Canadian Business Risk Management: Private Firms, Crown Corporations, and Public Institutions

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Abstract

This manuscript considers the current and possible institutions (programs, policies, participants, etc.) that govern public Business Risk Management (BRM) in Canada. This is an important policy topic for two reasons: BRM spending accounts for the vast majority of public monies funnelled to Canadian agricultural producers and the upcoming agricultural policy framework presents an opportunity to change these institutions in meaningful ways. We pay particular attention to the rhetoric surrounding greater involvement of private insurance, the lack of rhetoric regarding the use of crown corporations, and issues of subsidization. We conclude with policy recommendations favoring commodity-specific revenue versus whole-farm net margin insurance, a possible reduction in subsidy levels, and a call to reconsider the role of crown corporations. We also make programming recommendations regarding the discontinued use of private reinsurance, a reduction in the level of program reserves, and greater transparency.
1 Introduction

The magnitude and growth of public monies directed toward farm-level risk management in most developed countries is significant by any measure. In 2014, Canadian Business Risk Management (BRM) subsidies were just under $1.4 billion\(^1\) while United States (U.S.) premium subsidies totalled $6.2 billion. Clearly, risk management has become the backbone of many countries’ domestic agricultural support programs and the vehicle of choice to funnel monies to agricultural producers. We think this has arisen because publicly subsidized agriculture insurance is compliant with trade agreements and a relatively easy political sell (to both the general public and agricultural constituency). The federal government’s upcoming agricultural policy framework, expected to be termed Growing Forward 3 (GF3), is under development and offers an opportunity to change both BRM policy and BRM programming in meaningful ways\(^2\).

There is a significant amount of non-peer reviewed literature on Canadian BRM. Examples of peer-reviewed literature include Schaufele, Unterschultz, and Nilsson (2010), Rude and Ker (2013), and Vercammen (2013). Schaufele, Unterschultz, and Nilsson (2010) consider the performance of AgriStability under normal versus catastrophic risks using a simulation model. Rude and Ker (2013) analyzed the transfer efficiency of margin-based BRM using a general equilibrium model. Vercammen (2013) used a partial adjustment model to consider the reduction in BRM effectiveness caused by payment delays in direct payments to Canadian producers. We differ from the above literature by focusing on the economic institutions of BRM rather than a specific economic hypothesis or econometric methodology although we do introduce a notable generalization of Tolhurst and Ker (2015).

Our manuscript starts by focusing on Canadian BRM policy, the institutional history, roles of the federal and provincial governments, advent of provincial crown corporations, and the spotty involvement of the private sector. We outline the current suite of BRM products and highlight the responsibilities of the federal and provincial governments. We then proceed to consider private versus unsubsidized public insurance offerings, joint public-private insurance offerings, and finally private companies as intermediaries in public BRM. This sets the backdrop for our discussion on crown corporations, the institution that delivers the vast majority of BRM in Canada. We then proceed to discuss issues related to subsidized insurance. Finally, we empirically ask: are yield distributions changing through time consistent with producers using subsidized insurance as a substitute for adopting other risk-reducing technologies? The final section discusses our policy and programming recommendations for BRM under GF3.

\(^1\)This accounts for both direct subsidies and administrative and operating expenses.
\(^2\)We make a notable distinction between policy and the delivery of policy, the latter we term programming.
2 Canadian BRM

This section provides a backdrop to the manuscript by discussing the institutional history of BRM, roles of federal and provincial agencies, advent of provincial crown corporations as programming and delivery agents, and the spotty involvement of the private sector.

2.1 Institutional History

The political economy of agricultural BRM in Canada is interesting in that neither the federal nor provincial governments have sole jurisdiction. This is unique when compared to the U.S. as well as many developed nations whose domestic agricultural support is the domain of national governments. The arrangement in Canada does not appear to have caused a free-rider problem between the two levels of government. Both provincial and federal governments have been quite active in providing agricultural support which illustrates the political strength, at least historically, of the agricultural constituency in Canada.

While many ad-hoc support programs previously existed, the federal government’s introduction of the Agricultural Stabilization Act in 1958 was the first agricultural support program offered to all Canadian farmers and marked a milestone in agricultural support programs. The goal of the act was to stabilize farm incomes. It was replaced by a similar act, the Western Grains Stabilization Act, in 1976 which was in place until 1991. Both of these programs were exclusively federal. However, during this time there were also several provincial programs aimed at managing risk, stabilizing income, and funnelling funds to agricultural producers. Between 1986–1993 the National Tripartite Stabilization Program existed, notable as it represented the first negotiated federal-provincial cost-sharing agricultural support program, a structure that remains today.

The second milestone in Canadian agricultural support programs is marked by the introduction of the Farm Income Protection Act in 1991. It has provided the agricultural policy framework for all subsequent farm programs. This includes the Gross Revenue Insurance Plan (1991–1995), the Net Income Stabilization Program (1994–2003), the Agricultural Income Disaster Assistance program (1999–2004), the Canadian Farm Income Protection program (2001–2003), and the Canadian Agricultural Income Stabilization program (2003–2006). As in many developed countries the influence of the World Trade Organization (and, more recently, regional trade agreements) is omnipresent in the development of the current Canadian agricultural support policies. For a more thorough historical review of Canadian support programs see Barichello (1999).

Beginning in 2007, Canadian agricultural policy resembled the U.S. with five year programs much like the Farm Bill. Unlike the Farm Bill which effectively is negotiated between the federal government and private interests (e.g., farmer organizations, crop insurance industry representatives, conservation and en-
environmental groups, hunger and nutrition interests, and trade organizations), the Canadian agricultural policy framework is negotiated between the provincial and the federal governments at a fairly high level in terms of programmatic themes. In this respect, Canada resembles the European Union structure with its Common Agricultural Policy setting some broad parameters for insurance programs and providing financial support while member states develop their own specific insurance programs (European Union Parliament and Council, 2013). In Canada, after the policy framework is established, provinces have latitude to develop programming that suits their needs within these themes. Private interests can influence the policy framework through both federal and provincial governments.

A significant institutional development in the history of Canadian BRM policy is the advent of provincial crown corporations. Currently, Alberta, Saskatchewan, Manitoba, Ontario, Québec, and Prince Edward Island have crown corporations that administer BRM. These crown corporations handle the large majority of BRM programming in Canada: 96.9% of the total liabilities and 98.5% of the total premiums in 2014. Other provinces use their ministry of agriculture.

2.2 Current BRM

2.2.1 Growing Forward (2008–2013)

BRM took the form of AgriInvest, AgriStability, AgriInsurance, and AgriRecovery in GF. These products were funded based on a 60%-40% federal-provincial split. AgriInvest is meant to stabilize year-to-year small fluctuations in income. Under AgriInvest, agricultural producers could deposit funds -- up to 1.5% of their eligible net sales -- in a savings account and withdraw necessary funds when needed and without restriction. The government matched producer contributions up to $20,000 per year. AgriInvest is relatively unique to Canada.

AgriStability covers declines of more than 85% of a producer’s net margin. If the coverage is between 70–85% the coinsurance is 30%, below that it is 20%. The guarantee is an Olympic average of a producer’s net margin over the previous five years. Producers pay no premiums other than the transaction costs for signing up and an initiation fee. Given AgriStability is whole-farm and net margin based, guarantees as well as indemnities are derived ex-post by government using tax-records. As a result, claims are both delayed and uncertain to producers. In our opinion, AgriStability has two fundamental flaws. First, it introduces additional uncertainty via unknown guarantees, indemnities, and timing of payments. Second, it reduces incentives for on-farm output diversification.

See Vercammen (2013) for an analysis of the effects of delayed program payments with respect to AgriStability.

Diversification reduces variability in total farm revenue and margin thereby reducing the probability of a claim in whole-farm insurance. This is not the case for commodity-specific insurance where diversification does not change the probability of a claim.
AgriInsurance is subsidized multi-peril crop insurance. There is no federally subsidized livestock insurance but livestock producers can insure their on-farm feed production. Note that dairy, poultry and eggs are supply managed in Canada. AgriInsurance and AgriStability are similar in that they are both offered at the farm-level but differ in that AgriInsurance is commodity specific and yield-based whereas AgriStability is whole-farm and margin based. Although the federal government provides a cost-share of the premium subsidies, approves the rating methodology, and provides a reinsurance pool for provinces, practically it has a relatively hands off approach. Provincial governments design, rate, and administer AgriInsurance and, most importantly, absorb all of the underwriting gains and losses. The vast majority of crops grown are insurable and, as with most developed countries, participation is quite high and strongly correlated with subsidy level. AgriInsurance is not unique to Canada as named-peril or multi-peril crop insurance is available in more than 100 countries (Mahul and Stutley (2010)).

While there exist some differences across provincial rating methodologies, in general they are quite similar. Yield guarantees are farm-specific, indemnities are based on expected (at time of sign-up) or harvest prices, a single rate is derived from loss experience by region and commodity, farm-level surcharges and discounts based on farm-specific historical claims are applied, and premium subsidies are generally around 60%. This is consistent with most forms of multi-peril crop insurance in developed countries where guarantees are farm-specific, premium rates are initially established based on aggregated loss experience and then adjusted based on farm specific characteristics, and premium subsidies tend to be in excess of 50% (Barnett, 2014; Smith and Glauber, 2014; Mahul and Stutley, 2010). With respect to the U.S. in particular, U.S. producers can divide their farm into multiple units and choose to collect indemnities at the higher of the expected harvest price or realized harvest price whereas Canadian producers can do neither. In this respect, the U.S. program provides greater risk coverage.

AgriRecovery covers catastrophic losses from natural disasters similar to ad-hoc disaster aid. AgriRecovery has rarely been triggered. We think that the lack of clarity as to what defines a natural disaster as well as the requirement that it be initiated by the province or territory are contributing factors. Similar to AgriStability, AgriRecovery introduces uncertainty via how and when it is triggered.

2.2.2 Growing Forward 2 (2013–present)

The framework of BRM under GF2 did not see any substantial changes relative to GF. AgriInvest and AgriStability parameters changed to reduce the total government support while there were no significant changes to either AgriInsurance or AgriRecovery. With respect to AgriInvest, the government contribution was set equal to 1% of allowable net sales with a limit of $15,000 per year (compared to $20,000 per year under GF). As for AgriStability, the layer of protection between 85–70% was completely removed and the
coinsurance for the remaining protection below 70% was increased from 20% to 30%. It is worth noting that the decreased coverage level (85–70%) provided even greater disincentive for producers to diversify their farming operation as the probability of a claim necessarily decreased. Not surprisingly, producers responded to these changes: 119,121 producers participated in at least one product in 2007 (under GF) while only 73,607 producers participated in 2013 (under GF2). More specifically, for AgriStability whose premiums are 100% subsidized, 57% of farmers participated under GF while only 42% participated under GF2.

In Table 1 we present summary numbers of AgriInsurance by province for the 2013–14 crop year (most recent available). There are a number of noteworthy items: (i) premiums totalled $1.8 billion; (ii) government subsidies were roughly $1.1 billion (60% of $1.8 billion); (iii) British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, and Prince Edward Island purchased private reinsurance; (iv) Alberta, Saskatchewan, Manitoba, and New Brunswick participated in public reinsurance; and (v) Alberta, Saskatchewan, Ontario, and Québec have quite significant fund balances as a percent of liabilities.

2.3 Political Economy of BRM in Canada

As previously stated, the Canadian agricultural policy framework is negotiated at a fairly high level in terms of programmatic themes between the provincial and federal governments. What dictates much of the actual programming aspects of current BRM is where private political influence lies. In most developed countries private interests are predominantly national and influence the policy process at the national level. This is not the case in Canada because of the cost-sharing arrangement between provincial and federal governments. Interest groups can, and in some cases do, undertake significant rent-seeking activities at both the national and provincial levels of government. In fact, an argument can be made that agricultural constituencies in Ontario and Québec have targeted the majority of their non-trade related rent-seeking energies at the provincial governments.

Consider the following two examples of, what we think, are successful rent-seeking activities aimed at increasing domestic support and targeted at provincial governments. First, Québec’s ASRA (Le Programme d’assurance stabilisation des revenus agricoles) whose debt reached as high as $865 million in 2009. ASRA offers a price guarantee based on cost of production and covers apples, cereals, cattle, hogs, and sheep among other things. Producers pay 33% of the premium while the remaining is funded by the province. Second, Ontario’s Risk Management Program is an industry average cost of production price guarantee for cattle, hogs, sheep, veal, grains and oilseeds, and edible horticulture. This program has no federal monies but is supported provincially with a 40% premium subsidy as well as zero administration and operating costs passed on to producers.

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5 This debt has steadily decreased since that time through changes and additional government monies.
The influence of agricultural constituency groups at provincial levels of government, particularly in Ontario and Québec, are not necessarily surprising. First, provincial interest groups tend to have easier access to provincial governments. Second, spatial concentration of provincial interest groups tend to be higher and thus transaction costs of creating and maintaining coalitions tend to be lower. Finally, insurance and other forms of support are within the domain of provincial governments. Although we highlight the rent-seeking activities targeted at provincial governments, this does not suggest that agricultural groups do not have significant influence at the federal level as well. The federal government provides the majority of the cost-sharing funds into BRM. Moreover, the interests of supply managed commodities are maintained through federal legislation.

### 2.4 Private Interests in Canadian BRM

There is very little private insurance, historically or currently, in Canadian agriculture. This is not surprising given the breadth and depth of public BRM and the level of subsidies they have and continue to enjoy. Hail insurance and private reinsurance are notable exceptions.\(^6\)

Hail insurance exists in many countries with publicly subsidized crop insurance \(^{[Mahul and Stutley 2010]}\). From the private industry perspective, issues of fraud, moral hazard, and adverse selection are essentially non-existent with hail insurance. Producers cannot change the probability of or damage caused by hail. Expected losses from hail are not better known by producers than the private firm. Finally, damage from hail is easily adjusted by a loss adjuster. From the producer’s perspective, public multi-peril insurance may not pay indemnities from hail losses if the losses are not sufficiently widespread. Therefore additional insurance, from private firms, may be of interest to risk averse producers. There is some uptake of private hail insurance in Saskatchewan while Alberta and Manitoba crown corporations offer unsubsidized public hail insurance.

The private sector is perhaps most involved in Canadian BRM through the reinsurance market. In 2014, many provinces purchased private reinsurance with premiums totalling in excess of $100 million (see Table 1). Manitoba led the way with close to $41 million in premiums followed by Alberta ($25 million), Saskatchewan ($20 million), and Ontario ($17 million). It is worth noting five of the six crown corporations participate in private reinsurance while only one of the remaining provinces do. It is also worth noting that most of these crown corporations carry very significant reserves funds: Alberta is approaching $2 billion while Ontario and Saskatchewan are each approaching $1 billion.

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\(^6\)The federal government introduced in GF (and subsequently removed funding under GF2) the Private Sector Risk Management Partnership, a program meant to stimulate or foster the development of private sector agricultural risk management tools. The Cattle Price Insurance Program led by Alberta Beef Producers was subsequently introduced via this program but uptake was relatively weak.
The use of private reinsurance by governments of developed nations is economically puzzling for a number of reasons. First, governments should be risk neutral (relative to the agricultural insurance book of business) and therefore unwilling to pay a risk premium to offload all or a portion of their agricultural insurance risk exposure. Second, the risk premium is substantial, usually 25–50%, for private reinsurance. Third, governments face risky outcomes in a variety of sectors and as such have the ability to pool thereby mitigating their risk. Fourth, the probability of ruin for a government in a developed country is zero given the size of the agricultural insurance book of business relative to their economy as a whole. Fifth, governments tend to be able to deficit finance at relative low rates if needed. Not surprisingly, we are not aware of any government institution in a developed nation that purchases private reinsurance other than the above mentioned provincial crown corporations.

2.5 Summary

A number of notable points from this section are worth reiterating: (i) federal and provincial governments have always been and continue to be willing and able to funnel significant funds to production agriculture as premium subsidies totalled in excess of $1.1 billion in 2014; (ii) despite a 100% premium subsidy, a significant portion of producers have opted not to participate in AgriStability; (iii) AgriStability both introduces uncertainty and reduces incentives for on-farm diversification; (iv) private agricultural interests engage in rent-seeking activities at both provincial and federal levels; (v) many of the provinces have opted to use crown corporations to administer their BRM; and (vi) many of the crown corporations have opted to purchase reinsurance in the private market.

3 Private/Public Delivery of Agricultural Insurance

In this section we compare private to public insurance offerings, discuss issues related to joint public-private insurance offerings, and consider the use of private companies as intermediaries in public insurance. We ignore for now the issue of subsidization of public insurance offerings. We first review the literature on the lack of private insurance in agriculture discussing issues involving moral hazard, adverse selection, spatial correlation and risk pooling, crowding out, and ad-hoc disaster assistance.

3.1 Private Insurance

Historically, there have been many arguments put forward in the literature that support the government’s involvement in agricultural insurance markets. These can be separated into two categories: those dealing
with market failure (e.g., moral hazard, adverse selection, and spatially correlated risks), and those dealing with political economy (e.g., subsidization and ad-hoc disaster assistance) \cite{Barnett2014}. Yield losses are generally a function of climate outcomes which tend to be widespread in nature and therefore indemnities will tend to be highly spatially correlated. The lack of risk pooling forces private firms to retain higher capital reserves which may prevent them from entering the market \cite{SkeesBarnett1999, DuncanMyers2000, MirandaGlauber1997}. However, firms can now choose to alleviate all or a portion of their risk exposure through reinsurance markets \cite{GoodwinSmith2013, Goodwin2001} although not without significant costs.

Moral hazard occurs when the insured engages in actions, after the purchase of an insurance contract, that increase the probability of a loss or the severity of a loss. With multiple-peril crop insurance producers can engage in moral hazard activities such as reducing costly inputs (see for example \cite{QuigginKaragiannisStanton1993, SmithGoodwin1996, BabcockHennessy1996, Goodwin2001, GoodwinSmith2003, GoodwinVandeveerDeal2004}). Insurers can protect against moral hazard activities and fraud but monitoring and enforcement costs are generally prohibitive and remain a barrier to entry for private insurers \cite{Barnett2014}.

Adverse selection occurs when the insured knows more about their expected losses than the insurer. As a result, there is greater participation from producers facing underpriced contracts where indemnities will exceed premiums relative to those with overpriced contracts. Many have considered the problem of adverse selection in U.S. multi-peril crop insurance (see for example \cite{Goodwin2001, KnightCoble1999, BabcockHartHayes2004}). As with moral hazard, insurers can protect against adverse selection by using more disaggregated risk measures, but again obtaining these can be quite costly. It should be noted that with recent improvements in precision agriculture and data collection, these costs are decreasing and may not be as significant a barrier for private firms as they were previously.

We now turn to the political economy reasons for the lack of private insurance involvement, specifically crowding out. Assuming there is no publicly subsidized crop insurance and thus little producer participation, the argument is as follows: a sufficient number of uninsured producers suffer a loss (from say a drought), political pressure is brought to bear by the agricultural constituency, and ad-hoc disaster aid is given out by government \cite{CobleBarnett2013, Barnett2014}. The 1985 Special Canadian Grains Program’s $1 billion bailout is an example of this. Why would producers buy costly private insurance when ad-hoc disaster aid is probable? If we assume there is publicly subsidized crop insurance, why would producers purchase the same level of insurance at higher rates? Clearly, crowding out remains a barrier to private agricultural insurance.

Summarizing, issues of market failure (moral hazard, adverse selection, and spatially correlated risk) are

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less a problem for private agricultural insurance now than they were previously. However, issues related to crowding out remain as evidenced by the magnitude of monies funnelled to agricultural producers through BRM.

### 3.2 Private versus Public Insurance Offerings

The private premium rate for a given insurance contract is comprised of the following: (i) the actuarially fair premium rate, (ii) possible reserve load, (iii) administrative and operating costs, (iv) a return to capital, and (v) a risk premium based on the risk averse nature of the insurance company including the cost of reinsurance (Coble and Barnett, 2013).

The actuarially fair premium rate is equal to the expected loss and thus is equivalent for both public and private insurance products. Some may think that private firms have greater information than governments and thus face less uncertainty regarding expected losses. This may be true in some forms of insurance but not likely in agricultural insurance where governments have information on producer tax files as well as other government agricultural programs. Additionally, governments have access to patents on new agricultural technologies, data from weather stations, data from experimental farms etc.. Access to information does not necessarily mean premium rates will be more accurately estimated. How that information is processed can be highly technical (Tolhurst and Ker, 2015; Ker, Tolhurst, and Liu, 2016). It is not obvious that private insurance firms could obtain and accurately process information related to agricultural production risk better than government entities.

Reserve loading is a practice by which private insurance companies load their rates such that they maintain sufficient reserves so that the probability of ruin (i.e., bankruptcy) approaches some acceptable level, generally very close to zero. This is usually done on a program-by-program basis in the private insurance industry and ensures that program loading is not a function of their overall reserves but rather a function of that program’s reserve. Surprisingly, provincial governments in Canada, as well as the U.S. government, engage in this practice despite the probability of ruin being zero.

Administrative and operating costs (A&O) of private insurance firms are often hypothesized to be lower than those of government agencies. However, this does not appear to be the case. In Canada the A&O is generally below 10% of premium. For example, the AgriInsurance A&O in Alberta, Saskatchewan, and Manitoba for 2014 was 3.3%, 6.4% and 4.6% respectively. Conversely, the U.S. program uses private firms

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7 We note that with respect to most forms of agricultural insurance, particularly multiple-peril farm-level insurance, there is a great deal of uncertainty regarding expected losses.

8 There is vast literature in insurance mathematics on reserve loading and probability of ruin (see for example Paulsen and Gjessing (1997), Schmidt (2002), Delbaen and Haezendonck (1987)).

9 We are only able to decompose the total A&O in annual reports by programs for some provinces.

10 The Canadian figures do not correspond with Table 1 for two reasons: the A&O in the table represents total A&O for all BRM and the premiums only represent the producer portion of the premium for AgriInsurance (not all BRM). A conservative
to administer and deliver its programs. The A&O reimbursement is roughly 15% of premium although it varies by insurance product [Risk Management Agency, U.S. Department of Agriculture, 2015]. Moreover, this represents a lower bound as Risk Management Agency (RMA) costs are not included.

With respect to return to capital, a private insurance company must make a sufficient return to pay dividends and maintain the value of its stock. Conversely, the government generally does not require a return to its capital at the market level.

Private companies offering agricultural insurance often cannot pool their risk in a way that brings the risk of ruin to an acceptable level. This is because agricultural insurance is highly spatially correlated. Consequently, private companies generally reinsure their book of business (or a portion thereof) at a significant risk premium. This cost is necessarily passed along in the private premium rates but, as discussed previously, would not need to be included in public premium rates if governments retained all the risk.

For each of the five components of premium rates, public insurance offerings should not be disadvantaged relative to private insurance offerings. For some components there is reason to believe that public insurance offerings should be relatively less expensive. However, we acknowledge that government programs can be vulnerable to bureaucratic behavior and influenced by rent-seekers [Rausser, 1992]. This could reduce, nullify or even dominate any efficiencies arising from the governments’ natural endowments of risk neutrality, access to private information, and generally a lower required return to capital.

3.3 Public-Private Insurance Offerings

In this subsection we discuss additional complexities from private involvement in public programs. Private involvement can take many forms but private firms as program delivery agents and joint public-private insurance offerings are the two most common arrangements. There are a number of confounding issues that arise when private companies are involved in public programs. These include rent-seeking, the elicitation of private company involvement, and constraints put on government to incentivize alternative producer behavior. The last issue requires further explanation. It is clear that BRM in Canada as well as much of the developed world is the vehicle of choice for directing funds to agricultural producers. In this respect BRM represents the primary lever (without additional laws or regulations) to elicit publicly desired behavior from agricultural producers. For example, there have been many discussions regarding cross-compliance with a variety of other public programs for producers to qualify for BRM. Also, environmental lobby groups are continually pressuring governments to use additional premium subsidies to elicit desired producer behaviors (i.e., crop rotations).

and rough calculation of the producer premiums paid divided by 0.4 (given an average subsidy of 60%) yields an A&O expense as a percentage of total premiums around 9% for Canada. This figure would necessarily be lower if the premiums for AgriStability and AgriRecovery were included.
The typical rationale for having private firms involved in public programs is that they can administer the programs at lower cost. As illustrated above, this does not appear to be the case when comparing crop insurance programs in Canada and the U.S. Moreover, to elicit private participation in a public program, private companies require not only their cost of delivery but additional monies as a return to their capital. In addition, for the government and private insurance company to be incentive compatible, the insurance company must participate in the underwriting gains and losses. The above opens up an avenue for rent-seeking behavior by the private insurance company.

The U.S. program is an example of a joint private-public insurance program (see Ker (2001) for a more detailed discussion). The government sets the premium rates and subsidy levels for the insurance products while all sales and claims adjustments are conducted by private insurance companies. A reinsurance agreement establishes the terms by which the government and private insurance companies share in underwriting gains and losses. The private insurance companies are not allowed to deny coverage to any eligible applicant. To participate in the joint private-public program, they must agree to sell policies (at the government-established premium rate) to all eligible applicants. For this reason, the reinsurance agreement allows private insurance companies to pick and choose (within some pre-specified limits) the policies on which they will retain most of the premium and loss risk and the policies that they will cede to the government. Since the government strives to establish premium rates that are actuarially fair, there would be no expected return to capital for private firms if underwriting gains and losses were shared symmetrically. Thus, to provide some expected return to capital, the private insurance companies share of underwriting gains is somewhat larger than their share of underwriting losses. The limits on how companies can pick and choose which policies to cover and which to pass on to the government are part of the reinsurance agreement between the two parties. It is this agreement that creates an avenue for rent-seeking behavior by private insurers as empirically illustrated by Ker and Ergun (2007).

3.4 Summary

We highlighted various forms of private involvement in agricultural insurance markets and find little to recommend them. Governments may have efficiencies that private firms do not because of their natural endowments: risk preferences (risk neutral versus risk averse), information (private information from other governmental programs and agencies), a lower required return to capital, and the ability to incentivize desired producer behaviours. Also, comparing the A&O expense of private firms in the U.S. to provincial agencies,

11 Since the private companies conduct all claims adjustments, incentive compatibility is maintained by having them share in underwriting gains and losses.

12 The agreement between government and private insurers, detailed in the Standard Reinsurance Agreement, is more complicated than described here.
private firms do not appear able to administer BRM as efficiently. However, as noted by Rausser (1992), in practice, programs that start as an effort to address a market failure tend to be captured by rent-seekers and crop insurance programs appear be a good example. Market failure was the impetus for government involvement, but one might now argue that the program has largely been captured by producer interests (and private insurers in the case of the U.S.).

4 Crown Corporations

The purpose of this section is twofold: outline the institutional development of crown corporations and consider the programmatic implications of BRM being delivered via these corporations. This latter issue is of interest because there appears to be a dichotomy within those corporations between the roles and responsibilities of a public program delivery agent versus those of a private insurance company.

Provincial crown corporations are enterprises owned by the Crown in right of a province. They are established by an act of Parliament and are shielded from government intervention and legislative oversight, but necessarily report to the appropriate minister. In all cases, the provincial crown corporations administering BRM report to the Minister of Agriculture in their respective province. Whether this arrangement distances provincial programming from or exposes it to rent-seeking activities is unclear. In Ontario though, there were 78 paid lobbyists registered to lobby the Ministry of Food, Agriculture and Rural Affairs and 12 registered to lobby Agricorp in 2016 (Ontario Office of the Integrity Commissioner, 2016).

Alberta’s crown corporation, the Alberta Financial Services Corporation, was established in 1994 under Premier Klein’s (Progressive Conservative) austerity campaign. Saskatchewan’s crown corporation, the Saskatchewan Crop Insurance Corporation, was established in 1974 under Premier Blakeney (NDP). Manitoba’s crown corporation, the Manitoba Agricultural Services Corporation, was established in 2005 under Premier Doer (NDP). Ontario’s crown, Agricorp, was established in 1996 amidst Premier Harris’s (Conservative) “common sense revolution” reforms. Québec’s crown, La Financière agricole du Québec, was established in 2000 under Premier Lucien Bouchard (Bloc Québécois). Finally, Prince Edward Island’s crown, the Prince Edward Island Agricultural Insurance Corporation was established in 1994 under Premier Callbeck (Liberal) during very difficult financial times. Unfortunately, there is no information in the legislation that created these crown corporations in terms of their mandates and why BRM responsibilities were removed from provincial agencies of agriculture. It does appear that many of these provincial crown corporations came into existence during government cost-saving or down-sizing efforts. Ironically, Frieda Krpan the former (May 2016) chair of the Manitoba Agricultural Services Corporation (MASC), stated that the Manitoba government could save money if MASC was a division of the Manitoba Department of Agriculture rather
than a stand-alone crown corporation (Dawson, 2016).

Although we could not find documentation on why these agencies were initially established, it does appear they have evolved more like a private insurance company than simply a delivery agent of a public policy. For example, purchasing private reinsurance, while standard practice for a private firm hedging against bankruptcy, is economically puzzling for crown corporations. Alberta, Saskatchewan, Manitoba, Ontario, and Prince Edward Island purchased private reinsurance in 2014 and paid roughly $108 million in premiums. These costs are passed on in producer premium rates (given current subsidy levels, only 40% are actually passed on to the producer). As earlier noted, while it is prudent for private insurance firms to guard against the probability of ruin, this is not case for governments. In fact, to the best of our knowledge these provincial crown corporations represent the only public entities in the developed world that purchase private reinsurance. Additionally puzzling is that these five crown corporations had reserves totalling $3.65 billion in 2014 (latest figures). Moreover, the federal government provides a reinsurance program to assist provinces in risk pooling. Saskatchewan participates significantly in this program, Alberta and Manitoba marginally participate, and Ontario, Québec, and Prince Edward Island do not participate at all.

A second example also more representative of a private insurance firm than a public delivery agent is the size of their reserve funds. In 2014 reserves as a percentage of liability was 46% for Alberta, 16% for Saskatchewan, 8% for Manitoba, 25% for Ontario, 20% for Québec, and 11% for Prince Edward Island. In aggregate, the crown corporations reserves to total liability is just over 23%, almost three times higher than non-crown corporations at 8.7%. These reserve funds represent premiums in excess of claims accumulated through time via risk averse rating measures commonly employed by private firms (i.e., loading rates). A certain level of reserves, and thus use of these measures, is prudent even for a delivery agent of a public program (so that reserves are not depleted every few years). To determine the expected number of years for reserves to be depleted in Ontario and Alberta, we undertook the following simulation. We calculated

\[ R_{t+1} = R_t + (1 - l r_j) \times P_{2014} \]

where \( R_t \) is reserves in period \( t \), \( l r_j \) is the sampled (with replacement) loss ratio from the set of historical loss ratios, and \( P_{2014} \) is the premium charged in 2014. We continued sampling new loss ratios with replacement until the current level of reserves were depleted. If the reserves were not depleted after 10,000 years we stopped the simulation. We repeated the simulation 1,000 times for both Alberta and Ontario. The expected number of years to depletion was 8,831 for Alberta and 8,345 for Ontario. This illustrates how very risk averse these crown corporations have been in accumulating reserves. The consequences of excess reserves is an inter-generational transfer from current producers to future producers assuming at some future point reserves are forced to decrease and monies are returned to producers via lower premiums. Interestingly, political pressure from producers citing excessively high

\[ ^{13} \text{We used these two provinces as we have historical program loss ratios for at least twenty years.} \]
reserves led the Prince Edward Island Agricultural Insurance Corporation to decrease premium rates 20% in 2015.

Another example that is more reflective of a private insurance company rather than a public delivery agent is the asymmetric loading algorithms employed as reserves deviate from their target levels. While we were not able to obtain the information from all crown corporations, most adjust premium rates so that any excess surpluses are removed over a longer period (close to double) than deficits. This asymmetry resembles the loss function of a risk averse private firm facing capital costs rather than a risk neutral public delivery agent. We repeated our above simulation exercise but this time imposing a reserve target of 14% of liability (this is very similar to adjustments by crown corporations). If reserves exceeded the target we divided the surplus by 25 and subtracted that from premiums for the following year. Conversely, if reserves were below the target we divided by 15 and added that to premiums for the following year. Given the asymmetric loading the expected number of years to depletion increased roughly 6% for both Alberta and Ontario. While not a significant increase, it does continue to illustrate the risk averse nature of the rating methodologies.

Our final point worth mentioning with respect to behavior more aligned with a private company versus a public delivery agent is the lack of programmatic information publicly available from provincial crown corporations. For example, in the U.S. the Risk Management Agency maintains current and historical records in a publicly accessible (and user-friendly) database on premiums and indemnities disaggregated by crop, county, and insurance program. Moreover, one can download the Standard Reinsurance Agreement between private firms and the federal government and any project reports (see http://rma.usda.gov). Freedom of information requests are required to gain access to similar types of the information from provincial crown corporations.

5 BRM Subsidization

In this section we consider subsidizing premium rates in BRM. First, Canada is not alone with high government subsidies for multi-peril agricultural insurance. The U.S. has an average subsidy of 63% (Risk Management Agency, U.S. Department of Agriculture 2015), Austria 46%, China 60–80%, France 65%, Italy 64%, Luxembourg 50%, and Spain 49% (Bielza et al. 2007; Wang et al. 2011). Note, governments also tend to absorb the A&O associated with these programs -- an additional 10–20% subsidy. In Canada, total government premium subsidies in 2014 were almost $1.1 billion and A&O was an additional $276 million. Note, there is a significant literature on subsidization in agricultural programs (see ofr example Barnett (2014); Coble and Barnett (2013); Goodwin and Smith (2013); Glauber (2013)).

Second, greater subsidies mean greater producer participation (Barnett 2014; Coble and Barnett 2013; Goodwin and Smith 2013; Glauber 2013).
Schaufele, Unterschultz, and Nilsson (2010). Governments subsidize to achieve sufficient participation levels in order to avoid ad-hoc disaster aid. Although yet to be considered in the literature, these subsidies may in fact be more costly than disaster aid. Furthermore, given that subsidies are generally on a percentage basis, more dollars go to those producers who have higher premiums (i.e., producers in riskier production areas), no different than ad-hoc disaster aid.

Third, many in the literature have shown insured producers use less risk-reducing inputs, commonly referred to as the intensive margin effect (see for example Quiggin, Karagiannis, and Stanton (1993); Smith and Goodwin (1996); Babcock and Hennessy (1996)). It has also been shown that subsidized insurance incentivizes producers to grow crops in places where they might not have grown them otherwise, commonly referred to as the extensive margin effect (see Claassen and Just (2011), Miao, Hennessy, and Feng (2016), Wu (1999)). Given there is less personal burden from a significant yield shortfall, producers will, at the margin and to the extent possible, reduce costly risk-reducing inputs or bring into production marginal land or both. As subsidies increase and deductibles decrease, the price of crop insurance decreases relative to other risk reducing inputs. On a wide-scale basis this will be exacerbated as participation rates increase.

Rather than focus on specifics like the aforementioned empirical literature for the Canadian case, we step back and consider a broader question: are yield distributions changing through time consistent with producers utilizing risk-reducing technologies or are yield distributions changing through time consistent with producers using subsidized insurance as a substitute for risk-reducing technologies?  

To answer this question we use field crop yield data from Ontario counties between 1950–2016. The data were collected from a provincial archive of agricultural statistics. Only counties with complete yield histories are included in the analyses. We have 32 corn, 6 soybean, and 26 winter wheat counties. Although soybeans are now one of Ontario’s most important crops, for a number of technical and economic reasons they were not widely grown outside southern Ontario until the mid- to late-1980s. As a result, long-term soybean yield data do not exist for many counties in Ontario.

We generalize the approach forwarded by Tolhurst and Ker (2015) and estimate yield distributions using a mixture of two normals with possibly unique temporal processes for the components means, variances, and mixing parameter. Tolhurst and Ker (2015) only considered temporal processes for the component means. That is, we assume the data generating process of yields can be modelled as:

\[ y_t \sim \lambda_t N(\alpha_l + \beta_lt, \delta_l + \gamma_lt) + (1 - \lambda_t)N(\alpha_u + \beta_ut, \delta_u + \gamma_ut) \]  

(1)

We interpret the lower component to represent yield realizations in poor years whereas the upper component

\[14^2\text{We make the very significant distinction between causation, which we are not asserting, and consistency.} \]
to represent yield realizations in regular to good years. The probability of a poor realization is given by the mixture coefficient $\lambda_t$. Technological change is represented by a linear function in the parameters (other functions were considered and results changed trivially). Figures 1, 2, and 3 (one for each corn, soybean, and winter wheat respectfully) show typical estimation results. A number of observations are worth noting. First, the location of the two components are moving upwards through time. Second, the location of the lower component tends to move upwards at a slower rate than the upper component. Third, the probability of the lower component (and therefore upper component as well) does not appear to be changing over time. Fourth, the overall variance tends to be increasing with time. Less obvious, is that the component variances tend to be increasing through time as well.

We investigate these tendencies further by undertaking a number of hypothesis tests. The results are presented in Table 2. The first hypothesis test considers whether the temporal models of the component locations are constant. Not surprisingly, this null is rejecting for both component locations for 32 of the 32 corn counties, 6 of the 6 soybean counties, and 26 of the 26 wheat counties. This confirms that yields are increasing through time. The second hypothesis test considers whether the temporal models for the component variances are constant. This is rejected for at least one component in 22 of the 32 corn counties, 5 of the 6 soybean counties, and 13 of the 26 wheat counties. Basically, conditional on the component, the variance of yields tends to be increasing through time.

The final two hypothesis tests are of particular interest. We test if the mixing parameter (the probability of the lower component) is constant through time. We can reject the null in only 3 of 32 corn counties, 0 of 6 soybean counties, and 5 of 26 winter wheat counties. Note, for the 8 rejections, the probability of the lower component is increasing not decreasing through time. We also consider if the location of the lower component is increasing at an equal or faster rate than the location of the upper component. We reject this null in 28 of the 32 corn counties, all 6 soybean counties, and 21 of the 26 winter wheat counties. This suggests that the yield distribution is not moving upwards uniformly through time but that the lower tail is lagging behind. If producers were adopting risk reducing technologies we would expect the probability of the lower component to decrease through time or that the location of the lower component move closer to the upper component over time or both. Note, our results are consistent with producers using subsidized crop insurance rather than adopting costly risk reducing technologies. Moreover, conditional on insurance being purchased, it can be economically optimal to forgo costly risk reducing technologies as shown in the intensive margin literature.

15 We purposely illustrate the top two producing counties for each crop.
16 We use a standard likelihood ratio test comparing the unrestricted to the restricted likelihood.
5.1 Summary

It is clear that the level of subsidization has significant consequences beyond the very large sums of monies transferred to producers. As discussed, many empirical papers have found both intensive and extensive margin effects from subsidized crop insurance. We empirically estimated changes in the yield distribution over time and found that yields are shifting up but not uniformly, the lower tail is lagging behind. Our results are consistent with the literature that producers may be substituting insurance for costly risk-reducing technologies.

6 Policy and Programming Considerations

Policy Consideration 1: Discontinue AgriStability. BRM policy is meant to assist producers in managing business risk. However, we believe that AgriStability introduces uncertainty (through its uncertain guarantees, claims, and timing of payments) and disincentivizes on-farm diversification. In addition, given processing times in excess of one year, producers must manage their loss event through other means. It is not surprising that AgriStability participation has significantly declined (particularly in some areas) and that other provincial level products have been introduced. A new product that overcomes these shortcomings should be considered.

Policy Consideration 2: Introduce a commodity-specific revenue insurance. Revenue insurance is far simpler than net margin-based insurance. Input usage and prices are not required and thus tax records are not needed, revenue guarantees are known at time of sign-up, indemnities are not uncertain, and processing times are relatively quick providing assistance at time of loss.

Policy Consideration 3: Private firms/insurance should not be used in Canadian BRM. Governments have natural endowments -- risk neutrality, private information, lower required return to capital -- that allow them to provide insurance more efficiently than private firms. Furthermore, excluding private involvement maintains BRM programs as a policy lever for governments to incentivize desired producer behaviors.

Policy Consideration 4: The use of provincial crown corporations as delivery agents of BRM programming should be reviewed. Crown corporations are generally formed to mitigate government bureaucracy. From a political economy perspective, it is not clear that crown corporations are any less susceptible than government entities to rent-seeking activities. From a cost savings perspective, the autonomy of crown corporations
can result in uncaptured efficiencies between the agricultural ministries and their crown corporations. We highlighted what appears to be a significant dichotomy between the roles and responsibilities of a public program delivery agent versus those of a private insurance company. We find it most puzzling that private reinsurance is being purchased despite options by the federal government and the size of reserve funds. It appears that these crown corporations act first as an insurance company and second as a public program delivery agent. Given the public funds involved and the number of years since provincial governments established these institutions, governments should revisit whether crown corporations are the best way to deliver BRM programming.

*Policy Consideration 5: The level of subsidies should be re-evaluated.* While we made an argument for public agricultural insurance based on governments’ natural endowments, we did not make any such arguments for subsidies. Subsidies definitely increase participation which reduces the likelihood of ad-hoc disaster aid. However, subsidies also have unintended consequences regarding intensive and extensive margin effects. As with many government programs, there is a stickiness and it is unclear whether the historical political forces remain today to warrant the current level of public transfers.

*Program Consideration 1: Coinsurance should be introduced into AgriInsurance.* One of the enduring characteristics of AgriStability is the coinsurance component. Given producers incur a portion of their losses with coinsurance, producers would tend to engage in more on-farm risk-reducing activities. Note, coinsurance could be easily introduced in AgriInsurance.

*Program Consideration 2: Private reinsurance should not be purchased.* Crown corporations have significant reserves and options for deficit financing within public institutions if needed. Given the costly nature of private reinsurance, crown corporations should self-insure.

*Program Consideration 3: Reserve targets should be reviewed.* An appropriate target level of reserves should be determined based on each provinces book of business, historical loss experience, and the availability of federal reinsurance. Currently, reserves far exceed private norms let alone public norms.

*Program Consideration 4: Transparency should be improved.* With the notable exception of Québec, in general, information on BRM is not easily attainable. Given the significant public and producer monies involved, detailed statistics -- while being mindful of confidentiality requirements -- should be readily available. The provinces’ reinsurance agreements and rating methodologies should also be easily accessible by the public.
<table>
<thead>
<tr>
<th>Production insurance fund balance</th>
<th>Private reinsurance premiums paid</th>
<th>Public reinsurance premiums paid</th>
<th>Total premiums received</th>
<th>Total liabilities</th>
<th>Total indemnities paid</th>
<th>Administrative expenses paid</th>
</tr>
</thead>
<tbody>
<tr>
<td>British Columbia</td>
<td>43,557</td>
<td>2,805</td>
<td>0</td>
<td>17,937</td>
<td>433,243</td>
<td>5,656</td>
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<tr>
<td>Alberta</td>
<td>1,801,833</td>
<td>25,170</td>
<td>6,524</td>
<td>577,781</td>
<td>4,322,237</td>
<td>41,826</td>
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<tr>
<td>Saskatchewan</td>
<td>881,410</td>
<td>19,539</td>
<td>104,627</td>
<td>693,657</td>
<td>5,406,441</td>
<td>128,868</td>
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<tr>
<td>Manitoba</td>
<td>215,084</td>
<td>40,890</td>
<td>34,706</td>
<td>289,217</td>
<td>2,700,280</td>
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<td>Ontario</td>
<td>731,746</td>
<td>17,133</td>
<td>0</td>
<td>160,220</td>
<td>2,924,495</td>
<td>84,341</td>
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<td>Québec</td>
<td>233,433</td>
<td>0</td>
<td>0</td>
<td>66,118</td>
<td>1,158,302</td>
<td>28,032</td>
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<td>New Brunswick</td>
<td>n/a</td>
<td>0</td>
<td>1,258</td>
<td>7,400</td>
<td>60,714</td>
<td>7,994</td>
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<tr>
<td>Prince Edward Island</td>
<td>20,715</td>
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<td>20,371</td>
<td>183,619</td>
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<tr>
<td>Nova Scotia</td>
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<td>1,848</td>
<td>38,021</td>
<td>2,346</td>
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<tr>
<td>Newfoundland and Labrador</td>
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<td>0</td>
<td>0</td>
<td>123</td>
<td>1,069</td>
<td>96</td>
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<tr>
<td>Total</td>
<td>3,887,179</td>
<td>107,914</td>
<td>147,115</td>
<td>1,834,672</td>
<td>17,228,420</td>
<td>402,066</td>
</tr>
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</table>

Table 2: Hypothesis Test Rejection Counts.

<table>
<thead>
<tr>
<th>Null Hypothesis</th>
<th>Corn</th>
<th>Soybean</th>
<th>Winter Wheat</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\beta_l \leq 0$</td>
<td>32</td>
<td>6</td>
<td>26</td>
</tr>
<tr>
<td>$\beta_u \leq 0$</td>
<td>32</td>
<td>6</td>
<td>26</td>
</tr>
<tr>
<td>$\gamma_l \leq 0$</td>
<td>17</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>$\gamma_u \leq 0$</td>
<td>10</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>$\lambda_u = \lambda$</td>
<td>3</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>$\beta / \pi \leq 1$</td>
<td>28</td>
<td>6</td>
<td>21</td>
</tr>
<tr>
<td>Total Counties</td>
<td>32</td>
<td>6</td>
<td>26</td>
</tr>
</tbody>
</table>

Note: Statistical significance evaluated at the 5% significance level using a likelihood ratio test.
Figure 1: Estimated County Yield Distributions for Corn.
Figure 2: Estimated County Yield Distributions for Soybean.
Figure 3: Estimated County Yield Distributions for Winter Wheat.
References


