

Changing Structures in the Barley Production and Malting Industries of the United States and Canada

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Substantial changes have taken place recently in the regulation of agricultural trade in North America. The effect of these changes on trade in agricultural commodities is of particular interest to producers and policymakers in the Northern Plains and Rockies region. In this paper, we discuss specifically the malt barley production, malting, and brewing industries in light of these new trade agreements and their ramifications. We evaluate the incentives that free trade provides for mergers between barley malting firms, and then we assess the consequences of these mergers on the realized gains from trade for consumers, barley producers, and malting firms.

The globalization of markets has fundamentally changed the world in which economic agents operate. Trade has been liberalized through multilateral world-wide agreements such as the General Agreement on Trade and Tariffs (GATT) and through regional free trade agreements such as those within the European Union, the Canadian/United States Trade Agreement (CUSTA), and the North American Free Trade Agreement (NAFTA). A striking phenomena which has accompanied trade liberalization has been the international merger of firms and the creation of many jointly owned multinational operations.

There are two distinct types of malt barley that differ in their yield and in their production areas in North America. Montana and the Canadian provinces grow primarily high-quality two row barley, while North Dakota and Minnesota produce primarily six row malting varieties. Two row barley yields more malt per bushel for maltsters, but it is more prone to disease for barley producers. The opening of the border between the United States and Canada has made large quantities of two row barley available to U.S. malting firms and brewers.

The trade policy literature suggests that trade liberalization will have a profound impact on domestic policy choice, making the costs of any government action to increase market prices above the prevailing world price more expensive. Open borders should also provide discipline on how

industries price in the domestic market. With import restrictions such as tariffs in place, the non-competitive industry structures that raise prices in the domestic market can exist with limited fear of foreign competition. With freer trade, however, the industry faces more potential competition.

When a free trade policy merges formally distinct markets for which stable industry structures exist, this creates additional incentives for mergers within the newly combined industry that reduce these gains from free trade.

This analysis was motivated by observing the malting barley industry in Canada and the United States. In 1985, prior to CUSTA, the two domestic markets for barley malt were distinctly separated by import license requirements into Canada and import tariffs in the United States. As such, both countries had large malting industries, but there was little trade flow between the two countries in malting barley, in barley malt, or in beer. Four firms controlled 90 percent of the Canadian malting market, and six firms controlled over 80 percent of the U.S. malting market before CUSTA.

As a result of mergers after CUSTA, five firms owned 90 percent of the malting capacity in North America. Economies of scale and elimination of high cost plants often drive industry consolidation. Interestingly enough, despite all of the merger activity among malting firms, there were very few plant closures and very little new capacity built. Even new entrants to either the United States or Canadian industries purchased the assets of existing firms, rather than building new plants.

We review relevant literature for firm behavior and report the results of a model for the incentives for plant mergers in the North American malting industry following CUSTA. We evaluate malting firm profits, the changes in malting margins, the price effects, and the overall welfare effects of the creation of the free trade area and subsequent mergers within the industry.

We found that free trade, in the absence of mergers, increases output in both countries and reduces malting margins leading to large gains for consumers and producers of malt barley. The agreement, however, also increases incentives for mergers. With the mergers that took place, we show that merging barley malting firms have incentives to decrease output by about 21 percent, while their producers' surplus increased by approximately 34 percent.

The net benefits of free trade to consumers and input suppliers are reduced by mergers, while the profits of merging firms are increased by them. Overall, with free trade and mergers, there is still a net social gain relative to pre-CUSTA. Malt production in Canada increases by over 12 percent, while that in the U.S. is slightly lower, leaving North American consumers, firms, and barley producers better off.



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Substantial changes have taken place recently in the regulation of trade in North America. The effect of these changes on trade in agricultural commodities is of particular interest to producers and policymakers in the Northern Plains and Rockies region. In this paper, we discuss the malt barley production, malting, and brewing industries in light of these new trade agreements and their ramifications. Specifically, we evaluate the incentives that free trade provides for mergers between firms, and then we assess the consequences of these mergers on the realized gains from trade for consumers, barley producers, and malting firms.

Review of Domestic and Trade Policies

The Canadian U.S. Trade Agreement (CUSTA) and the North American Free Trade Agreement (NAFTA) have reduced barriers to trade in barley, malt, and beer.

The objective of CUSTA was to create a Canadian-U.S. free trade area where trade between the two countries would be uninhibited by border measures. CUSTA was signed in 1988 and implemented in 1989. The agreement called for conversion of nontariff border measures to tariffs, with all tariffs to be phased out over a 10-year period.

The implementation of CUSTA has created one market for Canadian and U.S. malting industries. Import license requirements for malt and barley into Canada and restrictions on beer imports were quickly reduced. In 1988 the Canadian Wheat Board (CWB) adopted a domestic pricing policy to sell to the Canadian maltsters at cash prices in Minneapolis less transportation costs. Consequently, Canadian maltsters faced the same barley prices and operated in the same malt market as did U.S. maltsters—there was no effective price protection for Canadian maltsters. U.S. protection from Canadian malt imports also decreased over the 1987 to 1993 period, as the U.S. tariff on Canadian malt was reduced from \$8 per metric ton in 1987 to zero in 1995. By 1995 the transition to a single Canadian-U.S. malt market was complete.

NAFTA is an agreement between the U.S., Canada, and Mexico that was ratified in 1993. NAFTA extended the guidelines set out by CUSTA to include Mexico. NAFTA's general objective is to eliminate barriers to trade between these three countries. NAFTA required that U.S. import tariffs on barley and malt be eliminated by 1997. The agreement also

The implementation of CUSTA created one market for Canadian and U.S. malting industries.

required that Canadian tariffs on malt barley and malt be eliminated by 1996 and 1998, respectively.

Industry Description

The three segments of the North American malting barley industry are the malt barley growers, maltsters, and brewers. Mexico is excluded from the discussion because it makes up a very small portion of industrywide production.

U.S. Production

In the United States, the four states that are major producers of malt barley all lie on the Canadian border: North Dakota, Montana, Idaho, and Minnesota. In 1996, these four states planted approximately 74 percent of the nation's total barley area and about 82 percent of the nation's malt barley acreage. There are two distinct types of malt barley that differ in their yield and in their production areas. Two row barley yields more malt per bushel for maltsters, but it is more prone to disease for barley producers.

North Dakota and Minnesota produce primarily six row malting varieties. In 1996, both North Dakota and Minnesota planted 100 percent of their malt barley area to six row varieties. Montana and Idaho produce mainly two row varieties. In 1996 Montana planted 95 percent of its malt barley area to two row varieties. Idaho planted 57 percent of its malt barley area to two row (Table 1).

In the United States, the four states that are major producers of malt barley all lie on the Canadian border: North Dakota, Montana, Idaho, and Minnesota.

Table 1. Seeded Area of Barley in the Top Four States, 1996 (1,000 Acres)

State	All Barley	Percent of Total	Malt Barley	Percent of Total	Percent Two Row	Percent Six Row
North Dakota	2,650	37.1%	2,395	59.0%	0.0%	100.0%
Montana	1,300	18.2%	558	13.8%	95.2%	4.8%
Idaho	750	10.5%	387	9.5%	57.4%	30.5%
Minnesota	550	7.7%	545	13.4%	0.0%	100.0%
Four State Total	5,250	73.6%	3,885	95.8%	19.4%	79.4%
U.S. Total	7,134		4,057			

Source: National Agricultural Statistics Service, respective state statistical services, and North Dakota Barley Council

In 1996, North Dakota continued to rank first in the nation in malt barley acreage as well as total barley acreage. Producers in the state planted 2.65 million acres of barley in 1996, constituting 37 percent of the U.S. total acreage. The state also accounted for 60 percent of the nation's malt barley acreage, with a 1996 seeded area of about 2.4 million acres. More than 90 percent of the state's planted acres are in malting varieties, and all of the malting varieties are six row (Table 2). Stander and Robust are by far the two most planted varieties in the state, accounting for about 80 percent of the state's malt barley area. Because of high humidity in the major growing areas and disease tolerance of the six row varieties, two row varieties are not grown in North Dakota.

**Table 2. Seeded Area of Malt Barley in North Dakota, 1995-1996
(Acres)**

Variety	Variety Type	1996	Percent of Total Barley
Stander	Six Row	1,043,200	39.4%
Robust	Six Row	1,017,100	38.4%
Excel	Six Row	146,400	5.5%
Foster	Six Row	97,200	3.7%
Morex	Six Row	48,500	1.8%
Azure	Six Row	42,300	1.6%
Total Malt Area		2,394,700	90.4%
Total Barley Area		2,650,000	
Percent Two Row		0%	
Percent Six Row		100%	

Source: North Dakota Agricultural Statistics Service

Montana ranks second behind North Dakota in seeded area of both all barley and malt barley varieties (Table 3). In 1996, over 550,000 Montana upland acres were planted to malt barley varieties, which accounted for about 43 percent of the state's total barley acreage and about 14 percent of the U.S. total malt acres. Two row varieties dominate the malt barley acreage in Montana, and Montana provides approximately 68 percent of the nation's two row barley production. Harrington, a two row variety, accounts for about 32 percent of all barley acreage planted in Montana and 75 percent of malt barley planted.

Two row varieties dominate the malt barley acreage in Montana, and Montana provides approximately 68 percent of the nation's two row barley production.

**Table 3. Seeded Area of Malt Barley in Montana, 1995-1996
(Acres)**

Variety	Variety Type	1996	Percent of Total Barley
Harrington	Two Row	422,000	32.5%
B 1202	Two Row	69,300	5.3%
B 2601	Six Row	16,800	1.3%
Galena	Six Row	na	
Moravian III	Two Row	23,100	1.8%
Morex	Six Row	9,900	0.8%
Klages	Two Row	10,600	0.8%
Chinook	Two Row	6,600	0.5%
Other		na	
Total Malt Area		558,300	42.9%
Total Barley Area		1,300,000	
Percent Two Row		95.2%	
Percent Six Row		4.8%	

Source: Montana Agricultural Statistics Service

Contracting by brewers has had a substantial impact on barley varieties planted in Montana. Anheuser Busch and Coors contract significant malt

barley acreage with Montana producers, contracting for Morex, Harrington, B-1202, and B-2601 varieties. Both B-1202 and B-2601 are Anheuser Busch proprietary varieties. Coors also contracts for the Moravian III variety.

Idaho ranks third in the nation in both barley and malt barley area seeded.

Idaho ranks third in the nation in both barley and malt barley area seeded. In 1996 there were 387,000 acres seeded to malting varieties, constituting 52 percent of the state's barley acreage and about 10 percent of the nation's malting barley area (Table 4). Harrington, a two row barley variety, accounted for 14.5 percent of Idaho's barley acreage.

Table 4. Seeded Area of Malt Barley in Idaho, 1995-1996 (Acres)

Variety	Variety Type	1996	Percent of Total Barley
Harrington	Two Row	108,900	14.5%
B-1202	Two Row	83,100	11.1%
Morex	Six Row	57,200	7.6%
Galena	Six Row	35,600	4.7%
Stander	Six Row	23,800	3.2%
B-2601	Six Row	17,700	2.4%
Crystal	Two Row	16,600	2.2%
Triumph	Two Row	8,400	1.1%
Russell	Six Row	7,500	1.0%
Klages	Two Row	2,700	0.4%
Crest	Two Row	2,500	0.3%
Chinook	Two Row	1,500	0.2%
Other		21,500	2.9%
Total Malt Area		387,000	51.6%
Total Barley Area		750,000	
Percent Two Row		57.4%	
Percent Six Row		30.5%	

Source: Idaho Agricultural Statistics Service

There is significant brewer contracting in Idaho. The Harrington and Morex barley varieties are contracted by Anheuser Busch, although not exclusively. B-1202 and B-2601 are proprietary Anheuser Busch varieties that are contracted. Galena and Moravian III are varieties that are exclusively grown under contract for Coors.

Minnesota accounts for about 8 percent of the nation's total barley acreage and about 13 percent of the nation's malt barley acreage. Although Minnesota plants only approximately 545,000 acres annually to barley, 99 percent of this area is planted to six row malting varieties (Table 5). This places the state third in the nation for malt barley acreage. Six row varieties are planted primarily because of their high tolerance to disease. Stander and Robust are the two most planted varieties, accounting for 92 percent of Minnesota's malt barley area.

**Table 5. Seeded Area of Malt Barley in Minnesota, 1996
(Acres)**

Variety	Variety Type	1996	Percent of Total Barley
Stander	Six Row	275,000	50.0%
Robust	Six Row	231,000	42.0%
Excel	Six Row	22,000	4.0%
Morex	Six Row	5,500	1.0%
Other		11,000	2.0%
Total Malt Area		544,500	99.0%
Total Barley Area		550,000	
Percent Two Row		0%	
Percent Six Row		100%	

Source: Minnesota Agricultural Statistics Service

In Canada, approximately 5.7 million acres were planted to malt barley, with about 70 percent of the Canadian malt barley area planted to two row varieties.

Canadian Production

Canada produces feed and malting barley, seeding over 9.5 million acres in 1994 (Table 6). Approximately 5.7 million acres were planted to malt barley, with about 70 percent of the Canadian malt barley area planted to two row varieties.

Table 6. Seeded Area of Barley in Canada, 1994 (Hectares)

Province	All Barley	Percent of Total	Malt Barley	Percent of Total	Percent Two Row	Percent Six Row
Alberta	1,943,000	51.1%	1,064,000	47.1%	70.8%	29.2%
Saskatchewan	1,127,000	29.7%	947,000	41.9%	76.5%	23.5%
Manitoba	383,000	10.1%	249,000	11.0%	39.4%	60.6%
Three Province Total	3,453,000	90.8%	2,260,000	100.0%	69.7%	30.3%
Canadian Total	3,801,000		2,260,000			

Source: Schmitz and Koo 1996, 16-19

Alberta and Saskatchewan plant mostly two row malting varieties. In 1994 about 71 percent of the more than 1.06 million hectares of malt barley in Alberta were in two row varieties.¹ In the same year Saskatchewan planted almost 947,000 hectares to malt barley, of which 77 percent of the area was in two row varieties.

Manitoba produces primarily six row malting barley, due to the province's proximity to the Minneapolis market, to its proximity to the Canadian brewers who utilize six row barley, and to Manitoba's growing conditions. Of the 249,000 hectares seeded to malt barley in Manitoba in 1994, approximately 61 percent was planted to six row varieties.

¹ A hectare is about 2.5 acres.

Shifts in Canadian planted varieties are due to the reduction of trade restrictions and an increase in Canadian brewer demand for two row varieties and advances in two row barley varieties.

Production Comparisons

Comparisons of area planted to six row, two row, and feed barley in the United States and Canada in years that are approximately before, during, and after CUSTA are presented in Table 7. In Canada over this period six row barley varieties planted have decreased, and planting of two row varieties has increased. These shifts in varieties planted are due to the reduction of trade restrictions and an increase in Canadian brewer demand for two row varieties concurrent with advances in two row barley variety development. In the United States shifts in production from six row to two row varieties have not paralleled those in Canada. Planting areas of both six row and two row malting varieties in the United States were lower in 1994 than in 1980. Feed barley variety area increased in absolute area and as a percentage of the slightly smaller total area planted.

Table 7. Seeded Area of Barley in the United States and Canada (1000 Hectares)

Variety Type	1980	Percent of Total	1990	Percent of Total	1994	Percent of Total
<i>United States</i>						
Six Row	1,160	44.8%	1,320	45.1%	1,060	42.2%
Two Row	420	16.2%	270	9.2%	270	10.8%
Feed	1,010	39.0%	1,340	45.7%	1,180	47.0%
Total	2,590		2,930		2,510	
<i>Canada</i>						
Six Row	1,850	42.6%	830	18.9%	685	18.0%
Two Row	1,430	32.9%	1,870	42.7%	1575	41.4%
Feed	1,060	24.4%	1,680	38.4%	1541	40.5%
Total	4,340		4,380		3,801	

Source: Schmitz and Koo 1996, 21.

A major difference between the U.S. and Canada is that, on average, selection rates in Canada are much lower than in the United States (Table 8). Selection rate is defined as the amount of malt barley selected divided by the amount of all barley varieties grown. Canadian selection rates average 11 percent with little variation during the period 1980 to 1995. U.S. rates average 33 percent during this period. This difference may be due in part to the differences between the single-desk selling by the CWB and the cash and contracting system in the United States.

Table 8. Average Produced Selection Rates

	1980	1990	1993	1995	15-Year Average
Canada	9.0%	11.0%	13.0%	na	11.0%
United States	34.0%	35.0%	35.0%	na	33.0%
Montana		22.0%	22.0%	32.0%	na

Source: Schmitz and Koo 1996, 28; and Montana Agricultural Statistics Service

Montana has seen a large increase in selection rates over the last five years. In 1995 32 percent of the total barley crop was selected for malt compared to 22 percent in 1990. In 1995 nearly 90 percent of the total malt barley crop was selected for malt. This high selection rate in Montana may be an indication of the increasing demand for two row malt barley by U.S. maltsters and brewers.

The Structure of the Malting Industry

Eight firms control 97 percent of malt production in the United States and Canada. The smallest firm, Coors, has a capacity of about 222,000 metric tons of malt, and the largest, ConAgra, has a capacity of about 815,000 metric tons. Eight firms operate twenty-three plants in both countries ranging in capacity size from 32,253 to 329,042 metric tons of malt. Major North American maltsters' capacities, subsidiaries, and market shares are identified in Table 9.

Table 9. Capacities of Major U.S. and Canadian Maltsters, 1997

Commercial Maltsters	Subsidiary	Subsidiary Locations	Capacities (MT)		Percent of Malting Capacity
			Before Mergers	After Mergers	
ConAgra				814,857	22.3
	Canada Malt	Canada	461,000		
	Great Western		353,857		
Cargill		U.S.		557,693	15.2
	Ladish	U.S.	557,693		
Rahr		U.S.	329,042	414,042	11.3
	Westcan Malting	Canada	85,000		
ADM		U.S.	297,952	389,952	10.7
	Dominion Malting	Canada	92,000		
Schreier		U.S.	137,878	372,878	10.2
	Prairie Malt	Canada	235,000		
Froedert		U.S.		348,759	9.5
Commercial Total				2,898,181	82.3
<i>Brewer/Maltster</i>					
Anheuser Busch		U.S.		424,483	11.6
Coors		U.S.		222,600	6.1
Brewer/Maltster Total				647,083	17.7
Industry Total			3,545,264	3,545,264	100.0

Source: Industry source

Major changes have occurred in the malting barley industries of the United States and Canada since the implementation of CUSTA. First, Great Western Malting was purchased by Canada Malt. This made Canada Malt the largest maltster in North America. Schreier purchased 51 percent of Prairie Malt in September 1989. Archer Daniels Midland purchased 65 percent of Dominion Malting in September 1990. Cargill and Ladish entered into a joint venture in 1991. Rahr constructed a plant with an annual capacity of 85,000 metric tons in Alix, Alberta, doing business as Westcan Malting. ConAgra acquired 70 percent of Canada Malt in 1996.

With the exception Canada Malt's purchase of Great Western, all of the other changes have involved U.S. firms acquiring interest in Canadian firms. The single new construction (the Westcan plant) gave only a 2 percent increase in industry capacity.

ConAgra's purchase of Canada Malt represents the company's first entry into the North American malting barley industry. Part of this purchase involved Molson and Labatt breweries selling their combined 39 percent of Canada Malt (Milling and Baking News). However, ConAgra was already in the malting business in the Pacific Rim and Europe.

Over the last thirty years the U.S. malting industry has experienced a large increase in concentration (Table 10). The number of firms has decreased from thirty-one to eight, while the four largest firms' market share has increased to 60 percent. The Canadian industry structure has historically been quite concentrated. With the introduction of free trade, there has been considerable merger activity across the border. These mergers have caused a large increase in concentration in the combined North American malting industry. The number of firms has been cut in half, from sixteen in 1992 to eight in 1997. Malting firms sought to capture gains brought by free trade and lower procurement costs for their raw input—barley. Through mergers, these firms obtained procurement facilities and expertise in the barley growing areas just newly open to these firms. As a consequence of these mergers, the remaining firms increased their market share in the newly integrated North American malting industry.

Table 10. Structure of Canadian and U.S. Malting Industries, 1968–1997

	United States			Canada		Combined	
	1980	1992	1997	1992	1997	1992	1997
Number of Plants	37	23	17	6	6	29	23
Number of Firms	26	13	8	4	4	16	8
Industry Capacity (1000 MT)	178	186	181	39	57	225	237
4-Firm Market Share	51%	59%	60%	100%	100%	60%	60%
Herfindahl Index	1,009	1,208	974	4,010	3,759	1,178	974

Source: Johnson and Wilson 1994, 29; Industry source; and calculations by authors

The low number of firms in each country, the lack of entrants, and the relatively price-insensitive demand for malt suggest that firms within the malting industry had the potential to influence both the price of malt and price of malting barley. In this sense each firm was a middleman with potential market power in both the upstream and downstream markets.

We have estimated the effects of mergers within the barley malting industry to capture their impact on malting barley producers and consumers (Buschena and Gray forthcoming). Potential cost savings from mergers is critical to our analysis of this market, since these potential cost savings offset the losses to society from decreased competition. Cost savings are likely to occur between malting plants that have different input procurement areas and overlapping shipping areas. Many of these plants are located near specific local production regions, and these plants have built up reputation and expertise in purchasing barley that annually varies in quality. A merger between firms in different geographic areas, such as across national boundaries, could give each firm access to a wider input base.

We examine three scenarios for the malting industry: pre-CUSTA and two post-CUSTA scenarios. In the first post-CUSTA situation we assumed that no mergers have taken place

and that all eleven firms face one Canadian-U.S. market for malting services. In the second post-CUSTA simulation we incorporated the four mergers that took place in conjunction with CUSTA (after 1985). These mergers reduced the number of firms from eleven to seven. Table 11 presents the prices, quantities, and economic surplus measures for malt producers, malt consumers, and barley producers in each of the three scenarios.² The pre-CUSTA outcomes are given in the second column and serve as our basis for comparing the post-CUSTA outcomes.

The percentage changes in Column 3 of Table 11 reflect the conventional measurement of free trade benefits. No industry merger is allowed as the two formerly separate markets become one with no change in industry structure. There are decreases in the malt price (-5.1 percent), the price for malting services (-17.8 percent), and producer surplus for malting firms (-16.9 percent) as firms within the industry face increased competition. The barley price increases (3.1 percent) while total quantity malted increases (6.3 percent). Most of the increased barley malting occurs in Canada, reflecting the relatively lower procurement costs for high-quality two row barley and the importance of transportation costs for this bulky commodity. Overall, malt consumers, barley producers, and society in general gain from free trade without mergers, whereas malting firms lose.

Overall, mergers increase the total gains to free trade beyond free trade without mergers.

Table 11. Effects of Free Trade and Mergers on the Canadian and U.S. Malting Industries

Economic Variable	Pre-CUSTA (base case)	Post-CUSTA		
		Free Trade Change	Merger Change	Free Trade Plus Merger Changes
<i>Prices (US\$1 per MT)</i>				
Malting services	89	-17.8%	12.5%	-7.5%
Malt	222	-5.1%	3.1%	-2.1%
Barley	133	3.1%	-1.8%	1.3%
<i>Quantity malted^a (1000 MT)</i>				
Canadian locations	516	18.3%	-5.1%	12.2%
U.S. locations	1,677	2.6%	-2.8%	-0.3%
Total quantity malted	2,193	6.3%	-3.4%	2.7%
<i>Overall welfare effects (US\$1,000)</i>				
Malt consumer surplus	214,970	11.9%	-6.2%	4.9%
Barley producer surplus	73,089	13.0%	-6.7%	5.4%
Malting firm producer surplus	154,820	-16.9%	48.7%	23.6%
Total welfare	442,878	2.0%	9.3%	11.5%

^aQuantity malted by brewers excluded.

² Economic surplus for producers is revenues less variable costs; surplus for consumers is the difference between the amount they are willing to pay and the market price.

A good deal of the gains from free trade—price reductions in malt and malting services, and the price increases in barley—are offset by the reduced number of malting firms due to mergers.

The fourth column of Table 11 reports the additional effects of the industry mergers, while the fifth column gives the net effects of CUSTA. A good deal of the gains from free trade—price reductions in malt and malting services and the price increases in barley—are offset by the reduced number of malting firms due to mergers. Total quantity of barley malted increases but by less than half the level that would occur under free trade without mergers (2.7 percent above the pre-CUSTA level in Column 3 as opposed to 6.3 percent). Mergers reduce the gains from free trade to malt consumers and malt barley producers, while the producers' surplus in the malting industry increases to levels almost 25 percent larger than the pre-CUSTA. Overall, mergers increase the total gains to free trade beyond those without mergers.³

U.S. malt barley producers lost more from these industry mergers than did Canadian producers. The bulk of these losses are likely to fall on producers of the lower-quality six row barley in Minnesota and North Dakota. Our estimation results were robust to changes in the malt demand and industry cost structures.

The Structure of the Brewing Industry

Four brewers produce about 85 percent of beer sold in the United States. The largest brewer, by far, is Anheuser Busch. Over the last ten years, total U.S. sales of beer have risen about 14,000 barrels, and the four-firm market share has remained relatively constant (Table 12).

Table 12. Major U.S. Brewers Annual Sales (1000 Barrels)

Brewer	1984	Market Share	1996	Market Share
Anhesuer Busch	64,000	35.9%	91,100	45.2%
Miller	37,250	20.9%	43,875	21.8%
Coors	13,187	7.4%	19,950	9.9%
Stroh	40,660	22.8%	16,700	8.3%
U.S. Total	178,088	87.1%	201,525	85.2%

Source: Beer Marketer's Insights, 27; and 1995 Modern Brewery Age Blue Book, 304.

Vertical integration is quite prominent in the United States but has decreased in North America overall since free trade. Brewers control 24 percent of malting capacity. Anheuser Busch produces 30 percent of its malt and is the third largest producer of malt in the United States and Canada. Coors is highly vertically integrated as it produces 100 percent of its own malt. Both Anheuser Busch and Coors are active in developing and distributing seed for the varieties of malt barley they use. Stroh is also involved in malt production but on a smaller scale (Carter 1993). Vertical integration in Canada decreased dramatically when Molson and Labatt sold their combined 39 percent of Canada Malt to ConAgra.

³When considering the barley producer's welfare, it is important to note that portions of malting enterprises in Canada were owned by producers' groups. Gains to producers from sales of these firms were not included in our producers' welfare analysis.

In addition to vertical integration, Anheuser Busch is also extensively involved in the county elevator business and in farmer contracting (Johnson and Wilson 1994). However, beginning in 1993 the company began reducing its contract acres in the United States. Anheuser Busch has begun contracting for malt barley in Canada. The Canadian brewing industry is highly concentrated, with two brewing companies controlling about 88 percent of brewing capacity (Table 13).

**Table 13. Major Canadian Brewers' Annual Capacity, 1994
(1000 Hectoliters)**

Brewer	Capacity	Market Share
Molson	14,770	54.7%
Labatt	8,966	33.2%
Canadian Total	27,023	87.9%

Conclusions and Expected Trends

The North American malt barley industry is characterized by distinct two row and six row malt barley production regions and high concentration in the malting and brewing industries. CUSTA and NAFTA have had significant impacts on the North American malt barley industry. The most dramatic change has been the mergers between malting firms in the United States and in Canada. Through mergers, the industry has become more concentrated as malting firms adjust to the new larger market. It is difficult to say how much more of this merger activity will take place, but the industry structure is considerably different from what it was prior to the mergers.

There is a very large difference in selection rates of the United States and Canada. This difference in selection rates does not appear to be due only to differences in quality. Decreases in malt use of barley, and thus selection rates, are expected to come at the expense of six row malt producers, as the world demand for malting barley is essentially for the higher-quality two row varieties. Two row producers in the United States, primarily in Montana and Idaho, will likely continue to receive premiums over six row producers in North Dakota and Minnesota but will face increased competition from Canadian production. Given the large production of two row malting barley in Canada, free trade should cause Canadian selection rates to increase and U.S. selection rates to decrease as U.S. maltsters use more Canadian two row barley.

Free trade will likely decrease acres of malt barley produced under brewer contracts. The increased supply of quality malt barley will lower brewers' incentive to contract with producers. The number of acres contracted in Canada by U.S. brewers will depend on varieties planted in Canada. If the malting varieties demanded by U.S. brewers are the same varieties approved for malting by the Canadian Wheat Board, then there will be minimal U.S. brewer contracting in Canada. However, if U.S. brewers

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demand varieties different from those approved for malting in Canada, U.S. brewer contracting in Canada will increase. Future changes in contracting arrangements will be particularly important for malt barley producers in Montana.

For malt barley producers in the Northern Plains, consumers, and processors, free trade agreements matter very much. They not only affect trade barriers but also impact industry structure. What is most striking is the speed with which private processing firms have captured the cost savings and increased selling opportunities made possible by free trade.

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