The Welfare Economics of Dismantling Dairy Quota in a Confederation of States

G. Cornelis van Kooten

April 2017

For copies of this or other REPA working papers contact:

The Welfare Economics of Dismantling Dairy Quota in a Confederation of States

by

G. Cornelis van Kooten
Department of Economics
University of Victoria
Victoria, Canada

DRAFT: April 28, 2017

ABSTRACT

Supply-restricting marketing boards shift the costs of agricultural support payments from the treasury to consumers. Canada, Australia and the European Union adopted quota regimes in dairy, but Australia and the EU subsequently dismantled their programs, while providing milk producers with compensation, but the dairy quota system remains entrenched in Canada. In this paper, dairy policies in the aforementioned jurisdictions, plus the U.S. and New Zealand are reviewed, and a stylized description of the EU reform is provided. An applied welfare economics framework based on the EU experience is then used to investigate potential mechanisms for reforming Canada's dairy quota regime. The main issue regards producers' compensation. The analysis shows that one has to be careful not to overcompensate producers, which could make a reform program prohibitively expensive on the treasury. The analysis provides a framework within which policy discussions regarding compensation can take place.

Keywords: supply management; quota buyback programs; compensation; welfare measurement

JEL Categories: Q13, Q17

1. INTRODUCTION

Agricultural producers face price and production risks that are less common in other sectors of the economy. Governments have intervened to protect farmers against such risks through various programs that raise prices above those in a free market. The support prices led to overproduction and restricted policymakers to a limited number of options regarding the operation of the support program. The authority could set the support price and sell the output at a much lower price to clear the market or simply purchase what was over produced, storing it for an opportune time when commodity prices exceeded the support price (which occurred infrequently). The authority could also sell excess product abroad, essentially dumping it onto the export market. The results were high costs to the treasury (domestic and foreign consumers and domestic producers gained at the expense of the treasury), deadweight losses to society due to the misallocation of resources, and impediments to the resolution of multilateral trade negotiations.

Another option that some countries pursued was to limit production and thereby increase the price received by farmers. By restricting supply, no cost is imposed on the public treasury, except for the transaction costs related to the implementation and governance of a quota scheme – the administrative costs of setting production levels, allocating quota (output) across producers, setting rules for transferring quota, allocating quota to importers, and monitoring compliance. A quota scheme essentially transfers income from consumers to producers, but requires limits on imports (to which trading partners object). In one form or another, supply management was adopted by Australia, Canada and the European Union (EU) to benefit dairy producers, while the

U.S. relied primarily on support prices until recently.[1] The most comprehensive supply-managed dairy marketing regimes were implemented in Canada (1974) and the EU (1984), both of which are characterized by a supra-government where independent states/provinces have jurisdiction over domestic agricultural policy but not over foreign trade or inter-regional trade.

While Australia and the EU subsequently abandoned supply restrictions in dairy, supply management remains in Canada despite pressure from the international community to reform the quota regime and a World Trade Organization (WTO) ruling in 2002 that Canada's quota system constituted an export subsidy (Furtan, Romain and Mussel 2005; Goodloe 2005).[2] The dairy quota remains in place because of a strong dairy lobby, but eventually the quota regime will need to be greatly reformed or totally dismantled. In this study, we focus on how this might be accomplished in a politically feasible way – one that would compensate dairy producers for their lost rents. To do so, we use the tools of applied welfare economics to evaluate methods for dismantling such a quota regime (see Schmitz et al. 2010). In doing so, we also provide insights into how the EU managed dismantling of its quota system.

We begin in the next section by providing a brief background to dairy policy in the U.S., EU, Canada, Australia and New Zealand. While only Canada, the EU and Australia employed quota regimes, we include the U.S. and New Zealand because these countries are two of the largest exporters of dairy products in the world (Jongeneel, Burrell and Kavallari 2011). We also discuss the Australian and European experience in dismantling their dairy quota systems. Then, in section 3, we focus particularly on the Canadian dairy regime because it is the focus of this inquiry, and the European dairy system because it serves as a template for dismantling the

---

[1] This meant deficiency payments and Commodity Credit Corporation payments as determined by various farm bills (see Schmitz et al. 2010).
[2] In April, 2071, the U.S., New Zealand and Australia again called for reform of Canada's dairy quota regime and greater access to its market (e.g., Reuters 2017; Solomon 2017).

Canadian quota. In section 4, we build upon research by Schmitz and Schmitz (2010), and Schmitz, Haynes and Schmitz (2016a, 2016b), pertaining to tobacco and peanut quota buyouts, to recommend how Canada might eliminate its dairy quota while compensating producers. In essence, we use these insights to build upon the stylized model of EU dairy reform to develop a model to illustrate how Canada might dismantle its dairy quota. We conclude with some discussion.

2. BACKGROUND TO INTERNATIONAL DAIRY POLICY

Because supply restrictions increase the domestic price above the world price, Anderson, Rausser and Swinnen (2013) include the implicit role of such programs in their study of government intervention in agriculture. As an indication of agricultural support, the authors use the nominal rate of assistance (NRA), which is the percentage by which the domestic producer price is above (or below if negative) the border price of a similar product, net of transportation costs and trade margins. The NRA is an estimate of direct government policy intervention. In Figure 1, we see that, since the late 1950s, the EU has assisted its dairy sector to a much greater extent than the U.S. or Canada, although levels of protection in the latter countries have at times exceeded the world price by 200% compared to more than 400% for the EU. Nonetheless, the EU was the world's largest exporter of dairy products, primarily because of export subsidies, and it continues to be the largest exporter (Figure 2).

The EU began to eliminate its dairy supports during the 1990s as a result of the Agreement on Agriculture (AA), which was negotiated during the Uruguay Round of the GATT, came into affect with the establishment of the World Trade Organization (WTO) in 1995, and was to be fully implemented by 2000. The EU's quota system was subsequently dismantled beginning in 2006, with the transition to a competitive market completed by mid 2015. Dairy

producers were compensated using deficiency payments followed by a single farm payment as discussed below.
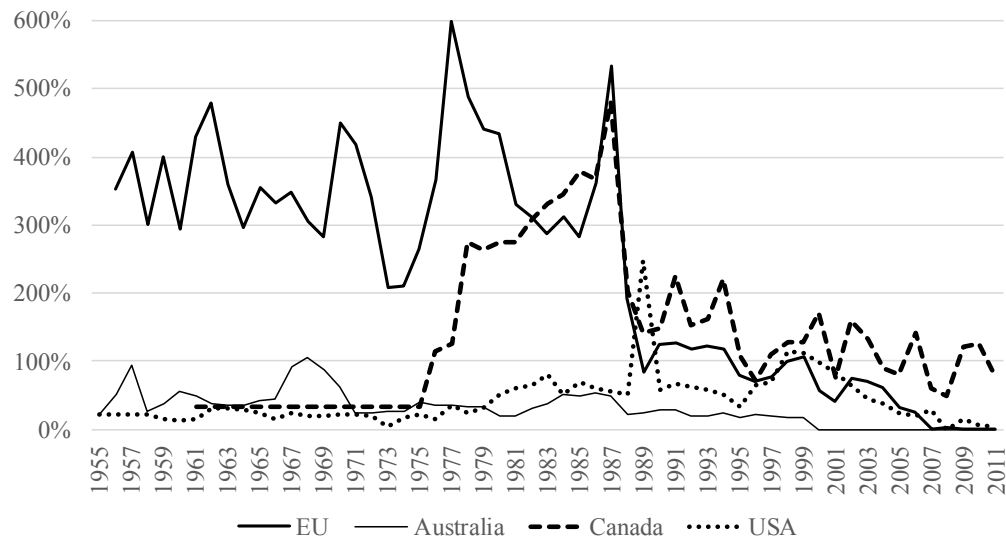

Figure 1: Nominal Rates of Assistance to the Dairy Sector, Selected Countries or Regions, 1955-2011(Source: Anderson and Nelgen 2013)
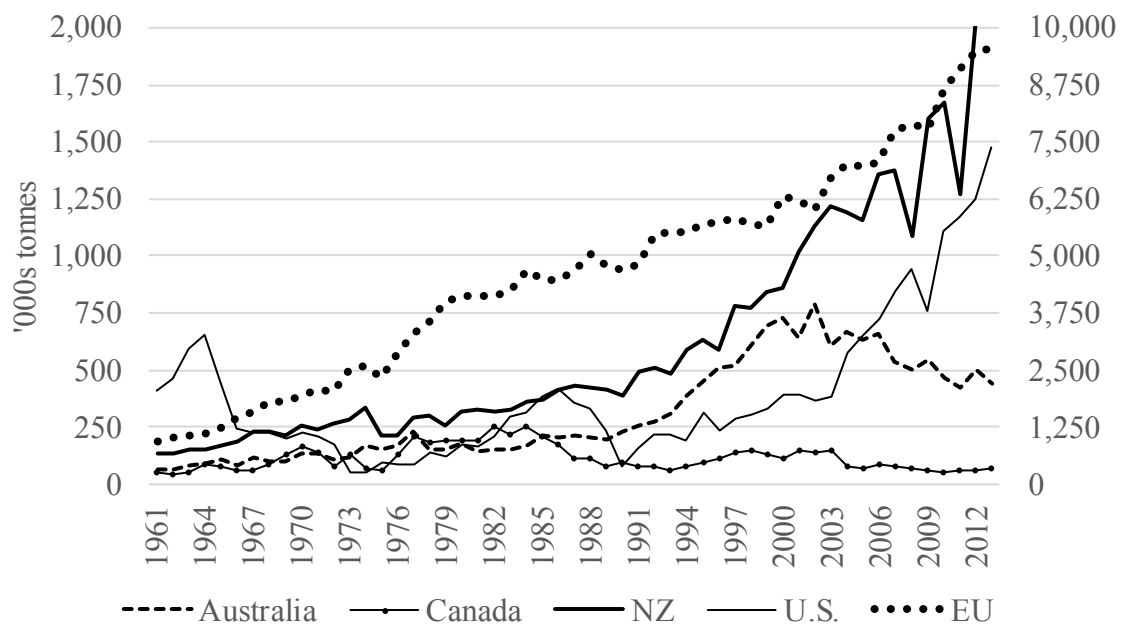

Figure 2: Total Exports of Dairy Products, Selected Countries (left scale) and European Union (right scale), 1961-2013 (thousands tonnes) (Source: FAO 2017)

As indicated in Figure 2, New Zealand, Australia and the U.S. are the second to fourth

ranked major exporters of dairy products. Australia's dairy quota system only covered fluid (fresh) milk and not industrial milk (butter, cheese, etc.). While industrial milk could be exported and traded across state lines, fluid milk sales were restricted by state-level supply management authorities under the umbrella of the Australian Dairy Industry Council, which proposed deregulation of fluid milk in early 1999. In 2001, the government removed price supports, providing dairy producers quarterly compensatory payments for a period of eight years to assist farmers in adjusting to the new market. As a result, the Australian dairy industry became more efficient (Edwards 2003; Balcombe, Doucouliagos and Fraser 2007). Meanwhile, New Zealand never adopted supply management nor did it provide significant price support to dairy farmers (which is why it is not included in Figure 1), because 94% of its dairy output is exported, mainly to Southeast Asia (Conforte et al. 2008).

In the U.S., dairy producers had been supported by the Milk Income Loss Contract (MILC) that provided a deficiency payment if the market price fell below a threshold price, limited by the pre-set quantity of milk produced (Novakovic and Wolf 2016). When grain prices increased as a result of biofuel policies, the threshold price was increased. Then in the 2014 Farm Bill an insurance product was added to the MILC. Thus, although the U.S. dairy program placed some restrictions on dairy production, it never relied on a true quota system.

In contrast to other nations, Canada continues to employ supply restrictions in dairy, with the result that domestic prices are approximately double the world price. Supply management in the dairy sector began with the creation of the Canadian Dairy Commission in 1965 followed by the National Milk Marketing Plan in 1970, although it was only after passage of the Farm Products Agency Act (1972) that all provinces and the federal government signed on; thus, supply management effectively began in the dairy sector in 1974 (Findlay and Gres 2012). The

impact is clearly seen in Figure 1. However, Canada continues to maintain a stronghold on its supply managed dairy sector even though the restrictions imposed on dairy producers have prevented them from taking advantage of export opportunities in developing countries whose citizens desire safe and high-quality processed dairy products from developed-country suppliers (Figure 2). The quota regime remains despite increasing pressure by the United States, Australia and New Zealand to allow imports (Reuters 2017; Solomon 2017).

Under the bi-lateral Comprehensive Economic and Trade Agreement with the EU, Canada agreed to increase its imports of cheese from European suppliers by 17,700 tonnes, which represents about 2% of Canadian milk production. While the previous Conservative government had promised to compensate dairy producers $C4.3 billion over 15 years in exchange, the Liberal government now in power has promised $C350 million over five years to help domestic producers compete with European imports by, for example, subsidizing modernization of equipment.[3] The proposed size of the original payout and political fallout from the revised payment does not bode well for future efforts to compensate producers for reforming Canada's dairy quota.

To understand the welfare implications of compensation, Schmitz et al. (2016a, b) examine quota buyout programs in peanuts and tobacco in the U.S. and tobacco in Ontario. The U.S. peanut quota buyout program paid producers a total of $0.55/lb, with payments spread over five years. The program cost the government $264 million, but the net benefit to society only amounted to about 10% to 15% of this amount (Schmitz et al. 2016a, p.128). U.S. tobacco producers were compensated $9.6 billion via ten equal annual payments. In Ontario, the buyout

---

[3] "Canadian dairy farmers unhappy with Europe trade deal payout," *Western Producer*, November 10, 2016. http://www.producer.com/daily/canada-dairy-farmers-unhappy-with-europe-trade-deal-payout/ [accessed April 20, 2017].

program employed a producer's basic production quota (BPQ) rather than total marketing quota (TMP), which was what farmers actually produced and was significantly less than although based on BPQ. As a result, farmers who participated in the voluntary buyout, and 99.5% did, received a buyout of $C275,000 each, or total $C286 million (Schmitz et al. 2016b). Even so, a loophole in the buyout legislation permitted tobacco farming to continue with production actually increasing after the buyout occurred. In effect, producers were highly overcompensated in at least two of the three programs.

3. CANADA, THE EU AND SUPPLY-RESTRICTING MARKETING BOARDS

By restricting supply, no cost is imposed on the public treasury, except perhaps expenses related to the implementation and governance of a quota scheme – the costs of maintaining a supply-restricting marketing board that sets production levels, allocates output across producers, sets rules for transferring quota, allocates quota to importers (if any), and monitors compliance. A quota scheme essentially transfers income from consumers to producers. The economic implications of a quota system can be demonstrated with the aid of Figure 3.
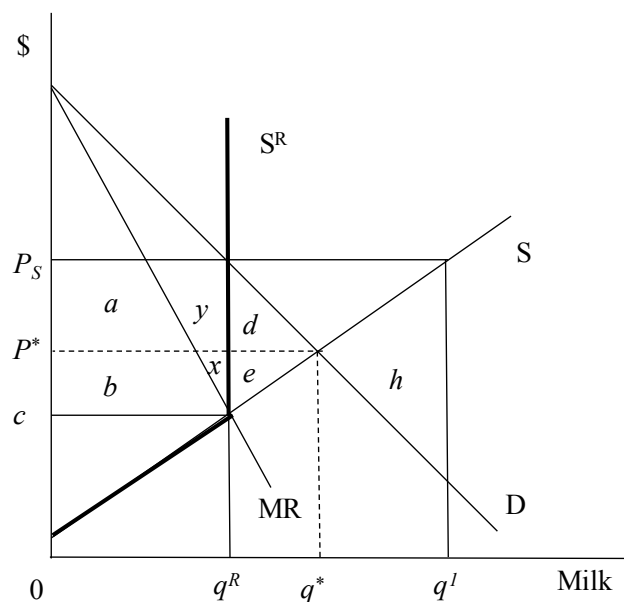

Figure 3: Restricting Supply and the Need for Quota

By restricting the supply of milk, say, to q^R, the relevant supply curve is kinked as indicated by the dark curve S^R – producers are allocated milk quota to prevent output from exceeding q^R. With less output entering the market, producers receive P_S which is also the price consumers pay, while producers' supply costs are c. The deadweight loss is $d+e<h$, where h measures the deadweight loss associated with a support program that sets the price at P_S. In going from free to restricted trade (Figure 3), consumers lose surplus $a+y$, which constitutes an income transfer to producers. However, because the marginal cost to the producer is c, the wedge between price and marginal cost results in a policy-induced scarcity rent equal to $a+y+b+x$, known as the quota rent. That is, the right-to-produce now has value, determined as follows: the annual rent R_A received by a dairy producer is given by the producer's quota q multiplied by the difference between the market price and the marginal cost of production: $R_A = q \times (P_s - c)$. If the quota scheme is assumed to continue into perpetuity, the value of quota would equal $QV = R_A/r$, where r is the rate used to discount future quota income. One unit of quota is worth $(P_s - c)/r$. Since the quota scheme is not likely to continue into perpetuity as there is a risk that outside lobbying will result in the eventual demise of the quota regime, the discount rate r used to discount the annual stream of quota rents will be high, although r will vary from one producer to another.

The true value of quota can only be determined in a market where quota is bought and sold. However, quota is not always sold in a separate or unregulated market; rather, its value is often capitalized in another factor of production, such as land, equipment or livestock. In that case, it would be necessary to estimate area $a+y+b+x$ using empirical estimates of supply and demand elasticities, along with whatever information can be garnered from farm management studies about the costs of various factors of production. It is important to recognize that, when

quota rent gets capitalized into factors of production, the costs of production are ratcheted upwards with the original quota owners capturing the initial windfall. Finally, it is necessary to determine the discount rate producers might use in valuing their milk quota in order to determine *QV*.
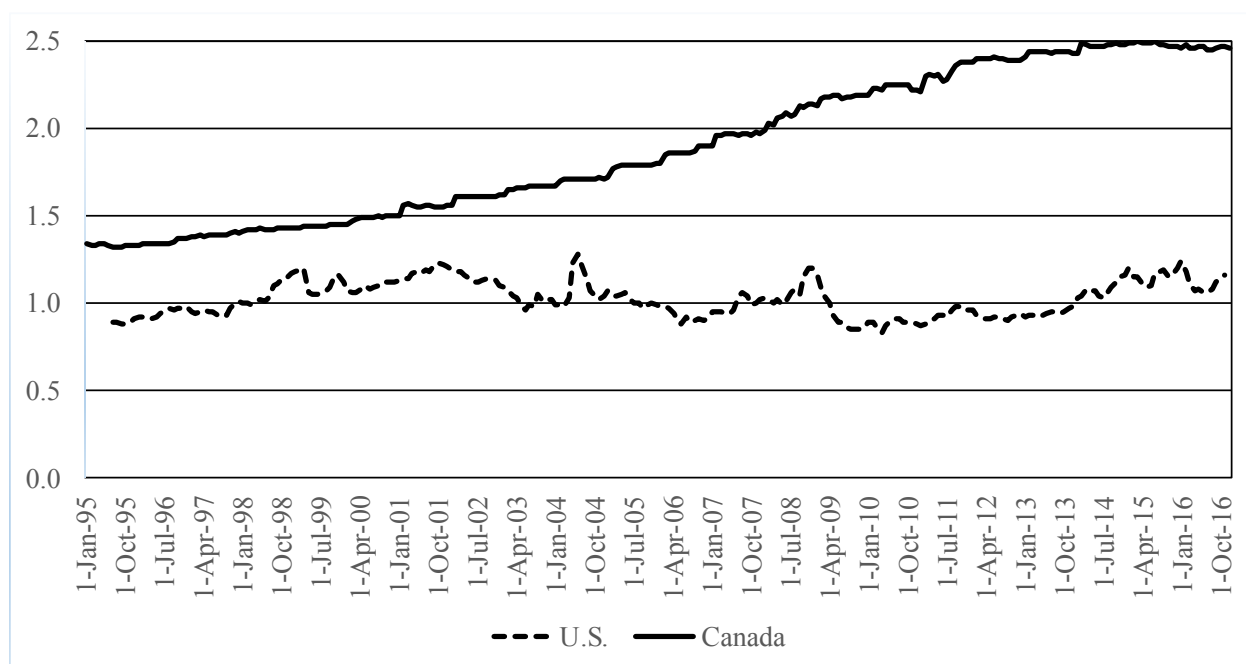
What is often neglected in discussions of quota buyouts or compensation is that QV, or the annual quota value *a+y+b+x* is not the loss to producers should the quota regime be eliminated. Rather, producers would only lose area *a+y–e*; that is, they would lose *a+y*, which would revert back to consumers as a surplus, but gain the quasi-rent given by area *e*. Appropriate compensation would thus amount to: $BV = (a+y–e)/r$, where *BV* is the buyout required.

Canada

Canada implemented a supply-restricting management regime in dairy in 1974, much to the consternation of most economists (see Veeman 1982, 1987, 1997; van Kooten and Spriggs, 1984; van Kooten 1988, 1990; van Kooten and Taylor 1989). The Canadian system established separate supply management boards in each province, with the Canadian Dairy Commission (CDC) allocating quota for industrial milk. The federal government abrogated its responsibility over trade in dairy and vested this responsibility with the provinces, which then suppressed interprovincial trade and essentially prevented exports of dairy products by quota holders and non-quota holders alike (Busby and Schwanen 2013). As a result, Canada failed to benefit, for example, from the rapid growth in demand by China and other developing countries for safe dairy products from rich countries (see Figure 2).

Since the mid-1970s, the price of milk in Canada has been guided by a cost of production formula that includes the cost of purchasing quota, so that costs and thus prices are continually ratcheted upwards. The value of quota amounts to approximately $25,000-$30,000 per cow, and

the farm-level price of milk (nominal US$/cwt) averaged $29.9 in Canada over the period 2007-2010 (~$33 in January 2010), $16.4 (~$16) in the U.S., $19.2 (~$17) in the EU, and $14.5 (~$16) in New Zealand (Barichello, Castellanos and McArthur 2013). The cost to Canadian consumers is particularly pronounced at the retail level; as shown in Figure 4, the retail price of whole milk in Canada diverged significantly from that in the U.S. beginning in 2001. On-farm herd size in Canada is also well below that in the U.S. and especially New Zealand (Figure 5), indicating failure to take advantage of economies of scale which has also resulted in higher production costs.[4]

Figure 4: Whole Milk Retail Price, 1995-2016, $C/liter
Source: Statistics Canada, U.S. Bureau of Labor Statistics

---

[4] As shown in the Appendix, the introduction of the quota regime caused producers to invest more in animals and machinery that raised productivity per cow as access to additional quota was limited. Further, the data in the Appendix confirm that high costs and restrictions on exports led to a decline in Canada's position in global export markets.
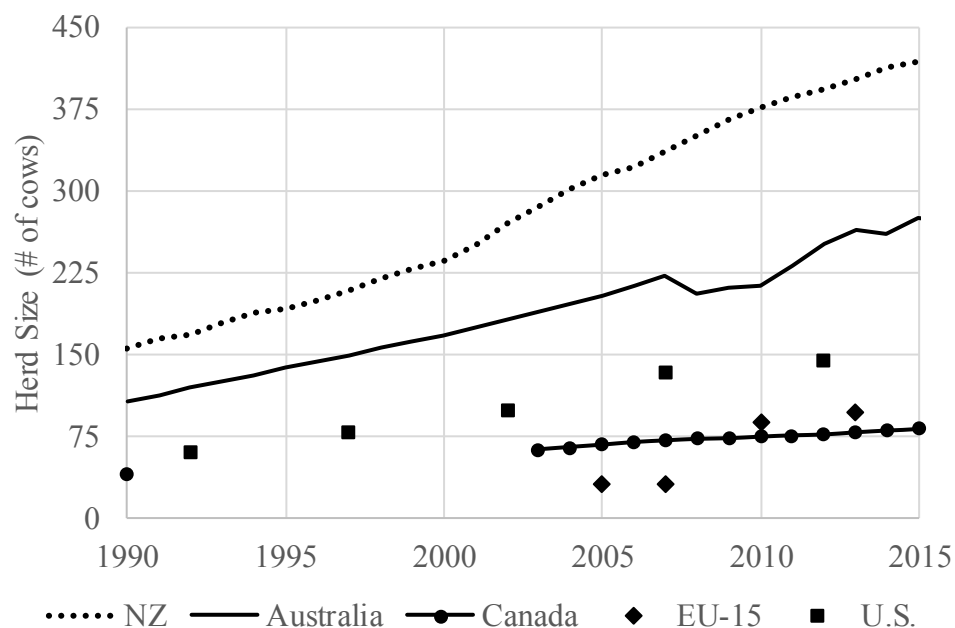
Figure 5: Cows per Farm, Australia, Canada, EU-15, New Zealand and U.S., 1990-2015

As noted, economists have railed against Canada's supply managed sector, which also includes eggs and poultry meat. Politicians on the other hand have expressed unqualified support for supply management as evidenced by a 2005 unanimous House of Commons motion asking the government not to give up any protection for supply-managed sectors in WTO negotiations, and something similar with respect to other trade negotiations in the Government's 2011 Speech from the Throne (Busby and Schwanen 2013). Policy analysts at the C.D. Howe Institute have recommended that the government could retain supply management and, at the same time, slowly make the quota regime redundant by simply capping the support price for butter, cheese and milk powder. The price of industrial milk would be capped until a benchmarking exercise found dairy producers to be as efficient as their U.S. counterparts. The argument suggests that, if the CDC were required by law to cap its support prices, there would be a "trickle down impact on industrial milk prices [set by the provinces] and, then, on fluid milk prices since all these products come from the same source" (Busby and Schwanen 2013, p.16). This would, according

to the authors, eliminate the 'ratchet effect' of quota values on costs, although wage and other cost increases as the economy grew would not bring domestic milk prices down to the international level as suggested. The required mechanism is not that simple and more is needed in this regard.

Agricultural economists had earlier considered how Canada might dismantle its dairy quota (Barichello, Cranfield and Meilke 2007). While arguing that dairy producers would need to be compensated, they concluded that it would be unrealistic to compensate farmers the $25 billion quota value estimated for 2004. Rather, they recommended a compensation package similar to that used in Australia – payments targeted where the largest losses occurred (e.g., targeting most recent entrants, regions most reliant on dairy production) with payments provided quarterly over a period of eight years (although the authority helped facilitate a lump-sum buyback through commercial banks). The policy package also focused on reform of the sector to reduce the negative impact on producers. Barichello, Castellanos and McArthur (2013) did not recommend compensation equal to the value of the quota asset as they believed the growth in quota value over the past decades had created an asset price bubble.

There are several reasons why dairy farmers should not be compensated the full amount of the quota rent. First, depending on when they joined the marketing board, many farmers have already recouped their investment in quota – their purchase of quota. The quota scheme provides them a windfall at the expense of consumers. Dairy producers will engage in rent seeking to protect this windfall, while some will squander the windfall by failing to take advantage of new technology, markets, et cetera. Second, while recent entrants into the sector are disadvantaged by less-than-full compensation, these producers are also likely to be the most efficient producers, who might benefit from an ability to expand their operations without needing to purchase quota.

This might also enable them to access export markets. After all, unlike New Zealand, for example, Canada has not participated in the growing global demand for dairy products from developed-country producers. Third, as discussed in the context of Figure 3, the quota rent is not the correct loss experienced by producers. Rather, it is the loss identified by the buyback value $BV < QV$.

Lastly, quota rents and deficiency payments accrue over time. The rate used to discount the periodic rents determines the value of quota. If a market for quota exists, prices for quota can be used as a basis for setting compensation; they can also be used to estimate the discount rate purchasers use to value quota. Because there is uncertainty regarding the survival of the quota regime, future milk prices and the size of the rent to which the quota buyer is entitled, purchasers of quota generally employ a short payback period in making decisions. This explains why the annual deficiency payment should not equal the entire quota rent and why a program of compensation should be limited to seven (as under the 1996 U.S. Farm Bill) or perhaps ten years.

European Union

As early as 1968, the EU's Agricultural Commissioner, Sicco Mansholt, recognized that the Europe's Common Agricultural Policy (CAP) would lead to overproduction while doing little to enhance farm incomes. His proposals for reform were controversial and opposed by small farm holders and governments with strong farm lobbies, but, as predictions of oversupply and growing support payments came true, the EU began to implement reforms. Although the EU subsidized exports of dairy products to address mounting stocks of butter and milk powder, continued over-production and rising CAP expenditures led to the implementation of a dairy quota regime in 1984. Annual national reference quantities or quota were established for each member state on the basis of historic production, with states paying a levy (known as a

'superlevy') for output above the quota. States assigned quota to individual producers, determined how quota would be transferred, and how an overproduction levy would be shared among producers.

Beginning in the 1990s, reforms to the CAP came about for reasons that had as much to do with the evolution of the EU – the politics of expansion and greater integration – as they did with agriculture per se. In the case of dairy, the quota system was not conducive to further integration as it limited trade, particularly between member states. Further, unlike Canada, the EU continued to export dairy products at a time when it sought to shift limited CAP funds into environmental, animal health and regional development programs. The EU was the largest global exporter of dairy products before the 1984 superlevy and thereafter, and continues to occupy this position.

As a result of the 2003 mid-term review of the Agenda 2000 reforms, the dairy quota system was to be phased out beginning in 2006/2007 (see Oliver and Caspari, 2008). This was done by reducing intervention prices for some products and increasing countries' quota. Only butter and skim milk powder were considered eligible for public intervention because these products could be stored. In preparation for the phase-out, intervention prices were reduced beginning 2003/2004 as indicated in Table 1, with buying only permitted from March 1 through August 31 in a calendar year. There were also limits as to how much the EU would purchase – 109,000 tonnes of skim milk powder over the period from 2004 until the quota system ended; for butter, a maximum of 70,000 t would be purchased in 2004, but the amount would decline by 10,000 t annually until it leveled off at 30,000 t/year from 2008 onwards (Jongeneel et al. 2011, p.75). However, the Commission could purchase more in times of emergency. At the same time, the quota was slowly increased as indicated in Table 2.

Table 1: Reductions in Intervention Prices on Butter and Skim Milk Powder, €/100 kg)

Year[a]	Butter	Skim Milk Powder
2003/04	328.20	205.52
2004/05	305.23	195.24
2005/06	282.44	184.97
2006/07[b]	259.52	174.69
2007/08	246.39	174.69
2008 onwards	246.39	169.80

[a] The agricultural year begins April 1 and ends March 31.
[b] Phase-out of the quota regime begins with increases in the quota of about 1% per annum.
Source: Jongeneel et al. (2011, p.76).

Table 2: Percent Increases in Dairy Quota as Supply Managed System Dismantled

Year[a]	Increase in quota level	Year[a]	Increase in quota level
2001-2004	0.4%	2009-2010	1.3%
2004-2006	15.5%	2010-2011	0.9%
2006-2007	0.8% [c]	2011-2012	0.7%
2007-2008	3.3%	2012-2013	1.1%
2008-2009	2.3% [d]	2013-2015	0.9%

[a] The agricultural year begins April 1 and ends March 31.
[b] Starting with a quota level in 2000 of 118.389 million tonnes for the EU-15.
[c] For the EU-25 but still based on the original EU-15 starting amount. This is when the phase-out of the quota regime began.
[d] For the EU-27 but still based on the original EU-15 starting amount.
Source: Jongeneel et al. (2011, p.74).

To compensate dairy producers for the reduction in prices that inevitably occurs as quota levels are increased and for cuts in intervention prices, the EU began in 2003 to pay producers a milk premium based on the producer's reference quantity (historic quota). The premium was paid on March 31 of each calendar year as follows: €8.15/t in 2004, €16.31/t in 2005, and €24.49/t in 2006 and 2007. EU-15 member states could, as they saw fit, provide additional direct payments to dairy producers between 2003 and 2007, with limits on the total amount each state could allocate (Jongeneel 2011, p.78); after 2005 and for certain accession countries, direct payments could be made to milk producers from the complementarity national direct payments those countries received.

After 2007, the milk premiums and additional direct payments were rolled into the Single

Farm Payment (also known as the Single Payment System or SPS). Then, following the 'CAP Health Check' of 2008, individual states could still provide additional support to dairy farmers until March 31, 2014. However, under the SPS, dairy producers would be treated as other farmers, receiving a direct payment based on historic milk deliveries but no longer tied to production; indeed, the farmer could produce other crops and still receive the payment.[5] Finally, the EU dairy quota regime was eliminated as of April 1, 2015, but various programs to support dairy remain in place (European Parliament 2015). Under the 2014-2020 CAP, there remains a safety net whereby the Commission purchases butter and SMP (see above) and aids private storage of butter, SMP and certain cheeses under adverse market conditions; countercyclical payments, greater intervention purchases and storage subsidies, export subsidies, and other measures could be deployed in exceptional circumstances; and coupled support could be provided by individual member states while coupled support could be used at the EU level to promote regional production. Further, revenue insurance would be used to protect producers against a decline in income that exceeded 30% of the past three-year average. In essence, the quota regime and coupled support for dairy production have disappeared, but with qualifications.

With the exception of some discussion in Jongeneel et al. (2011), the literature on the elimination of the EU dairy quota lacks an applied welfare analysis of the economic benefits and costs and, importantly, the income re-distributional impacts. Such an analysis could prove helpful for policy analysts contemplating how the Canadian dairy quota regime could be dismantled while providing producers with appropriate compensation. Schmitz et al. (2016a) provide an overview of the Ontario tobacco quota buyback program and the U.S. peanut and tobacco buybacks; they also provide an analytic framework for analyzing how a dairy quota

---

[5] Beginning in 2015, the SPS became known as the Basic Payment System.

might be dismantled and compensation paid to producers. We now extend their approach to examine the EU dairy program and, then in section 4, extend this model to the situation in Canada. The main difference is that the EU has been a net exporter of dairy products both with and without a quota regime, while Canada would be a net importer, which is why its trading partners have attacked the dairy quota system.

Economics of Dismantling the EU Quota Regime

A stylized description of EU dairy policy over the period from establishment of the quota regime in 1984 through its demise in 2015 is provided in Figure 6. In this back-to-back diagram, the autarkic price and quantity where there is no trade between the EU and the rest of the world are given by P^* and q^*, respectively, in panel (b). With trade, the relevant demand function facing EU producers is D_T, which is the sum of the domestic demand function (D_E) and excess demand by the rest of the world (ED_R). In the absence of transportation costs (or assuming these are taken into account in ED_R), the world price would be P^W, with q^{wd} consumed domestically and the difference $q^W - q^{wd}$ in panel (b) exported to the rest of world – with equivalent imports indicated for P^W in panel (a).

Consider what happens when the EU's dairy producers face support price P^S. Farmers produce q^S but EU consumers would only consume q^D at that price. Since domestic EU consumers pay the higher price, the EU must either store the excess production or subsidize exports. The cost of purchasing the overproduced dairy products (butter and SMP) is given by the area bounded by points $ee'q^Sq^D$. Notice that the excess production is given by ee', which equals dd'; this is the relevant amount to consider in establishing the foreign price based on D_T, because amount ed is not sold at P^S. That is, the correct price in foreign markets is P_0 and not the higher price P_1, so that the export subsidy equals the area bounded by $ee'k'k < ee'q^Sq^D$. Of course,

this policy is quick to draw the ire of trading partners as this practice amounts to dumping, a practice essentially halted by the Agreement on Agriculture.

To avoid accumulating stocks of dairy products and/or the high costs of export subsidies while still supporting prices, the EU employed a quota beginning in 1984. Assume the quota was initially set at R_0. A dairy farmer would produce q^{R0}, and receive a price (P^S) greater than the marginal cost of production (c), thereby benefitting from a rent equal to the area bounded by P^Sxbc. The price EU consumers pay is still P^S in this case, so the amount ex must be exported. Assuming the distance $ee' = R_1–R_0$ (a coincidence for convenience), the price foreigners pay would be P'' and the EU would still be subsidizing exports.[6] As a consequence of the AA, the EU needed to eliminate the quota regime.

In the stylized version, the support price is initially removed but the quota remains in place. The price falls from P^S to P', with farmers provided an annual deficiency payment equal to the level of their initial individual quota (i.e., reference margin) multiplied by the price difference (or milk premium), with the total deficiency payment equal to area P^SxyP'. The quota is then increased in steps to the level that would lead to the free market trade outcome, price P^W and output q^W. In the first step, the quota is increased to R_1, which causes price to fall from P' to P''. The milk premium paid to dairy producers increases from $P^S–P'$ to $P^S–P'$ (or by $P'–P''$). Thus, the total milk premium rises by the darker shaded area. In the next steps (but shown as one step in the figure), the quota is increased to R_2 ($=q^{R2}$), but the total milk premium paid to producers is equal to the light-shaded area, which is only a proportion of the total decline in producer rent. That is, as the quota is slowly increased, the milk premium becomes a declining proportion of the fall in price. Increases beyond q^W are not needed as this is where price equates

---

[6] The amount of the subsidy is given by amount $ex \times (P^S – P'')$ in Figure 6(b).
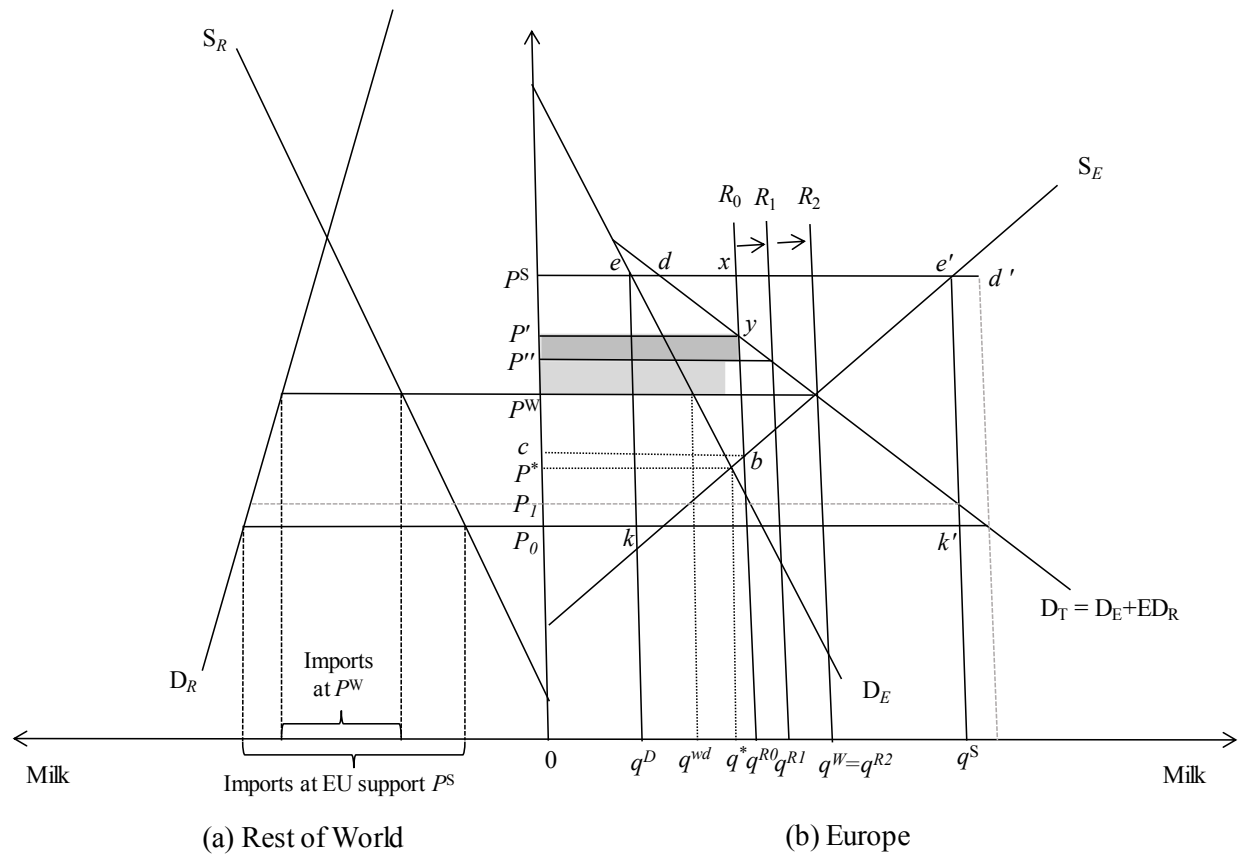
to the marginal cost.

Figure 6: Stylized Diagram of Europe's Dairy Regime and its Demise

In the EU case, the dairy premium was quickly rolled into a single farm payment. The payment was based on a politically determined final milk premium (€24.49/t) multiplied by the farmer's refence margin, although the quota kept increasing (Table 2) and states could still sell milk to the EU at intervention prices (Table 1) until 2015. After that dairy producers would receive a direct payment that was no longer tied to how much milk they produced or even whether they even produced milk. The market determined prices and production without intervention.

4. DISMANTLING CANADA'S DAIRY QUOTA

In this section, we consider two situations by which Canada might be able to eliminate its dairy quota regime while compensating producers for their loss. In the first, we consider the case where the quota in each province is allocated at the federal level, while in the second it is determined solely by provinces individually. In practice, the federal government assigns industrial milk quota to provinces, but perhaps not in optimal fashion as assumed here, while provinces rely on this information plus their expectations of demand for fluid milk to set the quota. Since neither quite applies, the analysis is stylized.

A Regionally-Optimal Quota Regime

The transition from a quota regime to a market if quota are allocated optimally across provinces is illustrated with the aid of Figures 7 and 8. Assume that the CDC, as the body overseeing the federal quota regime, seeks to set a quota where the marginal revenue associated with the total demand for milk products equals the joint supply function, as indicated in Figure 7. The overall quota is set at $\bar{q}_T$ with the respective quota for provinces A and B set at $\bar{q}_A$ and $\bar{q}_B$. The quota are set so that each province produces milk at the same marginal cost (with circles in the diagram indicating the intersections where agents would make their ouput decisions). Because province A has a much lower cost of production than B, more quota is allocated to A than to B, even though consumers in A consume much less than those in B (compare M_A in province A against M_B in B). The quota rents in provinces A and B are given by the light- and dark-shaded areas, respectively.

The problem with a quota scheme is that producers benefit as to when they received (original producers) or purchased quota. The latter would have paid the capitalized value of the quota rent, but would have benefitted once this investment was paid off and if quota gained

value. Quota constitute an input that raises the cost of production but do nothing to enhance efficiency. However, to eliminate the quota program it is necessary to compensate producers. The big question is: How much will a buyout cost?
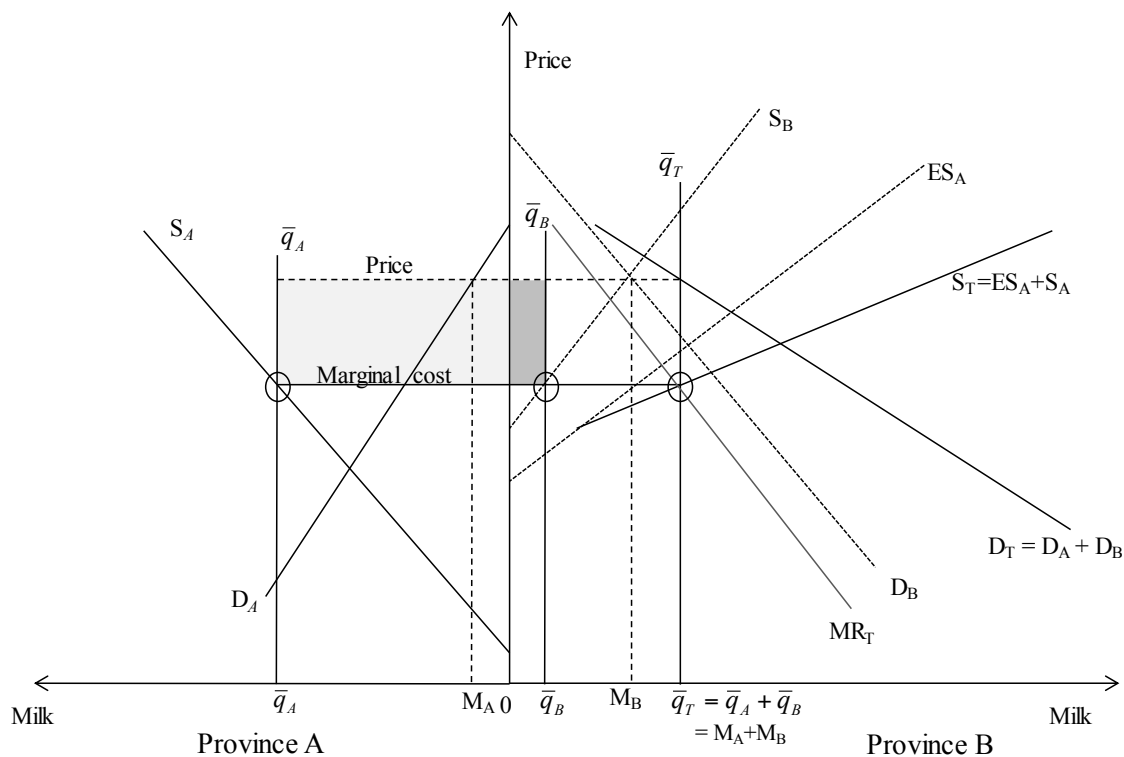

Figure 7: Allocation of Dairy Quota and the Creation of Quota Rents

To eliminate its quota scheme, Canada should first convert some of the quota rent into a deficiency payment. The CDC would incrementally increase the quota level thereby reducing the price of milk, with compensation to be paid on the difference between the previous price ('old price') and the reduced price ('new price') as indicated in Figure 8. (Arrows in the figure are used to indicate the directions in which shifts take place.) The deficiency payment is based on quota amount $\bar{q}_T$ and not the raised level of the quota $\bar{q}'_T$ that is required to lower the price. In Figure 8, $\bar{q}'_T$ represents the new national quota, with $\bar{q}'_A$ and $\bar{q}'_B$ denoting the new quota

assigned to provinces A and B, respectively. The deficiency payment in each province is given by the lighter of the two areas in each of the panels and is labelled in each case as DP. The darker areas labelled QR represent the new quota rents – the quota rents associated with higher production levels and a lower price.
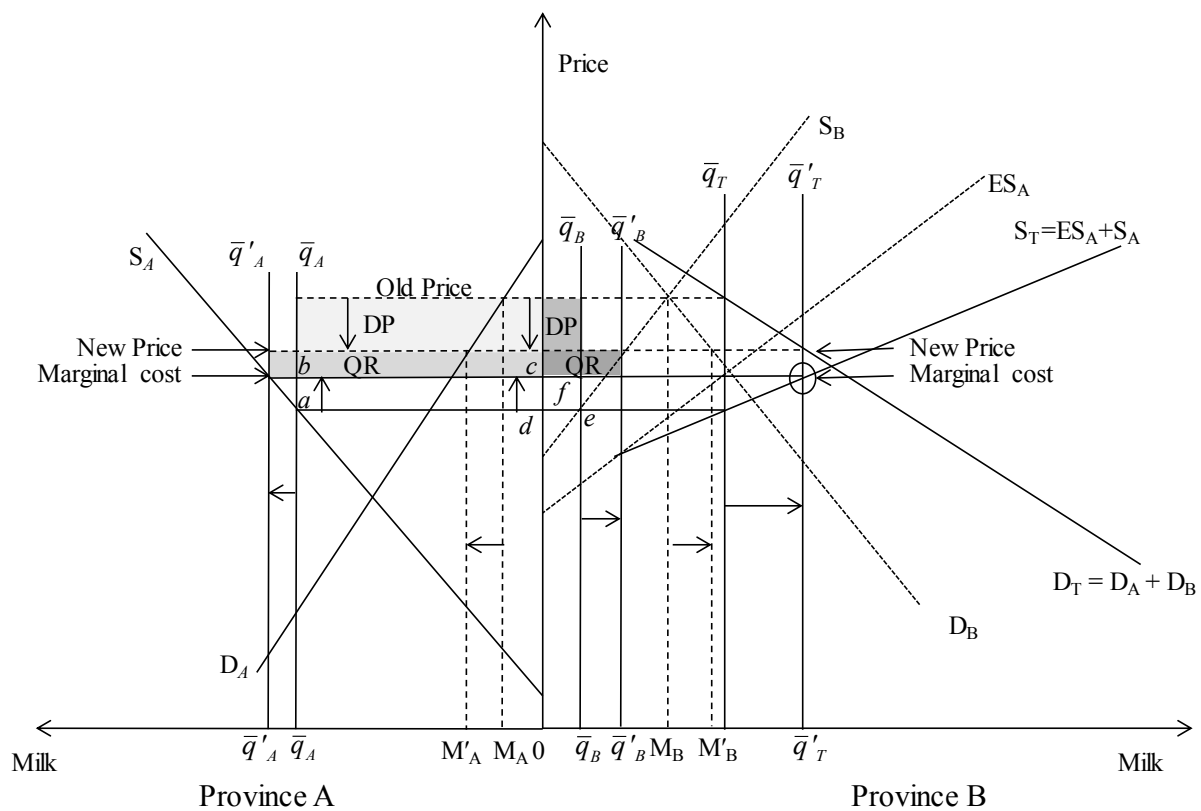

Figure 8: Intermediate Steps to Elimination of Dairy Quota Scheme: Gains, Losses and Income Transfers

Notice that the dairy producers in province A lose the area bounded by points *abcd*, but gain the small rectangle that is part of the dark-shaded DP area to the left of $\bar{q}_A$; that is, producers lose area *abcd* but gain $(\bar{q}'_A - \bar{q}_A) \times$ (old price – new price). Because the original quota maximized the monopoly rent (Figure 7) and any increase in quota reduces the welfare of the producers, the loss must exceed the gain. Likewise, for province B, the loss experienced by

dairy producers equals area *cdef* minus $(\bar{q}'_B - \bar{q}_B) \times$ (old price − new price). Finally, dairy producers in each province still gain the sum of the two shaded areas. However, the deficiency payment (the lighter of the two shaded areas in each panel) now comes from the government instead of consumers, unless of course the government taxes consumers of dairy products to compensate producers. The darker-shaded area in each panel continues to constitute a transfer from consumers to producers.

At least one other step is required to eliminate the quota system entirely, although in practice the process of eliminating the quota scheme likely occurs in several steps. In each subsequent step following the first, the orginal quota is used to determine the deficiency payment. Following the EU approach, the compensation in each subsequent step can be determined as a proportion of the eligible deficiency payment. Thus, the second step might only provide for 70% of the loss, the third step only 50%, and so on. In practice, then, the dairy producers are not compensated the full amount of the quota rent for reasons discussed earlier.

As a modification, however, the authority should consider compensating producers according to when they received quota. The dairy marketing authority would have this information. Thus, for any quota purchased within the last five years, say, a producer would receive 90% of the deficiency price in the second step, one who purchased quota within five to ten years might receive 70%, and the remainder 50%. The dairy quota could be eliminated over a period of seven years with producers continuing to receive a deficiency payment for another five to seven years thereafter. However, the latter payment would no longer be tied to production or require the farmer to produce milk.

Dismantling A Regionally-Optimal Quota Regime

Now suppose that, rather than the federal government determining the initial allocation of

quota across provinces, each province determined its own quota based on its domestic demand and history of exports of industrial milk to other provinces and abroad. In this case, the relative efficiency (marginal costs of production) across regions is not taken into account. Further, assume that each province determines its quota at the point where marginal cost equals marginal revenue. The stylized market is provided in Figure 9, where the supply (*S*) and demand (*D*) intersect at (q^*, p^*) – the market equilibrium to which each province needs to return. Suppose the optimal milk quota in that province was set at q_0, so the effective supply function is given by S^R. The support price is p_0 and the marginal cost of production is c_0, with the dairy producers earning a quota rent given by area $(a+b+k+d+e+f)$ in the figure.
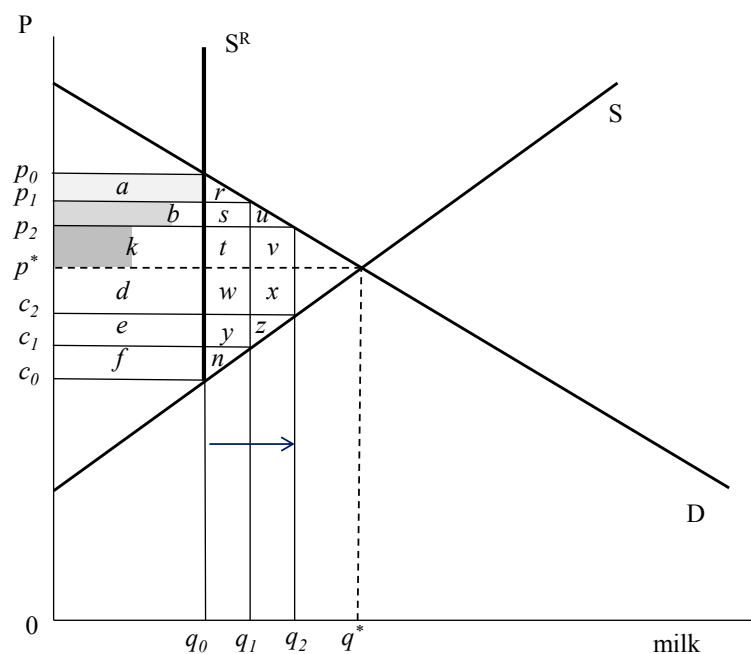

Figure 9: Allocation of Dairy Quota and the Creation of Quota Rents

It is reasonable to expect dairy producers to be compensated for policies that might eventually eliminate the quota regime. The questions pertain to the mechanism for providing compensation and how much a buyout costs. As in the main text, the method proposed for dismantling the milk quota regime begins by initially lowering the support price to p_1, which

requires that the quota be relaxed to q_1 from q_0 in Figure 9. Dairy producers are compensated for the loss with a deficiency payment constituting the difference between the the original support price and the new support price multiplied by the original quota amount. The deficiency payment is given by the light shaded area (=area *a*) in Figure 9. The new quota rent is now area (*b+k+d+e*); although area *f* was previously part of the quota rent, it now constitutes quasi-rent or producer surplus. Overall, in relaxing the quota from q_0 from q_1, consumers gain area (*a+r*), while, in addition to retaining a portion of the previous quota rent (area *b+k+d+e*), producers lose area (*a+f*) as a scarcity rent but regain area *a* as a deficiency payment and area (*f+n*) as quasi-rent, plus area (*s+t+w+x*) as additional quota rent. Overall, without the deficiency payment as compensation, the net change in producers' welfare is given by area (*s+t+w+x+n − a*) < 0. It is a loss because otherwise the quota q_0 would not have been optimal (the monopoly quantity).

Now consider the case where the quota scheme is implemented in more than one province, with each setting its own quota. Assume two provinces vary in the size of their market and, importantly, in the structure of their milk sectors. This is illustrated in Figure 10 where province A has much lower production costs but also a somewhat smaller market than province B. For example, in addition to management and other efficiencies, prairie provinces might be able to purchase feed inputs much more cheaply than other provinces.

Suppose province A's autarkic price (P^*_A) is lower than that of B (P^*_B). Milk quotas in the two provinces are set at M'_A and M'_B, respectively, so that the domestic price in B exceeds that in A, $P'_B > P'_A$. The periodic quota rent in A is given by the area bounded by points $P'_A \alpha \beta \delta$, while that in B is measured by area $P'_B mdc$. To maintain Canada's quota regime it had been necessary to prevent or at least control trade in dairy products across provinces. However, the trade restriction directly conflicts with the facilitation of greater movement of goods and factors

of production among provinces, and greater economic integration. This is one benefit of disbanding the dairy quota regime, although the benefits of freer movement of goods, services and factors of production among provinces is not included in the analysis.
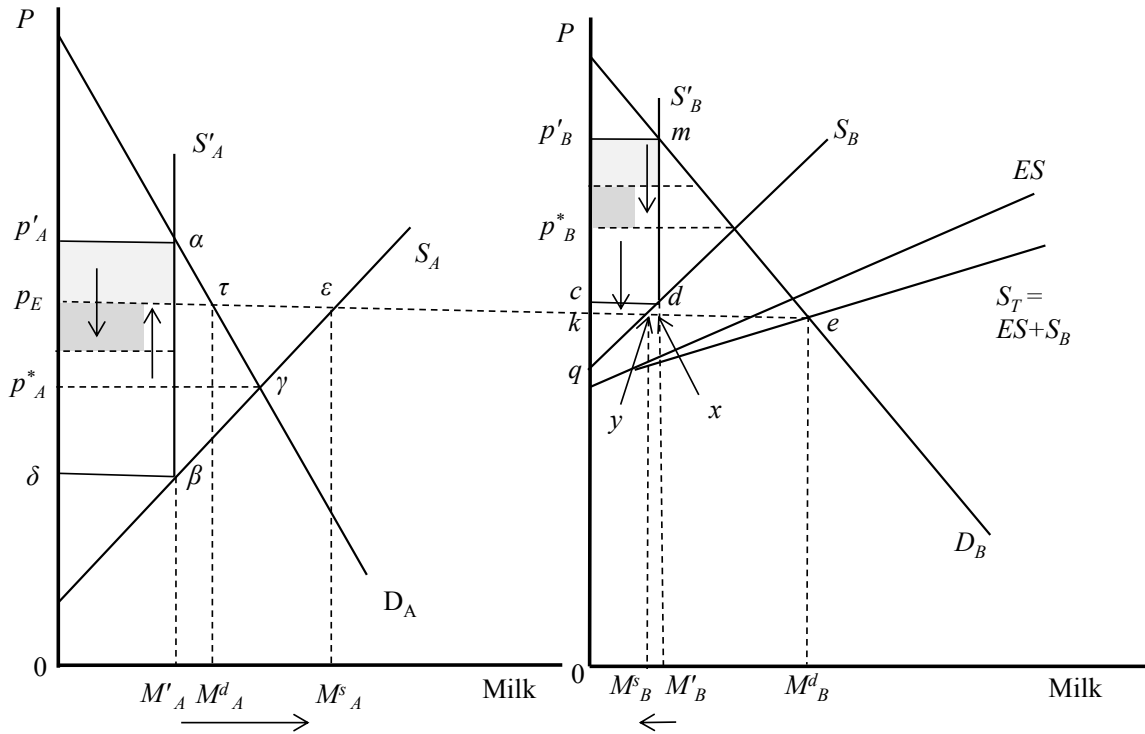

Figure 10: Intermediate Step to Elimination of Dairy Quota Scheme: Gains, Losses and Income Transfer

As noted earlier, the EU eliminated the quota scheme by first converting some of the quota rent into a deficiency payment. The authority initially reduced the price of milk only partly, providing compensation on the difference between the previous price and the reduced price in the form of a deficiency payment. The deficiency payments for countries A and B are based on respective quota amounts M'_A and M'_B, and and not the raised level of the quota that is required to lower the price. The payments are indicated by the lightly shaded areas in each of the panels in Figure 10. After the initial price reduction, prices are subsequently reduced further, but the deficiency payment amounts to a smaller component of the price drop, as indicated by the

darker shaded areas in the figure, with the arrows indicating the directions of the price movement. Because producers in province A are more efficient than those in B, the movement to a free market should lead to a final price of P_E in each province (not including shipping and handling costs), with province A increasing production from M'_A to M^s_A and province B reducing production from M'_B to M^s_B. However, consumption in both provinces increases compared to what it was under the quota regime as prices in both countries have fallen.

Provincial decision makers are concerned that the elimination of Canada's dairy program will concentrate production in a few provinces (e.g., the prairie provinces). The theoretical explanation provided in Figure 10 does permit such a conclusion as the price for province A falls as the quota is relaxed but then rises as free trade between provinces is permitted, while the price in province B continues to fall once trade is allowed; province B continues to slide down its supply function as the quota is relaxed and free trade occurs. This is indicated by the arrows. Nonetheless, it could happen that only a few provinces come to dominate the dairy market once it is liberalized.

Finally, notice that all provinces gain from the elimination of the quota system. In terms of Figure 10, the net gain to province A is given by area ($\alpha\beta\varepsilon\tau$), while that to B is given by area (*mxe*). And again it is possible to compensate the dairy producers as discussed in the previous section.

5. DISCUSSION

The benefits of restricting milk production accrue to very few in society, while imposing a large burden on consumers, especially the poorest in society. With the exception of a few dairy producers who have benefitted from rising quota values, even producers are harmed by a dairy quota regime because they carry unnecessary debt, have difficulty expanding output to take

advantage of economies of scale, and are unable to take advantage of potentially lucrative export markets. Given how entrenched a supply managed regime can become, a major problem is devising an acceptable means of compensating dairy producers and dismantling the system. In this paper, an underlying theoretical framework for doing so was provided. The advantage is that this framework makes explicit the political decisions that need to be made.

6. REFERENCES

Anderson, K. and S. Nelgen, 2013. *Updated National and Global Estimates of Distortions to Agricultural Incentives, 1955 to 2011*. June. Spreadsheet at www.worldbank.org/agdistortions. Washington, DC: World Bank.

Anderson, K., G. Rausser and J. Swinnen, 2013. Political Economy of Public Policies: Insights from Distortions to Agricultural and Food Markets, *Journal of Economic Literature* 51(2): 423-477.

Balcombe, K., H. Doucouliagos and I. Fraser, 2007. Inuput Usage, Output Mix and Industry Deregulation: An Analysis of the Australian Dairy Manufacturing Industry, *Australian Journal of Agricultural and Resource Economics* 51: 137-156.

Barichello, R., V. Castellanos and C. McArthur. 2013. "Dairy Farm Structure in Canada: International Comparisons and the Effect of Farm Quotas." Presentation at Canadian Agricultural Economics Society, 2011. University of British Columbia. Retrieved at: http://www.uoguelph.ca/catprn/PDF-Pres/CAES-2011-Barichello.pdf

Barichello, R., J. Cranfield and K. Meilke, 2007. Options for Supply Management in Canada with Trade Liberalization. CATPRN Commissioned Paper CP 2007-04. June. 29pp. http://ageconsearch.tind.io//bitstream/6124/2/cp070004.pdf [accessed April 27, 2017].

Busby, C. and D. Schwanen, 2013. *Putting the Market Back in Dairy Marketing*. Commentary No. 374, Trade and International Policy, C.D. Howe Institute. March. 21pp.

Conforte, D., E. Garnevska, M. Kilgour, S. Locke and F. Scrimgeour, 2008. The Key Elements of Success and Failure in the NZ Dairy Industry. AERU Research Report No. 313. December. Agribusiness and Economics Research Unit, Lincoln University, Lincoln, NZ.

Edwards, G., 2003. The Story of Deregulation in the Dairy Industry, *Australian Journal of Agricultural and Resource Economics* 47(1): 75-98.

European Parliament, 2015. The Future of the EU Dairy Sector after the End of Milk Quotas. June. http://www.europarl.europa.eu/thinktank/en/document.html?reference=EPRS_BRI(2015)564359 [accessed April 21, 2017].

FAO (Food and Agricultural Organization of the United Nations), 2017. Livestock Primary Data. FAOStat. http://www.fao.org/faostat/en/#data/QL [accessed April 5, 2017]
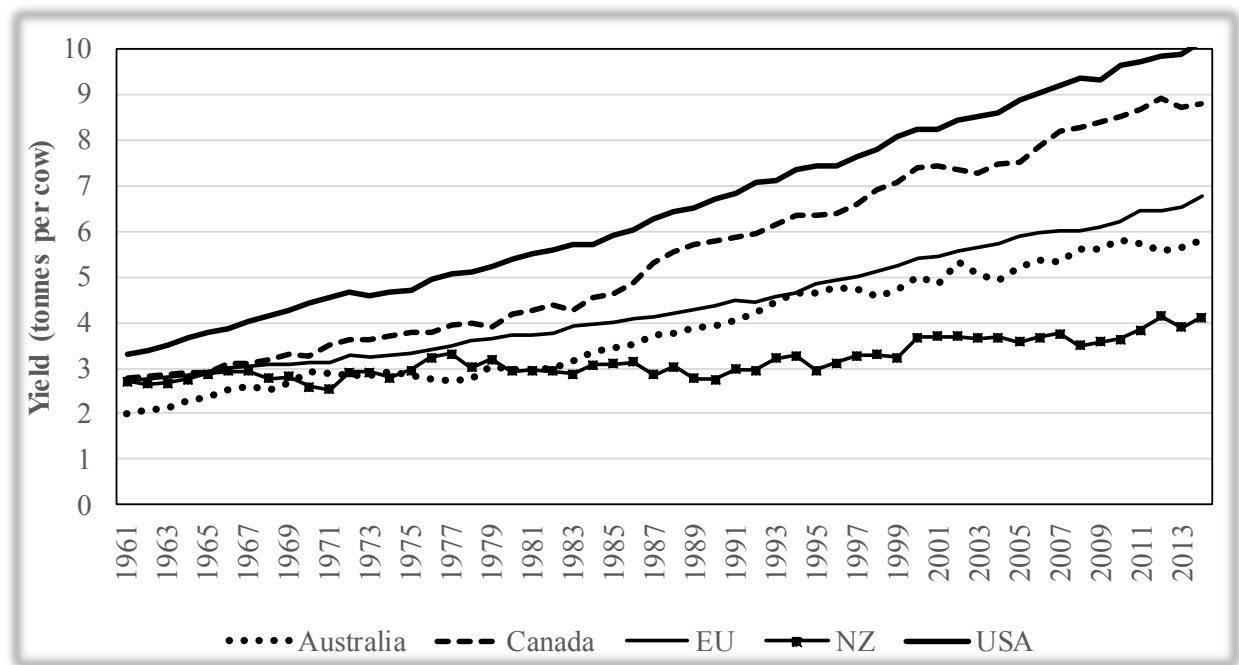
Findlay, M.H. and M. Gres, 2012. Supply Management: Problems of Politics and Possibilities, SPP Research Papers Vol. 5, Issue 19. 31pp. Retrieved at: http://www.policyschool.ca/authors/hall-findlay-martha/ [March 31, 2017]

Furtan, W.H., R.F. Romain and A. Mussell, 2005. The WTO Ruling on Canadian Dairy Exports. Chapter 7 (pp.101-112) in *International Agricultural Trade Disputes: Case Studies in North America* edited by A. Schmitz, C.B. Moss, T.G. Schmitz and W.W. Koo. Calgary, AB: University of Calgary Press.

Goodloe, C., 2005. The WTO Case on Canadian Dairy Export Subsidies: Implications for Two-Tiered Pricing. Chapter 8 (pp.113-120) in *International Agricultural Trade Disputes: Case Studies in North America* edited by A. Schmitz, C.B. Moss, T.G. Schmitz and W.W. Koo. Calgary, AB: University of Calgary Press.

Jongeneel, R., A. Burrell and A. Kavallari, 2011. *Evaluation of CAP Measures Applied to the Dairy Sector. Final Deliverable*. EU Directorate-General for Agriculture and Rural Development under Contract No. 30-CE-0382055/00-63. November. 336pp. Wageningen, NL: Wageningen University and Research Centre.

Novakovic, A.M. and C. Wolf, 2016. Federal Interventions in Milk Markets, *Choices* 31(4).

Oliver, E. and C. Caspari, 2008. The Future of Milk Quota: Different Scenarios. DG Internal Policies of the EU. IP/B/AGRI/IC/2007_037. January. 140pp. Policy Depart. Structural & Cohesion Policies, Agriculture & Rural Development. Brussels: European Parliament. http://www.europarl.europa.eu/activities/committees/studies.do?language=EN [accessed April 27, 2017].

Reuters, 2017. Australia, New Zealand back Trump's fight against Canada's 'very unfair' dairy industry, Financial Post April 19, 2017. http://business.financialpost.com/news/economy/australia-new-zealand-back-trumps-fight-against-canadas-very-unfair-dairy-industry [accessed April 26, 2017]

Schmitz, A., D. Haynes and T.G. Schmitz, 2016a. The Not-So-Simple Economics of Production Quota Buyouts, *Journal of Agricultural and Applied Economics* 48(2): 119-147.

Schmitz, A., D.J. Haynes and T.G. Schmitz, 2016b. Alternative Approaches to Compensation and Producer Rights, *Canadian Journal of Agricultural Economics* 64: 439-454.

Schmitz, A. and T.G. Schmitz, 2010. Benefit-Cost Analysis: Distributional Considerations under Producer Quota Buyouts, *Journal of Benefit-Cost Analysis* 1(1): Article 2. DOI:10.2202/2152-2812.1002.

Schmitz, A., C. Moss, T.G. Schmitz, W.H. Furtan and C. Schmitz, 2010. *Agricultural Policy, Agribusiness and Rent Seeking Behavior*. 2nd edition. Toronto, ON: University of Toronto Press.

Solomon, L., 2017. Trump just might make us put on our big-boy pants and make Canada great again, National Post April 22, 2017. http://news.nationalpost.com/full-comment/lawrence-solomon-trump-just-might-make-us-put-on-our-big-boy-pants-and-make-canada-great-again [accessed April 26, 2017].

van Kooten, K., 1990. Measuring the Welfare Costs of Supply Management: The Role of Indirect Benefits, *European Review of Agricultural Economics* 17(1): 57-67.

van Kooten, G.C., 1988. Economic Impacts of Supply Management: Review and Comparison of Alternative Measures of Consumer Welfare Loss, *Canadian Journal of Agricultural Economics* 36: 425-441.

van Kooten, G.C. and K.F. Taylor, 1989. Measuring the Welfare Impacts of Government Regulation: The Case of Supply Management, *Canadian Journal of Economics* 22: 902-913.

van Kooten, G.C. and J. Spriggs, 1984. A Comparative Static Analysis of the Welfare Impacts of Supply-Restricting Marketing Boards, *Canadian Journal of Agricultural Economics* 32(2): 221-230.

Veeman, M.M., 1997. Marketing Boards: The Canadian Experience Revisited, *Canadian Journal of Agricultural Economics* 45(4): 411–420.

Veeman, M.M., 1987. Marketing Boards: The Canadian Experience, *American Journal of Agricultural Economics* 69(5): 992-1000.

Veeman, M.M., 1982. Social Costs of Supply-Restricting Marketing Boards, *Canadian Journal of Agricultural Economics* 30(1): 21-36.
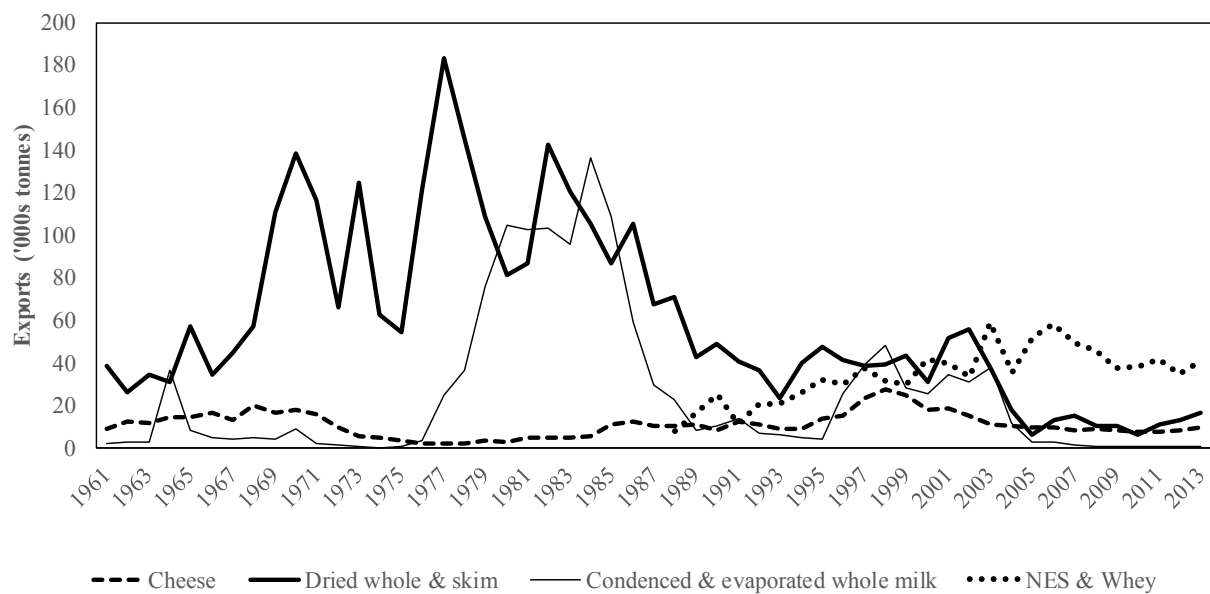
APPENDIX: ADDITIONAL ASPECTS OF THE CANADIAN QUOTA REGIME

Although the average herd size (number of cows per farm) in Canada lags well behind that of other countries, productivity per cow is ahead of that in other jurisdictions, except the U.S. (Figure A1). However, this provides suggestive evidence that farmers are unable to purchase quota, either because it is unavailable or too costly, and have instead invested in animals and milking technology.

Figure A1: Yield per Cow, Selected Countries, 1961-2014 Source: FAO (2017)

In Figure A2, we provide historical data regarding Canada's exports of various dairy products. When the dairy quota was first put in place in 1974, Canadian dairy products were competitive internationally as indicated by the relatively high levels of exports, particularly dry whole and skim milk powder, and condensed and evaporated whole milk, but not cheese. However, the longer the quota regime remained in place, the less competitive Canadian dairy exports appeared to become until, early in the new millennium, Canada was no longer a player in the global dairy market.

Figure A2: Canadian Exports of Dairy Products, 1961-2013 Source: FAO 2017