Distortions to Agricultural Incentives in the United States and Canada

Bruce Gardner

Formerly of the University of Maryland

Agricultural Distortions Working Paper 62, September 2008

This is a product of a research project on Distortions to Agricultural Incentives, under the leadership of Kym Anderson of the World Bank's Development Research Group. The author was grateful for helpful comments from workshop participants, for invaluable help with data compilation by Johanna Croser, Esteban Jara, Marianne Kurzweil, Signe Nelgen, Francesca de Nicola, Damiano Sandri and Ernesto Valenzuela, and for funding from World Bank Trust Funds provided by the governments of the Netherlands (BNPP) and the United Kingdom DfID) as well as the Rockefeller Foundation for use of the Bellagio Conference Center. Tragically Professor Gardner died in March 2008, so the editing of this paper (which does not include a discussion of the latest US Farm Bill but see Orden, Blandford and Josling 2009) was done as faithfully as possible, knowing Bruce would not be able to provide the final clearance. It will appear without the Appendix as Ch. 4 in *Distortions to Agricultural Incentives: A Global Perspective, 1955 to 2007,* edited by K. Anderson, London: Palgrave Macmillan and Washington DC: World Bank (forthcoming 2009).

Distortions to Agricultural Incentives in the United States and Canada

Bruce Gardner

There is much in common between the agricultural sectors of the United States and Canada. This chapter begins with a brief background on the two sectors, then reviews their histories of farm policy developments before reporting new estimates of rates of assistance to their farmers and their consequences for taxpayers and consumers. This is followed by an explanation of the politics behind the evolution and gyrations in farm policies in the two countries, and some speculation on the prospect for reform. Since the policy histories and their effects in the two countries are somewhat different, they are discussed sequentially in those sections.

The number of farms in North America has been falling for decades, a well known story that has given the public a sense that agriculture is a hard-pressed industry in decline. What is less well known is that the decline has greatly slowed in the last twenty years. During the 1950s and 1960s the number of U.S. farms fell at the rate of 3.0 percent annually (falling by half in 20 years), but between 1995 and 2005 the number declined by 4 percent for the whole decade (Appendix Figure 1).[1]

To understand the situation it is necessary to look at the picture separately for farms of different sizes. The number of farms with sales over $500,000 annually quadrupled between 1978 and 2005, from 18,000 to 79,000. The number having sales between $100,000 and $500,000 has increased too. What is most surprising is that the number with sales of less than $25,000 per year has held quite steady. The category that has declined most significantly in recent decades are those between $25,000 and $100,000 in sales.

U.S. land in farms has been gradually declining too, at an annual rate of 0.4 percent since 1950, which over the years since then has added up to a loss of about 230 million acres of farmland. However, available cropland acreage has remained almost constant over this period, with 345 million acres harvested in 1950 and 321 million acres in 2005. Considering

[1] This chapter's coverage of the US draws to some extent on Gardner (2002).

the increase in irrigated and better-drained acreage, quality-adjusted cropland may even have increased slightly. Together with declining farm numbers, the acreage data imply an increase in the average size of farms. But as the decline in numbers has slowed a lot in recent decades, so has the growth in average farm size. In 2005 the average U.S. farm had 444 acres (180 ha.), and 30 years earlier the average size was 431 acres (175 ha.).

The number of farms in Canada peaked in 1941. In the 40 years between 1961 and 2001, Canada lost half its farms, their number declining from 480,000 to 246,000 (Appendix Figure 2). This is a rate of decline of 1.7 percent annually, faster than the U.S. rate of 1.4 percent during this period. Canada's land devoted to cultivated crops has declined over the 1960-2000 period also, but less rapidly than the number of farms, so that Canada had 111 hectares of cropland per farm in 1961 and 147 in 2001 (as compared to about 75 hectares of cropland per U.S. farm in 2002). Yields and value of output per hectare of cropland were however lower in Canada than in the U.S., reflecting the cooler and drier climate of Canada generally. Total agricultural land declined much more slowly in Canada than in the U.S., indeed hardly at all, from 69.8 million hectares in 1961 to 67.5 million in 2001.

While the number of farms is declining only slowly, the farm labor force continues to fall mainly because of less unpaid family labor other than the operator. At the same time, the use of material inputs (fertilizers, fuels, purchased feed additives) has doubled in the U.S. since 1950. USDA's aggregate input index is remarkably constant. It was 102 in both 1950 and 2000 (relative to a base of 1996=100). But agricultural output has continued to grow at a steady clip, so total factor productivity growth has been an impressive 1.9 percent per annum (Appendix Figure 3), with no evidence of slowdown in the trend in recent years despite energy price shocks, environmental constraints and concerns about exhaustion of TFP gains attributable to earlier breakthroughs in improved hybrid seeds and other innovations. So far continued advances in genetics, livestock management, capital equipment, and economies of scale have kept the real cost of U.S. farm products on a pronounced downward path. These cost declines have been largely reflected in lower prices of farm products and hence lower costs of raw materials for foods. While the average price of farm products rose 40 percent between 1978 and 2005 (1.2 percent per year), the GDP deflator rose at an annual rate of 3.2 percent. Thus the real price of agricultural output fell by an average of 2.0 percent during this period – essentially the same as the rate of TFP growth.

Overall farm size (in terms of total land and output per farm) increased in Canada at a rate faster than in the U.S. As of 2001, the average Canadian farm had 670 acres as compared

to 440 in the U.S. The more extensive nature of Canadian agriculture has not hindered output or productivity growth though: real output per farm increased more rapidly than farm size (Appendix Figure 4), reflecting increased yields per hectare and a strong trend in total factor productivity growth, which has been estimated to increase 2.5 percent annually in recent decades (Furtan 2006).

The fact that farm prices have fallen in real terms largely in parallel with cost decreases indicates that real incomes of farmers may not have benefited from farm productivity growth. Yet the incomes of farm people have in fact grown, in real dollar terms and relative to real incomes of the nonfarm population. Not only in the 1930s Depression/Dust Bowl years but also through the 1960s, farm households could be reasonably categorized as a low-income population. Sustained equality between the two populations was however reached by the 1990s, and since 2000 U.S. farm household incomes have been significantly higher than nonfarm incomes (Figure 1).

How has this income growth been achieved, given that the decline in real prices has equaled the decline in farmers' costs of production? The answer is the increasing importance of farm households' integration into the nonfarm economy, so that in recent years off-farm income sources account for 85 to 90 percent of average U.S. farm household incomes (Appendix Table 1). These data suggest that income from farming itself may indeed be quite low. However, a full understanding of the farm income data requires consideration of differences between farms of different sizes. Numerically a majority of farms, 87 percent of them in 2004, have less than $10,000 annually in sales. The costs of farming at this scale are such that these farms on average earned only $1,020 from farming, and more than half are estimated to have losses from their farm enterprises. Nonetheless, the average household income of these farms is $71,500 thanks to off-farm income. At the other end of the spectrum, family farms classified by USDA as commercial scale operations (those which have $250,000 or more in sales) earned an average of $145,300 from farming plus $46,038 from off-farm sources, and these latter farms produce more than two-thirds of U.S. agricultural output.[2]

[2] There is one category of farms in the USDA classification that has low incomes both from farming and from off-farm sources, called "limited resource farms". There were an estimated 199,000 such farms in 2004, ten percent of all farms, and their average household income was $7,700. Their average farm earnings was a loss of $5,900. Apart from these farms, the other 90 percent of U.S. farm households are doing well economically, either from farm or off-farm income sources. The data underlying this and subsequent information about farm household economics are developed by the Economic Research Service of USDA, using their Agricultural Resource Management Survey of about 10,000 farms annually.

Net income from farming in Canada over the five years 2001-05 averaged almost the same as the average U.S. net income per farm, and Canadian net farm income is similarly highly variable from year to year.[3] However, Canadian farm households receive on average less off-farm income than in the U.S.

Agricultural Policies

We begin with an extensive discussion of U.S. policies, and then discuss the somewhat different experience in Canada.

United States

Legislative proposals in the U.S. to improve the economic situation of farmers through governmental intervention in commodity markets were first developed conceptually as remedies for the precipitous fall in product prices in the aftermath of World War I. After several failed attempts to enact farm support bills in the 1920s, the further decline in agriculture's situation with the onset of the Great Depression of 1929-32 led to legislative success in the landmark New Deal programs beginning in 1933. These programs had the principal purposes of increasing the incomes of farm people (with an explicit goal stated in terms of "parity" of farm income with reference to a pre-World War I standard) and stabilization of farmers' revenues. The fateful choice was to attempt to achieve both these goals by means of supporting farmers' prices received for a subset of commodities ("basic" commodities in U.S. law -- initially wheat, corn, cotton, rice, tobacco, pork and milk).

Already in the 1930s the four main feasible means of market intervention in pursuit of higher producer receipts had been implemented for key commodities: production controls; government purchases of commodities for stockpiling at price support "loan rates" at which farmers could forfiet the basic commodities instead of making repayment of the loan plus interest; disposal of surplus stocks through distribution or subsidized sale for export or to domestic consumers; and direct payments to producers. The first direct payments, in 1933,

[3] For 2001-05 the annual net incomes per farm that yields the C$11 thousand average are, respectively: 11.0, 6.0, 11.1, 16.4, and 10.6 (Statistics Canada 2006).

were tied to farmers' idling of land or destruction of livestock, so from their inception they were not classical production-inducing subsidies.

In 1936 the U.S. Supreme Court ruled that the federal government had no authority to administer land-idling acreage controls under New Deal farm legislation, on the Constitutional grounds "that powers not granted are prohibited. None to regulate agricultural production is given, and therefore legislation by Congress for that purpose is forbidden." (U.S. Supreme Court 1936). Subsequently, the Court's alleged respect for precedent was not extended to this decision, and many later production control measures have passed Constitutional muster.[4] At the time, the result of the Court's decision was a merger of prior concerns about conservation with measures to remove acreage from commodity production. This was done in the Soil Conservation and Domestic Allotment Act of 1936 principally by defining "soil-depleting" crops (the main basic commodities) and "soil-conserving" crops (grasses and legumes), and paying farmers to substitute the latter for the former.

Trade policy was almost negligible in the 1930s' programs. The policy proposals of the 1920s, in contrast, had given a central role to export promotion. The Smoot-Hawley Tariff, signed into law in July 1930 (despite a petition to President Hoover signed by over 1,000 economists asking that he veto the bill) protected manufacturing much more than agricultural products. It is notable, however, that the crossover Democratic votes needed to pass the bill in the Senate (the Republicans then being the main protectionists and the Democrats free-traders) were lured by the desire to protect sugar (Louisiana), wool (Wyoming), and Florida fruit (Benedict 1953, p. 251). By 1934 it was clear that even these elevated tariffs were insufficient to protect sugar, and the first Sugar Act added sugar to the list of basic commodities, authorizing import and production quotas. With respect to overall agricultural trade, by 1934 the combination of Depression and trade restrictions in the US and elsewhere reduced both US agricultural exports and imports to about $600 million per year, one-sixth of the levels of 1920.

Experience during and after World War II made it apparent that export demand was capable of creating farm prosperity to an extent, and with far less cost and turmoil, than a decade of intensive effort by the federal government had been able to deliver in the 1930s. Under the Marshall Plan, U.S. exports of foodstuffs were 19 million tons annually in 1947-

[4] The Court changed its view in decisions of 1939 and 1942 upholding, respectively, tobacco and wheat marketing controls enacted in legislation of 1938 (Mulford v. Smith (1939) and Wickard v. Filburn (1942)). The reasoning was that agricultural production affected by such programs influenced national markets and so could be legislated under constitutional powers to regulate interstate commerce.

50, compared to 4 million tons in 1935-39. However, three aspects of the situation in the U.S. were obstacles to free-trade ideas in agriculture. First, the Marshall Plan and subsequent agricultural exports were in large part financed by subsidies rather than being bought abroad at world market prices. Second, U.S. commodity policy held some domestic commodity prices above world levels, so that import restrictions were vital to these policies (otherwise the program would have to support the world price and not just the U.S. price). Third, the relatively few US importable farm commodities, notably sugar, dairy products, and some meats and fruits, had sufficient political power to maintain protection via tariffs or quotas even when giving them up as part of a larger trade liberalization agreement would have been beneficial to the nation as a whole.

Section 22 of the Agricultural Adjustment Act of 1933 required import quotas to be imposed if imports threatened the effectiveness of a price support program. This situation led the United States to join Europe in pressing for a waiver of agricultural products from agreements of GATT members to reduce export subsidies or provide increased import access to their markets. Some experts argued vigorously for changing U.S. farm programs to make them compatible with liberal trade, notably in the "Brannan Plan" of 1948 and other proposals to replace production controls and price supports by payments to farmers and adjustment assistance (Johnson 1950). But U.S. policy did not turn to favoring the inclusion of agriculture in the GATT until the 1960s. By then European farm policy had decisively taken a protectionist path that precluded significant agricultural trade liberalization.

Beginning with the Agricultural Trade and Development Act of 1954 (P.L. 480), U.S. policy followed a path suggested by the Marshall Plan of using food aid to foreign countries as a mechanism for surplus disposal. During 1956-64 about one-fourth of U.S. agricultural exports that were shipped under this program. P.L. 480 exports had varying degrees of concessionary pricing, depending on the status of the importing country, but overall there is a substantial subsidy element in these exports. Since the 1970s the program has shipped a fairly constant amount of just under $1 billion in commodities annually. In addition, going back to 1935, government-provided export credit and guarantees of repayment to private sector lenders have been used to stimulate foreign demand for U.S. commodities. Exports have also been promoted through USDA grants to farm or commercial interests for the purpose of informational and sales efforts abroad. Revamped as the Marketing Assistance Program in 1990, such programs still spend about $100 million annually.

More explicit export subsidies were paid through most of the post-World War II period, most notably in wheat where their role was negotiated under the International Wheat Agreement starting in 1949.[5] In the 1960s more than 85 percent of U.S. wheat exports were assisted by subsidies. Then during the worldwide commodities boom of the 1970s it appeared that the era of export subsidies might be replaced by commodity scarcity, with trade policies restraining rather than subsidizing exports. The US embargoed grain shipments to the Soviet Union and a few other countries for short periods during 1974-80. Commodity scarcity proved temporary, however. The worldwide collapse in commodity prices of the 1980s provided the stimulus for export promotion programs. The European Community intensified its longstanding practice of export subsidies (Josling 2008). The U.S. began offering specific-destination export subsidies in retaliation in the early 1980s, and regularized this approach in the Export Enhancement Program, established under Executive authority of the Reagan Administration starting in 1983. Canada met the subsidy competition where feasible through pricing policies of the Canadian Wheat Board.

The Export Enhancement Program (EEP), like the pre-1970s export subsidies, was first and foremost a wheat program. It began as low-price government sales in North Africa in 1983 of wheat stocks held by the Commodity Credit Corporation (CCC) as a result of the domestic price support programs. The mechanism was complicated, using a payment-in-kind approach. USDA would determine particular countries and commodities for which it believed export subsidies would be helpful in selling U.S. products. Exporters would then negotiate a deal with a foreign buyer at a price discounted from prevailing world trading prices. The exporter would then apply to USDA for a payment sufficient to make up the difference between the market price and the negotiated discount price. USDA, if it approved the sale, would give the exporter sufficient wheat from CCC stocks to cover the payment, called the export "bonus." By the late 1980s the bonuses were adding up to a billion dollars annually, with over 80 percent of EEP commodities accounted for by wheat in 1985-89. The program was widened and generalized so that CCC wheat stocks could be used to subsidize exports of other commodities, and in 1990, when available CCC wheat stocks were exhausted, in-kind bonuses were replaced by cash.

[5] An earlier wheat agreement, in 1933, created a schedule of quotas limiting the shipments of wheat by exporting countries, but this proto-OPEC broke down and the agreement was allowed to expire in 1935 (Gale and Zaglits 1949). Explicit export subsidies were also implemented for a time early on in the New Deal, on Northwestern US wheat (Nourse, Davis, and Black 1935, pp. 93-95).

As the U.S. expanded its export subsidies in the 1980s, Europe and Canada, within their respective support structures, met the competition with increased export subsidies of their own. The Uruguay Round of GATT negotiations was a natural venue for mutual agreement to rein in this costly competition. After long and tortuous negotiations, the Uruguay Round Agreement on Agriculture (URAA) contained disciplines that, together with strategic rethinking and changed grain market conditions, greatly reduced the role of export subsidies after the mid-1990s in both the U.S. and European Union. Both have agreed such subsidies should be outlawed, and that has allowed farm policy discussion in the WTO's current Doha Round to focus primarily on market access (import protection via tariffs and quotas) and domestic price supports via subsidy payments to producers.

Import protection measures

International trade policy was a hot political issue in the U.S. a hundred years before the first domestic commodity support programs were enacted. Manufacturing interests of the North wanted protection and, after 1820, received it in the face of opposition from Southern agricultural interests who bought imported manufactured producer and consumer goods and also linked their capacity to export, cotton especially, to U.S. willingness to import from Europe. The North, to succeed politically, needed an alliance with the West, which was in place until the Jackson Presidency, when his vetoes of legislation for Western improvements changed the balance of interests in favor of lower tariffs, ultimately the "free trade tariff" legislation of 1846 which generated average tariff rates of 25 percent in 1850 (calculated from tariff receipts as a percentage of the value of dutiable imports) as compared to 57 percent in 1830. Higher tariff protection resumed after the Civil War, especially on manufactured goods, with average rates of about 40 percent between 1870 and 1910. Throughout this period there were tariffs on imported agricultural products such as wool and sugar, but rates averaged about 5 times as much for manufactured imports as for agricultural imports (Davis, Hughes, and McDougall 1965, Table 18-2, p. 327).

Table 1 shows the evolution of U.S. protection as measured by customs duties as a percentage of the value of imports. This measure does not always provide a good indicator of the trade effects of tariffs, notably because a tariff so high as to shut off all imports generates no customs duties and so counts the same as free trade in calculating the numerator of this measure. Irwin (2007) reviews this and other shortcomings of that Table 1 indicator, and estimates a Trade Restrictiveness Index (TRI) that takes into account the effect of a tariff on imported quantities and the fact that the distortive effects of a tariff increase more than

proportionately with the height of the tariff. His estimates indicate that for all merchandise trade, while customs duties as a percentage of all imports had fallen to 60 percent of the 1875 level in 1931, the TRI in 1931 remained at 97 pecent of its 1875 level, i.e., that the reduction in the crude measure greatly overstates the extent of liberalization. But between 1931 and 1960 the TRI fell faster than the crude measure and by 1960 the extent of overall trade liberalization between 1875 and 1960 was about the same for both measures. That is, by either measure, the restrictivenes of tariffs in the post-World War II period was about one-fourth the level of the late nineteenth century (Irwin 2007, Table 2).

Because the United States has always been a net exporter of agricultural goods, and imported manufactured goods are used directly and in the production of inputs used in farming, the tariff structure effectively taxed agriculture throughout the nineteenth century. The estimates of Irwin (2006) indicate that for the 1870-1900 period, an average 30 percent protection on imported goods (duties as a percentage of all import values including duty-free imports) generated a net subsidy to import-competing manufacturers of 15 percent and a net tax on agriculture (and other exporters) of about 11 percent.[6]

This situation was reversed by increasing protection (through both import restrictions and domestic support) of agriculture after 1920. Import duties on wheat, maize, wool, sugar, and meat were raised sharply in "emergency" legislation of 1921 and the Tariff Act of 1922 when "the representatives of the agricultural states had committed themselves to a policy of high and even ruthless protection" (Taussig 1931, pp. 452-53). At the same time, imports of many manufactured products used in farming were made duty-free.[7] After 1910, U.S. manufacturing became sufficiently export-oriented itself as not to be the strong political force for protection it once was, and after World War II protection of manufacturing steadily declined to the point that by 2000 import duties as a percentage of aggregate import value had declined to 1.6 percent (albeit with additional signficant protection of politically sensitive sectors such as textiles through non-tariff barriers). Tariffs on agricultural products were also reduced but protection from imports increased due to quantitative restrictions. In short, between the broad periods of 1820-1900 and 1930-2000 there was a substantial turnaround in

[6] Irwin's estimate of a net subsidy rate of 15 pecent is less than the tariff protection rate of 30 percent primarily because of the effect of higher import-competing goods in increasing costs of nontraded goods.

[7] It was such political successes of agriculture in tariff legislation that led H.L. Mencken to pillory farmers in one of his famous diatribes: "Has anyone heard of a farmer practising or advocating any political idea that was not absolutely self-seeking – that was not, in fact, deliberately designed to loot the rest of us to his gain? …There has never been a time, in good seasons or bad, when his hand were not itching for more…One might almost argue that the chief, and perhaps even only aim of legislation in These States is to succor and secure the farmer." (Mencken 1958, pp. 158-60).

manufacturing as compared to agricultural import protection. However, it was apparent already in the 1920s that too much agricultural production was exported to make import protection effective in alleviating farmers' losses in the post-World War I price plunge, and this changed the focus of farm policy to other measures.

Overall, the protection of agricultural products relative to merchandise in general continued to increase over the last fifty years. The rates of import protection of both sectors were equal in the late 1950s and 1960s, but the protection of manufacturing has since fallen faster than assistance to agriculture. It should be noted however, comparing market-distorting agricultural protection with merchandise tariff rates has become decreasingly relevant in capturing the main U.S. import protection elements in either agriculture or manufacturing, because in agriculture and in industries such as steel, automobiles, and textiles, the more important distortions of international trade have become quantitative restrictions, often in the form of "volutary restraint" agreements between the United States and exporting countries. More economically relevant measures compare internal U.S. prices with international prices for the same goods, as discussed below. Nonetheless, the picture remains essentially the same – that governmental action to assist agriculture is increasing in impact as compared to action to protect manufacturing.

Export subsidy measures

An indicator of the role of export subsidies can be obtained from the value of subsidies paid per unit quantity of exports. In the U.S. these have been most significant for wheat, as noted above. Subsidies were as high as $1.3 billion for exported wheat in 1993 under the Export Enhancement Program. The subsidies were targeted to particular sales, however, and not available for all exports. This raised questions about their efficacy in actually increasing the quantity exported. By focusing subsidy funding on particular sales, the government's expenditures were made more effective at increasing those targeted sales. Subsidized wheat received payment of as high as $43 per tonne in 1991. But at the same time large sales to other importers, notably Japan, were not subsidized at all.

Because of the targeted nature of the subsidies, the proper measurement of the subsidy, not to mention its effects on net exports, is difficult to nail down (as is the effects of the wheat export embargoes of the 1970s).[8] The USDA budget provides information on the range of export promotion activities. In FY2005 as in the prior few years there were no

[8] For estimates of effects of U.S. wheat export subsidies, see Gardner (1996). On the effects of grain export embargoes, see USDA (1986).

export subsidies under the EEP and also none under the more recent Dairy Export Enhancement Program. A total of $2.2 billion was spent on USDA's Foreign Agriculture Service (FAS) programs, but $1.7 billion of this was on food aid programs. Market development programs and export credit guarantees are export promotion activities that also have features making them similar to export subsidies. In FY2005, FAS spent $184 million on market development programs such as sending teams abroad to make the case for US commodities, and on informational campaigns in the US and abroad. Export Credit Guarantees covered $2.6 billion in sales during FY2005 (at a budgetary cost of $137 million, which is a rough indicator of the subsidy element of the program). In response to a WTO dispute resolution panel in 2005, the U.S. has eliminated some high-risk countries from the guarantees and made other changes "intended to remove any long-term subsidy component of the program" (USDA 2006, p. 38). Unlike import restrictions, whose effects can be estimated by comparing internal and world reference prices because they are focused on a few commodities and create big effects, these export programs are spread so thinly across many commodities that it would not be credible to attribute to them any observed elevation in U.S. commodity prices relative to foreign prices for the same commodities. What makes more sense is to treat these expenditures together with domestic programs as elements of overall non-product-specific support, following OECD practice.

Direct support of producers through commodity programs

Payments to producers have been a central element in US agricultural policy since the first New Deal programs of 1933. Figure 2 shows payments in billions of US$ in real terms using the GDP deflator with 2000 = 100. For comparison, the figure also shows the total level of spending on "commodity stabilization and support" as measured by the U.S. Office of Management and Budget. The spending levels are higher than payments prior to 1990 because much of the spending was for removing products from the market using stockpiling programs, purchases for sale to schools and other food assistance, or subsidized sales abroad. In recent years, spending has been overwhelmingly dominated by direct payments to producers.[9]

[9] The spike in spending relative to payments in 2000 is an artifact of government budgetary spending being reported on a Fiscal Year (October-September) basis while payments to farmers are reported on a calendar year basis. In 2000, an election year, Congress rushed to get payments to farmers that would normally have gone out after October 1, before October 1, and this resulted in payments that would normally have occurred in two fiscal years occurring in one calendar year.

Summarizing the effects of U.S. direct support programs is difficult because of the variety of policy instruments used and their evolution towards being increasingly decoupled from production decisions over time. Throughout the 1950s, the price suppport loan rates at which farmer could forfeit basic commodities to the CCC remained a primary policy instrument, and were reinforced by payments for idling land. By the 1960s, lower loan rates and direct payments to reduce forfietures at a supported price entered the policy arsenal. In the 1970s, the direct payments were further institutionalized in the form of "target prices" and payment to farmers of a "deficiency payment" when the price of basic crops they produced fell below the target. By the 1980s, deficiency payments were being made only on 85 precent of a farmer's base acreage, and for a historical level of "program yields." Thus deficiency payments came to be somewhat decoupled from production decisions, although the specific basic crop for which payments were received had to be grown on the corresponding base acreage. Farmers also had to comply with annual acreae reduction requirements to be eligible for the deficiency payments. Annual acrege reductions idled an average of 46 million acres during 1983-1988 as world agricultural prices collapsed in the mid-1980s, then fell to much lower levels.

Income support in the 1996 and 2002 Acts

The most important change in the 1996 Farm Act was its Title 1, the Agricultural Market Transition Act (AMTA). With rising world prices for the U.S. farm commodities in 1995 and 1996, AMTA replaced target prices, deficiency payments, and annual acreage set-asides for wheat, rice, feed grains, and cotton by a scheme of fixed "production flexibility" payments. The payments were based on amounts farmers received, or would have received if they had participated, in the pre-1996 deficiency payment program. The amount of the payment was independent of prices and was fixed by each farm's production history. It could not be increased or decreased by changes in the farm's acreage or yield of the program crops, while the program allowed farmers to plant a wide range of crops on base acreage (the reasons for the "production flexibility" label). The production flexibility payments were in this sense further decoupled from both prices and production, although payments were not divorced from all production decisions in that producers lost payments if they increased plantings of non-supported fruits or vegetables or they left farming completely. The aggregate of payments was scheduled to decline from about $6 billion annually in 1996 and 1997 to $4 billion in 2002. AMTA payments constituted the bulk of projected commodity support in

1996, and the projections were for substantially less government spending on commodity programs than had occurred before 1995, as Figure 3 shows.

The 2002 Act

Within a year after the 1996 Act was introduced, commodity prices had begun to fall substantially. With the 1998 crops it became clear that prices were likely to remain at low levels for some time. The Asian financial crisis and China's lack of an expected increase in imports weakened world demand and hence U.S. exports and prices. These low prices triggered two policy responses, one automatically and one through Congressional response. The automatic response came through the "marketing loan" program. This program was introduced in 1990 to replace the former loan rate program of supported market prices through forfeitures of commodities at an established "loan rate" price. The forfieture program had created a market price floor at the loan-rate price (because farmers could always get that price through the loan program). To keep this program from resulting in the government accumulating unwanted stocks of commodities, loan-rate prices were mostly kept below actual average prices after the 1960s. The marketing loan program precluded stock accumulation altogether by having the government not actually acquire grain but instead offer farmers a "loan deficiency payment" equal to the difference between the policy-determined loan-rate price (which varied from county to county) and the local county price. Because the loan-rate prices were set below average prices, hardly any loan deficiency payments were made during 1990-1997. But by 1998 commodity prices fell below loan-rate levels sufficiently to trigger $500 million in loan deficiency payments. Unlike the target-price-related deficiency payments paid on a historically fixed level of output, the loan deficiency payments are made on all of current output. In Fiscal Years 1999, 2000, and 2001 these payments rose to $3.4, $6.4, and $5.3 billion, respectively, as all the grains, cotton, and rice experienced continuing historically low market price levels.

The Congressional response to these low prices was to enact emergency "market loss assistance" programs in each of the years 1998-2001. These programs provided an average of $4.8 billion annually for those four years, added proportionally to each farmer's production flexibility payments (in most cases doubling them during 1999-2001).

These two added sources of spending are the main factors that account for the huge expansion of commodity program spending during 1998-2001, as compared to the levels

anticipated in 1996, shown in Figure 3. Instead of the roughly $6 billion annually that had been expected, actual spending averaged over $20 billion in those years.

By 2001 it was clear that Congress was sufficiently dissatisfied with the political wrangling involved with annual emergency legislation that more permanent revision of the 1996 Act would be legislated. The Farm Security and Rural Investment Act of 2002 provided for additional spending on farm programs of more than $50 billion over and above projected "baseline" spending if the 1996 Act had been continued. This increase was possible because at that time the U.S. budget was in surplus and was projected to continue in surplus, and because farm commodity producers had sufficient political power to defeat competitors for the funds available. This expanded commitment is the most significant, and to some most shocking, aspect of the 2002 Act.[10]

In addition to the issue of spending levels, the 2002 Act addressed structural issues in the form and scope of farm subsidies. Some farm groups, mainly centered in Great Plains wheat growing, wanted to return to supply management, in order to reduce production and increase commodity prices. Environmental groups pushed to have a substantial part of the new spending allocated to conservation and environment-improving programs. The legislation as enacted continued the fixed production flexibility payments from 1996 (renamed fixed direct payments). Supply management was rejected but a new "Countercyclical Payment Program" was added to provide payments that rise or fall inversely with market prices (although the quantity base for payments remained fixed, with an option for one-time updating to 2002, for each farmer). This amounted basically to a re-institution of pre-1996 deficiency payments, but without annual acreage reduction set-aside requirements and with farmers retaining the planting flexibility introduced in 1996. In addition, earlier production quotas for peanuts were replaced with strengthened support programs similar to the other program crops and a new program of direct support payments for milk was added. Conservation and environmental programs ended up with a substantial share of the new spending, but not as much as the proponents of these programs had argued for.

[10] A Washington Post editorial termed the bill "The Mother of All Pork." *Business Week* magazine opined: "It's a dreadful piece of legislation – bad for most farmers, bad for consumers, and horrendous for taxpayers" (May 7, 2002). *The New York Times* editorialized against the Act on several occasions, notably in one entitle "The Hypocrisy of Farm Subsidies" (December 1, 2002).

The Congressional Budget Office (CBO) estimated that the innovations of the Act would cost an average of $8.0 billion over the ten Fiscal Years 2002-11.[11] Of this, $4.5 billion were for direct payments to farmers under either the fixed payments or the mandated new Countercyclical Payment Program. In addition were estimated 10-year spending increases of $0.5 billion in marketing loans and loan deficiency payments, $0.5 billion for the new peanut program, $160 million for the new dairy program, and $43 million for increasing support in the sugar program, partly offset by savings projected at $26 million from tightening payment limitation slightly, for a total of a $5.7 billion average annual spending increase for all commodity programs (Title I of the Act). New initiatives in the Conservation Reserve Program and the Wetlands Reserve Program (both long-term paid land-idling programs that have enrolled a total of over 30 million acres since 1990), as well as the Environmental Quality Improvement Program, the Farmland Protection Program, and a new Conservation Security Program were projected to cost $1.3 billion annually over ten years (FAPRI 2002a). The expanded costs of these programs consisted mostly of payment made to farmers to encourage the use of soil conservation or water quality improvement practices. Some of the practices reduce production, such as replacing cultivated crops near streams or lakes with "filter strips" of grass in the Conservation or Wetlands Reserve Program. Other "working lands" programs are roughly neutral with respect to production or even increase production, such as Farmland Protection Program payments to farmers in exchange for their maintaining land in farming rather than selling it for commercial development.

Apendix Table 3 shows details by program of spending on farm support. Total outlays in FY 2003 and 2004 were lower than projected because commodity prices higher than had been projected resulted in less spending than had been forecast on countercyclical payments and loan deficiency payments, both of which are lower the higher are commodity prices. But in FY2005 these payments increased as commodity prices fell.

Overall summary of market-distorting support

Table 2(a) shows the NRAs for key agricultural products, which are partly based on the OECD's producer support estimates for 1986-07, and the author's use of their method back to 1955. This measure of NRAs excludes the deficiency, production flexibility and fixed direct payments, and the market loss assistance and countercyclical payments. These various

[11] Ten-year projected spending was estimated in accordance with Congressional budgetary procedures, even though the Act only authorized programs for the six years 2002-07. The "baseline budget scoring" assumption is that those programs will be reauthorized to cover the ten-year period.

support payments have been at the heart of U.S. farm policies, as described above, but have become increasingly "decoupled" from producion decisions and arguably can now be concluded to have minimal or at least small effects on production or trade (see the Appendix for further discussion).[12] The main policies included in the NRAs in Table 2(a) are: import protection, most notably for sugar, but also for dairy products and meats; export subsidies, most notably the Export Enhancement Program and earlier export subsidies for wheat, but also affecting rice and poultry in some years; and the various loan-related payments to producers that a producer can increase by increasing output, which are closest to a classical production subsidy. Plotting these data separately for exported products and for imported products that compete with US products shows somewhat higher rates of assistance for importables (Figure 4(a)). Given the dominance of exportables in overall US production, its line in Figure 4(a) is close to the line for all covered products.

The NRAs vary greatly across commodities, as summarized in the dispersion measure shown in the 2nd to last row of Table 2(a), and even more so if the other products that get negligible support are considered (the latter accounting in aggregate for one-third of the value of U.S. agricultural production at undistorted prices, see bottom row of Table 2(a)).

Appendix Table 4 describes support through various government payments (including those excluded from Table 2(a) which we term "decoupled") for the top 25 commodities, accounting for 91 percent of the U.S. farm value of production in 2004. Overall, commodities accounting for 42 percent of production received significant support, with payments amounting to 6.9 percent of the value of production in 2004. Yet 14 of the top 25 commodities, and a total of 58 percent of the value of production, received no significant support. Appendix Table 5 shows a broader picture of U.S. federal government activity in support of agriculture. In addition to the commodity programs there are conservation programs, export programs, governmentally underwritten loan programs for farmers, crop insurance, research funding, and marketing and regulatory programs. These additional activities have a price tag of $15 billion in 2005.[13] The sum of $34.1 billion for FY 2005

[12] That argument is harder to make for the 1980s when these payments were tied to significant annual land idling requirements and it ignores wealth effects, insurance effects, and remaining production restrictions, as discussed in the Appendix. Whether any of thes effects are quantitatively important is an empirical question. While impossible to estimate with precision from the data available, the analysis to date suggests these effects are small.

[13] "Price tag" is a vague term and is used because the figures shown in Appendix Table 5 are not all derived from a consistent set of U.S. budgetary concepts. Most notably, the export credit guarantees are not the expenditures of the government on these guarantees; rather they are the value of loans guaranteed. Unless there are defaults on these loans (funds borrowed by foreign importers to buy U.S. exports are not repaid to the U.S.

amounts to 14 percent of the market value of U.S. farm cash receipts for all crops and livestock.

Canada

Canada remained a British colony during the early period of U.S. trade policy, and did not introduce substantial tariff protection of manufacturing until the 1870s, and then at less than the U.S. levels (Fowke 1946, Ch. 10). Agricultural protection became important earlier, notably with wheat import tariffs directly against U.S. exports (and U.S. duties levied on Canadian grain exports). The signficance of particular policy steps has been debated, but a convincing case can be made that "The tariff (of 1843) was a true break in the old colonial system, and was brought about, not by capitalists seeking to establish new industries, but by pioneer farmers trying to exclude outsiders from the local markets" (Jones 1941, p. 537). Thus, while attempts to measure the relative protection of manufacturing and agriculture comparable to those cited above by Irwin for the United State for the nineteenth century are not available for Canada, it seems clear that agriculture was never implicitly taxed in Canada the way it was in the U.S. (or in Australia and New Zealand – see Anderson et al. 2008).

With respect to the context of agricultural support, Canadian agriculture varies substantially from east to west in cropping patterns and size of farms, in ways roughly parallel to corresponding U.S. areas south of the border. In those parallel areas there are many similarities, notably between the Prairie provinces and the Northern Plains. However, the history of policy and current practices in the two countries are quite distinct in several respects.

In the Great Depression of the 1930s, Canadian farmers were hit as hard as in the U.S., in both countries with particular severity in the Prairies. The Canadian government provided some debt relief through the Prairie Farm Rehabilitation Act of 1935, but Canada did not introduce an integrated set of programs or make substantial income transfers to farmers as the New Deal did in the U.S. Indeed it is arguable that at that time and still to the present day, while a series of ad hoc programs have been implemented Canada has no comprehensive farm policy comparable to the omnibus U.S. farm bills. This is attributable at least in part to Canada's more decentralized political system, under which many policies are Provincial rather the Federal, notably in the marketing area where Provinces have set up

---

lenders) the actual outlays on these programs is negligible. In fact, defaults are rare. In U.S. budgetary parlance, the value of loans guaranteed is the "program level", and this is what the USDA budget summary shows.

marketing legislation for fruits and animal products going back to 1926 (see Schmitz, Furtan, and Baylis 2002, Ch. 2).

The first major federal support of the U.S. type was provided under the Agricultural Stabilization Act of 1958. This program guaranteed producers 80 percent of the average price over the previous ten years, by means of payments from the federal government. Only small payments were made, and in 1975 the payment trigger was raised to 90 percent of a five-year moving average price and a mechanism was introduced for compensating farmers for rapid increases in cash costs of production, which "indicated the Canadian Government's continuing commitment to ensuring short-term solvency in agriculture" (OECD 1978, p. 29).

Canada's agricultural policies for grains and oilseeds have followed to an extent a path similar in some respects to those of the United States, but with less reliance on crop supply management through acreage controls and with more reliance on collective marketing most notably through the Canadian Wheat Board. The CWB has a legal monopoly on the sales of Canadian wheat and barley into foreign markets -- all exports as well as sales of wheat to domestic millers of flour must be sold through that agency. Farmers then get a pooled price depending on the receipts the CWB is able to earn from the exported and domestically sold commodities. The monopoly powers of the CWB have been challenged in Canadian courts, much as the original U.S. programs of the 1930s were in the U.S. courts, on constitutional grounds. In a case brought in 1994, a group of barley growers sued the CWB, arguing that it "breached the rights of individual farmers guaranteed under the Canadian Charter of Rights and Freedoms" (Schmitz and Furtan 2000, p. 145). The plaintiffs' plea was rejected (and following Canadian law they had to pay court costs of the defendants – the government of Canada).

The year 1995 was a watershed in that, under pressure because of federal budgetary deficits and the Uruguay Round Agriculture Agreement's disciplines on export subsidies, transportation subsidies under the Western Grain Transportation Act were ended. These had cost an average of about $(US)12 per tonne of grain and their elimination was estimated to have saved the federal government about $(US) 400 million in 1995.

With respect to income support for producers, Canada has undertaken far-reaching experimentation in its series of grain programs over the last 30 years. The Western Grains Stabilization Program (WGSP), initially enacted in 1976, made payments from a fund partly financed by growers when their aggregate cash receipts from grains fell below a 5-year

moving average. After accumulating large deficits without providing satisfactory income protection to producers, the WGSP was abandoned.

The Farm Income Protection Act of 1991 marked an important turning point in Canada's approach to farm support in crop production, moving from policies aimed at particular commodities toward a whole-farm approach. The 1991 Act introduced the Gross Revenue Insurance Program (GRIP) and the Net Income Stabilization Account (NISA). These programs were tuned to each producer's situation, with GRIP making crop-specific payments to producers when their production times the market-wide average market price fell below that producer's established average yield times a "target" price. The program was packaged as insurance in that each producer paid a premium for this coverage (but about two-thirds of the premium cost was paid by a combination of provincial and federal funds).

GRIP combined features of the U.S. deficiency payment and subsidized crop insurance programs, and its comprehensive approach has attractive features. But it proved to have too little political support from farmers to justify its budgetary costs in the belt-tightening environment of the mid-1990s, and GRIP expired after 1995. NISA, a more broadly conceived (avoiding support of specific commodities) and less costly program, continued until another decade. It is essentially a subsidized savings account into which producers can contribute 2 percent of the value of qualifying grain sales, to be matched by 1 percent each from provincial and federal governments. The producer can withdraw funds from the account if either annual farm operating income or family income falls below established triggers (see Huff (no date) and Gray and Smith (1997) for further discussion).

In 1998 Canada introduced the Agricultural Income Disaster Assistance (AIDA) program. Under that program, funded 60 percent by federal and 40 percent by provincial governments, anyone who files income tax returns as a farmer can get an indemnity payment if their gross returns fall below 70 percent of the similarly calculated returns over the average of the three preceding years (Edelman 1999; Schmitz, Furtan and Baylis 2002). In 2001, the Canadian Farm Income Program (CFIP) replaced AIDA. The experimental nature of farm income support has been intensified since 2004 with the phasing out of NISA and AIDA, and replacement with new and ad hoc programs.

The Canadian Agricultural Income Stabilization (CAIS) Program, introduced in 2003/04, combines insurance and income support features. It makes payments to producers when a farmer's "production margin" falls below the "reference margin" for the farm, calculated from previous years' experience. The reference margin is a measure of returns

minus costs that counts fewer expense items than under previous programs, because "Experience with previous farm programs such as the CFIP indicated that including a high number of allowable expenses often resulted in reference margins being low and in many case negative. This often resulted in producers being ineligible for benefits." (Agriculture and Agri-Food Canada 2006).

In response to the losses resulting from the Bovine Spongiform Encephalopathy (BSE) crisis which devastated the beef export business, and as a "bridge" to the CAIS Program, the Transitional Income Support Program was introduced in 2004 to assist both livestock and grain producers. This program together with more liberal payouts under the CAIS raised the costs of farm support in 2003-05 as compared to earlier years. In 2006 the government introduced payments under the Grains and Oilseeds Program (GOPP) that will further increase support.

The 21st century programs are organized and marketed under the Agricultural Policy Framework, which the Government of Canada and the provinces/territories agreed upon in late 2003 to coordinate agricultural policy under five headings: Business Risk Management, Environment, Food Safety and Quality, Innovation, and Renewal (see Agriculture and Agri-Food Canada 2005). The latter two areas comprehend what are traditionally described as rural development and research/extension programs. Business Risk Management covers CAIS and the more recent payment programs. All of the programs have notable differences in funding and delivery from province to province.

Unlike for grains, Canada has maintained supply management programs with strong control measures for dairy, poultry, and eggs. This is in sharp contrast to the U.S. where supply management in livestock is entirely absent.[14] Canada's supply management history grew out of Provincial marketing board which had become well established by the 1960s (Schmitz, Furtan and Baylis 2002 Ch. 9). The Canadian Dairy Commission, created in 1966, introduced supply management ideas which culminated in market-share quotas, under which a farmer must have an established quota in order to sell milk. Import quotas (under the Uruguay Round Agriculture Agreement converted to tariff-rate quotas) keep milk from entering Canada at the high domestic price established for milk sold at retail, while milk for processed dairy products is sold at lower prices to be competitive in world markets. Similar but less complex supply management programs exist for broilers (chickens), eggs, and turkeys.

[14] In the original programs of the 1930s there were U.S. supply control efforts in livestock, but the only significant such program since 1955 is the Dairy Herd Buyout Program of the mid-1980s.

Overall summary of market-distorting support

Table 2(b) shows the NRAs for key agricultural products, which again are partly based on the OECD's producer support estimates for 1979-07, and the author's use of their method back to 1961. These products cover between 75 and 85 pecent of Canadian agriculture. The average NRA for those covered products was around 8 percent up to the mid-1970s, rose to 28.6 pecent during the export price war period of 1985-89, but has since come back to around 12 percent. The dispersion in NRAs across the product range also rose substantially up to the mid-1980s and has more than halved since then. As usual, the estimated NRA for importables is well above that of exportables according to our classification based on trade status – and well above the average importables NRA for the U.S.

Agricultural relative to non-agricultural support

To get a more-complete picture of the policy distortions to farmer incentives in North America, we first provide 'guesstimates' of the NRAs for non-covered products (a weighted average across exportables, import-competing products and nontradables), we then add non-product-specific support such as input subsidies, and also add what we term "decoupled support" as measured by certain OECD categories of its Producer Support Estimates (PSEs) over the past 3 decades. As well, we compare the NRA for tradable farm products (including non-product-specific support but not decoupled payments) with the NRA for non-agricultural tradables by calculating a Relative Rate of Assistance. These are summarized in Table 3.

Input subsidies and other non-product-specific assistance is of non-trivial importance to the overall NRA for agriculture in North America as compared with the rest of the world, adding between one-quarter and one-third to the sectoral NRA in the U.S and only slightly less in Canada. In this category are included payments based on input use (OECD E1) and miscellaneous payments (OECD H).

Of even more importance is what we have termed as 'decoupled' payments, which are assumed to encourage production less than market price support policies. Following certain OECD categories, we include here not only the various commodity income support payments described above as increasingly decoupled from prices and production over time, but also payments made for long-term acreage idling under programs such as the Conservation Reserve Program and also subsidies for crop insurance and ad hoc annual disaster payments

(see note to Table 3 for the OECD categories included).[15] As can be seen from Table 3(a) and Figure 5(a), those decoupled payments nearly doubled the NRA for the U.S. in the mid-1980s, and added about one-third in the 1990s and the present decade. For Canada such 'decoupled' payments have been somewhat less important although still non-trivial (Table 3(b) and Figure 5(b)).

As pointed out above, it is difficult to summarize the effects of U.S. support programs because of the variety of policy instruments used. Although any estimate is conjectural, the set of most-reasonable estimates indicate that in the 1999-2005 period the marketing loan program has increased the U.S. output of grains and soybeans by about 2 percent, the direct payment program, including the 2002 Act's changes, about 1 percent, and crop insurance subsidies by 1+ percent, for a total effect of 4 to 5 percent more of these commodities being produced than would have been the case in the absence of commodity support programs. The long-run consequences (on conservation, agricultural research, technology adoption) of commodity support policies are a quite different matter not considered here.

Looking at the levels of border protection and domestic support payments themselves, overall government support for farmers in the U.S. rose in the decade or so from the mid-1970s (having fallen in the two decades prior to that). It has since fallen back slightly even when decoupled payments are included, although the level was as nearly as high during the period of low world agricultural prices during 2000-2004 as it was when prices were low in the late 1980s (see Table 3). It dropped substantially after 2005 as international food prices spiked, but this does not represent a change in policy so much as the countercyclical design of some US payments and a reduced need to support farmers because of higher prices. Support for farmers in Canada too rose steeply in the decade or so from the mid-1970s, but has since fallen back even more than in the U.S. especially when decoupled payments are

[15] Neither our categories "non-product specific" nor "decoupled" correspond directly to uses of these terms in WTO domestic support notifications or as has occurred in dispute settlement arguments. To illustrate, the NPS for 1986-2007 herein includes diesel fuel tax exemptions not reported by the US to the WTO under the URAA category of NPS, while it excludes crop and revenue insurance subsidies that are reported as WTO NPS support. The "decoupled" category herein includes not only the "decoupled income support" as defined in URAA Annex 2 as WTO Green Box (which is how the US reports its fixed direct payments); also included in this category is the countercyclical payments that the US reports as NPS. Subtleties in distinguishing between these categories of payments are discussed in the Appendix and both classifications are being subject to WTO dispute settlement litegation. The decoupled support herein also includes conservation payments (both for long-term land-idling and working lands) that are reported to the WTO by the U.S. as green box and the crop and revenue insurance subsidies reported to the WTO as NPS support. The use of these terms herein also differs from common classifications in U.S. farm bill discussions and budgets that, for example, often clearly separate commodity support from conservation expenditures.

taken into account. As in the U.S., the NRA for Canada dropped substantially after the early 2000s as international food prices rose.

By contrast, assistance to producers of non-agricultural tradable goods has been lower than for farmers throughout this period, and has declined more than for the farm sector. Hence even leaving decoupled payments aside, the rate of assistance to producers of agricultural products *relative* to those producing non-agricultural goods is now considerably higher than in the early 1960s in the U.S., other than in the years of historically high international prices, namely 1995 and 2006-07 (Table 3(a) and Figure 6(a)). The 2008 Farm Bill left the existing support programs in place and created others that could raise expenditures even if agricultural prices remain higher than they generally were during 1990-2006.[16] Assistance to Canada's producers of non-agricultural tradable goods, too, has been lower than for farmers since the mid-1960s, and has declined more than for Canada's farm sector and more than in the U.S. Hence the relative rate of assistance to the farmers became considerably higher in the 1980s than in earlier decades, but in the 1990s it returned to levels similar to those in the U.S., again with the lowest levels being in the years of historically high international prices, namely 1995 and 2007 (Table 3(b) and Figure 6(b)).

When expressed in real (constant 2000) dollars instead of percentage price wedges, the decine in border and domestic support recently is much less evident, because over time the value of the farm sector has been growing and the number of farmers shrinking. The peak real value of support in total dollars was higher in the latter 1980s than this decade, but when expressed on a per farmer basis it was even higher in 2000-04 (before international food prices rose) than in 1985-89. When the market price support compenent is expressed by product, the lion's share in recent decades has gone to dairy and sugar, which receive more border protection than cotton and maize (Table 4).

Consumer tax equivalents

While much of the support for farmers worldwide comes from border measures, in the case of North America there are also large shares that come from non-product-specific meaures and from payments that are decoupled somewhat from production. Hence consumers there are not taxed to the same extent as producers are assisted – although taxpayers bear additional costs. And, because of the differing net trade status of each product, the weighted average of ad

[16] See Orden, Blandford and Josling (2008) for discussion of the 2008 US Farm Act.

valorem consumer tax equivalents across all covered farm products differs also because consumption instead of production weights are used. There are also direct consumer subsidies in the U.S., notably through the food stamp program, and in some years for some products those direct subsidies more than offset the tax component of the trade measures used there to support producer prices, resulting in negative CTEs. The rises and falls in the degree of distortion on the consumption side of the market can be seen in Table 5.

Part (b) of that table shows how trivial these transfers from or to food consumers in North America have been on a per capita basis. Even in Canada they amount to only $154 or less per capita per year. This, together with the free rider problem associated with collective action, helps explain why consumers in that region do not counter-lobby farmers over farm support programs. It also means the trade and national economic welfare effects of U.S. programs are less than programs delivering the same NRA for farmers in other countries but via trade measures which generate a CTE equal to the NRA.

The Politics of U.S. and Canadian Policies

Explaining the political forces behind U.S. and Canadian agricultural policies requires qualitative rather than quantitative analysis, but the contrasts between the political treatment of commodities within and between the two countries suggests several hypotheses. I will discuss the following: (1) historical legacies of commodity producer cooperation, (2) the importance of supply-chain participant cohesion, and the linkage of that with technological change, (3) the role of budgetary pressures, and (4) the inherent weakness of opposition to agricultural support. There are both economic and cultural factors lying behind each of these.[17]

The importance of a historical legacy of producer cooperation was emphasized by Olson (1985). He noted the traditional and continuing strength of the dairy industry and traced that back to the long-standing organization of producers in marketing cooperatives. His underlying point is that lobbying is a voluntary collective activity of precisely the kind highly susceptible to free-rider problems, that this is in fact the chief hurdle to an interest group obtaining subsidies, and that cooperative organizations have already solved this

[17] For more on the political economy of U.S. farm policy, see Gardner (2002) and Orden, Paarlberg and Roe (1999).

problem sufficiently to permit effective lobbying. This hypothesis fits well with what would otherwise be perhaps the chief puzzle in Canadian as compared to U.S. agricultural support, namely why poultry has had a well entrenched support system via supply control and import protection in Canada but gets virtually nothing in the U.S. As Schmitz, Furtan, and Baylis (2002) explain it, supply control measures grew out of cooperative activity in those commodities by provincial producer organizations. But there were no corresponding such poultry organizations in the U.S.

Of course the efficacy of lobbying depends not only on getting organized to make one's case, but also on the legislators' listening and acting favorably. It is almost axiomatic that legislators have an interest in listening to their electorate, who hire and fire them. But a legislator cannot act in accord with the requests of all his or her constituents. Why do agricultural commodity interests get heard well in so many cases? Traditionally U.S. farmers were said to have a political advantage because of the structure of Congress, which has two Senators for every state, which means one representing each 300,000 residents of the Dakotas, Wyoming, and Montana and one for each 20 million residents of California. However, recent efforts at reform (such as taking payments away from producers who have over a million dollars in off-farm income) have been defeated in the House (where each Representative equally has about 600,000 resident constituents) as soundly as in the Senate.

The general principal of representation is that a legislator whenever possible provides the constituents what they ask for. What confounds the efficacy of asking is competing constituents who ask for policies that conflict. A strength of cotton growers is that they present to the agriculture committees of Congress a unified position of the supply chain including growers, ginners, shippers, and millers. This has led to policies like the "step two" payments to cotton textile millers that compensate them for paying prices for cotton that exceed the low world prices that trigger payments to cotton growers (until stopped, to comply with a WTO ruling). Similarly a strength of the corn growers is that they have powerful agribusiness allies who support ethanol subsidies, and a former weakness of the grain producers was their asking for acreage control measures that restricted raw material supplies for such agribusiness (former because the 1996 Farm Act revoked the authority of the Secretary of Agriculture to administer annual acreage reduction programs that until the 1990s were a key feature of grains policy). Cross-commodity dispute is a related problem, arising, for example, on the part of fruit and vegetable growers left out of "decoupled" payment

programs. Similarly, a strength of sugar import restrictions politically is that high sugar prices have created a large market for corn-based sweeteners.

Monetary contributions help in getting an interest group's case listened to. Farmers are not notably profligate donors, but agricultural Political Action Committees (PACs) have been important in the U.S. Table 6 summarizes PAC donations to politicians or candidates reported during the 2006 election cycle (Nov. 2004 – Oct. 2006). These data are from the legally required reporting of PACs for donations over $100,000, and do not capture all political spending. The $6.7 million they donated may seem a lot, but there were 1,200 non-agricultural PACs that spent over $100,000 in the U.S. during this period, and their aggregate spending was $800 million. The largest agricultural PAC, the Sugar Alliance, ranked 154th of the 1,200. Agriculture's share of the spending, 6.7/800 or just under 1 percent, is about the same as agriculture's share of national GDP. Overall spending by PACs in the broad Standard Industrial Classification code for agriculture was $15 million, but the majority of this was from agribusiness firms, notably Deere, Deans Foods, the International Dairy Foods Association, Cargill, Tysons, Archer-Daniel-Midlands, Conagra, and Heinz Foods. These companies have interests that are often the same as the commodity producers' interests, but not always, and what the agribusiness firms focus on in their lobbying is more typically their own specific issues of concern. In short, it does not appear likely that money is the source of farmers' exceptional political influence.

Technical or other exogenous economic changes create diverse interests within a commodity group that can make policy-making aimed at benefiting the group as a whole unattractive to legislators. This happened in the most notable case of a formerly important commodity program that totally disappeared, the U.S. potato price support program. During 1945-1950, the potato program became highly contentious and eventually died because the growing Western potato growers could produce profitably at lower prices than the support levels that prevailed, and saw their market potentially capped by restraints needed to control the costs of the support system (which then relied heavily on production control for the main supported commodities). Similarly the long-standing marketing order pricing systems for California oranges and lemons was ended in the 1990s, mainly because of within-industry disagreement about its operation; and differing interests of peanut and tobacco farmers with and without quotas to produce for the high-priced domestic market contributed to demise of these quota program earlier this decade.

One might expect consumer interests to oppose farm legislation that would increase food prices, but this has only rarely surfaced as a significant political force (the notable case being U.S. grain export embargoes of the 1970s). This lack of opposition seems to be associated with longstanding positive feelings that the general public has about farmers and farming. A broad-based source of resistance to agricultural support that has been effective is budgetary pressure at times when fiscal discipline is perceived to be a high priority. In both the 1985 and 1990 farm legislation, reductions in payments were enacted in order that farm bills could meet overall Congressional budget limits. The 1996 farm legislation was also designed to limit subsidy expenditures, but that budget discipline quickly broke down. As noted earlier, the Farm Security and Rural Investment Act of 2002 covering crops planted in 2002-2007 increased spending well above baseline levels from continuation of the legisltation it replaced. This Act was popular in Congress, having passed in the House of Representatives by a vote of 280 to 141 and in the Senate by 64 to 35. The Bush Administration did not raise serious objections and the President signed the bill in the presence of farm-group representatives with words of praise.[18] However, small-farm and environmental advocacy groups were unhappy that amendments failed that would have imposed more stringent payment limits on large farms, redirected some commodity program payments to conservation/environmental programs, and imposed various regulatory restraints on agribusiness. Outside the community of agricultural interests, the 2002 Act has been widely reviled, as mentioned earlier.[19] And just after the Act was passed, three western Provinces of Canada, along with a dozen Canadian farm groups, asked for $C1.3 billion to offset the effects of the new U.S. payments. Since that time, Canada has raised its payments to producers too, as herein described.

Prospects for Reform

[18] As a reminder that Presidents do not always accept what Congress delivers in support of agriculture, President Reagan in 1985 vetoed a farm bill on budgetary grounds, in the midst of the farm crisis of the 1980s. Congress could not muster the two-thirds majorities needed to override the veto, so the President's action was decisive.

[19] It is also notable that the more market-oriented members of Congress, even if they represent agricultural constituencies, opposed the bill. Among the opponents were not only the House Republican leadership, but also members of the Agriculture Committee such as Boehmer (R-Ohio) and Dooley (D-California), who wrote a Washington Post opinion piece entitled "This Terrible Farm Bill" (May 2, 2002). Similarly strong opposition was voiced in the Senate by Richard Lugar (R-Indiana) the senior Republican on the Senate's Agriculture Committee.

Both the United States and Canada have enacted agricultural support programs that have distorted their domestic commodity markets. Considering how similar the countries are in many respects, there are some notable differences between the policy approaches in the two countries in the choice of policy instruments. But the similarities are more fundamental, and the ones that bear on the prospects for reform are: (1) strong political resilience of support for farmers, (2) weak political expression of consumers' interests, (3) trends toward less reliance on measures that seek to control prices in particular markets (via stockpiling, supply management, import tariffs), (4) trends toward more reliance on whole-farm income support (especially in Canada) and payments under commodity programs that are de-linked from current production (U.S.), (5) acceptance of multilateral liberalization of agricultural trade, but only with maintenance of protection for some producer interests, (6) modest increases in political influence of environmental protection, and (7) episodic political strength of taxpayer interests in cutting farm-support spending, under circumstances that give general budget reduction. The result of these forces and trends has been that real spending on agricultural support has not diminished over time even as the share of the agricultural sector in the overall economy has diminished greatly, while at the same time both countries have moved in the last fifteen years in the direction of reduced directly market-distorting policies. In the face of historically low commodity prices 1998-2002 the U.S. maintained policies that have forestalled output reductions that these low prices would otherwise have induced.

What options does the preceding summary suggest for reform? First, the best prospects remain international negotiations, most notably the Doha Round. Given the failure of the Doha Round so far, this is perhaps a depressing conclusion. Nonetheless, it remains the case that the U.S. and Canada would sign on to such an agreement if it involved provisions that reform proponents could point to as offsetting gains in agricultural export markets. Second, there remain prospects that a combination of environmental/taxpayer interests could shift agricultural support spending toward public-good provision in ways that would be less market-distorting than are current policies.[20] Reforms in this direction were formulated and promoted by several organized coalitions of interests in preparation for the 2008 U.S. farm bill, mainly environmentalists, farmland preservationists, and internationally oriented agribusiness groups. Third, and not in the cards now but a possibility an economist (or at least one like me) can cling to is a resurrection of a general predisposition to economic liberalism,

[20] Even if these policies were more market-distorting, as they could possibly become, they would more likely be of the kind that would reduce agricultural output rather than increase it.

as occurred in Australia and New Zealand (Anderson et al. 2008). It was not so long ago that this predisposition in North America served to limit the scope of market-distorting legislation considerably, and could again, as the recent Canadian legal debate on the Canadian Wheat Board's authorities illustrates, despite its outcome. The ascent of free-market Republicans in the 1980s suggested this might be a real possibility for the U.S. But the policy salience of this strain of opinion has been thwarted by that party's embrace of muscular nationalism, military internationalism and cultural conservatism. Similarly, the once-prominent advocacy of free-trade Democrats has been swamped by the wave of industrial protectionism allied with anti-trade prairie populism that party believes it needs to regain power.

The prospects for each of the preceding openings to reform – a liberalizing WTO agreement, conservation/environmental pressures, and a resurgence of deregulatory policy dispositions – would be enhanced with the traditional economist's recipe of compensating the losers from policy changes with nondistorting transfers. Direct Payments under the U.S. 1996 and 2002 Farm Acts are a move in this direction, but what is really required are one-time payments, or "buy-outs." U.S. policy has carried out three notable experiments in buy-outs since 1980: in dairy, peanuts and tobacco. The dairy buy-out (Dairy Production Termination Program) was implemented in 1986/87, at a time when milk surpluses were chronic. It was calculated that having dairy farmers agree to sell their herds and leave dairying would save budgetary outlays. Farmers made offers to the government stating a price per hundred pounds of milk producing capacity of their herds at which they would be willing to leave the business. Producers who participated had to sell all their female cattle and agree to remain out of dairy farming for five years, and attempts were made to ensure that cattle sold were slaughtered or exported and not sold to another dairy farm. The program was estimated to reduce U.S. milk production by about 7 percent in the short term but to have had no long-term effect (Dixon, Susanto, and Berry 1991). The positive lesson is that buy-outs can be successfully implemented by USDA as a means of getting farmers to participate in policy reform.

Buy-outs to permanently remove producers from certain commodity support programs have been undertaken for peanuts and tobacco since 2000. The 2002 Farm Act authorized payments to peanut producers to buy their production quotas, which had well defined values under pre-existing programs. Premiums over market values of quota had to be paid, but again the approach was proven feasible. Similarly, tobacco quotas and its entire price support program were terminated in 2005. However, whether buyouts would be feasible

for commodities without production-limiting quotas or where program-created assets are not so precisely defined is questionable. An approximation to a buyout was in the minds of some proponents of production flexibility contract payments in the 1996 Farm Act. But this legislation did not formally end the pre-existing support structure and, in fact, did not end the support programs. Rather, the approach enabled additional payments to farmers. While students of the prospects for this approach remain cautious (see Orden 2006 and Orden, Blandford and Josling 2009), something like it coupled with changes of approach as outlined above are the most likely feasible avenue to future reform.

References

Adams, G., P. Westhoff, B. Willott, and R.E. Young II, (2001), "Do 'Decoupled' Payments Affect U.S. Crop Area? Preliminary Evidence from 1997-2000", *American Journal of Agricultural Economics* 83(5): 1190-95.

Agriculture and Agri-Food Canada (2005), "Agricultural Policy Framework: Federal-Provincial-Territorial Programs", Program Planning, Integration, and Management Directorate, Ottowa, available at www.agr.gc.ca/progser/index_e.phtml

Agriculture and Agri-Food Canada (2006), "The Canadian Agricultural Income Stabilization (CAIS) Program", Ottawa, available at http://www.agr.gc.ca/caisprogram/factsheets/faq_margins.html

American Agricultural Economics Association (1986), "Federal Milk Marketing Orders: A Review of Research on their Economic Consequences", Task Force on Marketing Orders, Occasional Paper No. 3, June.

Anderson, K. (ed.) (2009), *Distortions to Agricultural Incentives: A Global Perspective, 1955 to 2007,* London: Palgrave Macmillan and Washington DC: World Bank.

Anderson, K., R. Lattimore, P.J. Lloyd and D. MacLaren (2008), "Distortions to Agricultural Incentives in Australia and New Zealand", Agricultural Distortions Working Paper 09, www.worldbank.org/agdistortions, August (condensed to Ch. 5 in Anderson 2009).

Anderson, K. and E. Valenzuela (2008), *Global Estimates of Distortions to Agricultural Incentives, 1955 to 2007*, database spreadsheets available at www.worldbank.org/agdistortions, forthcoming October.

Bailey, K. (2005), "Dairy Programs Face Difficult Future", Staff Paper No. 373, Department of Agricultural Economics and Rural Sociology, Pennsylvania State University, March.

Benedict, M.R. (1953), *Farm Policies of the United States, 1790-1950,* New York: Twentieth Century Fund.

Carter, C.A., R.M.A. Loyns, and D. Berwald (1998), "Domestic Costs of Statutory Marketing Authorities: The Case of the Canadian Wheat Board", *American Journal of Agricultural Economics* 80(2): 313-24, May.

Chavas, J. and M.T. Holt (1990), "Acreage Decisions Under Risk: The Case of Corn and Soybeans", *American Journal of Agricultural Economics* 72(3): 529-38, August.

Clarke, S.H. (1995), *Regulation and the Revolution in U.S. Farm Productivity*, New York: Cambridge University Press.

Davis, L., J.R.T. Hughes, and D.M. McDougall (1965) *American Economic History*, Homewood IL: Richard D. Irwin Inc.

Dixon, B., D. Susanto, and C.R. Berry (1991) "Supply Impact of the Milk Diversion and Dairy Termination Programs," *American Journal of Agricultural Economics* 73(3): 633-40, August.

FAPRI (Food and Agricultural Policy Research Institute) (2002), "Farm Security and Rural Investment Act of 2002: Preliminary FAPRI Analysis", mimeo, 6 May.

Fowke, V.C. (1946), *Canadian Agricultural Policy: The Historical Pattern,* Toronto: University of Toronto Press.

Furtan, W.H. (2006), "Canadian Agriculture and Food Policy", Saskatchewan Agrivision Corp., 25 August.

Gale, E.G., and O. Zaglits (1949), "Intergovernmental Agreements Approach to the Problem of Agricultural Surpluses", pp. 306-27 in *Readings on Agricultural Policy*, edited by O. Jesness, Philadelphia: Blakiston.

Gardner, B.L. (1996), "The Political Economy of U.S. Export Subsidies for Wheat", pp. 291-331 in A. Krueger (ed.), *The Political Economy of American Trade Policy*, Chicago: University of Chicago Press.

Gardner, B.L. (1999), "Canadian/US Farm Policies and the Creation of a Single North American Grain Market", pp. 273-311 in J. Antle and V. Smith (eds.), *The Economics of World Wheat Markets,* New York: CABI Publishing.

Gardner, B.L. (2002), *U.S. Agriculture in the Twentieth Century: How it Flourished and What it Cost,* Cambridge MA: Harvard University Press.

Gardner, B.L., and R.A. Kramer (1986), "Experience with Crop Insurance Programs in the U.S", pp. 195-222 in P. Hazell et al. (eds.), *Crop Insurance for Agricultural Development,* Baltimore: Johns Hopkins University Press.

Gray, R. and B.L. Gardner (1995), "The Impact of Canadian and U.S. Farm Policies on Grain Production and Trade", Canada/U.S. Joint Commission on Grains.

Gray, R. and V. Smith (1997), "Harmonization and Convergence of Canadian and U.S. Grains and Oilseeds Policies", Montana State Univerity, Policy Issues Paper 4, December.

Glauber, J.W. (1999), Statement before the U.S. Senate Agriculture Committee, March 10.

Glauber, J.W. and K.J. Collins (2002), "Risk Management and the Role of the Federal Government", in pp. 469-488, R. Just and R. Pope (eds.), *A Comprehensive Assessment of the Role of Risk in U.S. Agriculture,* Boston: Kluwer Academic Publishers.

Hart, C.E. and B.A. Babcock (2002), "U.S. Farm Policy and the World Trade Organization: How do They Match Up?", CARD Working Paper 02-WP 294, Iowa State University, February.

Harwood, J., R. Heifner, K. Coble, J. Perry and A. Samwaru (1999), "Managing Risk in Farming", US Department of Agriculture, Economic Research Service, AER 774, March.

Hennessy, D.A. (1998), "The Production Effects of Agricultural Income Support Policies under Uncertainty", *American Journal of Agricultural Economics* 80(1): 46-57, February.

Carter, S.B. (ed.) (2006), *Historical Statistics of the United States: Colonial Times to 1970*, New York: Cambridge Uinversity Press.

Huff, H.B. (undated), "Changing Role of Public Policy in Canadian Agriculture", mimeo.

Irwin, D.A. (2006), "Historical Aspects of U.S. Trade Policy," *NBER Reporter* (Summer) at http://www.nber.org/reporter/summer06/irwin.html

Johnson, D.G. (1950), *Trade and Agriculture.* New York: McGraw Hill Publishers.

Jones, R.L. (1941), "The Canadian Agricultural Tariff of 1843," *Canadian Journal of Economics and Political Science* 7: 528-37, November.

Josling, T. (2008), "Distortions to Agricultural Incentives in Western Europe", Agricultural Distortions Working Paper 61, www.worldbank.org/agdistortions, August (condensed to Ch. 3 in Anderson 2009).

Keaton, K., J. Skees and J. Long (1999), "The Potential Influence of Risk Management Programs on Cropping Decisions", presented at American Agricultural Economics Association meetings.

Kee, H.L., A. Nicita and M. Olarreaga (2006), 'Estimating Trade Restrictiveness Indices', Policy Research Working Paper No. 3840, World Bank, Washington DC, February.

Mencken, H.L. (1958), *Prejudices: A Selection*, New York: Vintage Books.

Miller, T.S. and A. Walter (1997), "An Assessment of Government Programs that Protect Agricultural Producers from Natural Risks", *Agricultural and Food Policy Review* 1: 93-103.

Nourse, E., J. Davis and J. Black (1935), *Three Years of the Agricultural Adjustment Administration*, Washington DC: Brookings Institution.

OECD (1978), *Recent Developments in Canadian Agricultural Policy*, Paris: Organization for Economic Cooperation and Development.

OECD (2001), *Agricultural Policies in OECD Countries: Monitoring and Evaluation*, Paris: Organization for Economic Cooperation and Development.

OECD (2002), *Agricultural Policies in OECD Countries: Monitoring and Evaluation*, Paris: Organization for Economic Cooperation and Development.

OECD "Agricultural Policies in OECD Countries at a Glance", available online at Statlink: http://dx.doi.org/10.1787/421374348780 (subscription required).

OECD (2008), *Producer and Consumer Support Estimates* (online database accessed at www.oecd.org for 1986-2007 estimates; and OECD files for estimates using an earlier methodology for 1979-85).

Olson, M. (1985), "Space, Agriculture, and Organization", *American Journal of Agricultural Economics* 72(3): 928-37, August.

Orden, D. (2006) "Feasibility of Farm Program Buyouts," presented at North American Agrifood Market Integration Workshop, Alberta, Canada, May 31-June 2.

Orden, D., D. Blandford and T. Josling (2009), "Determinants of Farm Policies in the United States, 1996-2008", in *Political Economy of Distortions to Agricultural Incentives,* edited by K. Anderson (forthcoming).

Orden, D., R. Paarlberg and T. Roe (1999), *Policy Reform in American Agriculture: Analysis and Prognosis,* Chicago: University of Chicago Press.

Schmitz, A. and H. Furtan (2000), *The Canadian Wheat Board,* Regina: Canadian Plains Research Center.

Schmitz, A., H. Furtan and K. Baylis (2002), *Agricultural Policy, Agribusiness, and Rent-Seeking Behavior,* Toronto: University of Toronto Press.

Schnepf, R. and R. Heifner (1999), "Crop and Revenue Insurance", *Agricultural Outlook*, August, pp.15-18, US Department of Agriculture.

Statistics Canada (2006), CANSIM table, at http://www40.statcan/101/cst01/prim10.htm

Taussig, F.W. (1931), *The Tariff History of the United States*, New York: G.P. Putnam's Sons.

US Commodity Futures Trading Commission (1999), "How to Become an Agricultural Trade Option Merchant", Washington DC, February.

US Department of Agriculture (1986), "Embargoes, Surplus Disposal, and U.S. Agriculture", Economic Research Service, Ag. Econ. Report No. 564, Washington DC, December.

US Department of Agriculture (2006), "Budget Summary and Annual Performance Plan", Office of Budget and Program Analysis, February (online at http://www.obpa.usda.gov/budsum/2007/fy07budsum.pdf

US General Accounting Office (1976), "Alleviating Agricultural Producers' Crop Losses", Washington DC.

Westcott, P.C. and J.M. Price (2001), "Analysis of the U.S. Commodity Loan Program with Marketing Loan Provisions", Agricultural Economic Report No. 801, April.

Westcott, P. and C.E. Young (2000), "U.S. Farm Program Benefits: Links to Planting Decisions and Agricultural Markets", *Agricultural Outlook*, October, pp. 10-14, US Department of Agriculture.

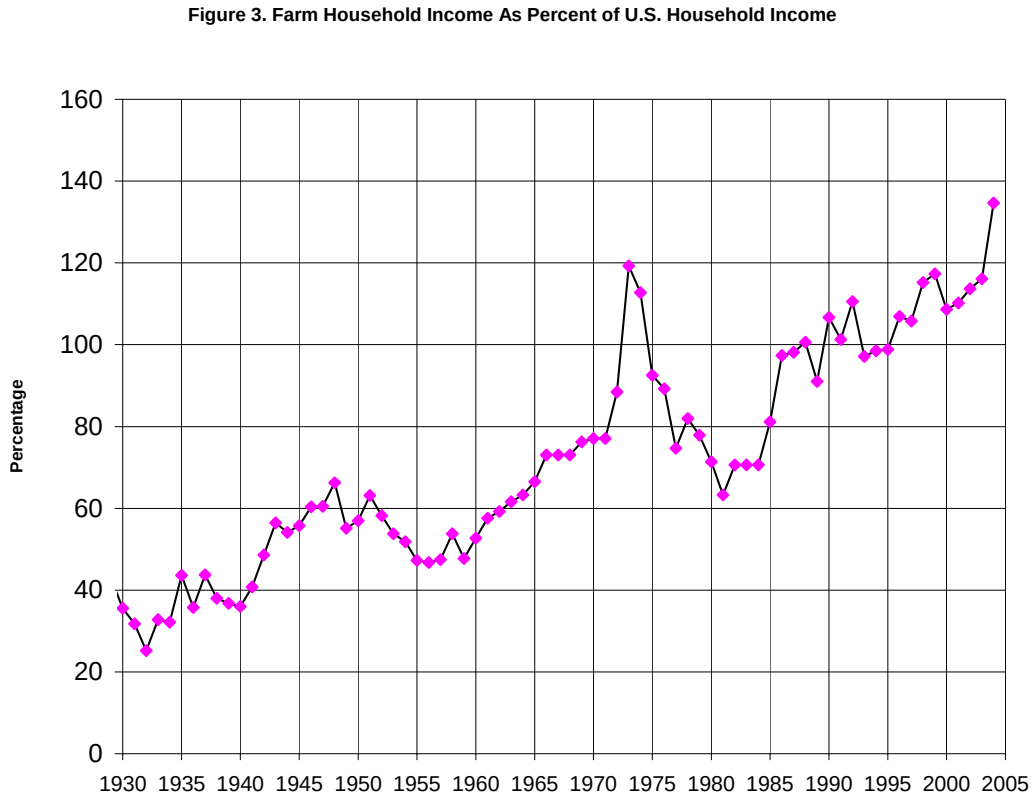
Womach, J. (2000), "Agricultural Marketing Assistance Loans and Loan Deficiency Payments", CRS Report for Congress, 98-744, Congressional Research Service, December.

World Trade Organization (WTO) (2002), "WTO Agriculture Negotiations: The Issues, and Where We Are Now", WTO website, April.

Young, C.E. and P.C. Westcott (2000), "How Decoupled is U.S. Agricultural Support for Major Crops", *American Journal of Agricultural Economics* 82(3): 762-67, August.

Young, C.E., M.L. Vandeveer and R.D. Schneff (2001), "Production and Price Impacts of U.S. Crop Insurance Programs", *American Journal of Agricultural Economics* 83(5): 1196-1203.

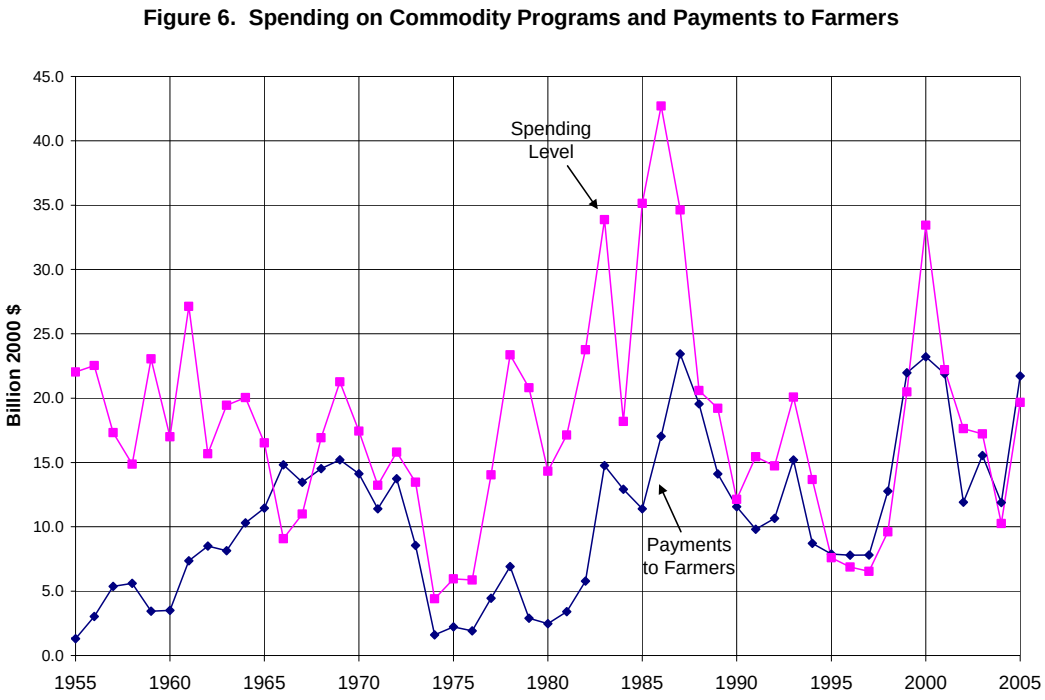
Figure 1: Farm household income as a persent of national household income, United States, 1950 to 2005



Source: Gardner (2002, Figure 3.12) and USDA, Economic Research Service, Briefing Rooms (http://www.ers.usda.gov/Briefing/)

Figure 2: Expenditure on commodity programs and payments to farmers, United States, 1955 to 2005

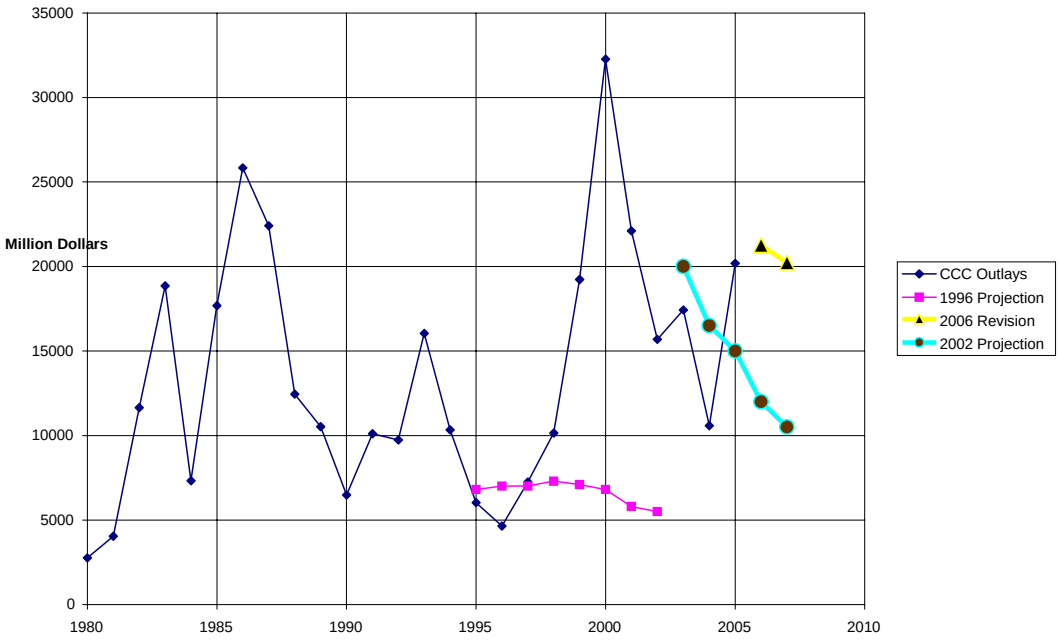
(2000 $billion)



Source: Author's compilation from the Congressional Budget Office, Washington DC.

Figure 3: CCC commodity program outlays, United States, 1980 to 2002

($million, fiscal years)

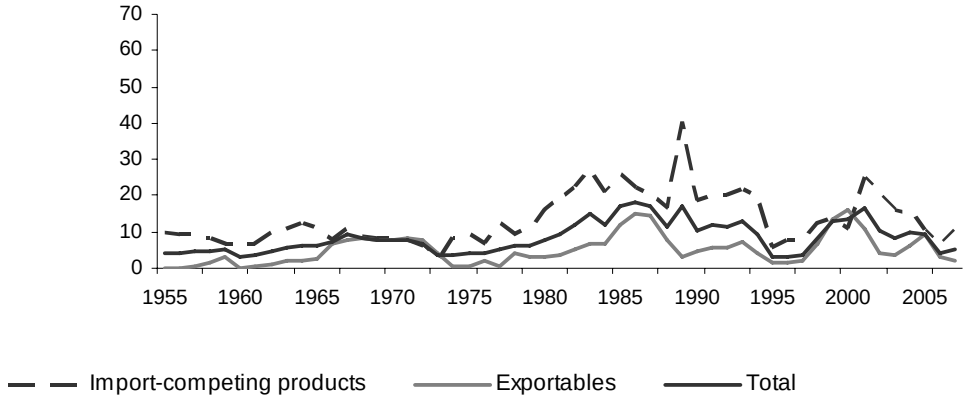


Source: Author's compilation from the Congressional Budget Office, Washington DC.

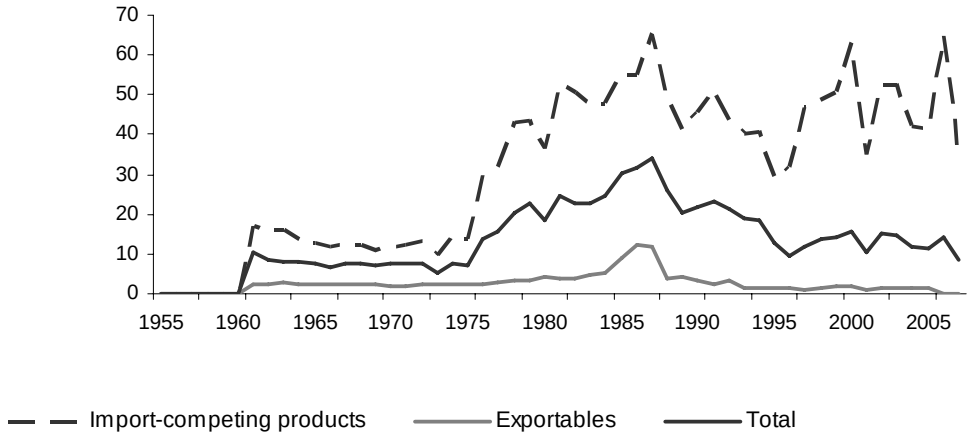
Figure 4: Nominal rates of assistance to exportable, import-competing and all covered agricultural products, United States and Canada,[a] 1955 to 2007

(percent)

(a) United States



(b) Canada

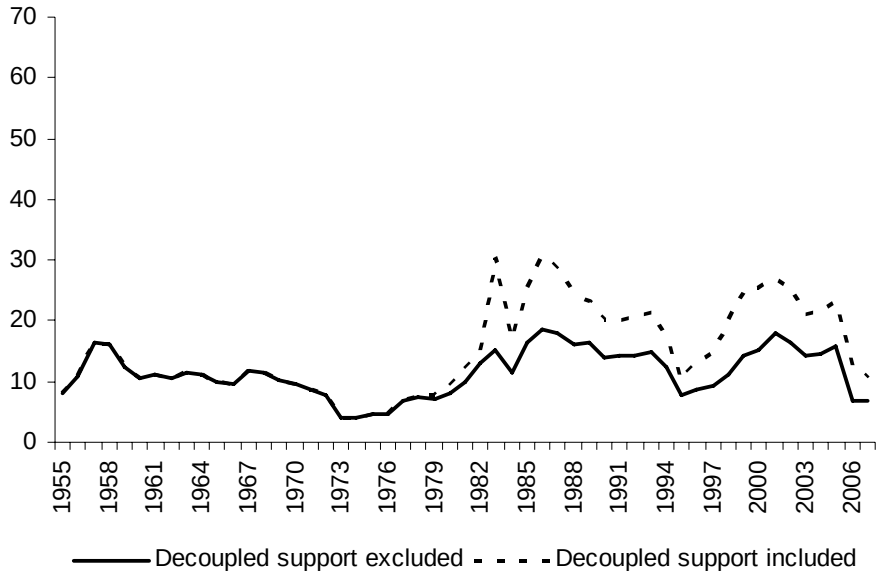


[a] Includes the NRAs shown in Table 2 and what we term as "non-product-specific" assistance, all of which is attributed to tradables. Non-product-specific for 1986-2007 includes payments classified by OECD as based on input use (E1) and miscellaneous payments (H). The total line does not include what we term "decoupled" assistance. Source: Anderson and Valenzuela (2008), drawing on authors' spreadsheet.

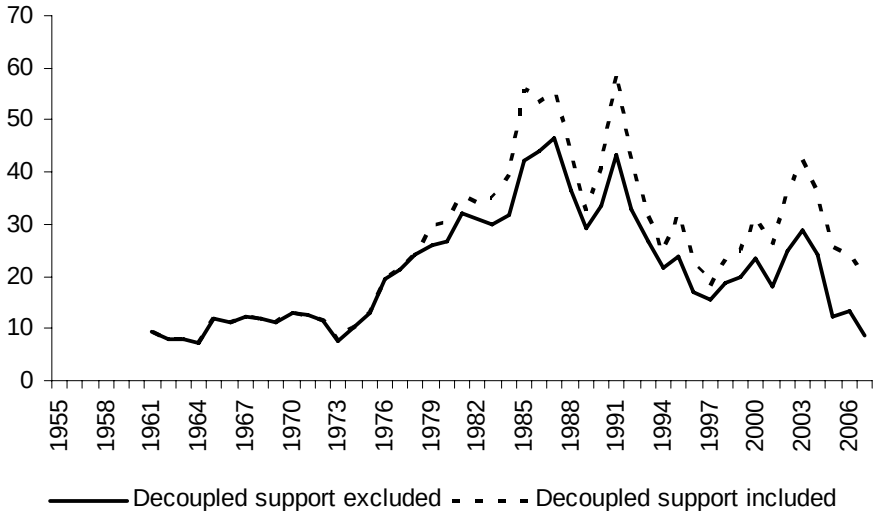
Figure 5: Nominal rates of assistance to all agriculture without and with decoupled support,[a] United States and Canada, 1955 to 2007

(percent)

(a) United States



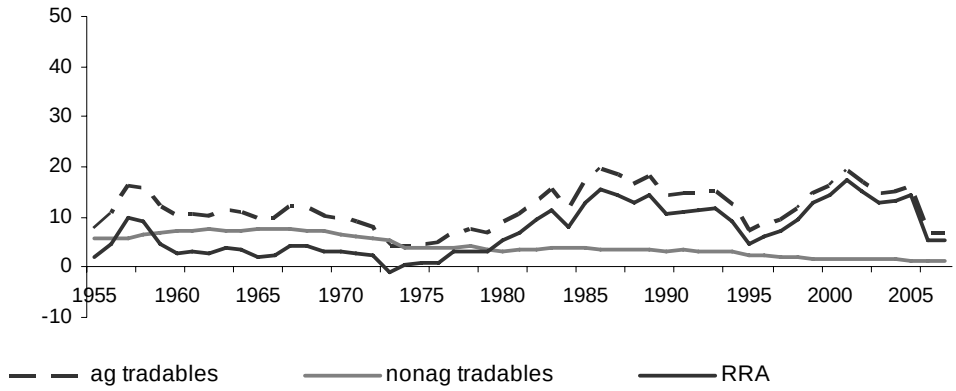
(b) Canada



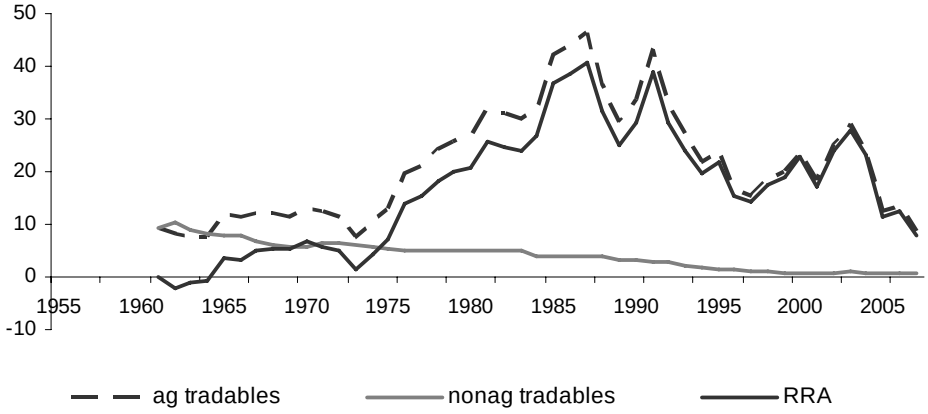
[a] Decoupled support includes 'direct payments' in the years 1979-85. From 1986 those payments are specified to comprise the OECD's items C (payments based on area planted/animal numbers), D (payments based on historical entitlements), F (payments based on input constraints) and G (payments based on overall farming income). And for 2005-07, those items replaced by similar but newly defined items C to E. The values of those payments are estimated by the OECD. Non-product specific support is also from OECD estimates as defined in the note to Figure 4 (see text for discussion).
Source: Anderson and Valenzuela (2008), drawing on authors' spreadsheet and OECD (2008 and earlier years).

Figure 6: Nominal rates of assistance to all non-agricultural tradables, all agricultural tradable industries, and relative rate of assistance,[a] United States and Canada, 1955 to 2007
(percent)

(a) United States



(b) Canada



[a] The RRA is defined as $100*[(100+NRAag^t)/(100+NRAnonag^t) - 1]$.

Source: Anderson and Valenzuela (2008), drawing on author's spreadsheet.

Table 1: Customs receipts as a percentage of value of imports, United States, 1821 to 2000

(percent)

	Manufactured products	Agricultural products	All merchandise
1821	47	47	43
1830	64	62	57
1840	21	00	18
1850	27	3	25
1860	19	2	18
1870	46	47	50
1880	39	6	29
1890	41	8	30
1900	40	15	28
1910	29	9	21
1920	7	2	6
1930	18	8	15
1940	15	7	13
1950	9	2	6
1960	na	na	7
1970	na	na	7
1980	na	na	3
1990	na	na	3
2000	na	na	1.6

Sources: Davis, Hughes, and McDougall (1965, p. 327) for manufactured and agricultural products, Carter (2006) for all merchandise.

Table 2: Nominal rates of assistance to covered farm products, United States and Canada,[a] 1955 to 2007
(percent)

(a) United States

	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-04	2005-07
Exportables	**1.0**	**1.1**	**6.7**	**5.7**	**2.1**	**5.0**	**10.5**	**5.5**	**5.1**	**8.1**	**4.8**
Cotton	5.8	0.2	65.2	43.2	9.2	15.6	32.6	24.6	27.8	70.0	77.0
Egg	na	na	na	na	4.1	5.8	4.6	8.1	2.2	0.0	0.0
Maize	0.0	1.4	2.4	3.4	0.4	2.6	10.4	0.6	4.8	7.0	6.6
Poultry	0.0	0.0	0.0	0.0	0.0	0.0	7.0	1.3	0.3	0.0	0.0
Rice	0.0	0.0	0.0	0.0	2.6	15.6	38.8	20.1	7.8	52.7	2.2
Sorghum	na	na	na	na	na	37.3	15.0	0.2	4.8	5.5	7.2
Soybean	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.1	6.6	12.4	0.6
Wheat	0.0	3.6	17.8	14.4	9.6	11.2	29.1	25.5	5.4	4.3	0.2
Import-competing products	**8.8**	**9.4**	**9.4**	**6.6**	**9.8**	**21.1**	**25.2**	**19.9**	**9.5**	**17.5**	**8.9**
Barley	na	na	na	na	na	na	61.9	59.6	4.8	5.3	3.2
Beef	0.0	0.0	2.0	2.0	2.0	2.0	1.3	1.0	0.0	0.1	0.0
Milk	20.2	23.6	21.0	17.0	25.4	61.8	96.9	59.9	78.8	66.5	24.2
Pigmeat	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0
Sheepmeat	na	na	na	na	na	7.1	2.4	1.2	3.4	13.8	9.9
Sugar	50.4	65.9	134.3	18.2	40.3	120.2	158.3	78.8	96.1	115.6	47.6
Wool	na	na	na	na	na	na	1.2	0.9	0.9	16.1	28.2
Non-tradable	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Potato	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
All covered	**4.7**	**4.8**	**7.8**	**5.9**	**5.1**	**11.1**	**16.2**	**11.2**	**6.2**	**11.6**	**6.3**
Domestic market support	0.0	0.0	0.0	0.0	0.1	0.9	2.3	0.4	2.2	3.6	1.0
Border market support	4.7	4.8	7.8	5.9	5.0	10.2	13.9	10.8	4.1	8.0	5.3
Dispersion of NRA of covered products	17.3	23.1	46.6	15.7	14.6	39.8	55.3	27.6	31.4	38.4	23.3
% coverage at undistorted prices	66	66	66	69	70	69	66	67	65	66	68

Table 2 (continued): Nominal rates of assistance to covered farm products, United States and Canada,[a] 1955 to 2007
(percent)

(b) Canada

	1961-64	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-04	2005-07
Exportables	**2.5**	**2.4**	**2.2**	**2.8**	**4.3**	**8.2**	**2.4**	**1.4**	**1.4**	**0.4**
Barley	2.0	2.0	2.0	5.8	8.0	10.4	2.5	1.4	2.8	1.0
Beef	1.0	1.0	1.0	1.2	2.6	4.0	3.9	nap	nap	nap
Peas	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pigmeat	2.0	2.0	2.0	2.0	2.0	6.3	5.1	3.8	2.0	0.4
Rapeseed	0.0	0.0	0.0	0.0	0.0	9.6	0.5	0.1	0.1	0.0
Soybean	nap	nap	nap	nap	nap	2.8	0.4	0.5	1.2	0.3
Wheat	3.0	3.0	3.0	3.1	5.3	10.4	1.4	0.6	0.6	0.2
Import-competing products	**15.7**	**12.0**	**12.2**	**32.3**	**47.2**	**53.1**	**44.0**	**41.3**	**49.1**	**46.9**
Beef	nap	nap	nap	nap	nap	nap	nap	2.0	1.8	0.7
Egg	na	na	na	na	41.1	30.1	33.1	27.7	10.6	64.7
Maize	4.9	4.7	3.5	2.3	2.0	12.8	2.5	3.3	8.7	2.9
Milk	34.4	34.4	34.4	162.8	307.2	314.2	182.6	109.4	125.9	94.4
Poultry	17.0	17.8	33.5	24.4	23.3	23.7	25.2	2.7	2.6	6.9
Soybean	0.0	0.0	0.0	0.0	0.0	nap	nap	nap	nap	nap
Sugar	na	na	na	na	32.5	79.5	31.0	17.7	na	na
Non-tradables	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Potato	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
All covered	**8.7**	**7.2**	**7.0**	**16.0**	**22.5**	**28.6**	**20.8**	**12.3**	**13.5**	**11.4**
Domestic market support	0.0	0.0	0.0	0.1	0.5	13.2	4.1	1.9	1.4	0.4
Border market support	8.7	7.2	7.0	15.9	22.1	15.4	16.6	10.4	12.1	11.0
Dispersion of NRA of covered products	11.1	11.0	13.8	47.5	84.5	87.2	50.1	31.1	35.9	32.5
% coverage at undistorted prices	71	76	79	84	86	83	81	79	76	76

[a] The main U.S. policies included are import protection; export subsidies; and the various loan-rate-related price support and payments to producers. Excludes deficiency, production flexibility and fixed direct payments, and the market loss assistance and countercyclical payments (see text for discussion). Weighted averages use weights based on the unassisted value of production. Dispersion is the standard deviation shown is the simple 5-year average of the annual standard deviation around the weighted mean.
Source: Anderson and Valenzuela (2008), drawing on author's spreadsheet.

Table 3: Nominal rates of assistance to agricultural relative to nonagricultural industries, United States and Canada,[a] 1955 to 2007
(percent)

(a) United States

	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-04	2005-07
Covered products	4.7	4.8	7.8	5.9	5.1	11.1	16.2	11.2	6.2	11.6	6.3
Non-covered products	8.0	7.7	6.0	5.0	4.7	6.6	10.9	8.4	8.5	9.6	5.4
All agriculture (excl NPS)	5.8	5.8	7.2	5.6	5.0	9.7	14.4	10.2	7.0	10.9	5.2
All importables	8.6	8.9	8.5	6.1	8.4	16.9	20.9	16.4	9.1	15.0	8.7
All exportables	2.7	2.7	6.5	5.5	2.6	5.3	10.6	6.2	5.8	8.4	4.7
All nontradables	8.0	6.8	5.1	4.3	4.2	5.7	9.4	7.2	7.3	8.2	2.3
Non-product specific (NPS)	7.0	5.2	3.3	1.1	1.2	1.8	2.7	3.7	3.3	4.9	4.3
All agriculture (incl NPS)	12.8	10.9	10.5	6.9	6.2	11.5	17.1	13.9	10.2	15.6	9.8
Decoupled payments	0.0	0.0	0.0	0.0	0.1	5.2	9.3	5.9	6.3	8.4	5.6
All agric (incl NPS & dec)	12.8	10.9	10.5	6.9	6.3	16.7	26.4	19.9	16.5	24.1	15.3
All ag tradables (incl NPS)	12.5	10.8	10.8	7.0	6.2	12.0	18.0	14.4	10.4	16.5	9.9
All nonag tradables	6.1	7.3	7.4	5.4	3.8	3.5	3.5	3.2	2.1	1.5	1.4
RRA[b]	6.0	3.2	3.2	1.5	2.2	8.2	13.9	10.8	8.1	14.7	8.4

Table 3 (continued): Nominal rates of assistance to agricultural relative to nonagricultural industries, United States and Canada,[a] 1955 to 2007 (percent)

(b) Canada

	1961-64	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-04	2005-07
Covered products	8.7	7.2	7.0	16.0	22.5	28.6	20.8	12.3	13.5	11.4
Non-covered products	6.6	5.4	4.9	9.8	12.9	14.9	10.6	6.2	7.1	6.7
All agriculture (excl NPS)	8.1	6.8	6.5	15.0	21.2	26.3	18.9	11.0	12.0	9.1
All importables	15.1	11.7	12.0	31.1	45.2	50.9	41.8	36.2	42.0	45.0
All exportables	4.3	3.5	3.0	4.6	6.3	10.1	4.8	2.9	3.2	0.9
All nontradables	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-product specific (NPS)	na	4.9	4.0	5.7	9.1	13.2	12.8	7.8	12.1	2.2
Inputs	na	na	na	0.5	0.8	6.9	5.6	2.4	1.8	2.1
Other	na	4.9	4.0	5.2	8.3	6.3	7.2	5.5	10.4	0.1
All agriculture (incl NPS)	8.1	11.7	11.0	20.8	30.3	39.7	31.6	18.9	23.9	11.4
Decoupled payments	0.0	0.0	0.0	0.7	4.7	8.6	8.0	5.3	10.3	11.8
All agric (incl NPS & dec)	8.1	11.7	11.0	21.5	35.0	48.3	39.6	24.3	34.2	23.2
All ag tradables (incl NPS)	8.1	11.7	11.0	20.8	30.3	39.7	31.6	18.9	23.9	11.4
All nonag tradables	9.2	6.9	6.0	5.1	4.8	3.9	2.6	1.1	0.8	0.8
RRA[b]	-1.0	4.5	4.7	14.9	24.3	34.5	28.3	17.6	22.9	10.5

[a] Decoupled support includes 'direct payments' in the years 1979-85. From 1986 those payments are specified to comprise the OECD's items C (payments based on area planted/animal numbers), D (payments based on historical entitlements), F (payments based on input constraints) and G (payments based on overall farming income). And for 2005-07, those items replaced by similar but newly defined items C to E. The values of those payments are estimated by the OECD. See text for discussion of non-product specific support.

[b] RRA is defined as $100*[(100+NRAag^t)/(100+NRAnonag^t)-1]$, where $NRAag^t$ and $NRAnonag^t$ are the percentage NRAs for the tradables parts of the agricultural and non-agricultural sectors, respectively.

Source: Anderson and Valenzuela (2008), drawing on authors' spreadsheet and OECD (2008 and earlier years).

Table 4: Gross subsidy equivalents of assistance to farmers, by product, per farm worker, and total, United States and Canada, 1955 to 2007

(a) by covered product (constant 2000 $US millions, excluding non-product-specific and decoupled payments)

	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-04	2005-07
Barley	na	14	19	44	97	141	518	392	48	53	20
Beef	0	25	442	555	541	549	388	307	53	69	25
Cotton	458	19	1573	1541	593	792	1170	1030	1094	1692	2442
Egg	na	na	na	na	395	495	302	432	174	34	167
Maize	0	273	509	998	163	848	1927	152	825	1316	1081
Milk	3365	4253	4116	3829	7775	13778	12986	9875	3761	8125	6666
Peas	na	0	0	0	0	0	0	0	0	0	0
Pigmeat	0	31	41	56	55	52	124	297	68	46	12
Potato	na	0	0	0	0	0	0	0	0	0	0
Poultry	0	105	127	248	222	197	791	363	68	38	90
Rapeseed	na	0	0	0	0	0	68	4	1	2	0
Rice	0	0	0	0	54	212	261	219	76	344	33
Sheepmeat	na	na	na	na	40	40	14	5	12	40	28
Sorghum	na	na	na	na	436	636	261	4	40	40	36
Soybean	0	0	0	0	0	0	91	18	734	1274	90
Sugar	515	594	995	476	711	1015	1173	800	759	824	552
Wheat	0	317	1308	1266	1248	1689	2108	1737	333	240	16
Wool	na	na	na	na	na	na	1	1	0	3	5

(b) Per person engaged in agriculture (constant 2000 US$, including non-product-specific but not decoupled payments)

	1961-64	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-04	2005-07
Total, North America	3115	3739	3445	4181	6720	8222	7370	5580	9165	7364
United States	3383	3886	3431	3728	6303	7710	6831	5185	8795	7279
Canada	1590	2914	3524	6478	8857	11412	11379	8591	12056	8034

Table 4 (continued): Gross subsidy equivalents of assistance to farmers, by product, per farm worker, and total, United States and Canada, 1960 to 2005

(c) total (constant 2000 $US millions)

	1961-64	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-04	2005-07
North America, Covered products	**5632**	**9130**	**9014**	**12331**	**20445**	**22185**	**15636**	**8044**	**14142**	**11264**
United States	4708	8115	7731	9029	16177	18088	12781	6195	12227	9109
Canada	924	1015	1283	3302	4268	4096	2856	1850	1915	2156
North America, Cov+noncov products	**9886**	**12539**	**12345**	**15387**	**25132**	**28745**	**20788**	**13195**	**19816**	**12985**
United States	8552	11263	10821	11816	20473	24224	17599	11100	17591	10717
Canada	1334	1276	1524	3570	4659	4521	3188	2095	2225	2268
North America, Non-product-specific	**7658**	**6192**	**3399**	**4077**	**5822**	**6863**	**8580**	**6999**	**10228**	**10166**
United States	7658	5269	2417	2678	3815	4548	6397	5491	7974	9598
Canada	0	923	981	1399	2007	2315	2182	1508	2254	568
North America, incl. NPS	**17544**	**18731**	**15743**	**19464**	**30954**	**35608**	**29368**	**20194**	**30044**	**23151**
United States	16210	16533	13238	14494	24288	28772	23997	16590	25564	20315
Canada	1334	2199	2505	4970	6666	6836	5371	3603	4480	2836
North America, Decoupled payments	**0**	**0**	**0**	**529**	**11199**	**16979**	**11526**	**11012**	**15598**	**14795**
United States	0	0	0	352	10193	15529	10177	9990	13657	11826
Canada	0	0	0	177	1006	1451	1349	1022	1941	2970
North America, including NPS and decoupled	**17544**	**18731**	**15743**	**19993**	**42153**	**52587**	**40894**	**31205**	**45643**	**37947**
United States	16210	16533	13238	14846	34481	44301	34174	26580	39222	32141
Canada	1334	2199	2505	5147	7672	8286	6720	4625	6421	5806

Source: Anderson and Valenzuela (2008) based on author's spreadsheet.

Table 5: Consumer tax equivalents of policies assisting farmers, covered products, total and per capita and by product, United States and Canada, 1960 to 2005

(a) Aggregate CTE (percent)

	1960-64	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-04	2005
Total, North America	**5.7**	**8.4**	**6.1**	**7.2**	**12.6**	**9.8**	**1.9**	**-4.7**	**-2.4**	**-6.3**
United States	5.4	8.4	5.9	5.8	11.0	7.5	-0.4	-6.8	-4.2	-8.5
Canada	10.1	8.2	7.8	19.1	27.3	31.0	24.6	14.1	15.6	14.1

(b) CTE per capita (constant 2000 US$)

	1960-64	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-04	2005
Total, North America	**27**	**41**	**36**	**44**	**68**	**42**	**8**	**-18**	**-9**	**-26**
United States	26	40	34	35	58	32	-2	-26	-16	-35
Canada	50	47	54	127	154	134	95	54	54	56

Table 5 (continued): Consumer tax equivalents of policies assisting farmers, covered products, total and per capita and by product, United States and Canada, 1960 to 2005

(c) CTE by covered product (constant 2000 $US millions), United States, 1955 to 2007

	1960-64	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-04	2005
Barley	na	na	na	na	na	89	99	-100	-95	-89
Beef	0	426	547	531	475	-776	-1529	-1806	-1813	-1976
Cotton	16	1489	1284	482	657	1028	865	965	1320	1955
Egg	na	na	na	-20	-9	-79	-54	-308	-409	-519
Maize	246	435	822	95	566	-1320	-2947	-3257	-3702	-4374
Milk	3398	3304	3056	5140	10134	9039	5777	1738	4264	1005
Pigmeat	0	0	0	0	0	-1142	-1748	-2253	-2362	-3122
Potato	0	0	0	0	0	0	0	0	0	0
Poultry	0	0	0	0	0	-134	-1076	-1263	-1328	-1657
Rice	0	0	0	25	100	-46	-138	-201	-199	-357
Sheepmeat	na	na	na	29	5	6	6	13	53	57
Sorghum	na	na	na	0	0	-143	-189	-185	-163	-161
Soybean	0	0	0	0	0	-199	-337	-365	-376	-483
Sugar	1011	1683	791	965	1051	1421	1018	926	992	593
Wheat	147	591	572	449	546	88	-126	-917	-859	-1293
Wool	na	na	na	na	na	2	1	1	0	0
United States	**4819**	**7929**	**7073**	**7696**	**13525**	**7835**	**-378**	**-7010**	**-4677**	**-10422**

(d) CTE by covered product (constant 2000 $US millions), Canada, 1961 to 2005

	1961-64	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-04	2005
Barley	11	15	29	68	86	17	16	0	0	0
Beef	26	41	52	54	108	70	54	6	5	0
Egg	na	na	na	70	127	98	121	89	33	141
Maize	17	23	27	23	23	22	1	0	0	0
Milk	709	682	749	2542	3185	2847	2137	1471	1641	1663
Peas	0	0	0	0	0	0	0	0	0	na
Pigmeat	31	41	54	56	45	7	0	0	0	0
Potato	0	0	0	0	0	0	0	0	0	0
Poultry	105	127	245	227	203	271	361	30	31	30
Rapeseed	0	0	0	0	0	22	1	1	1	0
Soybean	0	0	0	0	0	8	1	2	5	6
Sugar	na	na	na	44	39	43	31	25	na	na
Wheat	28	25	37	38	55	152	42	-3	-6	0
Canada	**927**	**954**	**1194**	**3122**	**3871**	**3557**	**2767**	**1622**	**1710**	**1841**

Source: Anderson and Valenzuela (2008) based on author's spreadsheet.

Table 6: Political Action Committee (PAC) disbursements during the election cycle, United States, Nov. 2004 to Oct. 2006

($million)

Commodity of PAC:	
Sugar Alliance	1.2
Farm Credit Council	1.0
Dairy	0.8
Texas Farm Bureau	0.5
Cotton Council	0.3
Sugar	0.3
Cattlemens Beef	0.3
Dairy	0.3
Broiler Chickens	0.3
FLA sugar	0.2
Indiana Farm Bureau	0.2
Sugar beets	0.2
Farmers' Group	0.2
Peanuts	0.2
Eggs	0.2
Michigan Farm Bureau	0.2
Farmer Coop	0.1
Sugar beets	0.1
Beef	0.1
TOTAL of ABOVE	**6.7**

Source: Political Moneyline, www.tray.com

Appendix: Complexities in analysing economic effects of farm policies of the United Stages and Canada

The policies affecting producer prices in the United States and Canada, as summarized in the NRA estimates, have affected farmers' production decisions in major and complex ways, albeit somewhat differently in these two countries and so they are discussed in turn.

United States

It is helpful to begin with trade policies and then to examine domestic farm support policies, before turning to the empirical literature.

Agricultural trade policies

Summarizing the effects of U.S. import restrictions and export promotion under the programs discussed earlier is difficult because of the variety of policy instruments used. These include import quotas, tariffs, special access provisions (such as the Caribbean Basin Initiative), "voluntary restraint" agreements (such as the ones on Australian beef sales to the U.S.), embargoes on trade with specific countries (such as grain exports to the Soviet Union), regional trade liberalization agreements (most notably NAFTA), and targeted export subsidies (EEP and DEIP). Some of the effects of those policies on domestic as compared to off-shore commodity prices are not straightforward.

U.S. policy provides an ideal indicator of domestic relative to international reference price for its single most protected major commodity, namely sugar. The New York Mercantile Exchange trades contracts in both off-shore Caribbean basis raw sugar and landed, duty-paid sugar at U.S. port locations. The percentage difference between these prices gives a market-based daily measure of the degree of protection afforded by the full complexity of the U.S. sugar program. The relevant price data are shown in Appendix Figure 5.

Over the 2001-2005 period, the average NRA on raw sugar was 110 percent. Although the sugar program has many complexities, including production controls if minimum import levels are not met, this percentage is a good measure of the protection afforded the U.S. industry relative to the world market. In assessing the impact of world markets, it is also helpful to know that the NRA is achieved through application of tariff-rate quotas, which together with agreements under NAFTA and CAFTA permitted 2.6 million tons of sugar (raw value) to be imported (as compared to 9 million tons produced domestically). It is also helpful to know that these quotas are allocated to country governments in a political process, as opposed to being auctioned off or assigned to U.S. importing companies. The 2005 allocations are shown in Appendix Table 6.

A more complicated trade policy picture is provided by dairy products. The price of milk is supported through government purchases of commodities to support prices for butter, nonfat dry milk (or powdered milk) and cheddar cheese, at prices that would attract imports if imports were allowed to enter freely. Since 1997 butter and cheese prices have generally been above the support levels, with the only product consistently purchased for price support being nonfat dry milk. In response to this, USDA cut the support price of nonfat dry milk over time, from $1.04 per pound in 1997 to $0.80 in 2005, and purchases slowed. In this respect, the distortions to the tradable dairy commodity markets appear likely to be small, and have been analyzed as having as

their chief result forestalling the conversion of nonfat dry milk production in California (which now produces half the U.S. output) to other manufactured milk products (Bailey 2005). Nonetheless tariff-rate quotas on imports of these products remain in place. And, although the market price of milk for manufacturing has been above the support price in all recent years, the U.S. price for such milk has remained well above the New Zealand price which is the best candidate for an international reference price. The average NRA for the five years 2000-04, comparing the U.S. manufacturing milk price with that of New Zealand, is 51 percent.

Import protection for other major commodities is minimal in the last two decades, as the commodities are exported and no longer have domestic programs that support market prices and thus draw imports that require section 22 quotas to foreclose. But quotas and tariff-rate quotas are used to restrict some competing imported products in fruits and vegetables, even from NAFTA partners.

Domestic support policies

The joint effects of border measures and domestic commodity programs are well illustrated by the case of milk. The price support system for manufacturing milk places a floor under the price of all milk produced. The effects of this policy is reasonable captured by internal and off-shore price comparisons. Over and above this support, classified pricing under marketing orders generates a price for fresh (drinking) milk that is higher. The premium for "Class I" milk varies regionally. The U.S. average increase to the price farmers receive for milk has been estimated in several studies over the last 30 years. A review by a Task Force of the American Agricultural Economics Association placed the average rate of subsidy achieved by classified pricing at 4 percent (AAEA 1986). Although this study is 20 years old, the structure and extent of the marketing order system remains essentially in place to the present. This 4 percent is properly counted as domestic support that generates additional milk production that adds to world supplies of dairy products but does not impose a border distortion. In addition, under the 2002 Farm Act there are the Milk Income Loss Protection program payments.

A major problem in analyzing the production-inducing effects of the many domestic programs is that the data available to characterize them are government spending levels. It would be relatively straightforward conceptually, though difficult empirically, to estimate the effects of this spending if it took the form of classical production subsidies (as is the dairy program, essentially). Then we could calculate a percentage distortion of the market price by dividing spending on each commodity by the quantity produced, and estimate the effects of that percentage subsidy using the relevant elasticities of supply and demand for the subsidized commodities, taking into account interactions between commodities that are substitutes in either production or consumption (and often both), and between commodities that are related vertically, as feed and livestock.

However, the bulk of U.S. spending in support of agriculture does not take the form of a production subsidy of this type. An attempt is made in Appendix Table 4 to distinguished "coupled" from "decoupled" payments. That attempt could be questioned, and the spending detailed in Apendix Table 5 is even more difficult to characterize.

If U.S. policies had no effects on world market prices, specifically on the reference prices used to calculate the effects of trade restrictions, then the difficulties of estimating domestic support effects would be less important. But for the major U.S. commodities, the effects of U.S. policies on world markets are potentially significant. So it is important to assess the production effects of these policies.

The question of which governmental expenditures do most to influence agricultural production comes to a head first in deciding what programs to omit from consideration as output stimulators. The earlier discussion of Appendix Table 5 left out the big domestic food assistance programs – the Food Stamp Program and Child Nutrition Programs – which had FY 2005 outlays of $50 billion, more than all the other programs listed in Appendix Table 4 combined. These programs are omitted on the grounds that they do not distort markets, but are analytically comparable to welfare programs that transfer cash to poor households.

The only food programs included in Appendix Table 5 are those that explicitly attempt to support agricultural markets where surplus production is a problem. The major programs in this category are P.L. 480, where a mix of foreign need and domestic political interests come into play (spending about $800 million), and "Section 32" purchases by USDA, a program under which USDA, at the discretion of the Secretary of Agriculture, purchases commodities deemed to be in surplus for use in school lunch or other feeding programs (spending about $450 million).

The OECD estimates a PSE of 23 percent of U.S. gross farm receipts for 1999-2001, and 15, 16, and 16 percent for 2003, 2004, and 2005, respectively (OECD 2006). The 2005 percentage is quite close to the 14 percent calculated above with reference to Appendix Table 5. Both percentages are higher than would be obtained from NRA calculation using Appendix Table 3 data where, for 2005, the payments of $20.2 billion amount to 8.5 percent of the $239 billion value of U.S. farm output. This occurs because Appendix Table 5 and OECD include a substantially wider range of government outlays as part of agricultural support.

The question for analytical purposes is the effect of this activity on U.S. agricultural output, prices and trade. As the OECD definition of the PSE makes clear, this issue is sidestepped in measures like the ones just calculated. The issue has been confronted most directly in the context of international trade negotiations. The World Trade Organization (WTO) aggregates "all domestic support measures considered to distort production and trade" (World Trade Organization 2002) as the Aggregate Measure of Support (AMS). Under the Uruguay Round Agriculture Agreement (URAA) of 1994, the members of the WTO agreed to discipline their spending on these "amber box" programs, with some exceptions. The exceptions are "de minimis" provisions that exempt spending that is less than five percent of a commodity's value (for commodity-specific programs) or five percent of all agricultural commodities produced in a country (for programs not tied to a specific commodity), and a "blue box" of programs that provide subsidies that are linked to production limitations.[21]

Each WTO member country is charged with notifying the WTO of its actions as related to URAA commitments. The United States, according to its notifications, has not provided support at levels that have reached its AMS commitments, and so has not had to undertake reductions in support under the URAA agreement. The biggest component of support up to 1996, deficiency payments, was in the blue box and so not disciplined. Since 1996, the biggest component of support, production flexibility contract payments under the FAIR Act, has been

[21] With the product-specific de minimis provision, it makes a difference how products are aggregated. For example, if butter receives support worth 10 percent of its value and cheese and other milk products receive no support, it is still possible not to exceed the de minimis level of support for dairy products as a whole. Therefore a country has an incentive to define commodities broadly. In fact the US spreads its support for all dairy products over a single aggregate dairy category (which is appropriate since what is being supported at the farm level is the underlying raw material, milk). But fruits and vegetables are not aggregated. U.S. submissions to the WTO report product-specific support for the following commodity categories: barley, beef, corn, cottonseed, cotton, dairy, pork, honey, canola, flaxseed, mustard, rapeseed, safflower, sunflower, mohair, oats, peanuts, rice, rye, sorghum, soybeans, sugar, tobacco, wheat, wool, potatoes, apples, cranberries, and lamb.

placed in the "green box", defined as program outlays that do not have the effect of supporting prices and "have no, or at most minimal" trade-distorting effects on production.

The latest notifications tabled by the United States as of 2007 were those for 2001. They are as follows (in billions of dollars):

	URAA Commitment	Amber Box Total	Amber Box net of de minimis
Product-specific		14.6	14.4
Non-product-specific		6.8	0.0
Total	19.1	20.4	14.4

The product-specific items include dairy price supports ($4.5 billion) and sugar import protection ($1.0 billion), as market support measures that do not involve payments and thus are excluded from the items listed in Appendix Tables 3 to 5. Loan deficiency payments and related marketing loan gains account for most of the rest. Production Flexibility Payments are notified as Green Box and not included here. The non-product-specific items include Market Loss Assistance payments ($4.6 billion), benefits from crop insurance programs ($1.8 billion), and input supply subsidies, mainly irrigation and grazing rights, $0.4 billion. Since 5 percent of aggregate U.S. agricultural output of $198 billion in 2001 is $9.9 billion, none of the $6.8 billion in non-product-specific support has to be counted against the $19.1 billion URAA ceiling, and no disciplines are required on U.S. domestic support.

As analytical categories, the amber box and green box raise several questions. The most obvious is how can Production Flexibility Contract payments be green, and at the same time Market Loss Assistance (MLA) payments, which provided a 50 percent supplement to PFC payments on exactly the same payment base, be amber. Since both are decoupled from the farmer's production decisions in the sense that they do not change if the producer increases or decreases acreage or output of the covered crops, why are not both equally green? The answer in the URAA text, as cited in USDA's explanation to Congress of why the U.S. notified the WTO that MLA payments fall into the amber box, is that MLA payments, as a Congressional policy response to low prices, are in fact "coupled" to market conditions and are therefore amber. The URAA is taken to require this even though the fixed payment base for the market loss assistance payments makes these payments not notably more production distorting than the PFC payments. Similarly, the Counter-cyclical Payments of the 2002 Act would have to be counted as Amber Box because they rise as prices fall, even though these payments too do not vary with a producer's output. However, the Bush Administration has not notified WTO of its policies after 2001, when the 2002 Act went into effect, possibly to avoid taking a stand on this issue.[22]

[22] The URAA has two requirements for payments to qualify for the green box. First, there is the basic criterion that payments "shall have no, or at most minimal, trade-distorting effects or effects on production" (Annex 2, Paragraph 1). The second is a policy-specific requirement that "The amount of such payment in any given year shall not be related to, or based on, the prices, domestic or international, applying to any production undertaken in any year after the base period" (Annex 2, Subparagraph 6(C). It would be possible to read this second requirement as pertaining to production over and above that of the base period (otherwise why use the term "undertaken", which could be omitted if all production is meant). This interpretation preserves the sense of the basic criterion, and the Bush Administration's unwillingness to embrace this plausible way of notifying MLA payments as green may be a reason why agricultural interests in Congress were irritated.

The marketing loan program is the aspect of U.S. policy that is closest to a classical production subsidy, since it makes use of the difference between a supported price and the market price on all of a producer's output that can be documented as available for sale from a farm (up to quite liberal levels of payment restriction). Westcott and Price (2001) estimated of the output effects of marketing loan supports by removing price wedges attributable to marketing loan provisions as of 1998, and simulating the effects for each commodity to 2005. They used a model embodying a complete set of commodity supply and demand elasticities and cross-elasticities, with baseline projections of yields and export demand. Taking an average of their results for 1999-2001, i.e., two to four years after the loan program is taken away, they estimate the following percentage changes in prices and quantities attributable to the program, as compared to the situation without the program:

Commodity	Market price	Cropland Area
Wheat	-2.2	1.5
Corn	-1.4	0.4
Soybeans	-3.7	1.4
Cotton[23]	-9.0	6.0

In contrast, it is arguable that the additional spending on direct and countercyclical payments, though large, is essentially a set of lump-sum payments that farmers cannot change through their decisions about what to produce, how much to produce, or the production practices followed. Therefore one may expect small if any output effects or price effects, and few if any deadweight losses due to market distortions.

What does this argument miss? One issue is the permitted updating of acreage bases for payments in 2002, which blunts the point that the payments do not influence production decisions. Given that updating farmers have an incentive to maintain acreage in order to be in a favorable position for future updating.

A second issue is a set of individually small but collectively significant policies that have remained in place: the market-distorting sugar support price; the Dairy Market Income Loss Protection (MILC) Program, which makes payments on current production (up to a limit of 2.4 million pounds per year – equivalent to a herd of about 140 cows), a marketing loan program for peanuts that makes payments on a current production base, and the introduction, in the 2002 Act, of similar marketing loan programs for wool, mohair, honey, and pulses (chickpeas, lentils, and dry peas). These last are significant new production-inducing subsidy programs, albeit on products with aggregrate values too small to register in Appendix Table 4.

With respect to Product Flexibility Payments (1996 Act) or direct payments (2002 Act), reasons have been given as to why the payments may result in commodity production higher than would be the case in the absence of the program, despite their "decoupled" nature. Most notable among the reasons are wealth effects, insurance effects, and restrictions on use of land in growing horticultural crops.

Whether any of these effects are quantitatively important is an empirical issue, and one that is impossible to estimate with precision from the data available. Westcott and Young (2001),

[23] The cotton figures are Westcott-Price estimates only for quantity. I estimate producer price based on a demand elasticity of –2/3.

following up on Young and Westcott (2000), use estimates of wealth effects on planted acreage, developed from pre-1990 data by Chavas and Holt (1990), to estimate that during the period of the FAIR Act PFC payments had "the possible increases in aggregate planted acreage range from 225,000 to 725,000", or about 0.3 percent of total cropland (p. 11). Adams et al. (2001) consider 1997-2000 acreage data directly for 11 major U.S. program-crop states. They find a positive effect of PFC plus market loss assistance (supplemental PFC) payments, but the effect has only marginal statistical significance. FAPRI's simulations imply that $10 billion in payments, about the average level in 1998-2001, would cause about 2.75 million acres of U.S. cropland to be devoted to program crops that would not have been in the absence of the FAIR Act, 1 percent of the acreage planted to those crops. The implied output effect of about 1 percent means the payments introduced in the FAIR Act had about half the downward world price effect of the marketing loan program. In view of the weak statistical significance of the underlying coefficient, the estimates are best taken as an upper limit of the program's effects.

In addition to commodity program effects, the Federal Crop Insurance Program has increased its subsidies and hence participation in the program since the 1994 Crop Insurance Reform Act. Estimates in the literature imply that $3 billion in crop insurance subsidies, a level being approached after 2005, would increase aggregate U.S. crop acreage by 0.5 to 10.0 percent, a remarkably wide range of uncertainty (see Glauber and Collins 2002; Young, Vandeveer and Schneff 2001; Orden 2001; Keaton, Skees and Long 2001). The most careful and detailed of these studies suggest the lower end of this range is most plausible. Young, Vandeveer, and Schneff project average acreages and yields during 2001-2010 in the absence of subsidized crop insurance. They estimate 960,000 acres would be withdrawn from grain, soybean, and cotton production (less than 0.5 percent), with more than half of this acreage from the Great Plains, a primarily wheat-growing area. Their implied estimate is that production of wheat would decline about 0.8 percent, cotton 1.7 percent, feed grains 0.2 percent, and soybeans 0.1 percent.

Overall effects

Although any estimate is conjectural, the set of most-reasonable estimates indicate that in the 1999-2005 period the marketing loan program has increased the U.S. output of grains and soybeans by about 2 percent, the direct payment program, including the 2002 Act's changes, about 1 percent, and crop insurance subsidies by 1+ percent, for a total effect of 4 to 5 percent more of these commodities being produced in 1999-2002 than would have been the case in the absence of commodity support programs.

Long-run policy effects

The long-run consequences of commodity support policies are a quite different matter. One has to consider government programs that have a longer-term focus (conservation, agricultural research), and the long-term effects of price supports through farmers' investment and technology adoption decisions.

The Conservation Reserve Program (CRP) idled 34 million acres (10 percent of all land used for crops) as of 2006, roughly the same level as for the last 15 years. If that program were to end, what would the output effects be? Most land in the CRP is designated as highly erodible or having other characteristics that make cropping it more than usually threatening to water quality (such as land within 100 feet of a stream or lake). These lands are expected to have lower than average yields when cropped, but analysis by the Economic Research Service of USDA has estimated that yield capacities of CRP land are not far below each area's corresponding cropped

acreage on average; but 58 percent of CRP land is in the relatively low-yielding Great Plains states and only 18 percent is in the Corn Belt. So bringing this land back into production would have a disproportionately large effect on wheat production. Assuming two-thirds of CRP land would return to crop production with 85 percent of the yield of average U.S. cropland, assumptions consistent with USDA-ERS analyses, a reasonable estimate of the effect on aggregate grain and soybean output is that the CRP has decreased output by the equivalent of (34·0.67·0.85=) 19 million U.S. average-quality cropland acres, about 7 percent. Thus the CRP slightly more than offsets the production increasing effects of marketing loans, crop insurance, and direct payments as operated under the 2002 Act.

In its benefit-cost analysis of the CRP, USDA estimates imply that 34 million acres placed in the program increase the prices of wheat, corn, and soybeans by 11 percent, 13 percent, and 12 percent respectively (USDA 1997, p. 7602). These estimated effects are probably too large as long-run impacts, but even if the long-run effects are only half as large, they still roughly offset the price-reducing effects of the USDA's current commodity support programs.

Empirical evidence

In order to provide an informal reality check for the preceding estimates of commodity program effects (not counting long-term effects of conservation or research programs), consider the time series data on corn, soybean, and wheat acreage, as shown in Appendix Figure 6. The period between 1970 and 1981 is one in which a huge increase in plantings of these crops occurred, from 160 to 240 million acres, a 50 percent increase. This expansion was induced by price rises in which farm-level corn and soybean prices more than doubled and wheat prices tripled. During the commodity crash and consequent farm income crisis of the 1980s, this acreage fell back, partly in response to lower prices and partly because of federal acreage-idling programs of pre-1996 legislation. The acreage reductions of 1983, 1986, and 1987 are specific consequences of these programs. By 1990-1995 relative stability in acreage emerged for aggregate grain and soybean acreage, but with a moderate continuing trend away from wheat and into soybeans. In this context the FAIR Act of 1996 was intended to let farmers respond more fully to market prices rather than deficiency payments (a goal already partly achieved in the 1990 Farm Act and likely responsible for some of the move to soybeans in 1990-1995).

What were the consequences of moving to "freedom to farm" in the 1996 Act? What was most clearly expected was a further shift to soybeans, and indeed this shift occurred. Beyond price incentives, one reason was the desire of some Corn Belt growers to introduce a two-year corn-soybean rotation for pest control purposes, but who had been trapped into continuous corn or nearly so by the loss of corn deficiency payments if they shifted to soybeans beyond the limits allowed under the limited flexibility provisions of the 1990 Act. However, regional data make it clear that the move to soybeans was not just a Corn Belt adjustment. Table 11 shows planted acreages for the main regions comparing the two years just before the FAIR Act (1994 and 1995 average) with the last two years (2000 and 2001 average). Soybean acreage increased by about the same amount (6 million acres) in both the Corn Belt and Great Plains, and by a much larger percentage in the latter.

Aggregate acreage for the three crops increased most in the Corn Belt. As Appendix Figure 6 shows, the main jump in acreage occurred in 1996. The predominant causes were the high commodity prices that persisted over a year from mid-1995, and the end of legislated acreage reduction programs. The effect of the FAIR Act's marketing loan, PFC payment, and crop insurance programs was to maintain that higher acreage. This can be seen most clearly by

plotting the data in price-quantity space. Appendix Figure 7 shows corn acreage planted and the average price received by farmers for the preceding crop.[24] It is noteworthy that the 1998-2002 levels of plantings are clustered in the lower right-hand corner of price-quantity space. This means that the acreage-response supply function lies below the supply function of earlier years. Why? One reason is that the real cost of producing corn has declined (note that prices are deflated to give real values), attributed to technological advances -- improved seed, machinery, etc.

Wheat	3 crops
-1,802	4,897
-23.1 percent	5.2 percent
-5,462	2,651
-13.2 percent	3.9 percent
-49	-1,721
-1.1 percent	-8.1 percent
-1,255	185
-7.8 percent	0.8 percent
-8,567	6,013
-12.3 percent	2.9 percent

There is an overall tendency for successive observations to lie lower and to the right, as the division of the data into the 1980s (squares), early 1990s (triangles), and 1998-2002 (diamonds) indicates. In addition, corn programs, particularly set-asides, make a difference. This is most obvious in the case of the Payment-in-Kind acreage idling program of 1983, which brought planted corn acreage down to 60 million. The 7.5 percent corn acreage reduction in the 1995 program in responsible for the left-most triangle in the 1990-1997 data and the only such year in which corn had an acreage reduction program.

The data suggest that the loan deficiency payments and perhaps the market-loss assistance payments of 1998-2001 also have played a role. Sketching in supply functions (adjusted for acreage reductions in years when they occurred) as shown in Appendix Figure 7 indicates that the curve shifted down by about 65 cents per bushel between 1991-97 and 1998-2002. If technical progress reduced costs by 2 percent per year during this period (USDA's estimate of the long-term average total factor productivity growth for U.S. agriculture), this

[24] This price is called the lagged price in the diagram, because it is received in marketing the crop preceding the crop whose planted acreage is shown. But the time is which the prices are observed actually coincides with the planting period. For example the price that corresponds to planted acreage in 2001 is the average price received for the 2000 crop. Most of the crop is sold in the months immediately following the harvest, in October 2000 to January 2001, just a few months before planting the 2001 crop; but some sales whose prices make up the season average price of 2000-crop corn occur throughout the marketing year, which goes through August 2001. Therefore, it is possible that observation of plantings could influence the "lagged" price to some extent, and we would not be able to identify the acreage-proxied supply function exactly.

could have accounted for a shift of about 12 percent over the six years from the midpoint of the 1991-97 period to the midpoint of the 1998-2002 period, which at an average price of $2.50 would amount to 30 cents. This leaves a 35-cent apparent supply shift unaccounted for. That is, in 1998-2002 farmers are planting an acreage of corn that, based on farmers' historical behavior, would have required a price 35 cents per bushel higher than the actual price we observe in 1998-2002. (If there were no cost reductions, and the underlying real cost situation has remained the same since 1991, then the apparently missing price incentive is 65 cents per bushel.)

Recall from the earlier discussion of marketing loans that the average marketing loan benefit for 1999-2000 was 26 cents per bushel. This explains a substantial part of the apparent supply shift – if producers expect a 26-cent marketing loan benefit, they will commit acreage to corn that they would commit if the market price (which doesn't include the marketing loan benefit) was 26 cents higher and there were not marketing loans (as there were not in the higher-priced years of 1991-1997). Since the total apparent supply shift (measured vertically) is 65 cents, this leaves a 9-cent (if corn production costs were reduced 12 percent) to 39-cent (if costs were not reduced at all) shift to be explained by other factors. The prime candidate is the Production Flexibility and Market Loss Assistance payments made under the FAIR Act.

To estimate the additional corn production created by the policies, we need to convert the vertical shift to a horizontal one. For this transformation only one parameter is necessary, the elasticity of supply. Assuming it is 0.3, the horizontal shift is 1.2 (12 percent cost reduction) to 4.5 percent (no cost reduction). Taking the midpoint, and assuming no yield effects, the implication is that policies in place under the FAIR Act generated about 3 percent more corn than would have been the case under pre-1996 policies.

The data for soybeans indicate an even larger soybean acreage effect in 1998-2002. Despite record-low real prices, acreage keeps increasing. In part, following the discussion earlier, this is attributable to the FAIR Act's removal of previously existing disincentives to grow soybeans. Indeed, the soybean data call into question the estimate of the corn effect as estimated, because it too could be in part a result of corn acreage moving to soybeans as a result of FAIR Act soybean provisions rather than corn subsidies. The data of Appendix Figure 6 and Appendix Table 7 suggest that even a corn-soybean aggregate analysis would not tell the whole story, because there has been a substitution of both of these crops, but especially soybeans, for wheat. For the three-crop aggregate, the data indicate an acreage effect of about 4 percent. Appendix Figure 6 plots the path labeled "policy phase-out" as an estimated 4 percent less during 1999-2001 as the difference between the U.S. acreage actually planted to corn, soybeans, and wheat and the acreage the would have been planted in the absence of the PFC payments, market-loss payments, marketing loan payments, and added crop insurance subsidies that were paid in those years.

Canada

Appendix Table 8 shows applied tariff rates for Canadian agricultural, food, and nonfood manufacturing products. Wheat makes the highest contribution to Canada's measured tariff protection, but it is not clear how meaningful the tariff is, since the main cross-border traffic in wheat would be with the U.S., which under NAFTA would not be subject to those duties. There have been non-tariff barriers to wheat movement, most notably in the case of durum wheat in the 1990s, but here it was Canadian exports to the U.S. that were restricted. It is also likely that the

Canadian Wheaet Board (CWB) at times exercises voluntary restraint on exports to the U.S. (Gray and Gardner 1995).

As of 2000, the tariff levels for supply-managed commodities, which apply once triggering quantities are reached, were: milk, 241 percent, butter 299 percent, skim milk powder 202 percent, turkey meat 155 percent, eggs 164 percent, and chicken meat 238 percent (Schmitz, Furtan, and Baylis 2002, p. 272). These levels do not necessarily indicate differences between domestic Canadian and world reference prices, however, since they are set higher than necessary in years of average world price levels, so that no quantities will be imported above the in-quota levels that trigger the duties even in years when world prices are unusually low (so substantially lower tariffs might have been sufficient). Moreover, to the extent that supply management programs are actually restricting Canadian supplies, the effects on world markets of liberalizing the policies are unclear even as to the sign of the effect on world prices. Letting more products into Canada would be positive for world prices but letting Canadians produce more would be negative.

Because they make payments to producers based on estimates of returns for the farm enterprise as a whole, the main Canadian programs since 1991 do not lend themselves well to commodity-specific analysis. We can compare Canadian producer prices to international reference prices, adjusted for transportation and other transactions costs, and for differences in quality characteristics between Canadian and reference traded commodities.

The major long-standing market support policies for grains and livestock operate outside the Agricultural Policy Framework – the Canadian Wheat Board CWB and the supply management programs for livestock. As mentioned earlier, the CWB has a monopoly of Canadian wheat and barley exports. It is one of the largest wheat merchandisers in the world, and accounted for 12 percent of the world cereals market according to a recent estimate (Carter. Loyns, and Berwald 1998). The CWB aims to sell strategically in competition with other exporters, notably Australia, the EU, and the U.S. The strategy became one of matching export subsidies in the 1980s and 1990s. In a subsidizing world, the CWB could increase the farmers' "pooled" price of wheat exported and sold to domestic millers by selling less for domestic millers' use and more on the world market. With a relatively inelastic demand in the domestic market, this approach generates price discrimination that in principle would increase the farmer's revenue from any given amount sold. The effectiveness of this policy has been questioned by producer groups as discussed earlier (Schmitz and Furtan 2000). The question again is how to estimate appropriately the market-distorting effects of the CWB in the international perspective.

Given the structure of Canada's policies, with commodity price effects within Canada and between Canada and world market prices impossible to observe directly via policy instruments, the most feasible empirical approach is simply to compare internal Canadian prices to the closest corresponding international reference prices. The description of policies and policy instruments provides a qualitative sense of what to expect in such comparisons, but not much more. In price-comparison approach, we give up the attempt to determine detailed sources of distortions and take policies as, roughly, black boxes that generate the observed effects.

Consider wheat, Canada's most important farm product in value of production, and a paradigm of a heavily traded and reasonably standardized commodity with good historical international price data. What is the most appropriate comparison of Canadian and U.S. prices to measure "bottom line" protection of the Canadian wheat market? On the Canadian side, the best available candidate for a wholesale price is the price quoted for sales from the Canadian Wheat Board, f.o.b. Thunder Bay (Lake Superior). A widely used international reference price for wheat

is the U.S. Gulf price published by the U.S. Department of Agriculture. This price is for hard red winter wheat, comparable in quality to the predominant Canadian wheat but not as close as dark northern spring wheat (winter wheat, planted in the fall, generally does not survive northern winters) which has prices quoted at the Minneapolis Grain Exchange.[25] So, a good indicator of Canadian protection should be the Thunder Bay relative to the Minneapolis price. This is shown as NRA3 in Figure 8a.

It indicates about a 20 percent rate of protection in 1997-2003. This indicator can be questioned on the ground that the Thunder Bay price is an asking price posted by the CWB rather than a transactions price. The CWB makes deals at both discounts and premiums from this price (but jealously guards any information about prices in these deals). A better indicator might be the realized export value of Canadian wheat. FAO's data on the unit export value of Canadian wheat, relative to the Minneapolis price. This is shown as NRA2 in Figure 8. It suggests the CWB has been doing vastly better than the Thunder Bay price since the mid-1990s, averaging almost 70 percent over Minneapolis in 2000-03. This seems too good to be true (why aren't the CWB customers going after the much cheaper Minneapolis and Gulf wheat)? In addition, a lot of Canadian wheat goes to domestic milling and livestock feeding (which is outside CWB control). So the export price may be overstating the protection given to wheat as a whole. For information on farm-level protection NRA1 in Appendix Figure 8 shows the percentage relationship between the FAO producer price of wheat in Canada, and the U.S. gulf price, backed off to the U.S. farm level (using the average margin over this data period of $24 per tonne). By this measure Canadian wheat is disprotected by about 20 percent in recent years.[26] Overall, the wheat price comparisons, unfortunately, provide more of a puzzle than an answer. For present purposes I use the middle-of-the-road estimate, the Thunder Bay/Minneapolis relationship.

Canadian relative to international reference prices for other commodities vary in ways that are not transparently related to policies for some of them. Comparisons for Canada's top ten commodities by market value (excluding potatoes), which accounted for 70.4 percent of the value of Canada's farm output in 2005, are shown in Appendix Table 9.

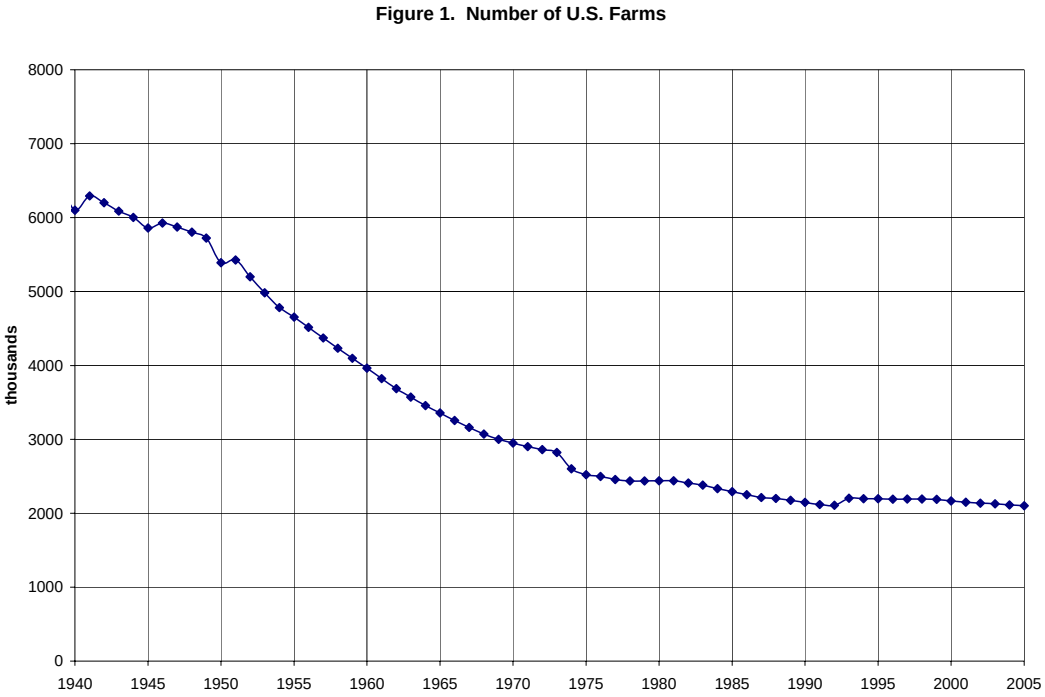
The final two tables in this appendix provide details of the annual NRA estimates for the United States and Canada.

---

[25] It should be noted too that the Gulf Price (New Orleans) is not really a market price at the Gulf, but rather USDA's imputation of a price at the Gulf using price quotes for wheat traded at the Kansas City or Chicago exchanges plus their estimate of shipping costs to the Gulf.

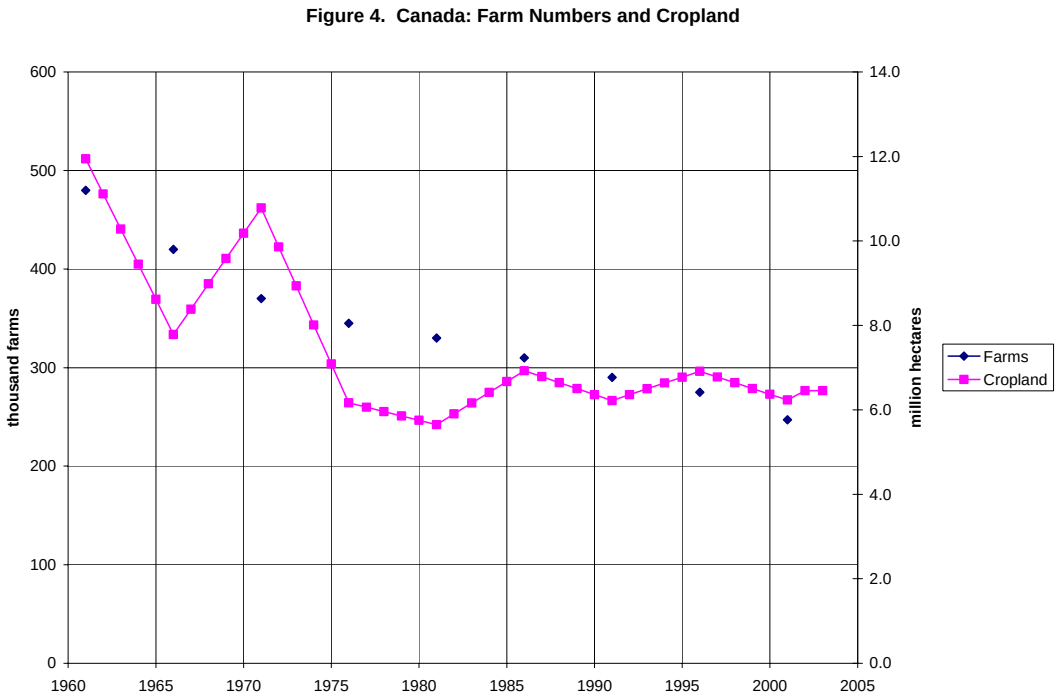
[26] A farm-level NRA can also be estimated by comparing the FAO producer prices for Canada and the US. This measure indicates even greater disprotection of Canadian wheat in recent years, averaging about -25 percent in 2000-03. Finally, it might be the case that because of NAFTA, Canadian and U.S. prices are jointly elevated relative to the rest of the world. To consider that possibility, an NRA was calculated with respect to the Australia wheat price reported by IFS. This generated an NRA of roughly zero over the last ten years. A Thunder Bay price 20 percent over Minneapolis but not above Australia is the opposite of what the NAFTA protection-in-common hypothesis would suggest (a common US-Canada price above the level of the Australian price).

Appendix Figure 1: Number of farms, United States, 1940 to 2005



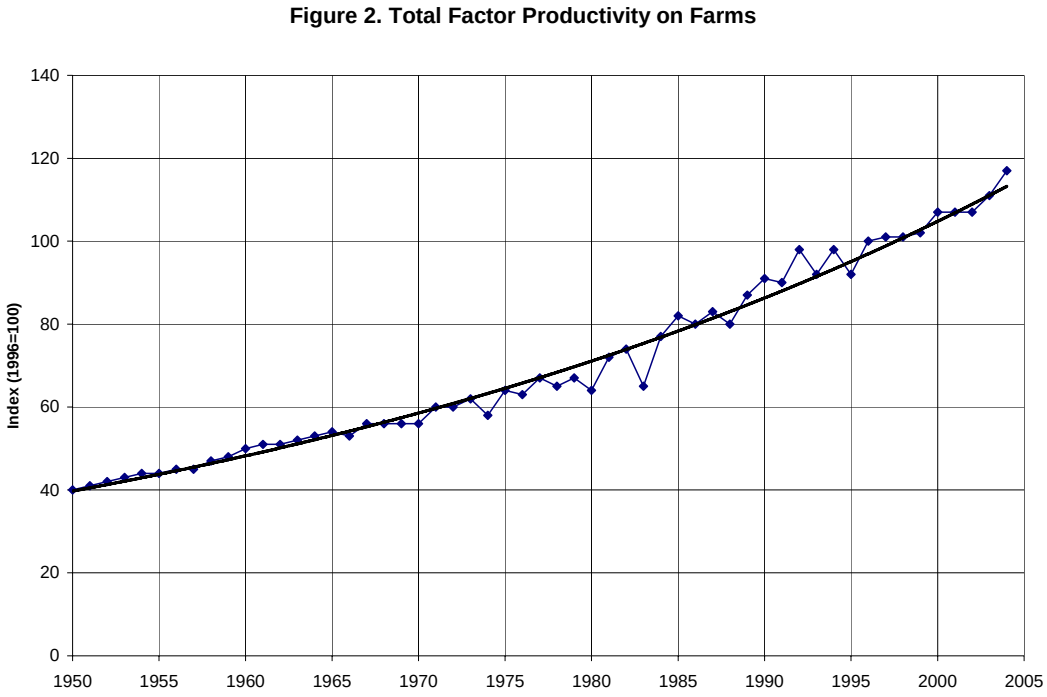
Sources: *Census of Agriculture*, 2002, *Agricultural Statistics*, 2006, and Carter (2006).

Appendix Figure 2: Number of farms and crop area, Canada, 1961 to 2003



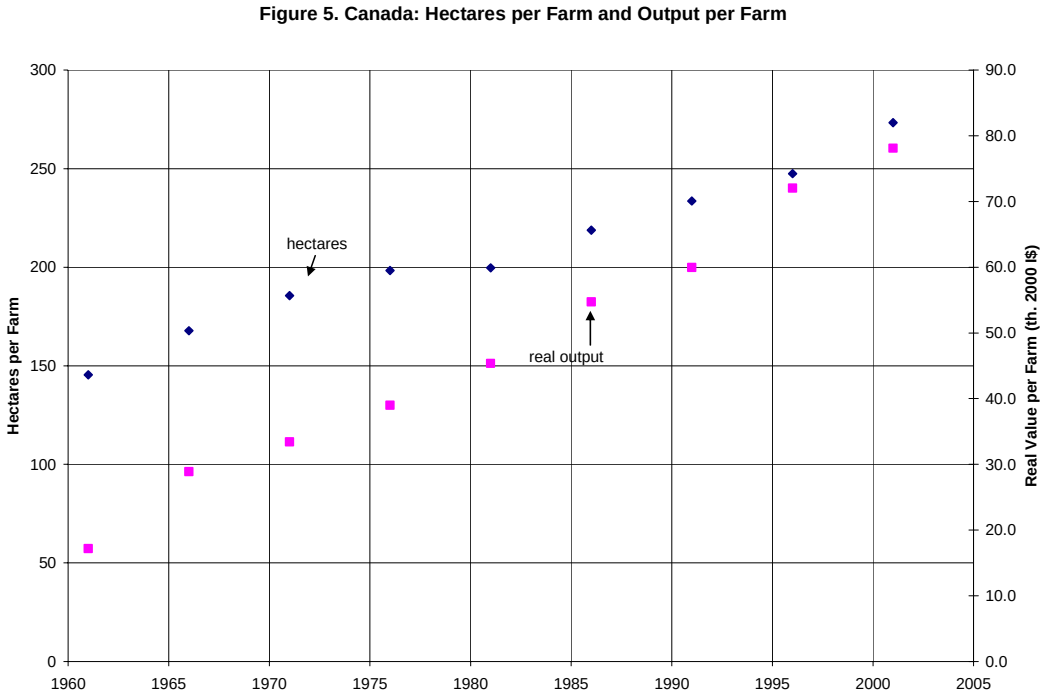
Source of data: FAOSTAT

Appendix Figure 3: Total factor productivity of farms, United States, 1950 to 2005



Source: U.S. Department of Agriculture (as reported in Economic Report of the President, 2006, Table B-100)

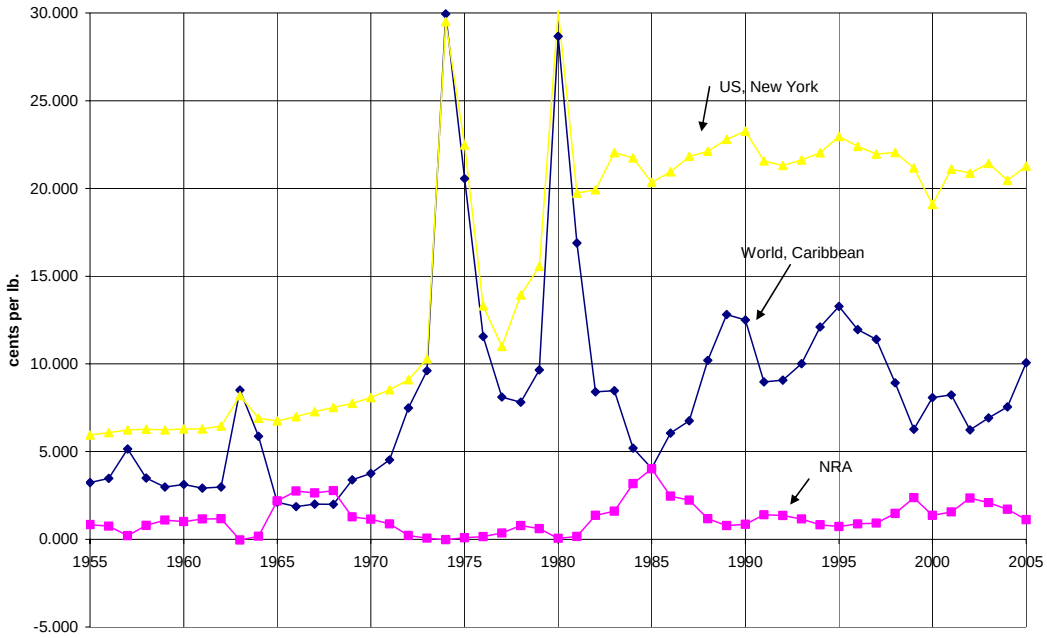
Appendix Figure 4: Land area and output per farm, Canada, 1961 to 2001



Source of data: FAOSTAT

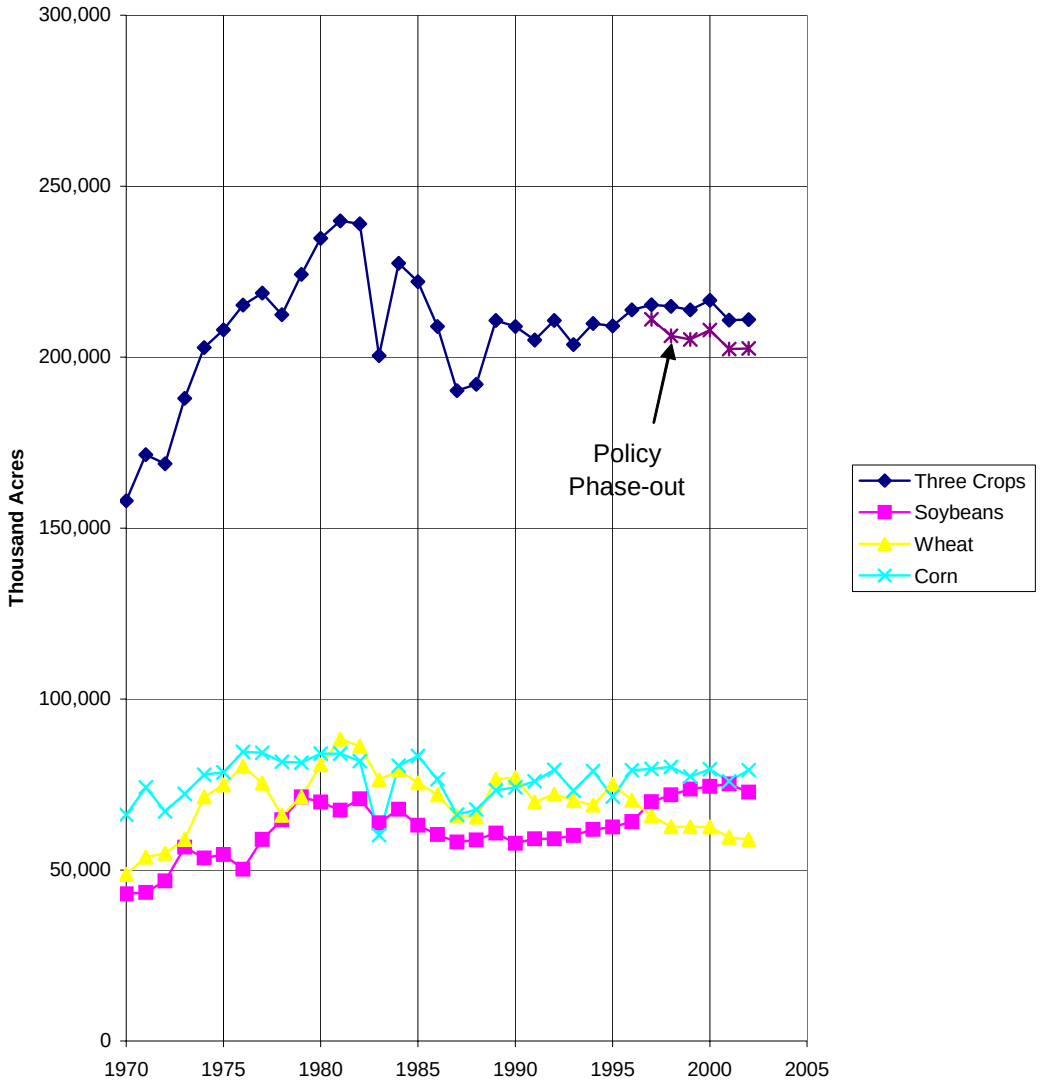
Appendix Figure 5: Prices and nominal rate of assistance for raw sugar, United States, 1955 to 2005

Figure 9. Raw Sugar Prices and NRA



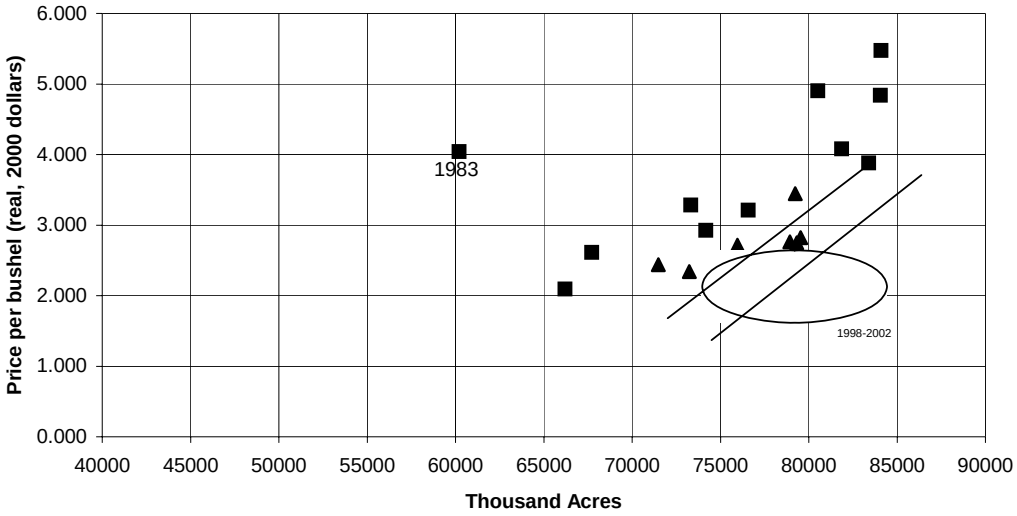
Appendix Figure 6: Area planted to corn, soybean and wheat, United States, 1970 to 2001

Figure 10. U.S. Acreage Planted, 1970-2001



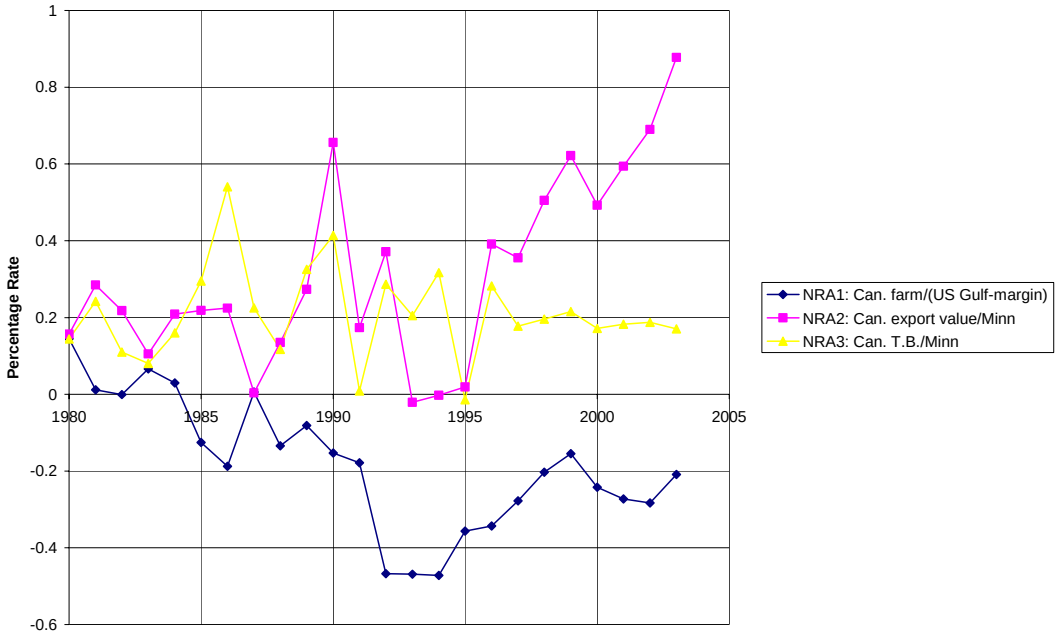
Appendix Figure 7: Area planted to and lagged price of corn, United States, 1980-2002

Figure 11. Corn Acreage Planted and Lagged Price, 1980-2002



Appendix Figure 8: Nominal rate of assistance for wheat, Canada, 1980 to 2003

Figure 8. Nominal Rates of Assistance: Canadian Wheat



Appendix Table 1: Average income of farm households, United States, 2000 to 2004
(dollars)

	2000	2001	2002	2003	2004
From farming	2,598	5,539	3,473	7,884	14,201
From off-farm sources	59,349	58,578	62,285	60,713	67,279
Total household income	61,947	64,117	65,757	68,597	81,480
U.S. average household income	57,045	58,208	57,852	59,087	60,528
Farm operator household income as % of U.S. average	*109*	*110*	*114*	*116*	*135*

Source: USDA, Economic Research Service, Agricultural Outlook Tables, ERS website.

Appendix Table 2: Tariffs on imported products, United States, 1989 to 2005
(percent)

	Agriculture		Manufactures		All merchandise
	Primary	Lightly processed	Highly processed food	Nonfood manuf.	
1989	0.9	3.2	6.3	4.2	12.0
1990	1.0	3.2	6.4	4.2	11.9
1991	1.0	3.1	6.2	4.3	5.8
1992	0.9	3.0	6.2	4.3	5.5
1993	0.8	2.7	6.3	4.3	5.2
1994			6.3	4.2	5
1995	0.8	2.6	7.0	3.7	5.1
1996	5.7	2.9			5.2
1997	4.4	3.9	7.2	3.4	5.4
1998	5.0	4.0	6.4	3.1	5.4
1999	3.5	2.5	6.3	2.9	5.1
2000	3.1	2.2	6.0	2.8	4.7
2001	3.4	2.1	6.2	2.7	4.6
2002	3.2	2.0			4.7
2003	2.7	1.9			5.1
2004	2.5	2.0			4.8
2005	2.5	1.8			

Sources: UNCTAD-TRAINS, compiled through WITS (for agriculture), Kee, Nicita and Olarreaga (2006) for manufactures, Carter (2006, Table Ee 424-430) for all merchandise.

Appendix Table 3: Expenditures on farm support, by program type, United States, 1998 to 2005

($million)

FY	Direct Payments	Counter-cyclical Payments	Subsidy payments*	Conservation Reserve Program	Ad hoc Assistance	Other**	Total
1998	5,672	0	2,229	1,693	26	523	10,143
1999	5,476	0	5,763	1,435	5,306	1,243	19,223
2000	5,057	0	10,354	1,476	12,536	2,842	32,265
2001	4,105	0	7,409	1,625	7,845	1,121	22,105
2002	3,968	0	8,977	1,785	427	523	15,680
2003	3,857	1,743	3,206	1,785	4,317	2,517	17,425
2004	5,278	809	2,033	1,786	1,057	-388	10,575
2005	5,236	2,772	5,979	1,788	2,580	1,832	20,187

* Loan Deficiency Payments, Net CCC Purchases, Cotton User Payments, Dairy Payments

** Main items are export programs and conservation programs other than the CRP.

Appendix Table 4: Support for main commodities, United States, 2004

(crop year)

	Million $	Million $ Payments					
	Value of Production	Decoupled	Pct. prot.	Coupled	Pct. Prot..	Total Prot. Pct.	Other Programs Features and Notes
cattle	34,888						Some gains from feed crop progs.
dairy	27,549	295	0.011				classified pricing,
corn	24,381	4,551	0.187	2,889	0.118	0.305	
chickens	20,505						Same as cattle
soybeans	17,895	598	0.033	299	0.017	0.050	
hogs	13,072						Same as cattle
hay	12,211						
eggs	5,903						Same as cattle
cotton	5,731	1,879	0.328	1,809	0.316	0.644	
wheat	4,950	1,140	0.230	78	0.016	0.246	
turkeys	3,065						Same as cattle
grapes	3,011						
potatoes	2,575						Program ended in 50s
almonds	2,189						
tomatoes	2,158						
citrus	2,099						Program ended in 90s
lettuce	2,015						
sugar crops	1,928			61	0.032	0.032	import quota
tobacco	1,752	18	0.010			0.010	Prod quotas ending
rice	1,702	585	0.344	133	0.078	0.422	
apples	1,648						ad hoc. purchases
Top 25	191,227	9,066	0.047	5,269	0.028	0.075	
The Rest	18,027			611*	0.034	0.034	
Total Agric.	209,254	9,066	0.043	5,269	0.025	0.069	

* Payments for peanuts, sorghum, barley, oats, wool, and honey

Appendix Table 5: USDA budget data, United States, 2001 and 2005

($million, fiscal years*)

	2001	2005
Contract Payments (2001) and Direct Payments (2005)	4,105	5236
Supplemental Payments (2001) and Countercyclical (2005)	5,455	2772
Loan Deficiency Payments	5,293	3856
Price Support Loans and Sales	1,377	1532
Disaster Assistance	3,146	2395
Other**	3,168	3060
Commodity Programs Outlays(CCC) (subtotal):	22,544	18,851
Conservation Reserve	1,358	1,788
EQIP and other	288	22
Natural Resource Management Programs	1,000	1,198
Conservation Programs (subtotal):	2,646	3,008
Export Credit Guarantees***	3,227	2,625
Market Development Programs	119	184
Export Subsidy Programs	15	1
Foreign Food Assistance	1,659	1,719
Export Programs (subtotal):	5,020	4,529
Farm Loan and Grant Programs (Budget Authority)	171	322
Crop Insurance, net indemnities paid	2,200	1,182
Administrative costs, above programs	2,223	2,440
Federal Research Funding	1,999	2,381
Marketing and Regulatory Programs	1,279	1,385
Total activity in support of agriculture	38,082	34,098

*Fiscal years are Oct-Sept., e.g., FY2001 is October 1, 2000 to September 30, 2001
**Includes cotton user payments, interest expenses, and "Section 32" commodity purchases (the last not in the CCC budget but included here).
***Amount of loans guaranteed, not the government's costs

Source: U.S. Department of Agriculture, FY 2006 Budget Summary

Appendix Table 6: Raw sugar tariff-rate quota allocations, United States

Countries	tons		
Argentina	77,258	Madagascar	7,258
Australia	149,126	Malawi	17,968
Belize	19,764	Mauritius	21,560
Bolivia	14,374	Mozambique	23,357
Brazil	260,522	Nicaragua	37,730
Colombia	43,121	Panama	52,105
Congo	7,258	Papua New Guinea	7,258
Cote D'Ivoire	7,258	Paraguay	7,258
Costa Rica	26,951	Peru	73,664
Dom. Republic	252,935	Philippines	224,012
Ecuador	19,764	South Africa	41,324
El Salvador	46,714	Swaziland	28,747
Fiji	12,934	Taiwan	13,953
Guatemala	86,241	Thailand	25,154
Guyana	21,560	Trinidad-Tobago	12,576
Honduras	17,968	Uruguay	7,258
India	11,497	Zimbabwe	21,560
Jamaica	19,764	NAFTA	830,015
		CAFTA TRQs (Calendar year)	86,000
		All Sugar	2,633,766

Source: U.S. Trade Representative

Appendix Table 7: Increase in crop planted acreages, United States, 1994/95 to 2001/02*

	Corn	Soybeans
change in million acres (percentage change below each entry)		
Midwest	150 0.3 percent	6,550 16.6 percent
Plains	2,030 12.0 percent	6,083 69.2 percent
South	-293 -5.6 percent	-1,380 -11.8 percent
All other states	564 10.2 percent	876 41.8 percent
US Total	2,452 3.3 percent	12,128 19.5 percent

* Averages of two crop years.
Midwest: IA,IL,IN,MI,MI,MN,MO,OH,WI
Plains: KS,ND,NE,OK,SD,TX
South: AL,AR,FL,GA,KY,LA,MS,NC,SC,TN,VA

Appendix Table 8: Applied tariff rates, Canada, 1988 to 2005

(percent)

	Wheat	Oilseeds	Cattle	Primary agriculture average	Processed food	Manufact food	Manufact nonfood
1988							
1989		0.0	0.0	2.6	5.3	7.2	7.5
1990						7.2	7.5
1991						7.2	7.6
1992						7.2	7.6
1993		0.0	0.0	0.7	3.4	7.6	7.3
1994						7.6	7.3
1995		0.0	0.0	5.3	25.6	32.6	6.5
1996	87.6	0.0	0.0	5.9	24.3	29.9	5.2
1997	85.5	0.0	0.0	0.7	2.1	8.0	4.8
1998	64.9	0.0	0.0	2.2	16.6	25.2	3.4
1999	3.4	0.0	0.0	1.5	16.2	25.1	3.1
2000	1.3	0.0	0.0	0.2	1.4	5.4	3.0
2001	28.3	0.0	0.0	0.3	1.7	5.3	3.1
2002	64.2	0.0	0.0	0.5	1.4	5.3	3.1
2003	30.5	0.0	0.0	0.3	1.3	4.9	3.1
2004	1.3	0.0	0.0	0.2	1.0	4.1	3.1
2005	1.3	0.0	0.0	0.2	1.0		

Sources: Agriculture, UNCTAD-TRAINS, compiled through WITS; Manufactures, Nicita A., and Olarreaga M. (2006)

Appendix Table 9: Percentage by which farm producer price exceeds external price, Canada, 2000 to 2003

(percent)

	2000	2001	2002	2003	2000-03 average	2005 market value (C$m)
wheat	17.1	18.3	18.7	17.0	17.8	3,985
beef	-19.4	-15.2	-1.8	1.7	-8.7	3,289
rapeseed	-27.7	-25.7	6.9	0.7	-11.4	2,399
pigmeat	7.4	4.4	11.5	8.8	8.0	2,359
milk	151.1	107.9	69.1	153.5	120.4	2,154
barley	-38.9	-27.8	-28.6	-42.1	-34.4	1,182
chicken	22.4	6.0	28.2	-42.1	3.6	1,137
maize	2.2	8.8	16.7	-3.0	6.2	975
soybeans	-3.3	-0.5	-1.1	0.4	-1.1	653
dry peas	-28.1	-10.4	-21.6	-16.6	-19.2	580

Appendix Table 10: Annual distortion estimates, **USA**, 1955 to 2007
(a) Nominal rates of assistance to covered products
(percent)

	Barley	Beef	Cotton	Egg	Maize	Milk	Pigmeat	Potato	Poultry
1955	na	0	0	na	0	21	0	na	0
1956	na	0	0	na	0	22	0	na	0
1957	na	0	2	na	0	22	0	na	0
1958	na	0	9	na	0	21	0	na	0
1959	na	0	18	na	0	15	0	na	0
1960	na	0	0	na	0	14	0	na	0
1961	na	0	0	na	2	15	0	0	0
1962	na	0	0	na	2	30	0	0	0
1963	na	0	0	na	2	31	0	0	0
1964	na	0	1	na	1	28	0	0	0
1965	na	2	2	na	2	25	0	0	0
1966	na	2	83	na	2	15	0	0	0
1967	na	2	90	na	2	25	0	0	0
1968	na	2	71	na	3	20	0	0	0
1969	na	2	80	na	3	20	0	0	0
1970	na	2	85	na	3	21	0	0	0
1971	na	2	60	na	4	22	0	0	0
1972	na	2	40	na	6	19	0	0	0
1973	na	2	25	na	4	5	0	0	0
1974	na	2	6	na	0	18	0	0	0
1975	na	2	5	na	0	22	0	0	0
1976	na	2	30	na	0	15	0	0	0
1977	na	2	1	na	0	35	0	0	0
1978	na	2	7	na	2	25	0	0	0
1979	na	2	3	4	0	30	0	0	0
1980	na	2	9	5	3	52	0	0	0
1981	na	2	13	6	0	60	0	0	0
1982	na	2	21	6	4	65	0	0	0
1983	na	2	17	6	0	80	0	0	0
1984	na	2	18	6	6	52	0	0	0
1985	na	2	29	6	11	70	0	0	2
1986	115	2	55	0	21	60	0	0	4
1987	115	3	25	8	11	56	0	0	25
1988	12	0	31	8	7	52	0	0	4
1989	6	0	23	1	2	247	0	0	0
1990	41	1	9	2	2	59	0	0	1
1991	61	1	21	4	0	68	0	0	2
1992	38	0	43	6	0	62	0	0	1
1993	89	2	40	15	0	58	5	0	0
1994	70	0	10	13	0	52	5	0	1
1995	3	0	10	10	0	34	0	0	1
1996	0	0	20	1	0	64	0	0	0
1997	0	0	30	0	1	69	0	0	0
1998	14	0	28	0	8	114	0	0	0
1999	7	0	51	0	15	113	0	0	0
2000	10	0	93	0	15	100	0	0	0
2001	3	0	84	0	7	83	0	0	0
2002	1	0	90	0	0	66	0	0	0
2003	0	0	53	0	1	46	0	0	0
2004	12	0	30	0	12	38	0	0	0
2005	8	0	77	0	20	23	0	0	0
2006	2	0	77	0	0	20	0	0	0
2007	0	0	77	0	0	29	0	0	0

	Rice	Sheepmeat	Sorghum	Soybean	Sugar	Wheat	Wool	All covered
1955	0	na	na	0	47	0	na	4
1956	0	na	na	0	12	0	na	4
1957	0	na	na	0	53	0	na	5
1958	0	na	na	0	74	0	na	5
1959	0	na	na	0	66	0	na	5
1960	0	na	na	0	78	0	na	3
1961	0	na	na	0	75	0	na	4
1962	0	na	na	0	0	1	na	5
1963	0	na	na	0	26	8	na	6
1964	0	na	na	0	151	9	na	6
1965	0	na	na	0	175	13	na	6
1966	0	na	na	0	167	15	na	7
1967	0	na	na	0	177	18	na	9
1968	0	na	na	0	81	22	na	8
1969	0	na	na	0	71	21	na	8
1970	0	na	na	0	52	21	na	8
1971	0	na	na	0	9	22	na	8
1972	0	na	na	0	0	21	na	7
1973	0	na	na	0	0	7	na	3
1974	0	na	na	0	29	1	na	4
1975	0	na	na	0	63	1	na	4
1976	0	na	na	0	43	1	na	4
1977	11	na	na	0	27	2	na	5
1978	1	na	na	0	30	26	na	6
1979	1	5	13	0	39	18	na	6
1980	1	6	14	0	6	4	na	8
1981	2	7	22	0	16	9	na	9
1982	17	7	17	0	111	11	na	12
1983	25	8	113	0	152	21	na	15
1984	33	7	21	0	317	11	na	12
1985	48	7	21	0	341	39	na	17
1986	98	1	34	3	141	36	2	18
1987	27	1	13	0	164	48	1	17
1988	9	1	5	0	88	16	1	11
1989	12	1	1	0	58	7	0	17
1990	21	1	1	0	53	23	1	10
1991	13	1	0	0	95	38	1	12
1992	34	1	0	0	88	21	1	11
1993	21	1	0	0	101	27	1	13
1994	12	1	0	0	57	19	1	9
1995	1	1	0	0	64	2	1	3
1996	0	1	0	0	59	0	1	3
1997	0	1	0	0	57	0	1	4
1998	1	1	7	9	94	8	1	8
1999	36	14	16	23	207	17	2	13
2000	58	14	9	29	96	15	2	13
2001	83	18	1	29	121	4	2	16
2002	79	18	0	1	97	0	32	10
2003	33	10	1	1	147	1	23	8
2004	10	10	16	3	117	1	22	10
2005	6	10	21	1	66	0	29	9
2006	0	10	1	0	27	0	31	4
2007	0	10	0	0	50	0	25	5

Appendix Table 10 (continued): Annual distortion estimates, **USA**, 1955 to 2007
(b) Nominal and relative rates of assistance to all agricultural products, to exportable and import-competing agricultural industries, and relative to non-agricultural industries (percent)

	NRA, all agric products,[a] by component					NRA, agric tradables				
	NRA, covered products (1)	NRA, non-covered products (2)	NRA, non-product-specific support (3)	NRA, all ag products (incl NPS) (4)=1+2+3	NRA, all ag products (incl NPS and decoupled) (5)	NRA, ag export-ables (6)	NRA, ag import-competing (7)	NRA, all agric tradable goods[c] (8)=6+7	NRA, all non-ag tradable goods (9)	RRA[b] (10)
1955	4	9	2	8	8	2	9	8	6	2
1956	4	9	5	11	11	2	9	11	6	5
1957	5	8	11	16	16	2	9	16	6	10
1958	5	6	11	16	16	3	8	16	6	9
1959	5	9	6	12	12	5	7	12	7	5
1960	3	7	6	11	11	2	7	10	7	3
1961	4	10	6	11	11	3	8	11	7	3
1962	5	6	5	10	10	2	9	10	8	3
1963	6	7	5	11	11	3	10	11	7	4
1964	6	8	4	11	11	3	11	11	7	4
1965	6	7	3	10	10	4	10	10	8	2
1966	7	4	3	10	10	6	7	10	8	2
1967	9	5	4	12	12	7	9	12	8	4
1968	8	7	3	11	11	8	8	12	7	4
1969	8	8	2	10	10	8	8	10	7	3
1970	8	7	2	9	9	7	8	10	7	3
1971	8	5	2	9	9	7	7	9	6	3
1972	7	6	1	8	8	7	6	8	6	2
1973	3	4	0	4	4	4	3	4	5	-1
1974	4	3	1	4	4	1	7	4	4	0
1975	4	3	1	5	5	1	8	5	4	1
1976	4	3	1	5	5	3	6	5	4	1
1977	5	5	2	7	7	2	10	7	4	3
1978	6	7	1	7	7	5	8	8	4	3
1979	6	6	1	7	8	4	10	7	4	3
1980	8	5	1	8	9	3	13	9	3	6
1981	9	5	2	10	12	4	15	11	3	7
1982	12	7	3	13	15	6	18	13	4	9
1983	15	10	2	15	30	7	22	15	4	11
1984	12	6	1	12	17	6	16	12	4	8
1985	17	10	1	16	25	12	21	17	4	13
1986	18	12	3	19	31	14	20	20	4	15
1987	17	12	3	18	29	14	18	18	4	14
1988	11	9	5	16	24	8	15	17	3	13
1989	17	11	2	17	23	5	31	18	3	14
1990	10	9	4	14	20	5	16	14	3	11
1991	12	9	4	14	20	6	17	15	3	11
1992	11	8	4	14	20	6	16	15	3	11
1993	13	9	3	15	21	8	18	15	3	12
1994	9	7	4	12	17	5	16	13	3	9
1995	3	5	4	8	10	3	6	7	3	5
1996	3	7	4	9	13	3	7	9	2	6
1997	4	7	5	9	14	3	7	9	2	7
1998	8	11	2	11	20	8	12	12	2	9
1999	13	13	1	14	25	13	13	15	2	13
2000	13	12	2	15	26	15	11	16	2	14
2001	16	11	3	18	27	11	21	19	2	17
2002	10	9	6	16	25	5	17	17	2	15
2003	8	7	6	14	21	5	13	15	2	13
2004	10	8	5	15	22	7	13	15	2	13
2005	9	8	7	16	23	9	10	16	1	15
2006	4	4	4	7	12	3	6	7	1	5
2007	5	4	3	7	10	2	10	7	1	5

a. NRAs including assistance to nontradables and via inputs and other forms of non-product-specific (NPS) assistance without and (in column (5)) with decoupled support.
b. The Relative Rate of Assistance (RRA) is defined as $100*[(100+NRAag^t)/(100+NRAnonag^t)-1]$, where $NRAag^t$ and $NRAnonag^t$ are the percentage NRAs for the tradables parts of the agricultural and non-agricultural sectors (columns 8 and 9), respectively, so it excludes decoupled payments but includes all NPS support.
c. Including NPS but excluding decoupled payments, so more than the weighted average of columns (6) and (7).

Appendix Table 10 (continued): Annual distortion estimates, **USA**, 1955 to 2007
(c) Value shares of primary production of covered[a] and non-covered products, (percent)

	Barley	Beef	Cotton	Egg	Maize	Milk	Pigmeat	Potato	Poultry
1955	na	8	8	na	14	12	8	na	4
1956	na	8	7	na	14	12	8	na	4
1957	na	10	6	na	12	13	10	na	4
1958	na	11	5	na	11	11	10	na	4
1959	na	12	6	na	11	12	8	na	4
1960	na	11	7	na	12	12	8	na	4
1961	na	10	6	na	12	11	8	2	4
1962	na	11	6	na	12	10	8	2	4
1963	na	10	6	na	13	9	8	2	4
1964	na	11	6	na	13	10	8	2	4
1965	na	11	6	na	13	9	9	2	4
1966	na	12	1	na	14	11	10	2	4
1967	na	13	1	na	14	11	9	2	4
1968	na	13	2	na	12	11	9	2	4
1969	na	14	1	na	13	11	10	2	4
1970	na	14	1	na	12	11	10	2	4
1971	na	14	2	na	13	10	8	1	4
1972	na	14	2	na	15	9	8	2	3
1973	na	11	3	na	16	8	8	2	3
1974	na	10	3	na	16	8	8	2	3
1975	na	9	2	na	17	8	9	2	4
1976	na	10	3	na	15	10	8	1	4
1977	na	10	4	na	15	9	8	1	4
1978	na	12	3	na	15	9	8	1	4
1979	na	11	3	2	15	8	7	1	3
1980	na	10	3	2	15	8	6	1	3
1981	na	10	3	3	15	8	7	1	4
1982	na	10	2	2	15	8	8	1	4
1983	na	11	2	3	11	8	8	2	4
1984	na	10	3	3	14	8	7	2	5
1985	na	10	2	3	14	8	7	1	5
1986	0	12	1	3	9	9	9	2	6
1987	0	12	3	2	10	9	9	1	4
1988	1	13	2	2	9	8	7	2	6
1989	1	12	2	3	13	4	7	2	7
1990	0	12	3	3	12	8	8	2	6
1991	0	12	3	3	12	7	8	1	6
1992	0	11	2	2	13	7	7	2	6
1993	0	12	2	2	11	8	7	2	7
1994	0	10	4	2	14	8	5	2	7
1995	1	10	4	2	15	2	6	2	8
1996	1	9	3	3	14	2	7	1	8
1997	1	10	3	3	13	2	7	2	8
1998	0	11	2	3	12	2	6	2	10
1999	0	12	2	3	11	2	6	2	11
2000	0	13	2	3	11	2	8	2	10
2001	0	12	1	3	11	8	7	2	10
2002	0	11	1	3	13	7	5	2	9
2003	0	11	2	3	13	7	5	1	8
2004	0	10	3	3	11	9	6	1	10
2005	0	10	2	2	9	11	6	1	10
2006	0	15	1	2	13	8	5	1	9
2007	0	13	1	2	17	8	4	1	9

	Rice	Sheepmeat	Sorghum	Soybean	Sugar	Wheat	Wool	Non-covered
1955	1	na	na	3	1	7	na	33
1956	1	na	na	4	1	7	na	34
1957	1	na	na	4	1	7	na	33
1958	1	na	na	4	1	9	na	34
1959	1	na	na	4	1	7	na	35
1960	1	na	na	4	1	8	na	34
1961	1	na	na	5	1	7	na	33
1962	1	na	na	5	1	7	na	34
1963	1	na	na	5	1	6	na	34
1964	1	na	na	6	1	5	na	34
1965	1	na	na	6	0	4	na	34
1966	1	na	na	7	0	5	na	33
1967	1	na	na	7	0	5	na	34
1968	1	na	na	7	1	4	na	34
1969	1	na	na	7	1	4	na	34
1970	1	na	na	7	1	3	na	34
1971	1	na	na	8	1	4	na	34
1972	1	na	na	10	1	4	na	31
1973	1	na	na	10	1	7	na	29
1974	1	na	na	9	2	8	na	30
1975	1	na	na	9	1	9	na	29
1976	1	na	na	10	1	6	na	31
1977	1	na	na	12	1	5	na	31
1978	1	na	na	12	1	4	na	31
1979	1	0	1	11	1	5	na	29
1980	1	0	1	10	2	7	na	30
1981	1	0	1	9	1	7	na	30
1982	1	0	1	9	1	7	na	31
1983	1	0	1	11	1	6	na	33
1984	1	0	1	8	0	6	na	31
1985	0	0	1	9	0	4	na	34
1986	0	0	1	8	1	3	0	35
1987	1	0	1	9	0	3	0	34
1988	1	0	1	9	1	5	0	34
1989	1	0	1	8	1	5	0	34
1990	1	0	1	7	1	4	0	33
1991	1	0	1	8	1	3	0	34
1992	1	0	1	8	1	4	0	33
1993	1	0	1	8	1	4	0	35
1994	1	0	1	9	1	4	0	32
1995	1	0	1	9	1	6	0	33
1996	1	0	1	10	1	6	0	34
1997	1	0	1	10	1	5	0	34
1998	1	0	1	8	1	4	0	37
1999	1	0	1	7	0	4	0	38
2000	0	0	1	7	1	4	0	38
2001	0	0	1	6	0	3	0	35
2002	0	0	1	9	1	4	0	34
2003	1	0	1	10	0	4	0	33
2004	1	0	0	9	0	4	0	33
2005	1	0	0	9	0	4	0	34
2006	1	0	0	8	1	3	0	33
2007	1	0	1	9	1	4	0	29

a. At farmgate undistorted prices

Appendix Table 10 (continued): Annual distortion estimates, **USA**, 1955 to 2007
(d) Trade status of of covered products[a]

	Barley	Beef	Cotton	Egg	Maize	Milk	Pigmeat	Potato	Poultry
1955	na	M	X	na	X	M	M	H	X
1956	na	M	X	na	X	M	M	H	X
1957	na	M	X	na	X	M	M	H	X
1958	na	M	X	na	X	M	M	H	X
1959	na	M	X	na	X	M	M	H	X
1960	na	M	X	na	X	M	M	H	X
1961	na	M	X	na	X	M	M	H	X
1962	na	M	X	na	X	M	M	H	X
1963	na	M	X	na	X	M	M	H	X
1964	na	M	X	na	X	M	M	H	X
1965	na	M	X	na	X	M	M	H	X
1966	na	M	X	na	X	M	M	H	X
1967	na	M	X	na	X	M	M	H	X
1968	na	M	X	na	X	M	M	H	X
1969	na	M	X	na	X	M	M	H	X
1970	na	M	X	na	X	M	M	H	X
1971	na	M	X	na	X	M	M	H	X
1972	na	M	X	na	X	M	M	H	X
1973	na	M	X	X	X	M	M	H	X
1974	na	M	X	X	X	M	M	H	X
1975	na	M	X	X	X	M	M	H	X
1976	na	M	X	X	X	M	M	H	X
1977	na	M	X	X	X	M	M	H	X
1978	na	M	X	X	X	M	M	H	X
1979	na	M	X	X	X	M	M	H	X
1980	M	M	X	X	X	M	M	H	X
1981	M	M	X	X	X	M	M	H	X
1982	M	M	X	X	X	M	M	H	X
1983	M	M	X	X	X	M	M	H	X
1984	M	M	X	X	X	M	M	H	X
1985	M	M	X	X	X	M	M	H	X
1986	M	M	X	X	X	M	M	H	X
1987	M	M	X	X	X	M	M	H	X
1988	M	M	X	X	X	M	M	H	X
1989	M	M	X	X	X	M	M	H	X
1990	M	M	X	X	X	M	M	H	X
1991	M	M	X	X	X	M	M	H	X
1992	M	M	X	X	X	M	M	H	X
1993	M	M	X	X	X	M	M	H	X
1994	M	M	X	X	X	M	M	H	X
1995	M	M	X	X	X	M	M	H	X
1996	M	M	X	X	X	M	M	H	X
1997	M	M	X	X	X	M	M	H	X
1998	M	M	X	X	X	M	M	H	X
1999	M	M	X	X	X	M	M	H	X
2000	M	M	X	X	X	M	M	H	X
2001	M	M	X	X	X	M	M	H	X
2002	na	M	X	na	X	M	M	H	X
2003	na	M	X	na	X	M	M	H	X
2004	na	M	X	na	X	M	M	H	X
2005	na	M	X	na	X	M	M	H	X
2006	na	M	X	na	X	M	M	H	X
2007	na	M	X	na	X	M	M	H	X

	Rice	Sheepmeat	Sorghum	Soybean	Sugar	Wheat	Wool
1955	X	na	na	X	M	X	na
1956	X	na	na	X	M	X	na
1957	X	na	na	X	M	X	na
1958	X	na	na	X	M	X	na
1959	X	na	na	X	M	X	na
1960	X	na	na	X	M	X	na
1961	X	na	na	X	M	X	na
1962	X	na	na	X	M	X	na
1963	X	na	na	X	M	X	na
1964	X	na	na	X	M	X	na
1965	X	na	na	X	M	X	na
1966	X	na	na	X	M	X	na
1967	X	na	na	X	M	X	na
1968	X	na	na	X	M	X	na
1969	X	na	na	X	M	X	na
1970	X	na	na	X	M	X	na
1971	X	na	na	X	M	X	na
1972	X	na	na	X	M	X	na
1973	X	M	X	X	M	X	na
1974	X	M	X	X	M	X	na
1975	X	M	X	X	M	X	na
1976	X	M	X	X	M	X	na
1977	X	M	X	X	M	X	na
1978	X	M	X	X	M	X	na
1979	X	M	X	X	M	X	na
1980	X	M	X	X	M	X	M
1981	X	M	X	X	M	X	M
1982	X	M	X	X	M	X	M
1983	X	M	X	X	M	X	M
1984	X	M	X	X	M	X	M
1985	X	M	X	X	M	X	M
1986	X	M	X	X	M	X	M
1987	X	M	X	X	M	X	M
1988	X	M	X	X	M	X	M
1989	X	M	X	X	M	X	M
1990	X	M	X	X	M	X	M
1991	X	M	X	X	M	X	M
1992	X	M	X	X	M	X	M
1993	X	M	X	X	M	X	M
1994	X	M	X	X	M	X	M
1995	X	M	X	X	M	X	M
1996	X	M	X	X	M	X	M
1997	X	M	X	X	M	X	M
1998	X	M	X	X	M	X	M
1999	X	M	X	X	M	X	M
2000	X	M	X	X	M	X	M
2001	X	M	X	X	M	X	M
2002	X	na	na	X	M	X	na
2003	X	na	na	X	M	X	na
2004	X	na	na	X	M	X	na
2005	X	na	na	X	M	X	na
2006	X	na	na	X	M	X	na
2007	X	na	na	X	M	X	na

Source: Anderson and Valenzuela (2008), based on author's spreadsheets

Appendix Table 11: Annual distortion estimates, **Canada**, 1961 to 2007
(a) Nominal rates of assistance to covered products
(percent)

	Barley	Beef	Egg	Maize	Milk	Peas	Pigmeat	Potato	Poultry	Rapeseed	Soybean	Sugar	Wheat	All covered
1961	2	1	na	5	34	0	2	0	17	0	0	na	3	10
1962	2	1	na	5	34	0	2	0	17	0	0	na	3	9
1963	2	1	na	5	34	0	2	0	17	0	0	na	3	8
1964	2	1	na	5	34	0	2	0	17	0	0	na	3	8
1965	2	1	na	5	34	0	2	0	17	0	0	na	3	7
1966	2	1	na	4	34	0	2	0	17	0	0	na	3	7
1967	2	1	na	5	34	0	2	0	26	0	0	na	3	8
1968	2	1	na	5	34	0	2	0	20	0	0	na	3	8
1969	2	1	na	5	34	0	2	0	8	0	0	na	3	7
1970	2	1	na	4	34	0	2	0	21	0	0	na	3	7
1971	2	1	na	4	34	0	2	0	33	0	0	na	3	8
1972	2	1	na	4	34	0	2	0	49	0	0	na	3	7
1973	2	1	na	3	34	0	2	0	14	0	0	na	3	5
1974	2	1	na	2	34	0	2	0	51	0	0	na	3	7
1975	2	1	na	2	34	0	2	0	13	0	0	na	3	7
1976	2	1	na	2	115	0	2	0	40	0	0	na	3	14
1977	5	3	na	3	126	0	2	0	29	0	0	na	3	16
1978	10	1	na	2	275	0	2	0	18	0	0	na	3	20
1979	10	-1	25	2	264	0	2	0	22	0	0	9	3	23
1980	10	1	42	2	275	0	2	0	14	0	0	21	4	18
1981	5	3	46	2	275	0	2	0	32	0	0	37	4	25
1982	5	3	46	2	309	0	2	0	35	0	0	52	5	23
1983	10	1	45	2	332	0	2	0	27	0	0	25	6	23
1984	10	5	26	2	344	0	2	0	8	0	0	27	8	24
1985	15	4	38	13	378	0	2	0	19	10	2	122	12	30
1986	19	4	0	27	368	0	2	0	19	20	5	139	17	32
1987	16	5	29	14	480	0	2	0	36	18	0	67	19	34
1988	1	4	54	4	203	0	7	0	22	0	0	40	4	26
1989	1	3	29	5	142	0	18	0	23	0	6	30	0	21
1990	5	4	20	6	149	0	2	0	36	2	1	43	4	22
1991	2	5	28	2	226	0	6	0	41	0	0	37	1	23
1992	2	3	41	3	154	0	9	0	27	0	0	26	1	21
1993	2	6	38	0	163	0	3	0	19	0	0	29	0	19
1994	1	2	39	1	220	0	5	0	2	0	0	20	0	18
1995	1	2	39	1	108	0	5	0	2	0	0	19	1	13
1996	2	2	25	2	73	0	4	0	4	0	0	17	1	9
1997	1	2	30	3	110	0	1	0	5	0	0	na	0	12
1998	1	3	22	3	128	0	3	0	2	0	0	na	0	14
1999	2	2	22	7	128	0	6	0	1	0	2	na	0	14
2000	3	2	4	11	172	0	4	0	1	0	2	na	1	16
2001	3	1	12	9	77	0	2	0	1	0	2	na	1	11
2002	3	2	15	4	160	0	1	0	2	0	0	na	1	15
2003	2	2	0	8	132	0	2	0	7	0	1	na	1	15
2004	4	2	23	11	89	0	1	0	3	0	1	na	1	12
2005	3	2	55	9	81	0	1	0	1	0	1	na	1	11
2006	0	0	57	0	143	0	0	0	11	0	0	na	0	14
2007	0	0	82	0	60	0	0	0	9	0	0	na	0	9

Appendix Table 11 (continued): Annual distortion estimates, **Canada**, 1961 to 2007
(b) Nominal and relative rates of assistance to all agricultural products, to exportable and import-competing agricultural industries, and relative to non-agricultural industries (percent)

	NRA, all agric products,[a] by component					NRA, agric tradables				
	NRA, covered products (1)	NRA, non-covered products (2)	NRA, non-product-specific support (3)	NRA, all ag products (incl NPS) (4)=1+2+3	NRA, all ag products (incl NPS and decoupled) (5)	NRA, ag export-ables (6)	NRA, ag import-competing (7)	NRA, all agric tradable goods[c] (8)=6+7	NRA, all non-ag tradable goods (9)	RRA[b] (10)
1961	10	7	na	9	9	4	16	9	9	0
1962	9	7	na	8	8	4	15	8	10	-2
1963	8	7	na	8	8	4	15	8	9	-1
1964	8	6	na	7	7	4	13	7	8	-1
1965	7	6	5	12	12	4	12	12	8	4
1966	7	6	5	11	11	3	11	11	8	3
1967	8	6	5	12	12	3	13	12	7	5
1968	8	5	5	12	12	3	12	12	6	5
1969	7	5	5	11	11	3	10	11	6	5
1970	7	5	6	13	13	3	11	13	6	7
1971	8	5	6	13	13	3	12	13	6	6
1972	7	5	5	12	12	3	13	12	6	5
1973	5	5	3	8	8	3	9	8	6	2
1974	7	6	3	10	10	3	15	10	6	4
1975	7	5	6	13	13	3	13	13	5	7
1976	14	9	7	20	20	4	29	20	5	14
1977	16	10	7	21	21	5	30	21	5	15
1978	20	12	5	24	24	5	41	24	5	18
1979	23	13	4	26	30	6	42	26	5	20
1980	18	11	9	27	31	6	35	27	5	21
1981	25	14	9	32	36	6	51	32	5	26
1982	23	13	9	31	34	6	49	31	5	25
1983	23	13	9	30	35	7	46	30	5	24
1984	24	14	9	32	39	7	45	32	4	27
1985	30	16	14	42	56	11	53	42	4	37
1986	32	17	15	44	53	14	53	44	4	39
1987	34	18	15	47	56	14	62	47	4	41
1988	26	13	13	37	44	7	48	37	4	31
1989	21	10	11	29	32	6	39	29	3	25
1990	22	11	14	34	41	6	44	34	3	29
1991	23	12	22	43	59	5	49	43	3	39
1992	21	11	13	33	42	6	41	33	3	29
1993	19	10	9	27	31	4	38	27	2	24
1994	18	9	5	22	25	4	38	22	2	20
1995	13	6	13	24	32	3	27	24	2	22
1996	9	5	8	17	23	2	28	17	1	15
1997	12	6	5	15	18	2	41	15	1	14
1998	14	7	7	19	23	3	42	19	1	18
1999	14	7	7	20	25	4	43	20	1	19
2000	16	8	9	23	31	4	54	23	1	23
2001	11	5	9	18	26	2	31	18	1	17
2002	15	8	12	25	36	4	44	25	1	24
2003	15	8	16	29	42	4	45	29	1	28
2004	12	6	14	24	36	3	36	24	1	23
2005	11	6	2	12	26	3	36	12	1	12
2006	14	9	2	13	24	0	65	13	1	12
2007	9	5	2	9	20	0	34	9	1	8

a. NRAs including assistance to nontradables and via inputs and other forms of non-product-specific (NPS) assistance without and (in column (5)) with decoupled support.
b. The Relative Rate of Assistance (RRA) is defined as $100*[(100+NRAag^t)/(100+NRAnonag^t)-1]$, where $NRAag^t$ and $NRAnonag^t$ are the percentage NRAs for

the tradables parts of the agricultural and non-agricultural sectors (columns 8 and 9), respectively, so it excludes decoupled payments but includes all NPS support.
c. Including NPS but excluding decoupled payments, so more than the weighted average of columns (6) and (7).

Appendix Table 11 (continued): Annual distortion estimates, **Canada**, 1961 to 2007:
(c) Value shares of primary production of covered[a] and non-covered products,
(percent)

	Beef	Barley	Egg	Maize	Milk	Peas	Pigmeat	Potato	Poultry	Rapeseed	Soybean	Sugar	Wheat	Non-covered
1961	3	17	na	1	16	0	12	2	4	1	1	na	13	29
1962	5	14	na	1	12	0	10	1	4	0	0	na	23	30
1963	5	13	na	1	11	0	8	1	4	0	0	na	26	30
1964	4	17	na	2	11	0	8	2	4	1	0	na	22	29
1965	4	18	na	2	10	0	10	1	4	1	0	na	19	30
1966	6	20	na	2	9	0	11	2	4	1	1	na	24	21
1967	5	23	na	2	11	0	12	2	4	1	0	na	18	22
1968	6	24	na	2	11	0	11	2	4	1	0	na	16	23
1969	5	24	na	2	11	0	12	2	5	2	0	na	15	23
1970	6	24	na	3	11	0	14	2	4	3	1	na	8	24
1971	8	25	na	3	11	0	11	2	4	4	1	na	12	20
1972	10	22	na	3	10	0	12	2	3	3	1	na	14	20
1973	11	18	na	3	6	0	11	2	4	3	1	na	21	20
1974	10	17	na	3	10	0	11	2	3	4	1	na	19	20
1975	9	15	na	3	11	0	12	2	4	4	1	na	19	19
1976	9	20	na	3	8	0	11	2	3	2	1	na	22	17
1977	9	20	na	4	8	0	11	2	4	6	1	na	18	17
1978	6	22	na	4	5	0	11	1	4	8	1	na	21	15
1979	6	23	2	5	6	0	11	1	4	7	1	0	19	14
1980	9	20	2	5	4	0	10	3	4	4	1	0	21	14
1981	10	19	2	5	6	0	11	2	4	3	1	0	24	14
1982	8	19	2	5	5	0	14	2	3	4	1	0	24	13
1983	7	19	2	5	4	0	11	3	4	6	1	0	24	14
1984	7	19	2	6	5	0	12	2	6	7	2	0	19	14
1985	7	21	2	5	5	0	13	2	6	5	2	0	18	14
1986	6	20	3	3	5	0	15	3	7	4	1	0	17	17
1987	7	20	2	4	4	1	14	3	5	4	2	0	16	17
1988	7	20	2	4	8	0	12	3	6	6	2	0	13	17
1989	8	17	2	4	9	0	9	3	5	4	1	0	20	18
1990	8	16	2	4	9	0	11	3	5	4	2	0	18	18
1991	5	17	2	5	6	0	11	3	5	6	2	0	19	18
1992	5	18	2	3	8	1	11	3	6	6	2	0	15	19
1993	5	17	2	5	7	1	12	3	6	8	3	0	12	19
1994	4	16	2	4	6	1	11	3	6	12	3	0	11	19
1995	6	13	2	5	8	1	10	3	5	10	3	0	14	20
1996	7	11	2	6	8	1	10	2	5	7	3	0	17	20
1997	6	14	1	5	7	1	11	3	6	9	4	na	13	20
1998	5	15	1	5	7	1	8	3	6	11	3	na	11	22
1999	4	17	1	5	7	1	9	3	6	9	3	na	11	23
2000	4	19	2	3	6	1	13	3	6	6	3	na	11	23
2001	4	19	2	4	9	1	14	3	7	5	1	na	9	22
2002	4	18	2	6	6	1	12	4	6	6	3	na	8	23
2003	4	13	2	4	7	1	11	4	6	8	3	na	11	25
2004	4	14	1	4	8	2	12	3	6	9	3	na	9	25
2005	3	16	1	3	9	1	12	3	6	7	3	na	14	23
2006	4	17	1	4	7	1	11	3	5	8	3	na	12	25
2007	5	15	1	4	9	1	9	2	5	8	2	na	15	24

a. At farmgate undistorted prices

Appendix Table 11 (continued): Annual distortion estimates, **Canada**, 1961 to 2007
(d) Trade status of of covered products[a]

	Beef	Barley	Egg	Maize	Milk	Peas	Pigmeat	Potato	Poultry	Rapeseed	Soybean	Sugar	Wheat
1961	X	M	na	M	M	X	X	H	M	X	M	na	X
1962	X	M	na	M	M	X	X	H	M	X	M	na	X
1963	X	M	na	M	M	X	X	H	M	X	M	na	X
1964	X	M	na	M	M	X	X	H	M	X	M	na	X
1965	X	M	na	M	M	X	X	H	M	X	M	na	X
1966	X	M	na	M	M	X	X	H	M	X	M	na	X
1967	X	M	na	M	M	X	X	H	M	X	M	na	X
1968	X	M	na	M	M	X	X	H	M	X	M	na	X
1969	X	M	na	M	M	X	X	H	M	X	M	na	X
1970	X	M	na	M	M	X	X	H	M	X	M	na	X
1971	X	M	na	M	M	X	X	H	M	X	M	na	X
1972	X	M	na	M	M	X	X	H	M	X	M	na	X
1973	X	M	na	M	M	X	X	H	M	X	M	na	X
1974	X	M	na	M	M	X	X	H	M	X	M	na	X
1975	X	M	na	M	M	X	X	H	M	X	M	na	X
1976	X	M	na	M	M	X	X	H	M	X	M	na	X
1977	X	M	na	M	M	X	X	H	M	X	M	na	X
1978	X	M	na	M	M	X	X	H	M	X	M	na	X
1979	X	M	M	M	M	X	X	H	M	X	M	M	X
1980	X	M	M	M	M	X	X	H	M	X	M	M	X
1981	X	M	M	M	M	X	X	H	M	X	M	M	X
1982	X	M	M	M	M	X	X	H	M	X	M	M	X
1983	X	M	M	M	M	X	X	H	M	X	M	M	X
1984	X	M	M	M	M	X	X	H	M	X	M	M	X
1985	X	M	M	M	M	X	X	H	M	X	M	M	X
1986	X	M	M	M	M	X	X	H	M	X	M	M	X
1987	X	M	M	M	M	X	X	H	M	X	X	M	X
1988	X	M	M	M	M	X	X	H	M	X	X	M	X
1989	X	M	M	M	M	X	X	H	M	X	X	M	X
1990	X	M	M	M	M	X	X	H	M	X	X	M	X
1991	X	M	M	M	M	X	X	H	M	X	X	M	X
1992	X	M	M	M	M	X	X	H	M	X	X	M	X
1993	X	M	M	M	M	X	X	H	M	X	X	M	X
1994	X	M	M	M	M	X	X	H	M	X	X	M	X
1995	X	M	M	M	M	X	X	H	M	X	X	M	X
1996	X	X	M	M	M	X	X	H	M	X	X	M	X
1997	X	X	M	M	M	X	X	H	M	X	X	na	X
1998	X	X	M	M	M	X	X	H	M	X	X	na	X
1999	X	X	M	M	M	X	X	H	M	X	X	na	X
2000	X	X	M	M	M	X	X	H	M	X	X	na	X
2001	X	X	M	M	M	X	X	H	M	X	X	na	X
2002	X	X	M	M	M	X	X	H	M	X	X	na	X
2003	X	X	M	M	M	X	X	H	M	X	X	na	X
2004	X	X	M	M	M	X	X	H	M	X	X	na	X
2005	X	X	M	M	M	X	X	H	M	X	X	na	X
2006	X	X	M	M	M	X	X	H	M	X	X	na	X
2007	X	X	M	M	M	X	X	H	M	X	X	na	X

Source: Anderson and Valenzuela (2008), based on author's spreadsheets