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An Analysis of the Economic Impact of Cap-and-Trade Policy on the California Food Processing Industry: A Look at Processed Tomatoes and Dairy Products

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Abstract

California Cap-and-Trade policy, sets a statewide limit on sources responsible for an estimated 85 percent of the state's greenhouse gas emissions. To maintain the cap as per the policy, individual industrial facilities in California must obtain enough allowances to cover their emissions either by purchasing allowances at auction or reducing their emissions by operating more efficiently. This research report analyses the economic impact of the Cap-and-Trade policy on the California food processing industry. The results indicate that the average cost of production in tomato processing industry may ultimately increase by 7 to 21 percent and by about 1.5 to 3 percent in dairy product manufacturing industry.

Keywords: Cap-and-Trade policy, greenhouse gas emissions, food processing

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Introduction

The Global Warming Solutions Act of 2006, or Assembly Bill (AB) 32, is a California State Law that was signed in September 2006. The AB 32 requires California to return to 1990 levels of greenhouse gas emissions by 2020. It is expected that implementing all the programs under AB 32 will lead to a reduction of 15 percent in greenhouse gas (GHG) emissions compared to a 'business-as-usual' scenario in 2020 if we did nothing at all (ARB 2011). A key element of the AB 32 is the Cap-and-Trade policy, which sets a statewide limit on sources responsible for 85 percent of California's greenhouse gas emissions, and establishes a price signal needed to drive long-term investment in cleaner fuels and more efficient use of energy (ARB 2011).

The Cap-and-Trade policy came into effect on January 1, 2012, and sets the cap in 2013 at about 2 percent below the emissions level forecast for 2012. The cap will decline by about 2 percent until 2014 and by 3 percent annually from 2015 to 2020. The program also has carbon emission allowances for each industrial sector, which is basically a 'permit' for every ton of carbon dioxide and other GHGs they emit. The allowances will be set at about 90 percent of average emissions computed from recently available data. The allowances will be distributed to each industrial facility, which are covered under this program, for free in the start, but to be purchased later in the program. As the cap goes down every year, the facilities have to obtain enough allowances to cover their emissions either by purchasing allowances from the market or reducing their emissions by operating more efficiently. Auctions for allowances have been held since August 2012. The distribution of allowances will be updated annually for industries according to the production and efficiency of each facility. During the transition period allowances will be also made for industries that are determined to be in risk of having their production replaced by imported products (ARB 2013a).

In order to meet the requirements of Cap-and-Trade regulations, firms along with buying allowances from auctions organized by ARB on a quarterly basis, can also purchase allowances from others or purchase offset credits. An offset credit can be generated by a project that reduces emissions or acts as a sink for greenhouse gases. These offset credits are allowed for up to 8 percent of a facility's compliance obligation and presently they are restricted to only emission reduction projects in the US only.

Using an established benchmarking procedure the ARB has segmented industries subject to regulation into one of three categories with associated allowance assistance provisions. Based on this procedure food manufacturing firms in California that are determined to emit over 25,000 metric tons of CO2 per year are placed in the medium leakage risk ARB classification. Industries in the medium risk category are initially awarded 100% of their allowances free of charge, whereas in period two free allowances will decline to 75% and fall to 50% during the third compliance period. At present, the Cap-and-Trade policy exempts production agriculture from the new regulations (ARB 2013a).

The implementation of the Cap-and-Trade policy introduces a new cost to food processors in California. When food processors outside California are not subjected to these new costs, it may lead to distortion of competition in these markets. In this context, the Cap-and-Trade policy may lead to carbon leakage, which is defined as "the ratio of emissions increase from a specific sector

outside the country (as a result of a policy affecting that sector in the country) over the emission reductions in the sector" (Reinaud 2008). In other words, due to increased costs, the processing sector may move away from areas where carbon emission constraints exist to areas where they do not exist. Reinaud (2008) explains that due to asymmetric policies on carbon emissions, the carbon leakage may happen by various channels. It may be through short-term competitiveness channel, where products from carbon-constrained regions may lose their market shares to unconstrained competitors, leading to change in product trade flows. It may also happen through the investment channel, where differences in returns on investment due to asymmetric carbon emission policies may lead to firms relocating to areas of less stringent carbon emission policies. It may also lead to postponing the investment to expand or maintain the production facility in the carbon-constrained region.

In this context, this research report analyses the economic impact of this Cap-and-Trade policy on California food processing industry, with examples focusing on tomato processing industry and dairy industry.

Methodology

This report takes into consideration the annual carbon emissions reported by various food-processing firms in California and published by California Air Resources Board for 2012 (ARB 2013b). The carbon emission allowances for a typical tomato processing plant and dairy processing plant are tabulated according to the timetable for emission reduction put forward by the Cap-and-Trade policy. The rate of decline of the emissions cap will be 2 percent annually until 2014 and 3 percent annually from 2015 to 2020. The value of the beyond baseline allowances that have to be purchased has been calculated by taking into consideration the settlement price of allowances determined in the allowance auctions conducted by ARB, $14 per allowance (ARB Auction Report 2013c). The allowance price for the second period was $10.71, is the price for 2016 vintage allowances during the first auction period. For the final period a forecast of $18 per allowance is allocated based on the first auction mean price, settlement price and vintage allowance price (author's calculation). The cost of emission adjustments were apportioned to the unit cost of processing and a percent increase in average cost of production is determined. This procedure is applied to California tomato processing and dairy processing industries and the results are presented below.

Results and Discussion

Tomato Processing Industry

The state of California has the largest tomato processing industry among all countries in the world. California is responsible for the production of about 95 percent of the total processing tomatoes in the United States and 30 percent of the world (see Figure 1). As many firms in this industry emit more than 25000 tons of CO2 equivalents, the Cap-and-Trade policy may impact the competitiveness of those firms. In this research, we have assumed that a tomato processing facility with a processing capacity of 240 tons per hour has a processing cost of $0.27 per pound (proprietary industry information). In table 1 the three compliance periods and the corresponding emission caps and allowances permitted are presented. The results show that due to the Cap-and-

Trade policy, the average cost of production is estimated to increase by 7 percent in the second compliance period, and by 21 percent in the third compliance period.

Dairy Product Manufacturing Industry

California has one of the largest dairy processing industries in the United States. It ranks first in the production of many categories of dairy products in the United States. It produces about 35 percent, 21 percent and 45 percent of all the butter, cheese and non-fat dry milk produced in the United States (See Figure 2). Many of these facilities have large capacities and emit more than 25,000 tons of carbon emissions, and therefor come under the purview of Cap-and-Trade policy. In this research, we have analyzed the impact of the Cap-and-Trade policy on a dual product manufacturing plant of Butter and non-fat dry milk (NFDM). We have assumed that a 199.5 million pound milk processing plant per year producing butter and NFDM will emit 33571 tons of CO2 equivalents. We have also assumed that 90 percent of the emissions are due to manufacturing of NFDM and butter manufacturing contributes only 10 percent of the total emissions in such a dual product plant. The processing cost per pound of NFDM is taken as $0.20 per pound (CDFA 2012). In table 2 the three compliance periods and the corresponding emission caps and allowances permitted are presented. The results show that due to the Cap-and-Trade policy, the average cost of production is estimated to increase by only 1.5 percent in the third compliance period. But, when a higher price for allowances if assumed, $38 per allowance as per the new U.S. government standard (Drajem 2013), the cost of production of a pound of NFDM is estimated to increase by 3.2 percent.

The results suggest that the California Cap-and-Trade policy may increase the cost of food processing in California as seen from the case study of tomato and dairy processing industries. Higher production costs may be pushed back either in the form of lower prices to producers of raw materials and/or higher prices for consumers along with lower margins for processors themselves depending upon the level of substitutability of the product and the amount of increase in processing costs. These changes may lead to producers shifting to other more remunerative crops; consumers moving to cheaper imported goods or goods from ‘not-constrained’ regions as well as the processing industry curtailing any potential capacity expansion plans. These repercussions could be mitigated to some extent by an increasing demand for locally grown products and/or for products produced with lower carbon footprint. Presently however, the Cap-and-Trade policy of California would seem to have a potential to result in negative impacts for the California food processing industry.

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Appendix

Table 1. Impact of Cap-and-Trade on Tomato Processing Industry

Period	Baseline Emission	Emission Allowance Required	Allowance Cost within Admission Adjustments	Beyond Baseline Purchased Allowance	Reduction Allowance Cost	No Reduced Emissions Scenario Cost	Additional Cost Per Pound No Change	Additional Cost Per Pound Adjustment	Percent Increase in Average Cost
2012	49,292	48,306	$0	986	$13,802	$13,802	$0.00	$0.00	
2013	49,292	47,340	$0	1,952	$27,327	$27,327	$0.00	$0.00	
2014	49,292	46,393	$0	2,899	$40,583	$40,583	$0.00	$0.00	
Period 1 Total	**147,876**	**142,039**	**$0**	**5,837**	**$81,712**	**$81,712**			
2015	49,292	45,465	$121,734	3,827	$40,983	$162,717	$0.02	$0.01	0.067799
2016	49,292	44,556	$119,299	4,736	$50,722	$170,021	$0.02	$0.01	0.070842
2017	49,292	43,665	$116,913	5,627	$60,266	$177,179	$0.02	$0.01	0.073824
Period 2 Total	**147,876**	**133,686**	**$357,945**	**14,190**	**$151,971**	**$509,916**			
2018	49,292	42,792	$385,125	6,500	$117,006	$502,131	$0.05	$0.04	0.209221
2019	49,292	41,936	$377,422	7,356	$132,411	$509,834	$0.05	$0.04	0.212431
2020	49,292	41,097	$369,874	8,195	$147,508	$517,382	$0.05	$0.04	0.215576
Period 3 Total	**147,876**	**125,825**	**$1,132,421**	**22,051**	**$396,926**	**$1,529,347**			
Post Program									
Cumulative Emissions Reduction	443,628	401,550							
Annual Emissions Reductions	49,292	41,097							

Baseline CO2 Emissions 49,292 metric tons
Assuming 2% reduction in emission allowance per year beginning in first year 2012
Seasonal Tonnage 10,000,000
Average Cost of 240 Ton Per Hour Tomato Past Factory, $0.24 per pound

2012-14	Period 1 Emission Per Metric Ton Cost $14.00	Assuming Initial Free Allowances at Baseline Level; Purchase O
2015-17	Period 2 Emission Per Metric Ton Cost $10.71	75% of baseline allowances for second period; Purchase 25%
2018-20	Period 3 Emission Per Metric Ton Cost $18.00	50% of baseline allowances for third period; Purchase 50%

Table 2. Impact of Cap-and-Trade on Dairy Processing Industry (Butter/NFDM Plant)

Period	Baseline Emission	Emission Allowance Required	Reduced Emissions Allowance Cost % Phase-in Purchased	Required Beyond Baseline Purchase Allowance	Above Reduced Allowance Cost	Fixed Baseline Cost	Additional Cost Per Pound No Change	Additional Cost Per Pound Adjusted	Percent of Marginal Cost No Change
100% Free									
2012	33,571	32,900	$0	671	$9,400	$9,400	$0.00005	$0.00000	
2013	33,571	32,242	$0	1,329	$18,612	$18,612	$0.00009	$0.00000	
2014	33,571	31,597	$0	1,974	$27,639	$27,639	$0.00014	$0.00000	
75% Free									
2015	33,571	30,965	$82,908	2,606	$27,912	$110,820	$0.00056	$0.00042	
2016	33,571	30,346	$81,250	3,225	$34,545	$115,795	$0.00058	$0.00041	
2017	33,571	29,739	$79,625	3,832	$41,045	$120,670	$0.00060	$0.00040	
50% Free									
2018	33,571	29,144	$262,295	4,427	$79,689	$341,983	$0.00171	$0.00131	
2019	33,571	28,561	$257,049	5,010	$90,181	$347,229	$0.00174	$0.00129	
2020	33,571	27,990	$251,908	5,581	$100,463	$352,370	$0.00177	$0.00126	
End Period Total 100% Purchased	**33,571**	**27,990**	**$503,815**	**5,581**	**$100,463**	**$604,278**	**$0.00303**	**$0.00253**	1.51%

Assumptions
Baseline CO2 Emissions: 33571 metric tons
Reduction in emission allowance per year: 2%
Volume Processed: 199500000lb
% NFDM Production/ Emissions: 69% / 90%
% Butter Production / Emissions: 31% / 10%

2012-14	Period 1 Emission Per Metric Ton Cost $14.00	Assuming Initial Free Allowances at Baseline Level; Purchase O
2015-17	Period 2 Emission Per Metric Ton Cost $10.71	75% of baseline allowances for second period; Purchase 25%
2018-20	Period 3 Emission Per Metric Ton Cost $18.00	50% of baseline allowances for third period; Purchase 50%

Table 3. Impact of Cap-and-Trade on Dairy Processing Industry (Butter/NFDM Plant)- with higher prices for allowances

Period	Baseline Emission	Emission Allowance Required	Reduced Emissions Allowance Cost % Phase-in Purchased	Required Beyond Baseline Purchase Allowance	Above Reduced Allowance Cost	Fixed Baseline Cost	Additional Cost Per Pound No Change	Additional Cost Per Pound Adjusted	Percent of Marginal Cost No Change
100% Free									
2012	33,571	32,900	$0	671	$9,400	$9,400	$0.00005	$0.00000	
2013	33,571	32,242	$0	1,329	$18,612	$18,612	$0.00009	$0.00000	
2014	33,571	31,597	$0	1,974	$27,639	$27,639	$0.00014	$0.00000	
75% Free									
2015	33,571	30,965	$82,908	2,606	$27,912	$110,820	$0.00056	$0.00042	
2016	33,571	30,346	$81,250	3,225	$34,545	$115,795	$0.00058	$0.00041	
2017	33,571	29,739	$79,625	3,832	$41,045	$120,670	$0.00060	$0.00040	
50% Free									
2018	33,571	29,144	$553,733	4,427	$168,232	$721,965	$0.00362	$0.00278	
2019	33,571	28,561	$542,658	5,010	$190,381	$733,040	$0.00367	$0.00272	
2020	33,571	27,990	$531,805	5,581	$212,088	$743,893	$0.00373	$0.00267	
End Period Total 100% Purchased	**33,571**	**27,990**	**$1,063,610**	**5,581**	**$212,088**	**$1,275,698**	**$0.00639**	**$0.00533**	3.20%

Assumptions
Baseline CO2 Emissions: 33571 metric tons
Reduction in emission allowance per year: 2%
Volume Processed: 199500000lb
% NFDM Production/ Emissions: 69% / 90%
% Butter Production / Emissions: 31% / 10%

2012-14	Period 1 Emission Per Metric Ton Cost $14.00	Assuming Initial Free Allowances at Baseline Level; Purchase O
2015-17	Period 2 Emission Per Metric Ton Cost $10.71	75% of baseline allowances for second period; Purchase 25%
2018-20	Period 3 Emission Per Metric Ton Cost $18.00	50% of baseline allowances for third period; Purchase 50%

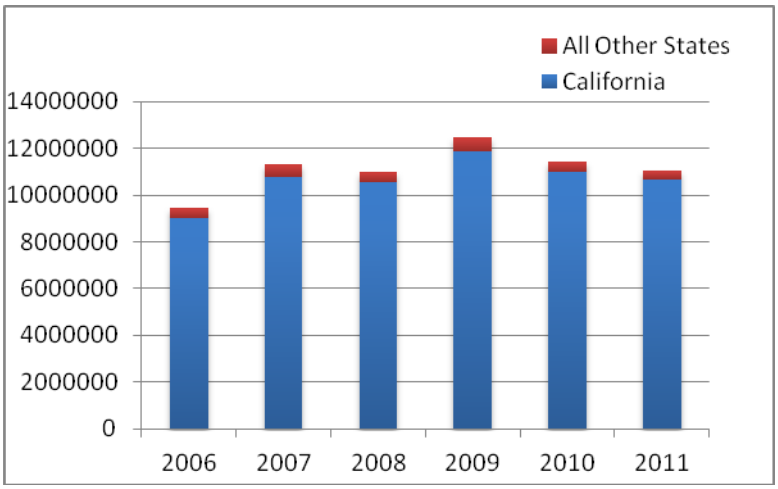


Figure 1. Share of California in U.S. Tomato Processing (million tons)
Source. World Processing Tomato Council, 2012

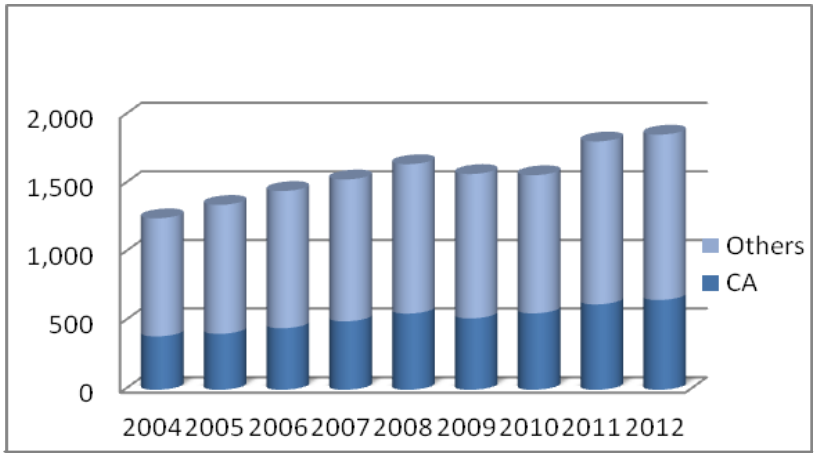
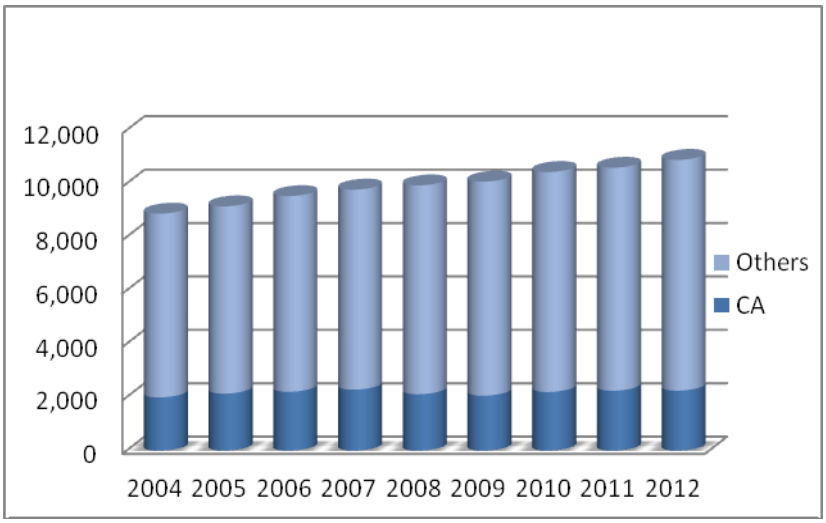
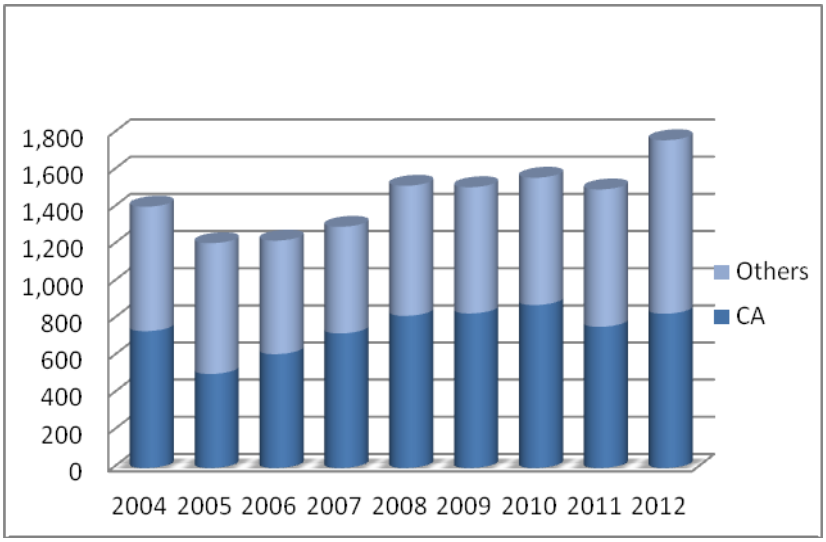


Figure 2. Share of California in U.S. Dairy Product Manufacturing (Million lb)
2 (a): Butter.
Source. USDA



2 (b): Cheese (all types).
Source. USDA



2 (c): Non-fat Dry Milk (for humans).
Source. USDA