%, * statistically significant at 10%

Table 5. Estimated Panel Regression Models

	Fixed Price Contract (FPC) (2004/05-2008/09) (a)		Basis Price Contract (BPC) (2004/05-2008/09) (a)		Daily Price Contract (DPC) (2005/06-2008/09) (a)		Early Payment Option (EPO) (2004/05-2008/09) (a)	
	coefficient	std. error	coefficient	std. error	coefficient	std. error	coefficient	std. error
constant	50.8126	2.8638***	57.2471	4.2915***	45.6966	8.4350***	77.4667	3.3382***
Same contract$_{t-1}$	-0.1481	0.0123***	-0.1252	0.0195***	-0.1000	0.0313***	-0.0660	0.0155***
EPO$_t$	-0.3753	0.0168***	-0.4977	0.0368***	-0.6912	0.0751***		
DPC$_t$	-0.3094	0.0227***	-0.3747	0.0293***			-0.5241	0.0501***
FPC$_t$			-0.5212	0.0246***	-0.3592	0.0525***	-0.5071	0.0273***
BPC$_t$	-0.4567	0.0227**			-0.5144	0.0605***	-0.2723	0.0438***
Performance$_{t-1}$ (b)	0.0596	0.0298***	0.1113	0.0293***	-0.1111	0.0580*	-0.0098	0.0279
PPO$_{t-1}$*Performance$_{t-1}$	0.0024	0.0003***	0.0008	0.0006	0.0046	0.0008***	-0.0041	0.0005***
Harvest Progress at Signing	0.0851	0.0087***	-0.0191	0.0201	-0.0090	0.0408	0.0628	0.0173***
10-Day Price Spread	0.2458	0.0170***	0.0792	0.0137***	0.2159	0.0222***	0.0070	0.0082
Historical Futures Price	-0.0056	0.0132	0.0062	0.0175	0.0485	0.0342	-0.0646	0.0131***
Wheat Acres	-0.0058	0.0010***	-0.0026	0.0013**	-0.0052	0.0020***	-0.0077	0.0018***
R^2 within	0.2227		0.3292		0.3222		0.2166	
between	0.0685		0.1369		0.1132		0.0965	
overall	0.0877		0.1702		0.1373		0.1110	
Number of observations	20,543		5,150		3,189		13,122	
Number of producers	14,074		3,695		2,421		9,477	

(a) Dependent variable in each equation is the percentage of crop priced with a given marketing contract (FPC, BPC, DPC, and EPO).

(b) Marketing performance is measured against a market benchmark (12-month historical futures price)

*** statistically significant at 1%, ** statistically significant at 5%, * statistically significant at 10%