

California's Egg Regulations: Implications for Producers and Consumers

Colin A. Carter and Tina L. Saitone

California's egg regulations became effective January 1, 2015. Immediately, egg prices in California were nearly double those in the rest of the U.S. as producers worked through an adjustment to new regulations. The price premium for eggs in California has narrowed but is likely to remain well above prices in the rest of the U.S. due to the continued regulatory uncertainty and higher costs associated with complying with the regulations.

In 2014, nearly 87 billion table eggs were produced in the United States—7.25 billion dozen. As recently as two decades ago, California was the number one egg producer. Today, egg production is concentrated in the Midwest, with the top 3 egg producing states (Iowa, Ohio, and Indiana) accounting for 33% of total U.S. egg production in 2014. According to the American Egg Board, 66 firms have more than 1 million hens (87% of total production) and 17 firms have more than 5 million hens.

The average person in the U.S. consumes nearly five eggs per week in various forms. California is the largest egg-consuming state in the U.S. but only produces 4.6% of the national supply. As a result, California imports eggs produced in Arkansas, Colorado, Illinois, Iowa, Minnesota, Missouri, Oregon, South Dakota, and Wisconsin.

The Regulations

In November 2008 California voters passed Proposition 2, which subsequently became the Prevention of Farm Animal Cruelty Act. This statute required that, by January 1, 2015, California egg producers comply with requirements that egg-laying hens be allowed enough space to turn around and move their limbs. While there is yet to be a consensus on exactly how much space per hen that requires, clearly it requires much more space than was typically provided.

Approximately 94% of the shell eggs produced in the U.S. are laid in conventional wire cages that house 6-10 laying hens. The typical caging system provides each bird with approximately 67 square inches of floor space, with sloped floors to facilitate egg collection and litter disposal. Research conducted at the UC Agricultural Issues Center (AIC) found that Proposition 2, if enacted in isolation, would almost completely eliminate egg production in California. The AIC report reasoned that production of eggs in California would not be competitive because production costs under California law would be too high relative to the production costs outside California.

Two years after Proposition 2 passed, Gov. Schwarzenegger signed Assembly Bill (AB) 1437 into law. AB 1437 requires egg farmers outside of California to comply with the confinement standards set forth by Proposition 2, if their eggs are sold in California for human consumption. Statements in this bill and the surrounding discussion indicate that its purpose was food safety, i.e., to protect California egg consumers from the dangers of *Salmonella* contamination. The bill claims that egg-laying hens subjected to stress will have higher levels of pathogens in their intestines, which increases the likelihood that consumers will be exposed to higher levels of food-borne illness. Recent research in *Poultry Science* by Jones et al., however, suggests that the prevalence of *Salmonella* on

Also in this issue

Faculty Profile: Tim Beatty.....4

The Economic Impact of Food and Beverage Processing in California

Richard J. Sexton, Josué Medellín-Azuara, and Tina L. Saitone.....5

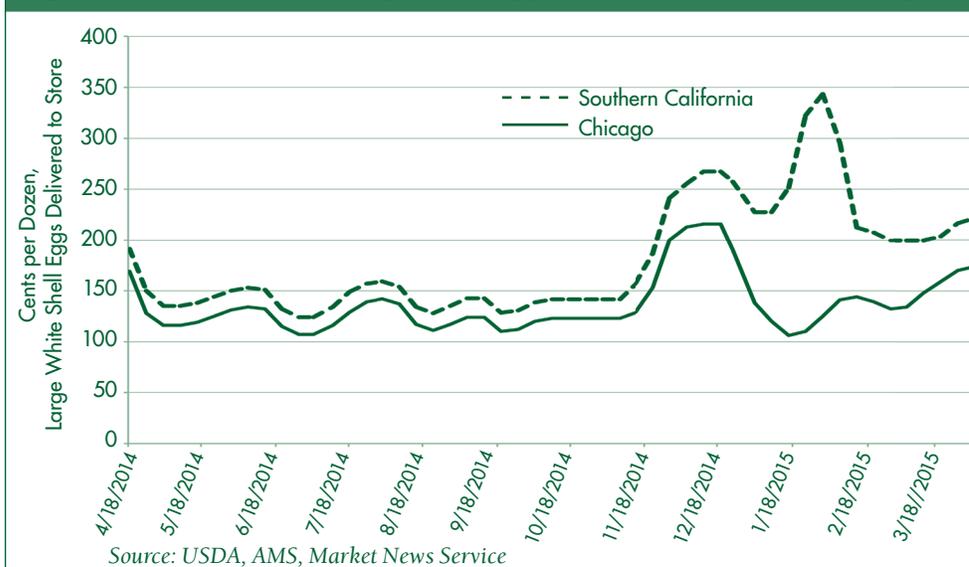
Port Slowdown Impacts California Agriculture

Georgi T. Gabrielyan and Daniel A. Sumner.....9

In the next issue

Special Issue:
The Economics of the Drought for California Food and Agriculture

Figure 1. Wholesale Price of Large White Eggs, Southern California and Chicago



egg shells does not differ significantly across egg-laying hen housing systems.

Six states, Alabama, Iowa, Kentucky, Missouri, Nebraska, and Oklahoma, filed suit against California in federal court over the egg regulations. The suit alleges that AB 1437 is an attempt by California to protect its egg industry and regulate out-of-state producers in violation of the U.S. Constitution's Interstate Commerce Clause. In October 2014, U.S. District Court Judge Mueller ruled that the plaintiffs lacked standing to bring this action on behalf of egg producers. This decision is under appeal.

With the passage of Prop 2 and AB 1437, considerable uncertainty permeated throughout the egg industry in terms of what confinement standards would be compliant with California law. Motivated by the goal of reducing the risk of *Salmonella* in shell eggs, the California Department of Food and Agriculture (CDFA) stepped into this void and issued minimum cage size regulations by adopting CCR 1350 in May 2013. This regulation stipulates specific egg-laying hen enclosure sizes, i.e., inches per bird. For example, an enclosure containing 9 or more birds shall provide a minimum of 116 square inches per bird. It is because of CCR 1350 that you will see a "CA Shell Egg Food Safety Compliant" seal or label on your egg carton.

While these regulations are intended to be "harmonious" with California's existing egg regulations, compliance with CCR 1350 does not necessarily imply compliance with Prop 2 or AB 1437. Further, CDFA does not have the authority to enforce the statutory requirements of Prop 2 or AB 1437.

Alternative Confinement Systems

Alternative housing systems, including cage-free, free range, and organic account for about 6% of national production. While statistics are not yet available, it is anticipated that California egg regulations will increase the amount of egg-laying hens housed in alternative housing systems by approximately 10% nationally.

Cage-free production systems can be categorized into two types: open floor and aviary. Open-floor systems, (or barn systems), house hens all together on an open barn floor with nesting boxes placed over automated egg collection equipment. Aviary systems provide hens with multiple tiers of nesting and access to feed and water while also retaining floor space for dust bathing and litter access. Free-range systems provide hens with outdoor access during the day and indoor shelter at night and for egg laying. Egg-laying hens used to produce certified organic eggs are

housed uncaged inside barns and are required to have some outdoor access. Finally, enriched colony cages, which have California compliant space per hen, offer hens added amenities (e.g., perches, scratching areas, and nesting boxes) to facilitate natural behaviors.

Producing eggs in alternative housing systems comes at an increased cost to farmers due to higher mortality rates, lower egg production, lower feed conversion rates, increased labor costs, and higher energy costs. Matthews and Sumner estimated cost increases for cage-free housing systems relative to conventional systems at 36%, and 13% for enriched. In addition to these per-unit cost increases, in order to comply with the California regulations, farmers will incur substantial fixed costs to retrofit their existing barns or build new facilities.

After years of acrimonious disagreement, in 2011, the Humane Society of the United States (HSUS) and United Egg Producers (UEP; a cooperative that represents members with 95% of egg-laying hens in the United States) came together to lobby for uniform national cage size requirements as part of the 2014 Farm Bill. Although ultimately unsuccessful, this attempt represented recognition by both organizations that imposing regulations or private standards on a piecemeal basis creates unintended consequences and leads to additional costs that would not exist under a unifying set of regulations or standards.

Implications for Egg Producers

One of the fundamental issues facing egg producers in California and elsewhere in the U.S. is uncertainty regarding what regulatory environment will ultimately emerge. The mandate set forth in Proposition 2 is rather vague, stipulating that animals shall not be confined in a manner wherein they are not able to lay down, stand up, fully extend limbs, or turn around freely. Thus, producers are not provided with

a metric of what constitutes minimum space per bird that will be considered compliant with California law. HSUS, which lobbied for passage of Proposition 2, believes farmers will only comply if their chickens are housed in a cage-free environment (e.g., see <http://cagefreeca.com/>), whereas others in the industry have come to use the space requirements associated with CCR 1350 as a guide for compliance.

Uncertainty is greatest for California egg producers. They must meet the minimum cage size standards specified by CCR 1350 without knowing whether the minimum of 116 square inches of space per bird required by this regulation is sufficient to meet the requirements of Proposition 2. California egg producers could invest millions of dollars to reconfigure their operations to meet this standard and later find this investment to be worthless if a court accepts the HSUS argument that Proposition 2 requires cage-free operations.

Out-of-state producers are similarly challenged in determining what they must do to comply with California law. Eggs produced from systems determined not to be in compliance with California law can be sold elsewhere. However, California operators could never survive in such a competitive environment because they would be saddled with higher production costs and higher transportation costs compared to operations located in the heartland.

Implications for Egg Consumers

Given this uncertainty, egg producers did not use the phase-in period offered by Prop 2 or AB 1437 and instead waited for additional clarification, if not through legislation then possibly through the judicial decisions associated with pending lawsuits. This lack of preparation caused a disruption of pricing in the market for eggs in California when the regulations became effective. This disruption is shown in Figure 1, which depicts wholesale

prices for large white shell eggs in Southern California and Chicago.

Prior to November 2014, prices in Southern California and Chicago moved in near lockstep, with prices in California exceeding those in Chicago by an average of almost \$0.19/dozen. Prices in the two markets began to deviate from this pattern in advance of the implementation of the regulations in January 2015. Almost a month after the regulations became effective, wholesale prices in California were nearly double (\$2.19/dozen higher) than those in Chicago and elsewhere in the U.S.

Yet, as time has passed, this substantial price premium associated with adjustment to the regulations has dissipated. As of early April 2015, wholesale prices in Southern California exceeded those in Chicago by about \$0.47/dozen— a 28% premium. Some consumers may, however, still be seeing relatively high retail prices in grocery stores. This prolonged price disruption at the retail level likely has more to do with retail prices responding asymmetrically to wholesale cost changes than it does with California's egg regulations. Retail prices are known to rise rapidly in accordance with increasing costs, but they decline slowly and sometimes incompletely in response to falling wholesale costs.

Because the housing systems now required for California and out-of-state producers shipping eggs to California have increased production costs, we anticipate that the California price premium will eventually approximate production cost differences. Assuming that the price differential observed in April 2015 persists, a consumer in California with average per capita consumption of 21 dozen eggs per year will pay nearly \$6 more annually as a result of Prop 2 and AB 1437. While this additional cost may seem insignificant at first glance, it may be substantial for low-income large families who use eggs as a relatively affordable source of protein.

In the U.S. typical consumers spend less than 10% of their income on food, and eggs are only one small component of this food budget. However, if California continues to impose cost-increasing regulations on an increasing number of food products, the additional cost burden to consumers could become important.

Conclusion

While some of the initial adjustment-period price spike has dissipated, California and out-of-state egg producers still face great uncertainty regarding whether or not their housing systems will comply with California regulations. This uncertainty will result in some out-of-state egg farmers to abandon the California market due to the high capital investments required for compliance. At the same time, California consumers will be paying higher prices for eggs than prior to the implementation of the regulations, but not at the levels that were seen in late January and early February 2015.

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For additional information, the authors recommend:

Sumner, D.A., J.T. Rosen-Molina, W.A. Matthews, J.A. Mench, and K.R. Richter. "Economic Effects of Proposed Restrictions on Egg-laying Hen Housing in California." University of California, Agricultural Issues Center, July 2008. Available at: http://aic.ucdavis.edu/publications/eggs/egg_initiative.htm.

Faculty Profile: Tim Beatty



Tim Beatty
Associate Professor
Agricultural and Resource Economics
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Tim Beatty recently joined the faculty at the University of California, Davis as an associate professor in the Department of Agricultural and Resource Economics. His research looks at consumption behavior, in particular as it relates to poverty and health. His research has focused on food consumption and the demand for nutrition and health, at both the household and aggregate levels.

Tim was born and raised in Toronto, Ontario, Canada. He did his undergraduate degree in Economics at Université Laval in Quebec City, his M.Sc. in Applied Economics at the École des Hautes Études Commerciales de Montréal, followed by a Ph.D. in the Department of Agricultural and Resource Economics at UC Berkeley. He started his career as a Canada Research Chair

in the Food and Resource Economics Group at the University of British Columbia (Vancouver, Canada), followed by tenured faculty positions at the University of York (U.K.), and the University of Minnesota. Over the years, he has held visiting positions at the Statistics Norway, BI Norwegian Business School, and the University of Bologna.

Much of Tim's research has focused on issues broadly related to poverty and specifically related to the consumption behaviors of low-income households. The consumption decisions of the poor are often of interest to and the target of government policy; providing research on these interventions goes to the heart of the kind of work an engaged academic at a land-grant institution should be involved in. Work in this area has looked at the prices low-income households pay for food and whether or not low-income households face a "Heat or Eat" trade-off.

A major interest has been the study of information provision as a tool of public policy. In principle, decision makers should optimally adjust behavior in response to new information, thereby increasing welfare; in practice, results vary. Work in this area has looked at consumer response to FDA warnings concerning high levels of mercury in fish, consumer responses to hurricane advisories, and response to air quality warnings.

A related area of work is the study of "labeled transfers." Labeled transfers are another way by which policymakers attempt to influence the consumption choices of social program participants, giving descriptive names to the resources provided. In work with co-authors, Tim has found that these descriptive labels are more effective than economic theory would predict.

For example, elderly households in the U.K. receive an unconditional cash transfer called the "Winter Fuel Payment"—these transfers are spent on fuel at a much higher rate than theory predicts. Recent work has found that increases in benefits from the Supplemental Nutrition Assistance Program (called CalFresh in California) result in a greater increase in food spending than we would expect if households had simply been provided with cash.

Tim has a long involvement with the Agricultural and Applied Economics Association, serving in leadership roles in the Food Safety and Nutrition section and the Econometrics section. He was recently appointed as one of the four co-editors of the *American Journal of Agricultural Economics*.

Tim and his wife Josephine used to have hobbies but now have three children: Max (10), Finn (8), and Hazel (6) who have quickly acclimated to life in balmy Northern California.

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The Economic Impact of Food and Beverage Processing in California

Richard J. Sexton, Josué Medellín-Azuara, and Tina L. Saitone

Food and beverage processing is the third largest manufacturing sector in California. In 2012 California's food and beverage processing sector contributed \$82 billion in value added to the California economy, 760,000 full- and part-time jobs, \$10.5 billion in federal tax revenues, and \$8.2 billion in state and local tax revenues.

California's role as the nation's leading producer of agricultural products is well known. In 2012 California's farms and ranches accounted for \$42.6 billion in output. California produced 15% of the nation's total value of crop production and 7.1% of the value of livestock and livestock products. Milk production was the state's largest agricultural industry in 2012, with production valued at \$6.90 billion in 2012, followed by grapes at \$4.45 billion, and almonds at \$4.35 billion. Nursery plants with \$3.54 billion in value and cattle and calves at \$3.30 billion rounded out the top five.

Most people, however, are probably less familiar with the state's vitally important food and beverage processing sector, which is responsible for acquiring the bounty produced on California's farms and ranches and converting it to the food, beverage, and fiber products demanded by consumers worldwide. Our study quantifies the economic impact of this integral component of California's economy. Food and beverage processing is California's third largest manufacturing sector, following computers and electronics and chemicals, and California's total of 3,421 food manufacturing establishments is the largest in the nation. In 2012 California's food and beverage processors accounted for \$82 billion of value added and 760,000 full- and part-time jobs.

Methodology

We derived value added for food and beverage processing as the value of the products produced by the food and beverage sector, less the cost of inputs used in producing those products. By deducting input costs, we avoid double counting the economic impact of agricultural production and are able to focus solely on the processing sector. All measures of impact reported in this study are annual estimates for 2012 (the most recent year for which full information was available at the time the study was conducted), with all impact measures reported in nominal U.S. dollars and all employment estimates reported as annual jobs, including full-time, part-time, and seasonal jobs.

Multiplier Impacts

A key part of any impact study is estimating the secondary or multiplier impacts from economic activity. These impacts occur as the value added from the primary economic activity, food and beverage processing in our case, reverberates through the local and regional economies, creating additional income and employment for the businesses. These businesses supply inputs to the primary activity, and for commercial enterprises generally, as income earned is spent on a multitude of products and services in the local or regional economy.

We estimated these secondary impacts using regional and inter-regional input-output models. These models provide a snapshot of a state or regional economy by tracing relationships among commercial sectors, as well as government, households, and the rest of the world.

Input-output models provide measures of the multiplier or spillover effects attributable to a primary

economic activity. These spillover impacts are broken down into two main categories: indirect and induced effects. Indirect effects are changes in local inter-industry spending transmitted through economic linkages among the different sectors of the economy. For example, a food processor that contracts with local businesses to provide containers and packing materials, or to ship farm products to the plant and finished products to markets, creates income and value added for those enterprises.

Induced effects are the result of spending household incomes generated from the sectors directly and indirectly affected by the primary economic activity. Thus businesses, such as retail shops and service providers, that may seem quite disconnected to food and beverage processing, benefit from the presence of these enterprises in the local economy through the income they generate that is then spent in these establishments.

The magnitudes of both indirect and induced impacts are determined by the degree to which income "leaks" from the local economy by being spent outside its boundary. Naturally, the larger and more economically developed the area of consideration, the smaller is the rate at which economic activity leaks beyond its boundary. Thus, multiplier impacts will be greater when we are considering California as a whole than when we are examining individual counties.

We utilized the Impact Analysis for Planning (IMPLAN) model to estimate the multiplier impacts generated by the food and beverage processing industry in California. The IMPLAN model is one of the most widely used and respected models for regional economic analysis, and it is utilized extensively in economics, planning, and engineering studies to estimate the full economic impacts

of injections or withdrawals of economic activity from regions of interest.

Results

We estimate that in 2012 the food and beverage processing sector directly

accounted for nearly \$25.2 billion in value-added activity and a total value added of \$82 billion, once indirect and induced impacts are included.

The food and beverage processing sector was responsible for over

760,000 jobs in 2012, over 198,000 of them being directly in food and beverage processing and another nearly 563,000 through indirect and induced employment impacts. Based upon its direct value-added contribution, the food and beverage processing sector is the third largest manufacturing sector in California, comprising 9.2% of the state's manufacturing value added, and trailing only electronic and computer equipment (34.5%) and chemical manufacturing (15.8%).

Figures 1 and 2 summarize the economic impacts for California's 10 leading food and beverage processing sectors for 2012. With milk production being California's largest agricultural industry, it is no surprise that dairy is the state's leading food processing industry. Dairy processing directly accounted for \$3.37 billion in value added. Once the multiplier impacts from the sector's activities are included, the total economic impact of dairy processing in California is \$15.6 billion. We estimate that the dairy sector directly accounts for 18,000 jobs, and that another nearly 122,000 jobs are generated from the indirect and induced impacts, resulting in over 139,000 California jobs that can be traced directly or indirectly to the dairy processing sector.

Grape production, California's second largest agricultural industry in 2012, goes into producing wine and other grape beverages, table grapes, and raisins. Wineries represent California's second-leading food and beverage processing sector, accounting for \$3.65 billion in direct value added in 2012. The multiplier for wineries is estimated to be 3.05, meaning indirect and induced impacts accounted for an additional \$7.4 billion in value added in 2012. California wineries were directly or indirectly responsible for just over 100,000 jobs in 2012.

Rounding out the top five California food and beverage processing sectors for 2012, in terms of value added, were baking (comprised of bread and

Figure 1. Top Ten Food and Beverage Processing Sectors by Value Added

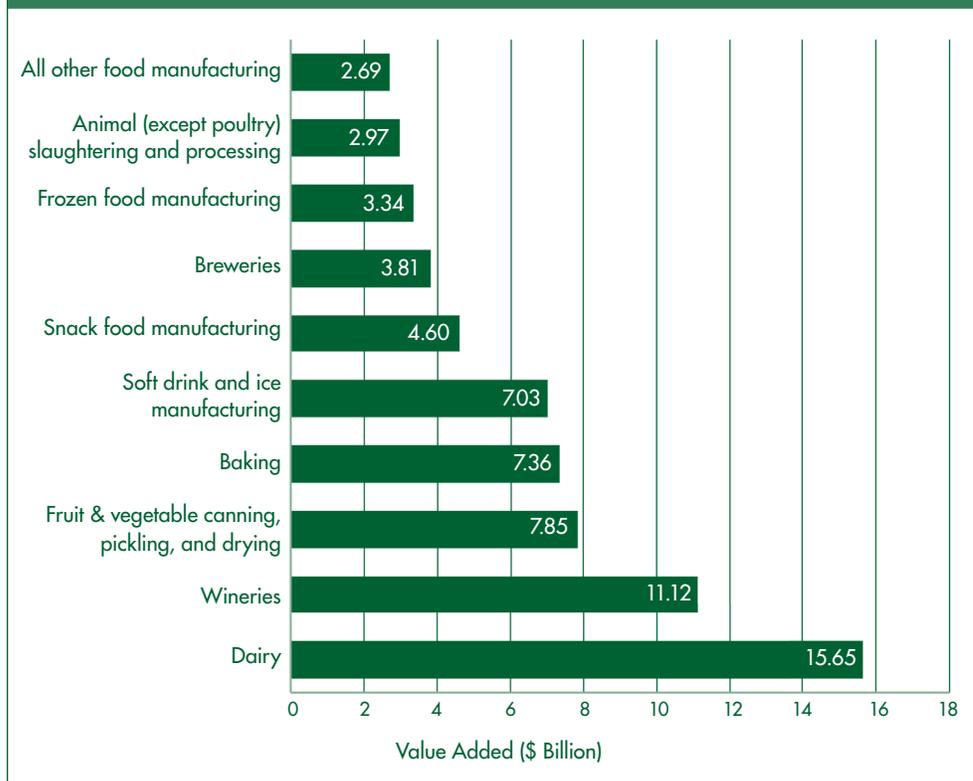
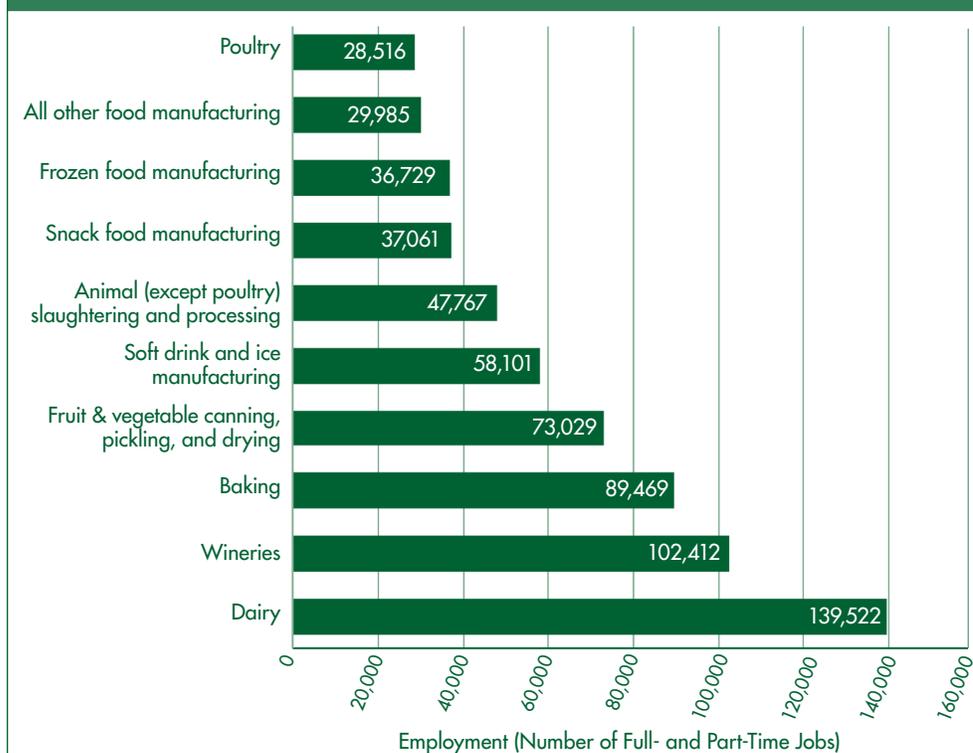


Figure 2. Top Ten Food and Beverage Processing Sectors by Employment



bakery product manufacturing; cookie, cracker, and pasta manufacturing; and tortilla manufacturing); fruit and vegetable canning, pickling, and drying; and soft drink and ice manufacturing. These sectors were responsible for \$2.64 billion, \$2.22 billion, and \$1.72 billion in direct value-added activity, respectively. In terms of employment, the baking sector accounted directly or indirectly for more than 89,000 jobs, the fruit and vegetable canning, pickling, and drying sector was responsible for another 73,000 jobs, and total employment due to the soft drink and ice-manufacturing sector was about 58,000.

Impacts in Selected Counties

Table 1 reports economic impacts from food and beverage processing for 30 individual counties in California. The counties were chosen based upon the importance of food and beverage processing in these local economies. The direct value added due to food and beverage processing in these 30 counties accounts for 72% (\$18.1 billion) of the statewide total, with Los Angeles County alone accounting for 24% of the state's direct value added. These 30 counties are responsible for 86% of direct food and beverage processing sector jobs in the state.

Among the 30 counties included in the table, Stanislaus County is second in terms of total value-added activity, employment, and sector output. Stanislaus accounted for nearly \$1.3 billion in direct value-added economic activity in 2012, with indirect and induced impacts accounting for another more than \$1 billion in value-added output. Food and beverage processing in Stanislaus County was responsible for nearly 25,000 total jobs in 2012 and generated more than \$8.6 billion in sector output.

Rounding out the top five food and beverage processing counties included in the study, in terms of direct value-added economic activity, were Orange (\$1.13 billion), Sonoma (\$1.05 billion),

County	Direct	Total	Total Jobs	Share of Total Employment
	\$ (1,000s)	\$ (1,000s)	Full- & Part-Time Jobs	Percent of Total
Alameda	877,097	2,017,476	20,696	4%
Butte	188,632	381,454	4,201	8%
Colusa	67,035	146,130	1,878	48%
Fresno	967,685	1,906,379	24,577	10%
Glenn	13,071	30,675	427	9%
Imperial	82,817	161,293	2,818	9%
Kern	483,405	866,153	10,271	5%
Kings	347,577	689,812	7,657	33%
Los Angeles	6,085,688	11,586,921	103,340	3%
Madera	48,460	71,384	892	4%
Merced	403,797	730,447	9,054	22%
Monterey	290,951	502,343	5,569	6%
Orange County	1,125,840	1,980,746	17,543	1%
Riverside	354,527	587,322	6,197	1%
Sacramento	592,753	1,098,735	10,219	3%
San Benito	67,995	91,351	1,197	13%
San Bernardino	693,931	1,098,319	12,389	2%
San Diego	619,630	1,328,662	13,633	1%
San Joaquin	682,654	1,343,416	14,870	9%
San Luis Obispo	202,673	364,080	3,921	5%
Santa Barbara	237,736	393,582	3,997	3%
Santa Cruz	116,566	245,415	2,989	4%
Solano	266,296	442,032	4,109	4%
Sonoma	1,048,163	2,104,685	21,756	15%
Stanislaus	1,259,509	2,355,483	24,922	20%
Sutter	71,316	150,516	2,016	11%
Tulare	528,591	1,022,194	12,034	14%
Ventura	161,235	285,861	2,731	1%
Yolo	173,228	412,751	4,770	8%
Yuba	4,663	8,682	117	1%

and Fresno (\$967 million). Food and beverage processing in Fresno County was directly and indirectly responsible for over 24,500 jobs; the comparable number for Sonoma County is 21,700 jobs. Alameda County,

responsible for about 20,700 jobs, replaces Orange County in the top five, based on the employment metric.

Column 5 in Table 1 reports the percentage of total jobs in a county due directly or indirectly to the food and

Table 2. County and State Tax Impacts

County	Per Million Dollars of Economic Activity	
	Federal	State and Local
Alameda	60,993	43,800
Butte	47,124	83,433
Colusa	26,804	22,209
Fresno	42,258	29,554
Glenn	28,079	16,474
Imperial	31,027	21,427
Kern	40,046	22,465
Kings	26,406	17,293
Los Angeles	62,350	51,651
Madera	29,066	36,085
Merced	34,764	21,881
Monterey	52,968	52,691
Orange	58,444	35,270
Riverside	42,570	56,557
Sacramento	53,299	38,556
San Benito	30,936	29,270
San Bernadino	27,378	15,118
San Diego	61,185	71,277
San Joaquin	48,915	42,467
San Louis Obispo	60,355	98,561
Santa Barbara	60,268	98,554
Santa Cruz	51,209	40,033
Solano	45,049	59,359
Sonoma	135,550	51,071
Stanislaus	49,068	40,846
Sutter	47,205	27,194
Tulare	33,580	20,404
Ventura	52,663	34,713
Yolo	38,055	32,342
Yuba	30,912	29,353
California Total ^a	99,783	77,940

^a California total is the statewide impact, therefore the sum of the counties in the table does not equal the state total.

beverage processing sector. The greatest employment impacts on a percentage basis are in rural counties and counties in the Central Valley. We estimate that the food and beverage processing sector contributes nearly \$20 billion in value added to the Central Valley economy and nearly 205,000 jobs. The largest

relative impact of food and beverage processing is in Colusa County, where the sector is responsible for nearly half (48%) of all jobs in the county. Food and beverage processing is responsible for 20% or more of all jobs in Kings, Merced, and Stanislaus counties.

Tax Revenues Generated

California's food and beverage processing sector is also an important contributor to tax revenues at all levels of government. Table 2 provides estimates of tax revenues generated by food and beverage processors in each of the 30 counties included in the study and for the entire state. The results are presented as total tax revenues generated per million dollars of direct output in the food and beverage processing sector. The tax revenues reported in the table account for the taxes generated from direct, indirect, and induced impacts. This presentation is convenient for policy analysis because any policies that will impact sales in the food and beverage processing sector, either positively or negatively, can be readily converted into impacts on tax revenues.

We see that statewide, each million dollars in output by the sector generates nearly \$100,000 in additional federal taxes and nearly \$78,000 in additional state and local taxes. In total, we estimate that statewide the sector is responsible, directly or indirectly, for \$10.5 billion in federal tax revenues and \$8.2 billion in state and local tax revenues.

Results vary for the individual counties based upon a number of factors, including types of food and beverage processors located in the county, structure of taxation at the local level, and income distribution within the population base. The greatest impact on federal tax revenues per million dollars in output is in Sonoma County, with nearly \$136,000 in tax revenues generated. The greatest impacts on state and local tax revenues occur in San Luis Obispo and Santa Barbara

Counties, where a million dollars in output generates nearly \$100,000 in state and local tax revenues.

Conclusion

Food and beverage processing is a key engine of the California economy and an indispensable complement to California's agricultural production sector. In 2012 California's food and beverage processors contributed directly or indirectly, through multiplier impacts, \$82 billion of value added and 760,000 jobs to the California economy. Food and beverage processing is a key driver of many county economies, in several instances accounting for 20% or more of total employment.

If food and beverage production and demand growth trends continue, as we expect they will, the impacts of the sector on value added, output, and employment reported here will soon understate the sector's true impacts. However, the multiplier values included in this article reflect the underlying fundamentals of the state and local economies analyzed in the study and should be relatively stable over time. Thus, it will be possible for future analysts to update this work by applying the multipliers to current information on the value of production in the different jurisdictions and industrial sectors included in this study.

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Port Slowdown Impacts California Agriculture

Georgi T. Gabrielyan and Daniel A. Sumner

The West Coast port delays that began in the summer of 2014 and lasted until near the end of February 2015 cost California agriculture dearly. As the delays extended into the winter, citrus exports were hit while exports of storable crops to Asia also slowed. The story for wine is more complex, because California both imports and exports wine through West Coast ports.



The port slowdown in late 2014 and early 2015 had the potential to damage California agriculture significantly. Shippers took measures that imposed extra storage, transport, handling and financing costs. However, ending the slowdown in February allowed California to avoid much more damage to annual exports and season average prices.

California agriculture exported about 26% of its production in 2013 worth \$21 billion. The top six destinations for California agricultural exports are Canada, European Union, China (including Hong Kong), Japan, Mexico, and Korea. Most export destinations rely almost exclusively on West Coast ports. The slowdown did not greatly restrict shipments from California to Mexico and Canada because most shippers use rail and truck for that trade. Exports of some products to Europe rely initially on rail and trucks and then shipping from eastern ports. The top seven California export commodities are almonds, dairy products, wine, walnuts, pistachios, table grapes, and oranges. Markets served by West Coast ports are important for all these commodities.

The port slowdown in late 2014 and early 2015 had the potential to damage California agriculture significantly. We examine several potential impacts: loss of export volumes, added costs of exporting from alternative ports, lower prices as products are diverted to the North American market, and loss of reputation as a reliable supplier. Another key fact about California exports to Asia is the surplus of containers and cargo ships arriving in West Coast ports, implying relatively low export shipping costs for the “backhaul.”

Chronology and Initial Impacts of the Port Delays

The new round of negotiations between the International Longshore and Warehouse Union and Pacific Maritime Association that began in May 2014 did not go well. Labor contracts expired in July 1, 2014 and ports operated without a formal contract since then. Noticeable increases in congestion in the ports of

Long Beach and Los Angeles emerged in the late summer of 2014. Backlogs at the Port of Oakland became noticeable by late November. These ports are nationally important; fully one-third of U.S. agricultural exports are shipped from the West Coast. Therefore, finally, on February 20, 2015, U.S. Secretary of Labor Tom Perez facilitated a tentative contract covering West Coast dockworkers. After almost nine months of delays, the normal operations resumed on the evening of February 21, 2015.

Due to the port slowdowns, products that were previously exported from West Coast ports had four options: 1) ship as usual and simply wait for available cargo ship space, 2) delay packing and hold products for shipping later, 3) reroute products through other ports, or 4) sell in the North American market. Some options were not economically feasible for some products, and shippers of different products used different combinations of feasible, yet still costly options. The magnitude of losses depended on storage capability, the ease of finding new export markets and the importance of West Coast port exports, especially to Asia, in the market for that product.

Press reports during the port slowdown highlighted short-term effects on California agricultural shipments. The largest navel orange shipper, Sun Pacific, normally shipped 350 containers of fruit a week during February, but company President Al Bates said the port delays cut that flow of exports in half. Blue Diamond, the large almond cooperative, noted that relatively solid export shipments for the drought-reduced 2014 crop, “would have been even stronger if not for containers held up in West Coast ports due to union inactivity.” The U.S. Forage Export Council noted slow

Table 1. Shares Useful for Understanding the Importance of Exports

Commodity	Average California Share of U.S. Exports	Average Export Share of California Production*	Share of U.S. Exports from West Coast Ports*
	-----Percent-----		
Almonds	100	67	91
Fresh Oranges	98	37	75
Hay	26	21	99
Wine	93	14	79

*Sources: U.S. Department of Commerce, USDA National Agricultural Statistics Service.
Shares are calculated of averages of 2011 to 2013 to smooth year-to-year production fluctuations.
Excluding exports to Mexico and Canada.

exports in the late fall and early winter and said, “a big carryover of unsold 2014 inventory will impact the 2015 crop, perhaps in price and volume.”

Shipment Patterns for Major Export Commodities

Exports and their importance differ by commodity. In order to better understand the effect of the port slowdown, we reviewed data for several major export commodities: almonds, hay, oranges, and wine. The United States exported about \$4.5 billion of almonds in 2014, all produced on California farms. California dominates U.S. fresh orange exports of about 1.1 billion pounds, which accounted for about \$550 million of exports in 2014. California producers accounted for about \$300 million

worth of hay exports in 2014 and California wineries shipped about \$1.4 billion worth of exports in 2014.

Table 1 shows the importance of California as the major producer of these commodities, the importance of export markets, and the importance of West Coast ports for exporting. California is the exclusive or dominant source of exports of these commodities except hay, for which other western states also supply export markets. Exports are a significant share of production for each, but clearly export markets are most important for almonds. Column 3 shows that West Coast ports are crucial, but oranges and wine do have important export markets in Canada.

Table 2 shows that exports fell for each commodity from the July through February period for 2014/15 compared

to 2013/14. Hay exports declined by 18%, while orange exports declined by 6% for the eight months of the slowdown. Of course, the size of the crop also drove export quantities, so Table 2 also shows exports as a share of annual production for each product. As a share of the annual U.S. production, hay exports declined by 27%. (Much of this national hay production is unrelated to exports because eastern hay tends to be produced and used on the same farm or a nearby farm.) Exports in the affected period as a share of production fell by 18% for almonds and 25% for wine. For oranges, about 13% of production was exported in both periods.

Our information on almond exports is supplemented by data from the Almond Board of California, which compiles monthly export reports. In addition to showing severe cuts during the months of the slowdown, the Almond Board reports that in March 2015 almond exports rose by 40% compared to March of 2014, indicating the magnitude of the backlog of almonds that had not been yet shipped. Almond Board data suggest the equivalent of a full month of backlogged exports that need to be shipped.

The detailed story for oranges is important because seasonality is crucial. Orange exports are typically low from July through October, and then shipping grows from November to the peak in March. April and May are also large export months. The industry expressed concern because November 2014 exports through the affected ports were only about half of 2013 shipments, and December 2014 exports were down by about 10%. January and February exports in 2015 were about the same as 2014, and the prospects for March, the peak export month, were bleak given the need to move a perishable crop into Asian destinations with limited market windows.

Table 2. U.S. Exports During the Months of West Coast Port Slowdown, Share of California Production and Percentage Changes Compared to the Previous Year

Commodity	Exports July 2014–February 2015		Exports July 2013–February 2014		% Change in Quantity	% Change in Shares
	Million lbs.	Share of Production Exported*	Million lbs.	Share of Production Exported*		
Almonds	948	47	1,093	58	-13	-18
Fresh Oranges	526	13	562	13	-6	2
Hay	4,925	5	6,043	7	-18	-27
Wine	63#	9	72#	12	-13	-25

*Source: U.S. Department of Commerce, USDA National Agricultural Statistics Service.
*The share of production exports during the period of 2014 or 2013 production.
Million gallons*

Market Impacts of the Port Slowdown

Shippers delayed or diverted exports from West Coast ports and those responses to the slowdown caused two current market impacts on quantities, prices, and revenues. Supplies shipped to export destinations declined and supplies in the North American markets rose, at least temporarily.

Almonds. Almonds are storable and exports from the affected ports account for shipments of half or more than half of the crop. California almonds dominate the supply in almost every market, which means market prices may respond to the reallocation of the crop. As shipments of almonds were diverted to other ports or other markets, there was the potential for the market price to rise in the shorted markets. However, there was also the likelihood for the price to fall in the North American market. So long as the full crop is marketed over the course of the year, these two price impacts tend to offset each other. Season average market prices and overall quantities are mainly affected by the size and quality of the crop and other demand side factors.

Several additional costs of the slowdown affected the almond export industry and other industries as well. First, exporters lost high-priced export contracts, say to meet the holiday-season market in Europe. Second, they faced higher storage, transport, and handling costs for shipments delayed and diverted. Third, delayed sales meant delayed payments, which raised financing costs. Finally, they suffered damage to their reputations as reliable suppliers.

Fresh Oranges. As a perishable crop, some of the oranges not shipped in November and December were lost. Also, early season prices tend to be higher so delayed shipments reduced revenue. The diversion into later exports and into the domestic markets tended to reduce prices in the North

American market and in the spring season. California is the main source of navel oranges in North America and in some key Asian markets such as Korea. However, oranges face competition from other fresh citrus such as mandarins during the winter and spring, so we expect price impacts to be muted. The port delays ended before the peak export months of March and April with moderate crop-year impacts.

Hay. Almost all hay ships through West Coast ports to Asian markets. California hay competes with hay from other western states in both the export and domestic markets. California is a larger consumer of hay as well as a large producer, so the share of California hay exported is likely less than that of some nearby states. Very little California hay is shipped to other states but significant amounts of hay from other states are consumed by California dairies and other livestock operations. The port slowdown may have caused slightly higher export prices and slightly lower prices in California, but the impacts are small relative to the effect of the drought.

Wine. California wine dominates U.S. production and exports but competes directly with wine imports, which are much larger than exports. Much of the imported wine, especially bottle wine, enters through eastern ports unaffected by the slowdown. However, bulk wine that is packaged in California enters through West Coast ports. We estimate a rough balance between imports and exports affected by the slowdown. That means wine market impacts were muted.

Conclusion and Broader Consequences

We considered examples of four specific affected industries in this study. However, the results are broadly applicable, with appropriate adjustments, to those other parts of

California agriculture, such as dairy products, processed tomatoes, and other tree nuts that also rely on West Coast ports. Our analysis showed why we expect only moderate season-long market impacts from the port slowdown. Shippers coped with the slowdown in ways that mitigated its economic impacts. They also were able to apply enough pressure to end the slowdown before much more serious damage occurred. In particular, ending the slowdown before the peak months of orange exports reduced losses for that industry.

We do not suggest that the slowdown had negligible impacts. All the measures that shippers took imposed extra storage, transport, handling and financing costs. However, ending the slowdown in February allowed California to avoid much more damage to annual exports and season average prices.

A final consideration is more worrisome. The supply disruptions caused by the port slowdown forced importers in major markets to consider alternative supplies or alternative products to service their markets. A reputation for reliability crucially defines California agriculture and export interruption threatens that reputation. Fortunately, the port delays ended before lasting damage occurred.

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