Standardized Regulatory Impact Assessment of Proposed Regulations to Implement Proposition 12

Prepared for the California Department of Food and Agriculture

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1. Introduction and Summary

1.1. Purpose of a SRIA

SRIA stands for Standardized Regulatory Impact Assessment (or Analysis). SRIAs are specific to California. When a California state agency proposes new regulations whose aggregate economic impacts are expected to exceed $50 million in the 12-month period after the regulations are fully implemented (the "Implementation Period"), then under state law, the agency must prepare a SRIA. The purpose of the SRIA is to estimate and explain the economic impacts of proposed state regulations and of reasonable alternative regulations that would fulfill the same statutory requirements. When the SRIA is completed, it is submitted by the state agency to the California Department of Finance, published into the public record, and consulted by various state officials as the rulemaking process goes forward. It is common for the SRIA to be revised, or new editions of the SRIA drafted, as revised drafts of regulations are released.

1.2. Scope of this SRIA: The impact of Prop 12 regulations

The background for this SRIA is Proposition 12 (the Farm Animal Confinement Initiative, hereafter "Prop 12"), a ballot question passed by California voters on November 6, 2018. Prop 12 imposed several new conditions on some veal, pork, and egg products that must be met in order for the products to be legally sold in California.

Prop 12, in its statutory text, mandates requirements that take effect in two phases. The first set of Prop 12's basic requirements, whose enforcement Prop 12 mandates beginning on January 1, 2020, introduces the following mandatory requirements:

- "Shell" and "liquid" eggs sold in California cannot come from hens confined in cages with less than 144 square inches of usable floor space per hen.

- Uncooked "whole veal" sold in California cannot come from calves confined in less than 43 square feet of usable floor space per calf.

- Eggs, pork, and veal sold in California cannot come from covered animals confined "in a manner that prevents the animal from lying down, standing up, fully extending the animal's limbs, or turning around freely." A covered animal is a calf raised for veal, breeding pig, or egg-laying hen kept on a farm.

The second phase of Prop 12 implementation, which is mandated under Prop 12 to begin on January 1, 2022, introduces the following additional requirements:

- "Shell" and "liquid" eggs can only come from hens kept in "cage-free" compliant spaces.

- Uncooked "whole pork" cannot come from breeding sows or the immediate offspring of breeding sows confined in less than 24 square feet of floor space per sow.

The California Department of Food and Agriculture (CDFA) and the California Department of Public Health (CDPH) were assigned the task of promulgating Prop 12 regulations. This means that CDFA and CDPH are responsible for turning Prop 12 requirements into a set of specific, enforceable rules in the state, including protocols for verification and enforcement of the animal housing standards described in the statutes of Prop 12. (These include, for example the 144 sq.in. minimum cage size for egg-laying hens starting in 2020, and mandatory cage-free housing for egg-laying hens starting in 2022, among other specifics for other species.)

One of the purposes of the SRIA is to compare proposed regulations with legally viable alternative regulatory implementations of the same statutes. CDFA has some discretionary choices to make in developing its regulations to implement Prop 12, but CDFA's choices are limited and deal with definitional issues and procedures. For example, CDFA must define terms, such as "liquid eggs" or "pork cuts" and implement processes for verification and enforcement of the new standards. However, CDFA is not choosing whether or not eggs must be cage-free, or by when: the voters made those choices. CDFA is deciding how to turn Prop 12 into a set of practical rules that can be followed and enforced. This means that the *discretionary regulatory choices* made by CDFA are narrower than the scope of Prop 12 itself.

Therefore, the "regulatory alternatives" we consider in this SRIA, which are explained below, do not vary the basic requirements of Prop 12 itself. Rather, the purpose of the alternatives is to evaluate the differences between economic impacts of CDFA's discretionary choices in how to implement Prop 12 regulations versus lower-cost and higher-cost alternative possible implementations of Prop 12. For instance, Prop 12 requires that starting in 2022, certain types of uncooked pork cannot be sold in California if the breeding sows have been kept in spaces with less than 24 square feet of usable floor space per pig. This 24-square-foot restriction is not the result of a discretionary choice by CDFA: CDFA is required by law to implement and enforce this 24-square-foot restriction. Thus, the 24-square-foot restriction is not varied in the regulatory alternatives we consider; it is applied in all alternatives. All regulatory alternatives must include the imposition of this standard as required by Prop 12.

1.3. How we calculate economic impacts of proposed regulations and alternatives

The basic approach to the SRIA is as follows. First, we use the market in a recent situation, before any new rules take effect or affect the market economic outcomes. These data from before the imposition of the regulations are useful in establishing a without-regulations **"Baseline"** to which the impacts of the regulations are compared. The "Baseline" for each year to be considered for regulatory impact, 2020 through 2023, is constructed using the regulatory and market situation before January 1, 2020, adjusted for actual and anticipated changes that are *not* a consequence of the proposed (or alternative) regulations under consideration. For example, the Department of Finance projections of per capita income in California help establish Baseline consumption of the products affected by these regulations. The regulations cause impacts relative to the Baseline, which has already incorporated other anticipated economic factors.

The most recent 12-month California market data available (for calendar year 2019) allows calculation of prices and quantities for the egg, pork, and veal markets (or to be more precise, subsets of each of these markets as defined by the statute, e.g. uncooked "whole veal," "whole pork," etc.). Note that none of the Prop 12 rules had been implemented in 2019. Model parameters, such as income elasticities, and Department of Finance forecasts generate Baseline prices and quantities for each market. These Baseline projections, for the years 2020, 2021, 2022 and 2023 do not include any impact of the proposed regulations.

Next, the models developed simulate and estimate the economic impacts of three regulatory scenarios year-by-year assuming that certain of the Prop 12 regulations have been implemented and markets have adjusted (in part or fully) to the new regulations. The impacts are calculated for the proposed regulations and two alternative regulatory packages, each of which implements the basic requirements outlined above and required by the text of Prop 12 statutes.

The first package of regulations we consider is CDFA's current package of "proposed regulations" (Animal Confinement Articles 1–5) to implement Prop 12. The other two packages of regulations are what we call "alternative packages" of regulations. In the two alternative packages we consider, we vary some of CDFA's discretionary choices of how to implement Prop 12 (i.e. on issues where Prop 12 is vague as written, e.g. whether or not "liquid eggs" include cooked egg patties or "pucks"). However, the two alternative packages of regulations do *not* vary the basic cage-size or other mandatory requirements of Prop 12. One alternative package is what we call a "lower-cost alternative," which imposes requirements on fewer businesses and fewer products than the proposed regulations do. The other alternative package is what we call a "higher-cost alternative," which imposes requirements on more businesses and more products than the proposed regulations do.

For each of the three regulatory packages (proposed regulations, lower-cost alternative, higher-cost alternative), we simulate the market and assess the economic impacts. The impacts to be considered are those that are imposed on the California economy and include consumer and producer responses. Impacts include industry output, employment, investment and consumer expenditures. We consider the impacts of the proposed regulations and we compare them with the impacts of the lower-cost alternative and the higher-cost alternative. Using economic simulations, we start with and calculate the expected economic outcomes under the three different possible packages of regulations.

Finally, we analyze "multiplier effects" using IMPLAN. These results take the industry and product specific implications and consider how these industry specific effects on job or value-added ripple through the economy first as "indirect impacts" on input supplying industries.

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Indirect impacts could include, for example, the indirect economic impacts of regulations on purchases of livestock feed by egg farms or electricity purchased by grocery stores in marketing of the food products affected. The second category of multiplier effects are "induced impacts," which include how the changes in employment and proprietor income affect consumer purchases and thus affect economic sectors, including government, that supply these goods and services.

1.4. Overview of main economic impact results

We consider implementation in two parts. Based on available data, detailed research, and economic simulations, we estimate that relatively small economic impacts will come from the first part of Prop 12 implementation on January 1, 2020, when 144-square-inch egg standards and veal standards take effect. Much more substantial impacts will come from the second part of Prop 12 implementation on January 1, 2022, when cage-free egg standards and breeding sow standards take effect.

As required by California law, this SRIA evaluates the economic impacts of full implementation in the 12-month period after "Full Implementation" of all the above sets of regulations. The 12-month period we consider is thus January 1 to December 31, 2022.

First, we note that Title 3, Section 1350 of the California Code of Regulations (CCR) is being revised under separate rulemaking (effective July 1, 2020) to change the minimum required cage size from 116 to 144 square inches per hen to be consistent with Prop 12. Effective January 1, 2022, the Prop 12 statutes will require egg-laying hens to be housed in cage-free enclosures, thereby superseding the 144-square-inch requirement specified under Section 1350 and enforced by CDFA's Shell Egg Food Safety Program. However, no fiscal savings is anticipated. The current statutes authorizing the Shell Egg Food Safety program, and the regulations under Section 1350, only include shell eggs and do not include pasteurized in-shell eggs, liquid eggs, frozen eggs or other egg products such as pucks and patties. Additionally, if industry utilizes CDFA personnel in the Shell Egg Food Safety program to confirm and certify Prop 12 compliance for shell eggs, either 144 or cage-free, such work would replace or reduce private

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third-party certifier activity, not CDFA Animal Care Program work. Thus, the current 1350 regulation and associated revisions, are projected to have a neutral effect on CDFA field resources.

California consumers will be affected by higher prices and respond with lower quantity consumed. In the 2022 calendar year, proposed regulations will increase consumer expenditures in California of $1,195 million. The largest impacts are on consumers of shell egg and pork products. Many of the shell egg farm business enterprises impacted produce shell eggs in California. Egg producers in California face higher costs by $72 million, and egg output will decline by 51 million dozen relative to the baseline in 2022. Shell egg farm revenue rises by $7 million.

Table 1.4.1 shows a summary of our estimates of economic impacts on each covered segment for four years: 2020, 2021, 2022, and 2023.

Table 1.4.1. Overview of baseline and economic impacts under Proposed Regulations

1.4.1a. Liquid eggs	2020	2021	2022	2023
Baseline Without Regulations				
Quantity consumed in CA (mil dozen equivalent)	288.2	281.9	284.5	289.3
Avg retail price ($ per dozen equivalent)	0.95	0.95	0.95	0.95
Consumer expenditure ($ millions)	273.8	267.8	270.3	274.8
With Proposed Regulations				
Quantity consumed in CA (mil dozen equivalent)	283.6	275.1	270.8	270.7
Change vs. Baseline	-4.7	-6.9	-13.7	-18.6
Avg retail price ($ per dozen equivalent)	1.10	1.10	1.26	1.26
Change vs. Baseline	+0.15	+0.15	+0.31	+0.31
Consumer expenditure ($ millions)	313.2	303.8	340.1	340.0
Change vs. Baseline	+39.4	+36.0	+69.8	+65.1

1.4.1b. Veal meat	2020	2021	2022	2023
Baseline Without Regulations				
Qty consumed in CA (mil lbs)	6.9	6.7	6.8	6.9
Avg retail price ($ per lb)[1]	15.91	16.97	17.10	17.53
Consumer expenditure ($ mil)	109.5	112.3	116.4	121.5
With Proposed Regulations				
Qty consumed in CA (mil lbs)	4.7	4.8	4.9	5.2
Change vs. Baseline	-2.2	-1.9	-1.9	-1.7
Avg retail price ($ per lb)[1]	19.89	21.36	21.85	22.23
Change vs. Baseline	+3.97	+4.39	+4.75	+4.70
Consumer expenditure ($ mil)	94.4	101.6	107.5	114.7
Change vs. Baseline	-15.1	-10.7	-8.9	-6.8

[1] Average retail price for veal meat represents a weighted average of veal meat sold at restaurants and veal meat sold at grocery stores.

1.4.1c. Shell eggs	2020	2021	2022	2023
Baseline Without Regulations				
Qty produced in CA (mil dozen)	378	387	397	407
Farm output value in CA (mil $)	504	517	530	543
Qty consumed in CA (mil dozen)	686	704	721	739
Avg retail price ($ per dozen)[2]	2.81	2.81	2.81	2.81
Consumer expenditure ($ mil)	1,929	1,977	2,026	2,077
With Proposed Regulations				
Qty produced in CA (mil dozen)	N/A[3]	N/A[3]	346	321
Change vs. Baseline			-51	-86
Farm output value in CA (mil $)	N/A	N/A	537	497
Change vs. Baseline			+7	-46
Qty consumed in CA (mil dozen)	N/A	N/A	629	583
Change vs. Baseline			-92	-157
Avg retail price ($ per dozen)[2]	N/A	N/A	4.75	4.75
Change vs. Baseline			+1.94	+1.94
Consumer expenditure ($ mil)	N/A	N/A	2,986	2,768
Change vs. Baseline			+960	+691

[2] Average retail price for shell eggs represents a weighted average of cage-free eggs and conventional eggs. For example, in 2020, we estimate conventional eggs to be about 80% of the total shell eggs consumed in California, at an average price of $2.32 per dozen; and we estimate cage-free eggs to be about 20% of the total shell eggs consumed in California, at an average price of $4.75 per dozen; thus the weighted average retail price for 2020 is $2.81. In 2022 and 2023, as required by Prop 12, conventional eggs will no longer be available and all shell eggs are cage-free, so with regulations, the weighted average is equal to the cage-free price (which we estimate will remain at $4.75 per dozen.

[3] Not applicable because proposed regulations do not go into effect until 2022.

1.4.1d. Pork meat	2020	2021	2022	2023
Baseline Without Regulations				
Quantity consumed in CA (mil lbs)	1,996	1,975	1,989	2,013
Avg retail price ($ per lb)[4]	3.50	3.50	3.50	3.50
Consumer expenditure ($ mil)	6,989	6,912	6,964	7,048
With Proposed Regulations				
Quantity consumed in CA (mil lbs)	N/A[5]	N/A[5]	1,959	1,955
Change vs. Baseline			-30	-58
Avg retail price ($ per lb)[4]	N/A	N/A	3.64	3.65
Change vs. Baseline			+0.14	+0.15
Consumer expenditure ($ mil)	N/A	N/A	7,138	7,131
Change vs. Baseline			+174	+83

[4] Average retail price for pork meat represents a weighted average of whole pork meat, as defined under the proposed regulations; and other pork meat whose consumption is impacted by the proposed regulations due to substitution effects. Here, other pork meat is defined as pork meat that does not satisfy the definition of whole pork meat under Prop 12 statute. For example, other pork meat includes cooked pork meat and combination food products (including soups, sandwiches, pizzas, hot dogs, or similar processed or prepared food products) that are comprised of more than pork meat. We estimate that whole pork meat makes up about 58% of all pork meat consumed in California, at an average price of $3.30 per pound in 2020; and that other pork meat makes up about 42% of all pork meat consumed in California, at an average price of $3.78 per pound in 2020; thus the weighted average retail price for 2020 is $3.50.

[5] Not applicable because regulations governing pork meat do not go into effect until 2022.

In SRIA Section 4, we define the impacted food categories ("liquid eggs," "whole veal meat," "shell eggs," and "whole pork meat") and report the main results that are summarized above. In Appendices 1–4, we provide additional detail on these results.

We also consider broad economic "ripple effects" of the proposed regulations in the SRIA. Higher farm costs for production of covered products is the foundation for other economic impacts. These higher farm costs apply to production in California for a significant share of shell eggs and outside California for the other share of shell eggs and for veal, liquid eggs and pork. The higher farm costs for shell eggs generate further downstream economic impacts in

California. Our analysis does not develop estimates of economic impacts of Proposition 12 regulations outside of California.

These higher farm costs lead to higher prices received by farmers and higher prices paid for the covered products by wholesalers, retailers and consumers. Since much of the farm production and initial costs are incurred outside of California, much of the impact within California derives from effects on livestock product marketers and consumers. These impacts are shown in the product-specific results summarized in this Section 1.4 and below in Section 4, and provided in detail in the appendix.

As costs and prices rise, the quantities of the covered products are projected to be lower than they would have been but for the regulations. For these products, consumers buy less when faced with higher prices. Consumer expenditures may rise because the percentage increase in price is often larger than the percentage decline in quantity for these products. The impact on overall food sales at wholesale and retail is projected to be very small. Therefore, we expect that economy-wide impacts such as on employment, number of firms and investment in overall food marketing and retailing are likely to be too small to be measurable in the large scope of the California economy. With very small direct effects on employment and value added in food marketing and retailing, there are also negligible multiplier impacts from food marketing to the rest of the economy.

Proposition 12 mandates cage-free housing, which raises costs of production per dozen eggs. Reduced quantity demanded reduces the overall number of hens. Therefore, feed use and most other inputs such as labor decline roughly in proportion with number of eggs. For example, under the proposed regulations, for 2022, the quantity of shell eggs produced in California is lower than it would have been by about 15 percent, and in 2023 shell egg production is lower by about 27 percent (Table 1.4.1c). Table 1.4.2 shows how reducing California egg production reduces direct and total jobs associated with egg production.

Table 1.4.2. Impacts On Jobs Related to Egg Production in California

	2020	2021	2022	2023
Baseline Without Regulations				
Direct Jobs	471	482	495	507
Total Jobs	2,957	3,028	3,106	3,184
Change With Proposed Regulations				
Job Impact Direct	N/A[1]	N/A[1]	-64	-107
Job Impact Total	N/A	N/A	-31	-332

[1] Not applicable because regulations governing shell eggs do not go into effect until 2022.

The impacts of the Proposition 12 regulations on shell egg farm production ripple economy-wide in California as shown above for jobs. In addition to the jobs impact, we project that the proposed regulations for eggs would add about $16 million to total statewide value of output in 2022, but decrease statewide value of output by about $114 million in 2023. We project that the proposed regulations for eggs would increase statewide value added by $5 million in 2022, but decrease statewide value added by $33 million in 2023.

The other California economy-wide impact is associated only with the higher-cost regulation package. In particular, the provision that would require that pork exported from California ports meet the California standards would stimulate pork exports to use other West Coast ports outside of California. Compared to the no-regulations baseline, we project 79 fewer direct jobs and 431 fewer total jobs in both 2022 and 2023. The total value of output statewide from the port impacts is lower by $135 million and statewide value added is lower by $60 million in both 2022 and 2023.

The full economy-wide economic impacts are shown in Section 5, with methods described in Appendix 5.

1.5. Overview of SRIA contents

The SRIA includes six sections, including this introduction. Sections 2 to 6 contain the main SRIA. Following this are six appendices providing more detail. To summarize the content:

- **Main SRIA.** The main SRIA, after this introduction (Section 1), includes the following material, which is supplemented by tables. Sections 2 through 6 describe the main results on the economic impacts of the proposed regulatory package and selected alternatives.

  - Section 2 includes important background information and a summary of our data and methods. We describe the effects of the statute, the proposed regulations, the approach of the SRIA, our data, and how the analyses are conducted.

  - Section 3 assesses situation of the three relevant markets (eggs, pork, and veal), without effects of the regulations.

  - Section 4 assesses the economic impacts of the proposed regulations and compares them with the impacts of two alternative packages of regulations: the lower-cost alternative and the higher-cost alternative. In Section 4.3 we report the central results of the SRIA: the outcomes of our economic simulations.

  - Section 5 reports our calculations of economy-wide "multiplier" impacts of the proposed regulations using the IMPLAN method, which include assessments on number of jobs and value added.

  - Section 6 makes additional economic determinations as required by state SRIA law.

- **Appendices.** There are six appendices:

  - Appendices 1 through 4 (Appendix 1 for liquid eggs, Appendix 2 for veal, Appendix 3 for shell eggs, and Appendix 4 for pork) describe the data going into

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our analyses, state our economic models in mathematical form, describe the econometric basis for our simulation parameters, and show detailed tables and economic calculations we made to arrive at each of our simulation results, market estimates, and other findings.

o Appendix 5 explains the methodology behind our assessments of the economy-wide impacts of the regulations and alternatives.

o Appendix 6, for convenience, includes the full statutory text of Proposition 12, which is cited and discussed at length throughout this SRIA.

o We do not attach the full text of the proposed regulations, which can be downloaded in their most recent current form from the CDFA website.

2. Background

2.1. Proposition 12 mandates

In 2018, the passage of California Proposition 12 created new minimum housing space requirements for selected farm animals. Proposition 12, the *Prevention of Cruelty to Farm Animals Act*, prohibits a business owner or operator from engaging in the sale within the state of whole veal meat, whole pork meat, shell eggs and liquid eggs from "animals confined in a cruel manner". The requirements would be phased in in two steps with full implementation of the law starting January 1, 2022.

Proposition 12 specifically states the following confinement space requirements for effected farm animals be implemented.

1) The confinement of a calf raised for veal shall provide no less than 43 square feet of usable floor space per calf effective January 1, 2020.

2) The confinement of a female breeding pig shall provide no less than 24 square feet of usable floor space per pig effective January 1, 2022.

3) The confinement of egg-laying hens shall provide no less than 144 square inches per hen effective January 1, 2020, and shall be confined effective January 1, 2022 in a cage-free housing system that follows the requirements laid out by the 2017 United Egg Producers' Animal Husbandry Guidelines for U.S. Egg-Laying Flocks: Guidelines for Cage-Free Housing.

The full text of Proposition 12 is included as Appendix 6 of this SRIA.

2.2. Determination of need for a SRIA

Government Code section 11346.3 specifies that a California state agency proposing a "major regulation," which Government Code section 11342.548 defines as "any proposed adoption, amendment, or repeal of a regulation subject to review by the Office of Administrative Law . . .

that will have an economic impact on California business enterprises and individuals in an amount exceeding fifty million dollars ($50,000,000), as estimated by the agency," is required to prepare a Standardized Regulatory Impact Analysis (SRIA) to be submitted to the state Department of Finance for review and comment before the regulations are noticed to the public.

The first requirement of a SRIA is that it must verify that the regulation under review meets the definition of "major regulation" under Government Code § 11342.548. The regulations adopted by the Department of Finance further define the threshold as $50 million in either costs or benefits occurring within one year of full implementation of the proposed regulations (which, as above, we call the "Implementation Period").

We have determined, based on the analysis summarized in Sections 3 to 5 and shown in greater detail in the Appendix, that these proposed regulations met the definition of "major regulation" because as is shown in Sections 4 and 5, the expected economic impacts of the full package of proposed regulations in California exceed $50 million during the Implementation Period. We have made the determination of the need for a SRIA based on the text of California SB 617 and its subsequent interpretations by the state government. In particular, we rely on guidance from the 2015 joint report by the Directors of the Office of Administrative Law and Department of Finance to the Chair of the Senate Committee on Governmental Organization and the Chair of the Assembly Committee on Government, which clarifies the interpretation of Government Code section 11346.3 with respect to SRIA content, purpose, and the "major regulation" determination.

2.3. Methods of analysis

This SRIA provides the detailed economic analysis required to understand the economic impacts on egg, pork and veal suppliers and buyers in California of change in law and regulations related to California's implementation of Proposition 12. The SRIA was prepared by a team at University of California, Davis and the University of California Agricultural Issues Center (AIC), including professors, project scientists, senior analysts, post-doctoral fellows, other Ph.D. researchers, and graduate student researchers.

We establish effects on costs of commercial farms in meeting regulations in the production of eggs, pork, and veal as rules change from current California regulatory standards or marketing meat and egg products in California. These estimates of farm costs draw on interviews with producers and prior academic research and publications of members of the AIC team and others.

We also develop estimates of the cost of segregation of eggs, livestock, and meat so that products destined for California can be appropriately traced to farm sources, assurances and certifications can appropriately accompany the products and labels attached for retail marketing. The costs of this traceability and product segregation are complicated at some stages of livestock product processing and marketing in the modern supply chain. Our estimates draw on academic research and publications of the AIC team and others.

Other drivers of the economic impacts include supply and demand function parameters and estimates of function relating to the marketing margins or mark-ups as products move through the supply chain from farm to retail. We draw on the published literature in agricultural economics, including our own studies. We use interviews with industry experts. Where no reliable evidence was available for crucial parameters, we have developed new econometric estimates using detailed cross section and time series data.

We utilized the results from each of the evidence gathering efforts to parameterize and calibrate the economic simulation models that we used to assess direct impacts of Proposition 12 regulations on livestock product prices and quantities. This allowed us to estimate on direct economic impacts on expenditures of consumers, and measures of consumer gains and losses. We also used these estimates to calculate the direct impacts on farm producers and other suppliers along the marketing chain on to retail firms in California.

We then assessed the indirect and induced impacts on the broader California economy as a whole in the well-known and often-applied IMPLAN model, adjusted for the specific circumstances of this application.

3. Baselines in Impacted Markets Before Proposed Regulations

The tables below show our estimates of basic market characteristics for the liquid egg, veal, shell egg, and pork markets in California. These estimates are based on the best available data and supplemented by industry interviews and other research. We use these estimates in order to construct parameters for our simulations. Our estimates account for the effects of COVID-19 based on California Department of Finance economic projections (see Section 4 below).

3.1. Market characteristics for eggs

Tables 3.1a and 3.1b show our estimates of market characteristics for the relevant liquid and shell egg markets in California if there were no Proposition 12 regulations.

Table 3.1a. Quantities and Average Retail Prices of Liquid Eggs in California, 2019 – 2023

	Unit	2019	2020	2021	2022	2023
Quantity of liquid eggs consumed in California, dozen equivalents						
Quantity	Mil. dozen	314	288	282	285	289
Retail/Restaurant price of liquid egg component of finished product, $ per dozen equivalents						
Price	$/dozen	0.95	0.95	0.95	0.95	0.95

Table 3.1b. Quantities and Average Retail Prices of Shell Eggs in California, 2019 – 2023

	Unit	2019	2020	2021	2022	2023
Quantity of shell eggs consumed in California						
Conventional	Mil. dozen	525	548	562	576	590
Cage-free	Mil. dozen	131	138	142	145	149
Total	Mil. dozen	656	686	704	721	739
Retail prices in California						
Conventional	$/dozen	2.20	2.32	2.32	2.32	2.32
Cage-free	$/dozen	4.75	4.75	4.75	4.75	4.75

3.2. Market characteristics for whole veal meat

Table 3.2 shows our estimates of market characteristics for the relevant veal market in California if there were no Proposition 12 regulations.

Table 3.2. Quantities and Average Retail Prices of Whole Veal Meat in California, 2019 – 2023

	Unit	2019	2020	2021	2022	2023
Quantity of whole veal meat consumed in California, millions of pounds						
Quantity	Mil. lbs.	7.6	6.9	6.7	6.8	6.9
Average retail price (retail and food service prices) of whole veal meat, $ per pound						
Price	$/lb.	17.78	15.91	16.97	17.10	17.53

3.3. Market characteristics for whole pork meat

Table 3.3 shows our estimates of market characteristics for the relevant pork market in California if there were no Proposition 12 regulations. We present two tables, depending on the definition of whole pork meat. In addition to the proposed regulations, we consider two alternative packages of regulations (lower-cost regulations and higher-cost regulations) for comparison. Under the proposed regulations and lower-cost regulations, whole pork meat does not include ground pork (including sausage). However, under the higher-cost regulations, whole pork meat includes ground pork.

Table 3.3. Quantities and Average Retail Prices of Pork in California When Whole Pork Meat Does Not Include Ground Pork, 2019–2023

	Unit	2019	2020	2021	2022	2023
Quantity of pork consumed in California						
Whole pork meat	Mil. lbs.	1,205	1,149	1,137	1,145	1,159
Other pork meat[1]	Mil. lbs.	889	847	838	844	854
Total	Mil. lbs.	2,094	1,996	1,975	1,989	2,013
Retail prices in California						
Whole pork meat	$/lb.	3.30	3.30	3.30	3.30	3.30
Other pork meat	$/lb.	3.78	3.78	3.78	3.78	3.78

[1] Here other pork meat is defined as pork meat that does not satisfy the definition of whole pork meat under Prop 12 statute. For example, other pork meat includes cooked pork meat and combination food products (including soups, sandwiches, pizzas, hotdogs, or similar processed or prepared food products) that are comprised of more than pork meat.

Table 3.4. Quantities and Average Retail Prices of Pork in California When Whole Pork Meat Includes Ground Pork, 2019 – 2023

	Unit	2019	2020	2021	2022	2023
Quantity of pork consumed in California						
Whole pork meat	Mil. lbs.	1,618	1,543	1,526	1,537	1,556
Other pork meat[1]	Mil. lbs.	476	454	449	452	457
Total	Mil. lbs.	2,094	1,996	1,975	1,989	2,013
Retail prices in California						
Whole pork meat	$/lb.	3.35	3.35	3.35	3.35	3.35
Other pork meat	$/lb.	4.00	4.00	4.00	4.00	4.00

[1] Here other pork meat is defined as pork meat that does not satisfy the definition of whole pork meat under Prop 12 statute. For example, other pork meat includes cooked pork meat and combination food products (including soups, sandwiches, pizzas, hotdogs, or similar processed or prepared food products) that are comprised of more than pork meat.

4. Estimated Impacts of Proposed Regulations and Alternatives

For the analysis in this SRIA, we look at the impacts of the proposed regulations for four specific 12-month periods. These are the January to December calendar years 2020, 2021, 2022, and 2023. The analyses and projections of impacts related to calendar years 2020 and 2021 apply only to veal and liquid egg impacts that began with implantation of Proposition 12 on January 1, 2020. For the year 2022 and 2023, the analyses and projects apply to those plus the impacts for Proposition 12 and regulations that take effect on January 1, 2022. Our analysis of the one-year period in fulfillment of the basic SRIA requirements is of the calendar year 2022, the first 12 months after "Full Implementation" of the full package of proposed regulations. We also include the years 2020, 2021, and 2023 for completeness.

Some of the analyses and projections specified below depend on the size of the California population and the state of the economy in California in the years considered. The SRIA uses the most recent information from the California Department of Finance for the data and projections of economic aggregates. Table 4.0 lists key data on California nominal and real personal income, labor force, employment, unemployment rate, population, per capita income, and the inflation rates in 2018 through 2023. Table 4.0 also shows year-to-year percentage changes. The historical data from 2018 and 2019 provide useful context. The economic analyses of impacts of the Proposition 12 regulations use the projection data for 2020 and forward. Of course, economic projections for future time period are always uncertain. The usual uncertainty about the future has been amplified by the COVID-19 pandemic which has affected all aspects of the economy.

The economic projections affect the magnitudes of the impacts of proposed regulations in complex ways, including through per capita consumption rates and income impacts. The California population and per capita income affect consumption of food items such as veal, liquid eggs, shell eggs and pork. In addition, for 2020, rules related to COVID-19 restricting business operation and employment affect consumption of veal and liquid-egg use. The analyses and projections of impacts of Proposition 12 regulations incorporate assessments of these effects. Although there were significant short-term COVID-19-related impacts on pork, as some plants in

the Midwest were shut down due to workers' illnesses, these effects have been transient and there have been no lasting significant direct disruptions on the supply side for pork. Our analysis for 2021 anticipates gradual shifts back to normal per-capita veal and liquid egg demand, given the per-capita income losses.

For 2022 and 2023, the impact analyses for all four product categories incorporate the California income, employment, and population projections in Table 4.0. The analyses do not include remaining supply chain disruptions for those years. Because of the uncertainly surrounding COVID-19, and the policy and economic responses, this SRIA includes several additional projections to represent sensitivity of results to alternative scenarios.

Table 4.0. California Data and Forecasts for Income, Employment and Population

	2018	2019	2020	2021	2022	2023
Total Personal Income, Nominal ($ Millions)	2,514.1	2,633.9	2,400.1	2,401.7	2,509.7	2,646.9
% change from previous year		4.76%	-8.88%	0.06%	4.50%	5.47%
Real Personal Income, 2018 base ($ Millions)	2,514.1	2,557.9	2,308.1	2,245.3	2,266.8	2,311.4
% change from previous year		1.74%	-9.77%	-2.72%	0.96%	1.97%
Civilian Labor Force (millions)	19.3	19.4	19.5	19.5	19.5	19.6
Pct change from previous year		0.67%	0.21%	0.10%	0.21%	0.31%
Civilian Employment (millions)	18.5	18.6	16.0	16.0	16.5	17.2
Pct change from previous year		0.87%	-14.34%	0.56%	2.68%	4.49%
Unemployment Rate (%)	4.3	4.1	18.0	17.6	15.6	12.1
Population (millions)	39.8	40	40.1	40.3	40.5	40.7
Per Capita Income, Nominal, $ Thousands	63.141	65.916	59.809	59.578	61.956	65.008
Pct change from previous year		4.39%	-9.26%	-0.39%	3.99%	4.93%
Per Capita Income, Real, $ Thousands	63.141	64.013	57.517	55.698	55.962	56.769
Pct change from previous year		1.38%	-10.15%	-3.16%	0.47%	1.44%
Consumer Price Index (1982-84=100) Pct change from previous year		3.0%	1.0%	2.9%	3.5%	3.4%

Note: Per capita income is nominal. Data on income and employment starting in 2020 are forecasts prepared in April 2020. Sources: http://www.dof.ca.gov/Forecasting/Economics/Eco_Forecasts_Us_Ca/index.html http://www.dof.ca.gov/Forecasting/Demographics/

4.1. Proposed Regulations

The proposed regulations, enforce the standards set out in the statute (Prop 12), as required by law and summarized in Sections 1.2 and 2.1 of the SRIA.

Prop 12 statutes are not specific about most aspects of enforcement, and instead leave many choices (e.g. registration and enforcement) to the discretion of CDFA. One role of the SRIA is to identify and evaluate the discretionary regulatory choices that we expect to be associated with nontrivial costs of compliance (and therefore some economic impacts). We find that the biggest discretionary impacts come from regulatory choices related to the breadth or narrowness of which products are included, and which businesses are subject to certification requirements.

The proposed regulations include the following discretionary regulatory choices, some of which are varied in the two alternative packages of regulations we consider (see Section 4.2).

- o **Inclusion of frozen, dried, and cooked eggs in the definition of "liquid eggs."** In the proposed regulations, Division 2, Title 3, California Code of Regulations, Chapter 10, Article 1, Section 1320(q), "liquid eggs" can be "raw or pasteurized, co-packaged with other foods, or sold frozen, dried, or as a cooked patty, puck or other cooked form"). "Liquid eggs" are not specifically defined in the text of Prop 12 to include these product categories.

- o **Inclusion of hard-boiled, peeled, sliced, chopped, and cut eggs in the definition of "shell eggs."** Article 1, Section 1320(q), says: "In its shell form" for purposes of section 25991(p) of the Health and Safety Code and this Article means an egg as developed, proportioned and shaped in the shell by an egg-laying hen, whether it is in the shell, raw, pasteurized in the shell, treated in the shell, hardboiled or otherwise cooked in whole form, peeled, co-packaged with other foods, or subsequently sold sliced, chopped or otherwise cut." "Shell eggs" are not specifically defined in the text of Prop 12 to include these product categories.

- **Exclusion of ground pork and ground veal from the definition of "whole meat."** Prop 12 is vague as to whether raw ground pork or veal meat is considered to be a "cut" of whole pork meat or whole veal meat. The proposed regulations exclude raw ground pork and raw ground veal and their products from Prop 12 requirements.

- **Registration requirements.** The proposed regulations (for eggs, Article 1, Section 1320.2; for veal, Article 2, Section 1321.2; for pork, Article 3, Section 1322.2; and for all, Article 5) require certain businesses, defined as "handlers" who sell or distribute Prop 12-covered shell eggs, liquid eggs, whole veal, or whole pork meat to an end-user in California to register annually with CDFA and show documentation of third-party certification and inspection by a CDFA-accredited third-party certifier for compliance with Prop 12 standards. Examples of an end-user as defined by the regulations are a consumer, retailer, restaurant or food manufacturing company. Below we refer to these registration, on-site inspection, and certification requirements, collectively, as "certification." The discretionary certification requirements in the proposed regulations, and associated costs, are applied to some categories of businesses and products and not others. Registration with CDFA requires an application form, proof of certification, and annual renewal process. Relevant businesses with multiple facilities are required to apply for registration separately for each compliant facility distributing or selling covered products to an end-user. Registration must be renewed every 12 months.

- **Which businesses must be certified.** 1) Under the proposed regulations (for eggs, Article 1, Section 1320(h); for veal, Article 2, Section 1321(w); for pork, Article 3, Section 1322(r) and Article 5), the initial CDFA certification requirements (including registration with CDFA and documentation of a third-party certification) and annual renewal requirements are imposed on a category of business called "handlers": "egg handlers," "veal handlers," and "pork handlers."

  - The "handler," in each case, means a person engaged in the business of commercial sales of shell eggs, liquid eggs, whole veal meat or whole pork

meat (as a pork producer or otherwise) to an end-user in California. This definition shall not apply to a person or facility that only receives whole pork meat as an end-user. Handlers include, but are not limited to, farms, distributors, warehouses, and co-packers selling, distributing, and moving the product in question to an end-user in California. Prop 12 statute does not impose any specific registration or inspection requirements on businesses, and Prop 12 statutes are vague as to which categories of businesses, if any, should submit to mandatory inspection, certification, or other enforcement measures.

o Under the proposed regulations (for eggs, Article 1, Section 1320(j); for veal, Article 2, Section 1321(x); for pork, Article 3, Section 1322(s) and Article 5), producers of covered shell eggs, liquid eggs, veal meat and pork meat must be third-party certified by a CDFA accredited third-party certification agency.

o **Certification exemptions.** The proposed regulations do not require CDFA certification or registration for end-users such as restaurants, retailers, or prepared food vendors who cook or prepare Prop 12-covered food products (liquid or shell eggs, raw pork, or raw veal), or who use covered food products as ingredients in other combination food products or prepared foods This exemption is only from the registration process with CDFA and does not exclude the covered products used by these end-users from being Prop 12-compliant.

o **Labeling requirements.** The proposed regulations (for eggs, Article 1, Section 1320.4; for veal, Article 2, Section 1321.4; and for pork, Article 3, Section 1322.4) require that compliant covered shell egg consumer-facing cartons and shipping manifests be labeled with the words "CA 144", "CA SEFS Compliant" or "CA Cage Free" (in 2022). In addition, all other covered shell egg, liquid egg, veal and pork shipping manifests are to be labeled with "CA 144" or "CA Cage Free" (for egg products), "CA 43+ Compliant" (for veal), or "CA 24+ Compliant" (for pork). We expect this requirement to impose some costs, but given existing labeling requirements, we expect these costs to be smaller than the margins of error in our

estimates, so we do not include labeling costs explicitly as a separate item in our simulations or economic impact calculations.

- o **Recordkeeping requirements.** The proposed regulations (for eggs, Article 1, Sections 1320.5 and 1320.8; for veal, Article 2, Sections 1321.5 and 1321.8; and for pork, Article 3, Sections 1322.5 and 1322.8) require that records must be sufficient for an audit trail and documented in a traceable manner that covered product originated from Prop 12 compliant operations; and that certified producers and certified handlers must keep the records on-site or available electronically for two years. We expect the recordkeeping requirements in the proposed regulations to impose some costs (including not only costs for egg, pork, or veal handlers but also costs for producers). However, we expect these costs to be smaller than the margins of error in our estimates, so we do not include recordkeeping costs in our simulations or economic impact calculations.

- o **Enforcement requirements.** The proposed regulations establish an enforcement system administered by CDFA, including a wide variety of administrative and enforcement rules. A variety of provisions in Articles 1 to 5 establish rules for administering the program, and ensuring compliance with Prop 12 standards for eggs, pork, and veal. For instance, Article 1, Section 1320.6 (Inspection of Conveyances) establishes that enforcement officers can stop and inspect vehicles transporting eggs, or vehicles can be inspected at a California inspection station, and that violating containers can be seized by enforcement officers. We have been provided with estimates of CDFA's administrative costs stemming from the proposed regulations, which we include the costs of enforcement as set out in the proposed regulations. We understand that the enforcement system in the proposed regulations is necessary for CDFA to carry out its legally mandated duties, so we do not vary the discretionary choices of enforcement system in the proposed regulations versus the lower-cost and higher-cost alternatives.

4.2. Selection of two alternative packages of regulations

Our "lower-cost" and "higher-cost" packages of regulations were constrained by our analysis of the statutory language of Prop 12. We do not consider regulatory alternatives that would conflict with the mandatory requirements of Prop 12. Below we summarize the key variations we have chosen in the lower-cost and higher-cost alternatives.

4.2.1. Alternative Regulatory Package 1: "**Lower-Cost Regulations**."

The lower-cost regulations apply a narrower interpretation of which food products are covered and which businesses are subject to annual registration and certification requirements. Key variations in the lower-cost regulations, versus the proposed regulations, are as follows:

- o "Shell eggs" include only raw or pasteurized eggs in the shell.

- o "Shell eggs" therefore exclude peeled, sliced, chopped, and cut hard-boiled eggs.

- o "Liquid eggs" include only eggs broken from the shell with the yolks and whites in their natural proportions, or with the yolks and whites separated, mixed or mixed and strained as defined by the following Code of Federal Regulations:
    - Liquid eggs as described by Section 160.115 of Title 21 of the Code of Federal Regulations.
    - Egg whites as described by Section 160.140 of Title 21 of the Code of Federal Regulations.
    - Egg yolks as described by Section 160.180 of Title 21 of the Code of Federal Regulations.

- o "Liquid eggs" therefore exclude frozen, dried, cooked, and prepared egg products (e.g. egg patties or egg "pucks" consisting of mostly eggs except for added seasoning and flavoring).

- o Prop 12 requirements are limited to shell eggs, liquid eggs, veal or pork meat sold at the retail level to an end consumer. Under the lower-cost regulations, restaurants, prepared food vendors, and food manufacturing are not required to source Prop 12 compliant shell eggs, liquid eggs, veal or pork for their business of further processing those ingredients.

4.2.2. Alternative Regulatory Package 2: "**Higher-Cost Regulations.**"

This package includes all the requirements of the proposed regulations are imposed, plus the following additional requirements:

- o Raw ground veal, raw ground pork, and their products (meaning foods composed of raw ground veal or pork plus seasonings, coloring, curing agents, etc.) are considered cuts of "whole veal meat" and cuts of "whole pork meat," and thus subject to Prop 12 requirements.

- o Prop 12 requirements apply to covered food products moving through California for sale and end-use in another state or country.

- o Consumer-facing labeling is required for all covered products or prepared foods containing a covered product. Labels would allow the buyer to scan a QR code at retail or when consuming a prepared food made with covered product and see record of Prop 12 animal confinement certification and traceability of product back to farm of origin.

Our estimates of impacts of the lower-cost and higher-cost regulations are shown below in section 4.3.

4.2.3. Costs of implementation, enforcement, and administration

Most of the impacts of the proposed regulations, and of the two alternative packages of regulations, are generated by the costs of complying with the new Prop 12-related animal-confinement standards. However, the proposed regulations and alternatives, like most new sets of regulations, also generate some administrative costs to the state. These include the costs of initial implementation, salaries and benefits for administrative and field officers, travel, enforcement and auditing activities, IT and data, administration, recordkeeping, and facilities operations. The administrative costs of implementing the proposed regulations and alternatives are as follows, based on fiscal projections.

The proposed regulations specify that certification and inspection for compliance with Prop 12 standards are conducted by third-party certification businesses. Those and other costs of certification are incorporated into the market simulation results that are reported in section 4.3 and detailed in Appendices 1 through 4. The administrative costs shown below, in Tables 4.2a and 4.2b, represent only the direct administrative costs to the state, which include the costs of auditing third-party certification businesses.

The fiscal cost to implement the smaller-scope regulatory alternative would be the same as the fiscal cost to implement the proposed regulations, because the resources needed for the regulatory framework (registration, accreditation and audits of third-party certifiers, verification and compliance activities, investigations, etc.) would not differ between the two alternatives.

In the higher-cost regulations, the increased workload at the food service sector for both inspection and investigative activity would be significant, given approximately 90,000 restaurants statewide (pre-COVID-19). Compliance and enforcement activity for the higher-cost regulations is estimated to require more than three times the number of field staff and increased supervisory personnel which implies an additional $5.8 million per year of overall fiscal cost compared to the proposed and lower-cost regulations.

Table 4.2a. Estimated Administrative Costs for Proposed and Lower-Cost Regulations

	2019-20	2020-21	2021-22	Ongoing
Full-time employees	11.0	17.0	26.0	26.0
Initial IT implementation	$ 2,537,000			
Salaries	$ 901,092	$ 1,317,588	$ 1,971,684	$ 1,971,684
Benefits	$ 514,341	$ 882,148	$ 1,150,760	$ 1,150,760
IT and data	$ 422,000	$ 485,800	$ 566,800	$ 566,800
General administrative	$ 134,700	$ 1,035,600	$ 1,217,600	$ 1,217,600
Facilities operations	$ 74,000	$ 137,280	$ 137,280	$ 137,280
Total	**$ 4,583,133**	**$ 3,858,416**	**$ 5,044,124**	**$ 5,044,124**

Table 4.2b. Estimated Administrative Costs for Higher-Cost Regulations

	2019-20	2020-21	2021-22	Ongoing
Full-time employees	11.0	17.0	65.0	65.0
Initial IT implementation	$ 2,537,000			
Salaries	$ 901,092	$ 1,317,588	$ 4,709,238	$ 4,709,238
Benefits	$ 514,341	$ 1,393,750	$ 2,786,566	$ 2,786,566
IT and data	$ 422,000	$ 517,000	$ 949,000	$ 949,000
General administrative	$ 134,700	$ 1,644,000	$ 2,099,000	$ 2,099,000
Facilities operations	$ 74,000	$ 343,200	$ 343,200	$ 343,200
Total	**$ 4,583,133**	**$ 5,215,538**	**$ 10,887,004**	**$ 10,887,004**

The administrative costs shown in Tables 4.2a and 4.2b are incorporated into our analyses of total economic impact to the state under the proposed regulations and alternatives in Section and 6. The funds used for the government activity are collected from taxed entities in the economy of California and/or user fees charged directly to Prop 12-regulated industries. These transfers do not change the overall economic activity in the state.

4.3. Estimated impacts of Lower-Cost, Proposed, and Higher-Cost Regulations

Basic simulation results of the impacts of the proposed regulations, higher-cost regulations, and lower-cost regulations for each of the relevant Prop 12-impacted markets are shown in the tables below, beginning with Table 4.3a. The initial characteristics of each of these markets (which are used as inputs going into our simulations) are summarized in Section 3. Appendices 1–4 provide details on our data sources and analysis, mathematical models, and calculations. The tables below are also reproduced in expanded form in Appendices 1–4, where they are shown together with sensitivity analyses that vary certain starting assumptions.

Table 4.3a. Liquid eggs: Summary of estimated impacts of Proposed Regulations

	2020	2021	2022	2023
Quantity of covered liquid eggs consumed, millions of dozens equivalent				
With regulations	283.6	275.1	270.8	270.7
Without regulations	288.2	281.9	284.5	289.3
Change	-4.7	-6.9	-13.7	-18.6
Average wholesale price, $ per dozen equivalent				
With regulations	0.63	0.63	0.74	0.74
Without regulations	0.52	0.52	0.52	0.52
Change	0.11	0.11	0.22	0.22
Average retail price, $ per dozen equivalent				
With regulations	1.10	1.10	1.26	1.26
Without regulations	0.95	0.95	0.95	0.95
Change	0.15	0.15	0.31	0.31
Consumer expenditure, millions of $				
With regulations	313.2	303.8	340.1	340.0
Without regulations	273.8	267.8	270.3	274.8
Change	39.4	36.0	69.8	65.1

Table 4.3b. Liquid Eggs: Summary of estimated impacts of Lower-Cost Regulations

	2020	2021	2022	2023
Quantity of covered liquid eggs consumed, millions of dozens equivalent				
With regulations	12.2	11.9	11.7	11.7
Without regulations	12.4	12.2	12.3	12.5
Change	-0.2	-0.3	-0.6	-0.8
Average wholesale price, $ per dozen equivalent				
With regulations	0.63	0.63	0.74	0.74
Without regulations	0.52	0.52	0.52	0.52
Change	0.11	0.11	0.22	0.22
Average retail price, $ per dozen equivalent				
With regulations	1.11	1.11	1.26	1.26
Without regulations	0.95	0.95	0.95	0.95
Change	0.15	0.15	0.31	0.31
Consumer expenditure, millions of $				
With regulations	17.1	16.6	18.6	18.6
Without regulations	15.0	14.7	14.8	15.0
Change	2.1	2.0	3.8	3.6

Table 4.3c. Liquid eggs: Summary of estimated impacts of Higher-Cost Regulations

	2020	2021	2022	2023
Quantity of covered liquid eggs consumed, millions of dozens equivalent				
With regulations	283.3	274.6	270.4	270.1
Without regulations	288.2	281.9	284.5	289.3
Change (%)	-5.0	-7.3	-14.2	-19.2
Average wholesale price, $ per dozen equivalent				
With regulations	0.63	0.63	0.74	0.74
Without regulations	0.52	0.52	0.52	0.52
Change ($)	0.11	0.11	0.22	0.22
Average retail price, $ per dozen equivalent				
With regulations	1.11	1.11	1.27	1.27
Without regulations	0.95	0.95	0.95	0.95
Change ($)	0.16	0.16	0.32	0.32
Average consumer expenditure, millions of $				
With regulations	315.6	306.0	342.1	341.8
Without regulations	273.8	267.8	270.3	274.8
Change ($)	41.8	38.1	71.8	67.0

4.3.2 Simulation results for veal

Table 4.3d. Veal: Summary of estimated impacts of Proposed Regulations

	2020	**2021**	**2022**	**2023**
Quantity of covered whole veal meat consumed, millions of pounds				
With regulations	4.7	4.8	4.9	5.2
Without regulations	6.9	6.7	6.8	6.9
Change	-2.2	-1.9	-1.9	-1.7
Average producer price, $ per pound				
With regulations	8.87	8.90	8.91	8.92
Without regulations	7.00	7.00	7.00	7.00
Change	1.87	1.90	1.91	1.92
Weighted average retail price (including restaurant and grocery), $ per pound				
With regulations	19.89	21.36	21.85	22.23
Without regulations	15.91	16.97	17.10	17.53
Change	3.97	4.39	4.75	4.70
Consumer expenditure, millions of $				
With regulations	94.4	101.6	107.5	114.7
Without regulations	109.5	112.3	116.4	121.5
Change	-15.1	-10.7	-8.9	-6.8

Table 4.3e. Veal: Summary of estimated impacts of Lower-Cost Regulations

	2020	**2021**	**2022**	**2023**
Quantity of covered whole veal meat consumed, millions of pounds				
With regulations	2.2	1.8	1.6	1.5
Without regulations	4.1	3.4	3.1	2.8
Change (%)	-1.9	-1.6	-1.5	-1.3
Average producer price, $ per pound				
With regulations	8.78	8.78	8.78	8.78
Without regulations	7.00	7.00	7.00	7.00
Change ($)	1.78	1.78	1.78	1.78
Average retail price, $ per pound				
With regulations	14.93	14.93	14.93	14.93
Without regulations	12.44	12.44	12.44	12.44
Change ($)	2.49	2.49	2.49	2.49
Consumer expenditure, millions of $				
With regulations	33.4	15.9	24.6	22.3
Without regulations	51.5	23.5	38.0	34.4
Change ($)	-18.1	-7.6	-13.4	-12.1

Table 4.3f. Veal: Summary of estimated impacts of Higher-Cost Regulations

	2020	2021	2022	2023
Quantity of covered whole veal meat consumed, millions of pounds				
With regulations	4.6	4.7	4.9	5.1
Without regulations	6.9	6.7	6.8	6.9
Change (%)	-2.3	-2.0	-1.9	-1.8
Average producer price, $ per pound				
With regulations	8.86	8.89	8.90	8.91
Without regulations	7.00	7.00	7.00	7.00
Change ($)	1.86	1.89	1.90	1.91
Weighted average retail price (including restaurant and grocery), $ per pound				
With regulations	20.47	21.13	22.02	22.05
Without regulations	15.91	16.97	17.10	17.53
Change ($)	4.56	4.16	4.92	4.52
Consumer expenditure, millions of $				
With regulations	93.5	100.9	107.0	114.2
Without regulations	109.5	112.3	116.4	121.5
Change ($)	-16.00	-11.40	-9.40	-7.30

4.3.3 Simulation results for shell eggs

Table 4.3g. Shell eggs: Summary of estimated impacts of Proposed Regulations

	2020	2021	2022	2023
Quantity of shell eggs produced in California, millions of dozens equivalent				
Conventional				
With regulations	N/A	N/A	0	0
Without regulations	302	309	317	325
Change	N/A	N/A	-317	-325
Cage-free				
With regulations	N/A	N/A	346	321
Without regulations	76	78	80	82
Change	N/A	N/A	266	239
Total				
With regulations	N/A	N/A	346	321
Without regulations	378	387	397	407
Change	N/A	N/A	-51	-86
Quantity consumed in California, millions of dozens equivalent				
Conventional				
With regulations	N/A	N/A	0	0
Without regulations	548	562	576	590
Change	N/A	N/A	-576	-590
Cage-free				
With regulations	N/A	N/A	629	583
Without regulations	138	142	145	149
Change	N/A	N/A	483	434
Total				
With regulations	N/A	N/A	629	583
Without regulations	686	704	721	739
Change	N/A	N/A	-92	-157
Average farm price in California, $ per dozen				
Conventional				
With regulations	N/A	N/A	N/A	N/A
Without regulations	1.28	1.28	1.28	1.28
Change	N/A	N/A	N/A	N/A
Cage-free				
With regulations	N/A	N/A	1.55	1.55
Without regulations	1.55	1.55	1.55	1.55
Change	N/A	N/A	0	0
Average retail price in California, $ per dozen				

		2020	2021	2022	2023
Conventional					
With regulations		N/A	N/A	Prohibited	Prohibited
Without regulations		2.32	2.32	2.32	2.32
Change		N/A	N/A	N/A	N/A
Cage-free					
With regulations		N/A	N/A	4.75	4.75
Without regulations		4.75	4.75	4.75	4.75
Change		N/A	N/A	0	0
Farm revenue, retailer expenditure and consumer expenditure on shell eggs in California, millions of $					
Farm revenue					
With regulations		N/A	N/A	537	497
Without regulations		504	517	530	543
Change		N/A	N/A	7	-46
Retailer expenditure					
With regulations		N/A	N/A	975	903
Without regulations		916	939	962	986
Change		N/A	N/A	12	-83
Consumer expenditure					
With regulations		N/A	N/A	2,986	2,768
Without regulations		1,929	1,977	2,026	2,077
Change		N/A	N/A	960	691

Table 4.3h. Shell eggs: Summary of estimated impacts of Lower-Cost Regulations

	2020	2021	2022	2023
Quantity of shell eggs produced in California, millions of dozens equivalent				
Conventional				
With regulations	N/A	N/A	33	34
Without regulations	302	309	317	325
Change	N/A	N/A	-284	-291
Cage-free				
With regulations	N/A	N/A	318	296
Without regulations	76	78	80	82
Change	N/A	N/A	238	214
Total				
With regulations	N/A	N/A	351	330
Without regulations	378	387	397	407
Change	N/A	N/A	-46	-77
Quantity consumed in California, millions of dozens equivalent				
Conventional				
With regulations	N/A	N/A	60	62
Without regulations	548	562	576	590
Change	N/A	N/A	-515	-528
Cage-free				
With regulations	N/A	N/A	578	537
Without regulations	138	142	145	149
Change	N/A	N/A	433	388
Total				
With regulations	N/A	N/A	638	599
Without regulations	686	704	721	739
Change	N/A	N/A	-83	-140
Average farm price in California, $ per dozen				
Conventional				
With regulations	N/A	N/A	1.28	1.28
Without regulations	1.28	1.28	1.28	1.28
Change	N/A	N/A	0	0
Cage-free				
With regulations	N/A	N/A	1.55	1.55
Without regulations	1.55	1.55	1.55	1.55
Change	N/A	N/A	0	0
Average retail price in California, $ per dozen				
Conventional				
With regulations	N/A	N/A	2.32	2.32

	2020	**2021**	**2022**	**2023**
Without regulations	2.32	2.32	2.32	2.32
Change	N/A	N/A	0	0
Cage-free				
With regulations	N/A	N/A	4.75	4.75
Without regulations	4.75	4.75	4.75	4.75
Change	N/A	N/A	0	0
Farm revenue, retailer expenditure and consumer expenditure on shell eggs in California, millions of $				
Farm revenue				
With regulations	N/A	N/A	536	502
Without regulations	504	517	530	543
Change	N/A	N/A	6	-41
Retailer expenditure				
With regulations	N/A	N/A	973	912
Without regulations	916	939	962	986
Change	N/A	N/A	11	-75
Consumer expenditure				
With regulations	N/A	N/A	2,886	2,695
Without regulations	1,929	1,977	2,026	2,077
Change	N/A	N/A	859	618

Table 4.3i. Shell eggs: Summary of estimated impacts of Higher-Cost Regulations

	2020	2021	2022	2023
Quantity of shell eggs produced in California, millions of dozens equivalent				
Conventional				
With regulations	N/A	N/A	0	0
Without regulations	302	309	317	325
Change	N/A	N/A	-317	-325
Cage-free				
With regulations	N/A	N/A	346	320
Without regulations	76	78	80	82
Change	N/A	N/A	266	238
Total				
With regulations	N/A	N/A	346	320
Without regulations	378	387	397	407
Change	N/A	N/A	-51	-87
Quantity consumed in California, millions of dozens equivalent				
Conventional				
With regulations	N/A	N/A	0	0
Without regulations	548	562	576	590
Change	N/A	N/A	-576	-590
Cage-free				
With regulations	N/A	N/A	628	581
Without regulations	138	142	145	149
Change	N/A	N/A	482	432
Total				
With regulations	N/A	N/A	628	581
Without regulations	686	704	721	739
Change	N/A	N/A	-93	-158
Average farm price in California, $ per dozen				
Conventional				
With regulations	N/A	N/A	Prohibited	Prohibited
Without regulations	1.28	1.28	1.28	1.28
Change	N/A	N/A	N/A	N/A
Cage-free				
With regulations	N/A	N/A	1.55	1.55
Without regulations	1.55	1.55	1.55	1.55
Change	N/A	N/A	0	0

Table 4.3i cont'd.	2020	2021	2022	2023
Average retail price in California, $/dozen				
Conventional				
With regulations	N/A	N/A	Prohibited	Prohibited
Without regulations	2.32	2.32	2.32	2.32
Change	N/A	N/A	N/A	N/A
Cage-free				
With regulations	N/A	N/A	4.78	4.78
Without regulations	4.75	4.75	4.75	4.75
Change	N/A	N/A	0.03	0.03
Farm revenue, retailer expenditure and consumer expenditure on shell eggs in California, millions of $				
Farm revenue				
With regulations	N/A	N/A	536	496
Without regulations	504	517	530	543
Change	N/A	N/A	6	-47
Retailer expenditure				
With regulations	N/A	N/A	973	901
Without regulations	916	939	962	986
Change	N/A	N/A	11	-85
Consumer expenditure				
With regulations	N/A	N/A	3,003	2,781
Without regulations	1,929	1,977	2,026	2,077
Change	N/A	N/A	976	704

4.3.4 Simulation results for pork

Table 4.3j. Pork: Summary of estimated impacts of Proposed Regulations

	2020	2021	2022	2023
Quantity of whole pork meat consumed in California, millions of pounds				
Whole pork meat				
With regulations	N/A	N/A	1,107	1,081
Without regulations	1,149	1,137	1,145	1,159
Change	N/A	N/A	-38	-78
Other pork meat				
With regulations	N/A	N/A	852	874
Without regulations	847	838	844	854
Change	N/A	N/A	8	20
Total				
With regulations	N/A	N/A	1,959	1,955
Without regulations	1,996	1,975	1,989	2,013
Change	N/A	N/A	-30	-58
Wholesale price in California, $ per pound				
Whole pork meat				
With regulations	N/A	N/A	1.44	1.45
Without regulations	1.20	1.20	1.20	1.20
Change	N/A	N/A	0.24	0.25
Other pork meat				
With regulations	N/A	N/A	1.68	1.68
Without regulations	1.68	1.68	1.68	1.68
Change	N/A	N/A	0.00	0.00
Retail price in California, $ per pound				
Whole pork meat				
With regulations	N/A	N/A	3.54	3.54
Without regulations	3.30	3.30	3.30	3.30
Change	N/A	N/A	0.24	0.25
Other pork meat				
With regulations	N/A	N/A	3.78	3.78
Without regulations	3.78	3.78	3.78	3.78
Change	N/A	N/A	0.00	0.00
Retailer expenditure and consumer expenditure in California, millions of $				
Retailer expenditure				
With regulations	N/A	N/A	3,030	3,032
Without regulations	2,803	2,772	2,793	2,827
Change	N/A	N/A	237	206
Consumer expenditure				
With regulations	N/A	N/A	7,138	7,131
Without regulations	6,989	6,912	6,964	7,048
Change	N/A	N/A	174	83

Table 4.3k. Pork: Summary of estimated impacts of Lower-Cost Regulations

	2020	2021	2022	2023
Quantity consumed in California, millions of pounds				
Whole pork meat				
With regulations	N/A	N/A	1,116	1,100
Without regulations	1,149	1,137	1,145	1,159
Change	N/A	N/A	-29	-59
Other pork meat				
With regulations	N/A	N/A	850	867
Without regulations	847	838	844	854
Change	N/A	N/A	6	13
Total				
With regulations	N/A	N/A	1,967	1,966
Without regulations	1,996	1,975	1,989	2,013
Change	N/A	N/A	-23	-47
Wholesale price in California, $ per pound				
Whole pork meat				
With regulations	N/A	N/A	1.38	1.38
Without regulations	1.20	1.20	1.20	1.20
Change	N/A	N/A	0.18	0.18
Other pork meat				
With regulations	N/A	N/A	1.68	1.68
Without regulations	1.68	1.68	1.68	1.68
Change	N/A	N/A	0.00	0.00
Retail price in California, $ per pound				
Whole pork meat				
With regulations	N/A	N/A	3.48	3.48
Without regulations	3.30	3.30	3.30	3.30
Change	N/A	N/A	0.18	0.18
Other pork meat				
With regulations	N/A	N/A	3.78	3.78
Without regulations	3.78	3.78	3.78	3.78
Change	N/A	N/A	0.00	0.00
Retailer expenditure and consumer expenditure in California, millions of $				
Retailer expenditure				
With regulations	N/A	N/A	2,974	2,979
Without regulations	2,803	2,772	2,793	2,827
Change	N/A	N/A	181	153
Consumer expenditure				
With regulations	N/A	N/A	7,097	7,103
Without regulations	6,989	6,912	6,964	7,048
Change	N/A	N/A	133	55

Table 4.3l. Pork: Summary of estimated impacts of Higher-Cost Regulations

	2020	2021	2022	2023
Quantity consumed in California, millions of pounds				
Whole pork meat				
With regulations	N/A	N/A	1,495	1,469
Without regulations	1,543	1,526	1,537	1,556
Change	N/A	N/A	-43	-87
Other pork meat				
With regulations	N/A	N/A	457	468
Without regulations	454	449	452	457
Change	N/A	N/A	5	11
Total				
With regulations	N/A	N/A	1,952	1,938
Without regulations	1,996	1,975	1,989	2,013
Change	N/A	N/A	-37	-76
Wholesale price in California, $ per pound				
Whole pork meat				
With regulations	N/A	N/A	1.45	1.46
Without regulations	1.26	1.26	1.26	1.26
Change	N/A	N/A	0.20	0.20
Other pork meat				
With regulations	N/A	N/A	1.91	1.91
Without regulations	1.91	1.91	1.91	1.91
Change	N/A	N/A	0.00	0.00
Retail price in California, $ per pound				
Whole pork meat				
With regulations	N/A	N/A	3.59	3.59
Without regulations	3.35	3.35	3.35	3.35
Change	N/A	N/A	0.23	0.23
Other pork meat				
With regulations	N/A	N/A	4.00	4.00
Without regulations	4.00	4.00	4.00	4.00
Change	N/A	N/A	0.00	0.00
Retailer expenditure and consumer expenditure in California, millions of $				
Retailer expenditure				
With regulations	N/A	N/A	3,046	3,032
Without regulations	2,803	2,772	2,793	2,827
Change	N/A	N/A	253	205
Consumer expenditure				
With regulations	N/A	N/A	7,189	7,144
Without regulations	6,989	6,912	6,964	7,048
Change	N/A	N/A	225	96

5. Projected Economy-wide Impacts of the Proposed Regulations and Alternatives for Eggs and the Higher-Cost Regulations that Affect Pork Exports Through California Ports

This chapter reports on the impacts of the proposed regulations on the broader economy outside of the directly regulated industries. The impact estimates build directly on the results presented in Section 4, and focus on how changes in costs and revenues for the targeted industries ripple back through the California economy. We use a modified version of the IMPLAN model and data set to develop the economy-wide impacts. For readers unfamiliar with this approach, a brief discussion of IMPLAN and similar models is provided as background in Appendix 5.

The first set of statewide impacts stemming from direct Proposition 12 regulations come from shifts in costs and revenues within the California egg industry (liquid eggs plus shell eggs). The California egg industry specializes in shell egg production which allows them to compete with producers outside of California, which have lower cost feed and other inputs, because of the cost of transport of shell eggs. Eggs processed for liquid eggs (breakers) do not have such large transport costs, so California production of liquid eggs in-state is very low (only 1.5% by volume). Our economy-wide impact estimates include shell eggs and liquid eggs.

California farms produce very little pork, and the pork that is produced in California is destined primarily for specialty markets and would be little affected by Proposition 12 regulations. There is no veal produced within California that is regulated by Proposition 12. Therefore, the economic impacts from shifts in farm cost and revenues to the pork and veal industries occur outside the state of California. For reasons discussed below, the retail market impacts of higher cost of veal and pork shipped into California affect California consumers, but there are unlikely to be significant measurable economy-wide impacts of those higher veal and pork costs on aggregates such as employment in California.

We do not include the impacts related to veal, eggs or pork shipped into California from other states. These products have additional Proposition 12-related production costs that occur outside of California. Consumers in California pay higher prices and buy smaller quantities of these

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products because these products have higher costs and wholesale prices. These results are all explained and quantified in Section 4.

Retailers pay more for products and charge consumers higher prices to offset the higher costs. However, based on much empirical research, we determine that overall food demand or marketing in California is unlikely to be affected measurably by Prop 12 regulations. We project negligible economy-wide impacts on economic activity, jobs or indirect economic aggregates related to impacts on food marketing in California. For that reason, we to do not attempt to use the IMPLAN model to assess economy-wide impacts of more expensive egg, veal or pork on the broader California economy. The projections for the markets for the covered products are fully assessed and reported in section 4 and in Appendices 1 through 5.

5.1 Multipliers Used for Eggs

The IMPLAN model categorizes the California economy into 546 separate industry sectors. Each sector represents a category of similar economic activity. For our analysis of the California egg industry, we use IMPLAN Sector 13 (Poultry and Egg Production). Since there is no separate egg sector, and poultry meat differs from egg production on farms, we adjust the IMPLAN data to represent eggs alone.

Table 5.1 provides the detailed multipliers that we use for the California egg industry. These multipliers are used to calculate impacts from changes in the shell egg value of output. "Value added" includes (1) proprietor income, (2) hired employee wages and salaries, (3) business taxes and (4) other returns to the operation. "Value added" measures the contribution to gross state product of the sector (output minus the value of indirect inputs purchased from other sectors). For example, for an egg farm, these indirect input purchases include feed, electricity services, cleaning supplies, equipment and etc. Table 5.1 includes jobs per million dollars of output. However, for estimates of direct employment in the California egg industry, our projections use employees per quantity of eggs rather than value of egg production. Based on recent research there are no additional on-farm labor when eggs are more costly Matthews and Sumner, 2015).

Table 5.1. Impact Multipliers of California Egg Farms to the California Economy

Multiplier	Impact Multipliers
Value of Output	*$ of output per $1.00 output*
Direct Effect	1.00
Indirect Effect	1.22
Induced Effect	0.29
Total Effect	2.51
Value Added	*GDP ($) per $1.00 of output*
Direct Effect	0.10
Indirect Effect	0.44
Induced Effect	0.18
Total Effect	0.71
Employment	*Jobs per $ million of output*
Direct Effect	0.82
Indirect Effect	3.36
Induced Effect	1.57
Total Effect	5.75

Source: Multipliers were generated in IMPLAN.

For each economic measure, the multipliers are provided for indirect effects. These multipliers represent the "ripple effects" of purchases by the egg industry from other industries outside the egg industry segment. The induced effects are associated with purchases made by those that earn the value added of the industry. The total effect adds the direct effect to indirect and induced effects.

5.2 Economy-wide Impacts of Propositions 12 Regulations of Shell Egg Production in California

The top panel of Table 5.2 shows direct value of output, value added, and jobs within the California egg industry using the IMPLAN multipliers and estimates shown in Section 4 about shell egg production in California. The top panel also uses multipliers to estimate the total economy-wide value of output, value added, and jobs associated with the California shell egg industry. The total value of output in the baseline starts at $1.27 billion in 2020 and rises to $1.36 billion by 2023. Total jobs rise from 2,957 in 2020 to 3,184 by 2023.

The next three panels of Table 5.2 provide projections of the impacts of the proposed regulations and the two alternative sets of regulations on the economy-wide impacts of California shell egg production. The proposed regulations increase shell egg farm value of output and value added (because of the cost and price increases) in 2022; and decrease the value of output and value added by 2023, when the industry has fully adjusted to reduced quantities. In 2022, economy-wide value added is higher by $5 million, but jobs are lower by 31 jobs. For 2023, total value added falls by $34 million. Results under the higher- and lower-cost regulations are also shown in Table 5.2.

Table 5.2 Changes to California Statewide Economy from Implementation of Proposition 12 Proposed Regulatory Packages on California Egg Farms

		2020	2021	2022	2023
Baseline					
Value of Output ($ mil)	Direct	504	516	530	543
	Total	1,266	1,296	1,329	1,363
Value Added ($ mil)	Direct	49	51	52	53
	Total	360	369	378	388
Employment (number of jobs)	Direct	471	482	495	507
	Total	2,957	3,028	3,106	3,184
Proposed Regulations Minus Baseline					
Value of Output ($ mil)	Direct Impacts	N/A[1]	N/A[1]	7	-46
	Total Impacts	N/A	N/A	16	-114
Value Added ($ mil)	Direct Impacts	N/A	N/A	1	-4
	Total Impacts	N/A	N/A	5	-33
Employment (number of jobs)	Direct Impacts	N/A	N/A	-64	-107
	Total Impacts	N/A	N/A	-31	-332
Lower-Cost Alternative Minus Baseline					
Value of Output ($ mil)	Direct Impacts	N/A	N/A	5	-41
	Total Impacts	N/A	N/A	14	-102
Value Added ($ mil)	Direct Impacts	N/A	N/A	1	-4
	Total Impacts	N/A	N/A	4	-29
Employment (number of jobs)	Direct Impacts	N/A	N/A	-57	-96
	Total Impacts	N/A	N/A	-31	-297
Higher-Cost Alternative Minus Baseline					
Value of Output ($ mil)	Direct Impacts	N/A	N/A	7	-47
	Total Impacts	N/A	N/A	16	-118
Value Added ($ mil)	Direct Impacts	N/A	N/A	1	-5
	Total Impacts	N/A	N/A	5	-34
Employment (number of jobs)	Direct Impacts	N/A	N/A	-64	-108
	Total Impacts	N/A	N/A	-31	-341

[1] Not applicable because Prop 12 regulations governing shell eggs do not go into effect until 2022.

5.3 Economy-Wide Impacts of High-Cost Alternative Packages of Regulations on Pork Exports from California Ports

We include analysis of economic impacts from loss of pork product exports from California ports under the high-cost alternative regulatory package. A large amount of pork that is produced in other states is exported through California ports, and the higher-cost alternative regulation package would affect those exports and have economic impacts on California ports.

California ports in Long Beach, Los Angeles and Oakland are major shipping exit points for U.S. agricultural products destined for Japan, Korea and many other Pacific Rim countries. U.S. pork competes in international markets for relatively homogeneous agricultural commodities mainly on the basis of price. The higher-cost regulations require that all Proposition 12 regulated products entering California destined for export through California ports must meet Proposition 12 standards. The United States exports very little value of egg products and no veal from California ports. Therefore, we evaluate quantitively impact on export of U.S. pork products through California ports.

We expect that rather than meeting California standards for pork products, which as shown in Section 4, raise cost of production substantially, exports will be diverted to other West Coast ports in California, or if that is too costly, will not be exported at all. The loss of economic activity at ports will cause impacts on the California economy.

Calculations in Table 5.3 use U.S. government trade data and data from the 2019 Port of Long Beach Economic Impact Study to estimate the magnitude of economic activity generated at California ports from the export of U.S. pork products. Approximately 822,000 metric tons of pork product pass through the ports of Long Beach, Los Angeles and Oakland annually. This activity generates approximately $61 million in added gross revenues for the state's ports. It is expected that enactment of the high-cost alternative package will eliminate the pork export revenues altogether as handlers and exporters will opt to ship their pork products from the ports in Seattle, Washington or Portland, Oregon, to avoid compliance costs. That means California ports lose $61 million in revenue.

Table 5.3. Value of Output Generated for California Ports from Export of U.S. Pork Products

Parameter	Measurement
Quantity of Proposition 12-regulated pork products exported through California ports (in metric tons)	821,881
Volume of product per Twenty-Foot-Equivalent shipping Unit (TEU)	21.6
Quantity of pork exported for California ports in TEU's	38,050
Average revenue generated for California ports per TEU	$1,595
Total value of California port output from export of U.S. pork products	$61 million

Source: Quantity of pork exported through California ports comes from U.S. International Trade Commission online trade database. Volume of product per TEU and average revenue per TEU is estimated using data from the 2019 Port of Long Beach: Economic Impact Study (https://globalmaritimehub.com/wp-content/uploads/2019/09/POLB-Economic-Impact-Report_FINAL.pdf).

To analyze the statewide impacts, we modeled the loss in revenue for California ports using IMPLAN data for Sector 216 "Water Transport." Table 5.4 presents the impacts for value of output, value added and jobs. The elimination of $61 million in total direct output by California ports results in a decrease of $135 million in value of output statewide. Direct labor income loss at the ports equals $9 million and statewide labor income is reduced by $35 million. Value added to the California economy declines by $60 million. The number of jobs statewide supported by California port activity is reduced by 431.

Table 5.4 Loss of Economy-wide Economic Activity from Elimination of U.S. Pork Exports from California Ports Under the High-Cost Alternative Regulations

Multiplier	*Economic Contributions*
Value of Output	*$ million*
Direct Effect	-$61
Indirect Effect	-$51
Induced Effect	-$24
Total Effect	-$135
Labor Income	
Direct Effect	-$9
Indirect Effect	-$18
Induced Effect	-$8
Total Effect	-$35
Value Added	
Direct Effect	-$18
Indirect Effect	-$27
Induced Effect	-$15
Total Effect	-$60
Employment	*Jobs*
Direct Effect	-79
Indirect Effect	-220
Induced Effect	-132
Total Effect	-431

Source: Economic contribution estimates come from IMPLAN modeling using revenue estimates generated in Table 5.3.

6. Determination of the impact of the regulatory proposal on the state economy, businesses, and the public welfare (Government Code § 11346.3(c))

In Government Code § 11346.3(c), the markers to be used in assessing the economic impact of the proposed regulations in a SRIA are the following:

(1)　　The creation or elimination of jobs in the state;

(2)　　The creation of new businesses or the elimination of existing businesses in the state;

(3)　　The competitive advantages or disadvantages for businesses currently doing business in the state;

(4)　　The increase or decrease of investment in the state;

(5)　　The incentives for innovation in products, materials, or processes; and

(6)　　The benefits of the proposed regulations, including, but not limited to, benefits to the health, safety, and welfare of California residents, worker safety, environment and quality of life, and any other benefits identified by the agency.

Our quantitative estimates are based where possible on the IMPLAN projections of economy-wide impacts shown in Section 5 above.

6.1. Assessment 1. The creation or elimination of jobs in the state

Impacts on jobs in California is minimal compared to the impact on consumer expenditures for the covered food items. Overall, we project a loss of 31 jobs statewide in the calendar year 2022, when the proposed regulations are fully implemented, and a loss of 332 jobs in 2023, after adjustments for the full reduction in egg production are fully incorporated. A large portion of the jobs effect from the proposed regulations are in the shell egg production industry and associated industries.

6.2. Assessment 2. The creation of new businesses or the elimination of existing businesses in the state

Creation and elimination of businesses is natural given any significant change to the business conditions. The regulations considered here will change the nature of veal, pork and eggs produced and marketed in California. The current businesses from farm through retail will be

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affected. Some farms may choose to exit during implementation rather that make adjustments others may find the implementation of the regulations attractive for entry. We expect this flux to be small relative to the numbers already in the production, distribution and retailing businesses. Indirect impacts are also small for the same reason. We expect entries and exits in the range of less than 100 businesses roughly in balance.

6.3. Assessment 3. The competitive advantages or disadvantages for businesses currently doing business in the state

The cage-free mandate for hens and 24-square-foot mandate for breeding sows (the portion of the proposed regulations that is enforced starting on January 1, 2022) may cause some egg and pork producers to exit because they find it uneconomic to adapt their facilities to comply with the new mandates required by Prop 12. We expect that some pre-existing producers whose facilities already meet Prop 12 standards will enjoy some corresponding competitive advantages. Pre-existing cage-free egg producers, whose potential market grows when regulations take effect, will have an advantage over those who had not engaged in cage-free production in that they will not face costs of converting non-compliant facilities. Similar competitive farm issues apply to sow operations but there are very few such businesses in California.

6.4. Assessment 4. The increase or decrease of investment in the state

As discussed in Section 6.2 and 6.3, some new businesses and investment may enter the market as a result of the proposed regulations, the overall effect of the regulations (as summarized in Section 1.4, reported in Section 4, and detailed in Appendices 1–4) is to decrease the total amount of egg, pork, and veal consumed in California. Although some one-time investments in construction, machinery, and labor will be made by businesses as they adapt their facilities, in the long run we expect that the regulations will decrease average annual investment in the California egg, pork, and veal businesses, relative to the Baseline. Although investment in other businesses in California may correspondingly decrease as investors move resources elsewhere, we expect the net effect to be a modest decrease in overall investment in the state. Under the higher-cost regulations, we would expect slightly more of a decrease in overall investment in the state.

6.5. Assessment 5. The incentives for innovation in products, materials, or processes

Farms may have some incentives to innovate in their business processes as they adapt their facilities to be compliant with Prop 12 cage-size standards. However, businesses involved in the design and manufacturing of products and materials that would be employed in Prop 12 adaptation, such as animal cages, are not typically located in California.

6.6. Assessment 6. The benefits of the proposed regulations, including, but not limited to, benefits to the health, safety, and welfare of California residents, worker safety, environment and quality of life, and any other benefits identified by the agency

Economic studies have shown that some government regulations of meat and poultry production and processing increase consumer willingness to pay in food markets. About 20% of California's pre-Prop 12 egg consumption already met government-set cage-free eggs standards. Cage-free egg consumers were already willing to pay more than twice as much, on average, for cage-free eggs than for conventional California eggs. Some other consumers who are not willing to pay full cage-free prices may still be willing to pay some smaller amount more for cage-free eggs than for conventional eggs. Such consumers would therefore receive some corresponding benefits (even if they are hard-to-quantify benefits such as moral satisfaction, peace of mind, social approval, etc.) from the cage-free attribute. Under the higher-cost regulations, consumers may receive additional such benefits due to the stricter cage standards. In addition, non-consumers of the animal products covered by Prop-12 may benefit from assurance that products sold in California meet the specified housing standards even if they do not plan to consume the products covered. We note that a large majority of voters in 2018 approved on the changes stated in Prop 12. We have not attempted to measure quantitatively the benefits of the Prop 12 requirements on Californians.

The scientific literature is not yet conclusive on links between animal housing space allocation, such as cage size, and human food-borne illness, worker safety, environment, viruses and other transmittable diseases, or other human health, or safety (Sumner et al. 2011). CDFA has no regulatory discretion over the Prop 12 cage-size mandates, so any such effects would stem not from the way regulations were written or enforced, but from the mandates directly imposed by Prop 12. It would be outside the scope of this SRIA to conduct a detailed food safety, worker

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safety, or public health analysis of the Prop 12 cage-size changes themselves. We do not estimate that any of these worker or public health benefits would vary between the proposed regulations and alternative regulatory packages we consider in this SRIA.

6.7. Types of costs considered for implementation of the Proposed Regulations

The initial start-up costs of implementing the proposed regulations is estimated by CDFA at about $2.5 million (in IT implementation costs), and the costs of administering the program and its enforcement arm during the calendar year 2022 (the period of evaluation for the SRIA) at about $5 million per year under the proposed and lower-cost regulations, and about $11 million per year under the higher-cost regulations (see sections 6.8 and 4.3.2).

Other costs to the industry necessary to comply with regulations comprise the most immediate, first-order costs. These costs are provided in detail in Appendices 1 through 4. The cost to consumers of higher costs of meat and eggs are detailed above and in the Appendices.

6.8. Effects on the General Fund, special state funds, and affected local government agencies attributable to the proposed regulations

As shown in Section 1.4, Section 4, and Appendices 1–4, in the 2022 calendar year, we estimate that the proposed regulations will increase total consumer expenditure in California on liquid eggs by about $36 million, decrease total consumer expenditure on veal meat by $9 million, increase expenditure on shell eggs by $960 million, and increase expenditure on pork meat by $174 million. This would result in a net increase in consumer expenditure on liquid eggs, veal, shell eggs, and pork of $1.2 billion.

However, given that consumers have budget constraints, some (or perhaps even all) of these expenditures on food could be offset (or more than offset) by corresponding decreases in consumption of other items including non-food items liable to sales taxes. Thus, we expect a slight decrease in overall sales tax revenue. Other tax revenue impacts are small as a share of the give the small size of the impacts as a share of the economy.

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Absent the establishment and use of fees charged to entities producing and/or selling Prop 12-covered products, the General Fund is also impacted by the administrative costs of implementing regulations, which are summarized in Section 4.3.2. Under the proposed regulations and the lower-cost regulations, we estimate CDFA's administrative costs at about $4.6 million in the 2019-20 fiscal year, $3.9 million in 2020-21, and $5.0 million in ongoing annual costs from 2021-22 onward. Under the higher-cost regulations, we estimate CDFA's administrative costs at about $4.6 million in 2019-20, $5.2 million in 2020-21, and $10.9 million in ongoing annual costs from 2021-22 onward. We estimate no impact on special funds and little impacts on local government of the proposed regulations.

Appendix 1. Data and Economic Modelling on the Proposition 12 Regulation of New Hen Housing Requirements for Liquid Eggs Supplying the California Market

In this appendix, we analyze the likely economic effects on liquid egg consumption in California of the proposed regulations by CDFA for implementing Proposition 12. We develop a simulation model to predict these effects, calibrated for expected prices and consumption of liquid eggs when the proposed regulations are implemented. We also perform a sensitivity analysis for the simulations.

We conduct our simulations in two stages. First, we simulate the effects of switching from the national standard for hen space to 144 square inches on the California market for liquid eggs in 2020 and 2021. Second, we simulate the effects of switching from 144 square inches to cage-free on the California market for liquid eggs in 2022 and 2023.

For both sets of simulations, we incorporate current forecasts for the California population and income from the State of California Department of Finance to determine the quantity of liquid eggs consumed. See the introduction to Section 4 and Table 4.0 of the main SRIA for more details.

In addition to the proposed regulations, CDFA considers two alternative packages of regulations: higher-cost regulations and lower-cost regulations (for more information about regulations, see the following section). In this appendix, we discuss the simulation results for each package of regulations.

Proposition 12 Liquid Egg Regulations

Proposed Regulations

Current draft regulations from the CDFA state that liquid eggs may be "raw or pasteurized, co-packaged with other foods, or sold frozen, dried or as a cooked patty, puck or other cooked form…" Liquid eggs used as an ingredient in food manufacturing and food service or liquid eggs going to retail must adhere to the new regulations.

Higher-Cost Regulations

The higher-cost regulations expand the definition of liquid eggs to encompass any liquid eggs imported, shipped into, or passing through California. The higher-cost regulations also allow end customers, at a grocery store or restaurant, to scan a QR code and see a record of Proposition 12 animal confinement certification and traceability of the product back to farm of origin.

Lower-Cost Regulations

The lower-cost regulations limit liquid eggs to exclude frozen, dried, and other solid forms of eggs shipped into California from being subject to Proposition 12 regulations. Under the lower-cost regulations, the regulations only affect liquid eggs produced in California and the sale of liquid eggs at retail, creating an exemption for liquid eggs intended for further processing, preparation, or manufacturing into a combination food product or prepared meal.

Baseline: Quantities and Prices of Liquid Eggs if There Were No Proposed Regulations

In this section, we provide quantity and price data of liquid eggs if there were no proposed regulations. Here "baseline" denotes those market outcomes without the proposed regulations. We use those baseline data to measure the likely effects of the proposed regulations of CDFA. Specifically, we measure the likely effects of the proposed regulations by differencing the market outcomes (including quantities and prices) with and without the proposed regulations.

In Table A1.1, we list the baseline retail prices and quantities of liquid eggs consumed in California for 2019 and projected through 2023 if there were no Proposition 12 regulations. Quantities are converted to dozen equivalents. To consider income and population changes in California, we incorporate current forecasts for the California population and income from the State of California Department of Finance. To convert income changes into the quantity changes, we use an income elasticity of 0.84 for liquid eggs, as estimated for food-away-from-home by Okrent and Alston (2011).

We expect that the annual average prices of liquid eggs at retail and food service (restaurants) will be stable from 2019 to 2023, based on reviewing related data and discussing with industry members. Note we refer to "finished product" prices as opposed to "retail" prices as liquid eggs

are primarily consumed at restaurants or in food products, and only a small fraction of those eggs are sold at retail as liquid eggs. Finished product prices reflect only the liquid egg component of the good, converted to dozen egg equivalents.

Table A1.1. Liquid Eggs Quantities and Prices without Proposition 12 Regulations in California

	Unit	2019	2020	2021	2022	2023
Quantity consumed of liquid eggs in California, dozen equivalents						
Retail	Mil. dozen	15	14	13	14	14
Food Manufacturing	Mil. dozen	151	139	136	137	139
Food service	Mil. dozen	148	136	133	134	136
Total	Mil. dozen	314	288	282	285	289
Quantity produced of liquid eggs in California, dozen equivalents						
Total	Mil. dozen	4.6	4.3	4.2	4.3	4.3
Retail/Restaurant price of liquid egg component of finished product, $ per dozen equivalents						
Price	$/dozen	0.95	0.95	0.95	0.95	0.95

Data and Parameters

In this section, we provide the values and definitions for all parameters used in the model (Table A1.2). Below we describe the parameters and their sources in more detail. All parameter values are calibrated based on our expectations of California liquid egg consumption after the implementation of Prop 12 regulations, incorporating CDFA income and population projections.

Table A1.2. Model Parameters: Definitions, Value Specifications, and Descriptions

	Parameter definition	Value	Descriptions
D	Total consumption of liquid eggs in California in 2019, millions of dozen equivalents	314	*See Consumption*
P_f	Wholesale price of liquid eggs in 2019, dollars per dozen equivalents	0.52	See *Prices*
P_r	Price of liquid egg component in finished product, dollars per dozen equivalent	0.95	See *Prices*
	Export price of liquid eggs, dollars per dozen	2.33	
ω	Farm-to-product markup (as a % of farm price)	0.83	See *Farm-to-Product Markup*
κ	Percent change in farm price from policy change to 144 square inches	0.21	See *Farm Cost Increase*
	Percent change in farm price from policy change to cage-free	0.17	
γ	Percent change in product price from segregation	0.00	See *Labelling Cost*
	Percent change in product price from segregation costs under higher-cost regulations	0.01	*Increase*
β	Demand shift for liquid eggs from policy change	0.00	See *Demand Shift*
η	Demand elasticity for liquid eggs, 2020	-0.10	See *Demand Elasticity*
	Demand elasticity for liquid eggs, 2021	-0.15	
	Demand elasticity for liquid eggs, 2022	-0.15	
	Demand elasticity for liquid eggs. 2023	-0.20	
	Demand elasticity of exported liquid eggs	−20	
ϵ	Supply elasticity of liquid eggs	∞	See *Supply Elasticity*

Consumption (D)

For simulations, we need the baseline quantity data of liquid eggs. To assess those quantity data, we begin with converting pounds of liquid eggs consumed in 2019 to dozens of liquid egg equivalents, and we estimate that there were 2.6 billion dozen liquid eggs consumed in 2019 in the United States. Given the 2019 data, we project the 2022 − 2023 data, considering income and

population projections. To estimate the 2019 quantity of liquid eggs, we use historical processed egg production data from the USDA (AMS 1). To project the 2022 – 2023 data, we also use CDFA projections for California's net income, and an income elasticity of 0.84. Okrent and Alston (2011) used the estimate of income elasticity for the demand for food consumed away from home.

Quantities of liquid whole, white, and yolk eggs and dried eggs are converted from pounds to dozens of egg equivalents for consistency. One pound of liquid eggs is approximately 9 liquid eggs; thus one pound of whole liquid eggs is equivalent to 9/12, or 0.75 dozen eggs (Rembrandt Foods). Egg whites account for 67% of liquid egg weight (AEB), and there are 14 egg whites per pound (Rembrandt Foods); therefore, one pound of liquid egg whites is equivalent to 0.78 dozen eggs (14*0.67/12). Egg yolks account for 33% of liquid egg weight (AEB), and there are 22 egg yolks per pound (Rembrandt Foods); therefore, one pound of liquid egg yolks is equivalent to 0.61 dozen eggs (22*0.33/12). One pound of dried eggs is equivalent to 3 dozen eggs (AEB). Total whole liquid egg equivalents are adjusted by the net liquid egg imports in California to determine the quantity affected by Proposition 12.

We use data from the National Health and Nutrition Examination Survey (USDA ARS) to adjust California per capita consumption relative to the rest of the United States; ultimately, we expect there to be offsetting demand effects from California's higher egg prices and larger proportion of ethnic groups that consume more eggs per capita. Therefore, we apply the national average egg consumption per capita to California, giving us 314 million dozen as our 2019 baseline for liquid egg consumption in California.

CDFA estimates based on internal data that 4.6 million dozen liquid egg equivalents were produced at California breaking plants in 2019. This is 1.5% of our total estimated quantity of liquid eggs consumed in California. We use this same 1.5% as the baseline for California production in other years. We estimate (as elsewhere) that approximately 80% of the liquid eggs produced in California are conventional, and the other 20% are cage-free. The 20% that are cage-free are not affected by Proposition 12 regulations.

California produces combination food products containing liquid eggs. Some of these products are consumed inside California, and others are consumed outside of California. People in California also consume combination food products containing liquid eggs. Some of these products are produced inside California and some of which are produced outside of California. For the purposes of our simulation, we assume that California produces combination food products containing liquid eggs in the same proportion that it consumes combination food products containing liquid eggs.

Using national egg usage data from a recent Urner Barry report (Urner Barry 2020), we estimate the quantity of egg use in California by sector (retail, food product manufacturing, and foodservice) and type (shell-eggs and liquid eggs). Specifically, among the total quantity consumed of liquid eggs (314 million dozen), our best estimates are 15 million dozen for the retail sector, 151 million dozen for the food product sector, and 148 million dozen for the food service sector.

Prices (P_f, P_r)

We use monthly United Egg Producers (UEP) certified wholesale prices for whole, white, and yolk liquid eggs and dried eggs for 2019 sourced from the USDA Egg Market News Reports (AMS 2). Months in which UEP certified prices are unavailable, non-certified prices are used instead. Certification adds no value to eggs—price differences for certified and non-certified eggs are based solely on availability.

If neither price is available for a given month, the price is estimated by multiplying the closest available monthly price by the percentage change in whole liquid eggs between the two months (prices for certified whole liquid eggs are available for all of 2019). Annual weighted average prices are then calculated for each liquid egg category, weighting by the monthly total production of the categories (AMS 2); prices are converted to dollars per dozen egg equivalents using the same conversion factors described in the *Consumption* sub-section. An overall annual weighted average price per dozen of liquid egg equivalents is calculated using the quantities of each category as weights.

Based on these data, we would expect the wholesale price for liquid eggs to be approximately $0.52 per dozen equivalents if there were no policy changes. We would expect the restaurant and bakery price for liquid eggs to be approximately $0.95, absent the policy change, assuming the same markup used for shell eggs (roughly 5/6 of the farm price). This price simply represents the egg portion of a product, e.g., baked goods, as liquid eggs are an ingredient and not a final product. Also note that this price is for conventional liquid eggs, not cage-free liquid eggs—we expect that few businesses at foodservice would use liquid eggs from cage-free eggs because of a substantially higher price of cage-free eggs relative to conventional eggs. To avoid uneeded complication we do not include cage-free liquid eggs in the formal model. Cage-free eggs have a farm-to-retail markup of approximately 200%. Owing to the nature of liquid egg use as an ingredient in the combination of food products or restaurant meals, we do not expect the markup to be similarly high.

Farm Cost Increase (κ)

Liquid eggs were not subject to the 116 sq. in. hen space requirement established in 2008 California Proposition 2. Liquid eggs must adhere to the increased space requirement of 144 sq. in. that began January 1, 2020. Liquid eggs must adhere to the cage-free housing requirement that will begin on January 1, 2022.

For 2020 and 2021, we assess a 21% increase in cost to go from national standard to 144 square inches. This estimate is based on Matthews and Sumner (2015), who estimate a 13% increase in cost to go from the national standard to 116 square inches, and our assessment of a 7% cost increase to go from 116 to 144 square inches. (1.13 x 1.07 = 1.21). For 2022 and 2023, we apply the additional cost increase from changing hen space from 144 square inches to cage-free, approximately 17%.

Farm-to-Restaurant Markup (ω)

Based on the farm and retail price data from the Egg Industry Center (Ibarburu 2019), we expect the farm-to-restaurant markup to be approximately $0.43 per dozen (or roughly 83% of the farm price) for liquid eggs with no cage-free requirements. There is debate as to whether the markup is additive or multiplicative. If it is additive, there would be no increase in the markup after

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assessing the cost increase from switching to cage-free; that is, it stays at $0.43. If the markup is multiplicative, we assume that the farm-to-restaurant price ratio stays constant—that is, the markup increases by 0.83 of the farm price increase. We assume that the farm-to-restaurant markup increase is equal to the midpoint of these two extremes—that is, the markup increases by 0.41 of the farm price increase.

Labelling Cost Increase (γ)

Retailers, food product manufacturers, and restaurants selling liquid eggs or food products containing liquid eggs may incur additional segregation and labeling costs as a result of Proposition 12. However, this cost is likely close to zero. For our simulations, we assume there is no increase in such costs for retailers under the Baseline. We include the parameter in the model for adjustment under the higher-cost regulations, increasing costs by 1%.

Demand Shift (β)

We incorporate a demand shift parameter in our model, but we set the parameter to zero in our simulations. In general, we do not expect the demand for eggs to increase as a result of the policy change.

Demand Elasticity (η)

When we refer to the elasticity of demand, we are specifically referring the restaurant (as opposed to the farm) elasticity of demand. In general, we expect demand for eggs to change very little in response to price changes. That is, we assume that the elasticity of demand for eggs is inelastic. As consumers adjust to the new market for eggs, they will become slightly more elastic over time. We set the parameter to -0.10 in 2020, -0.15 in 2021 and 2022, and -0.20 in 2023. These values are consistent with previous studies (Sumner et al. 2011). The demand elasticity for exported liquid eggs is extremely elastic as they compete with the world market. For exported liquid eggs, we change the demand elasticity to −20.

Estimates for 2020 are the first year in which the 144 square inch regulation takes effect—here buyers and sellers are less elastic because they have less time to prepare for the adjustment. Estimates for 2021 are the second year in which the 144 square inch regulation is in effect—here

the elasticity parameters are slightly more elastic as buyers and sellers have more time to adjust to regulations. Estimates for 2020 are the first year in which the cage-free regulation is in effect—here the elasticity parameters are the same as those used in 2021.

Supply Elasticity (ϵ)

As discussed previously, producers have had adequate time to adjust to proposed regulations; therefore, the elasticity is highly elastic, and we set it to infinity.

Economic Model for Market Equilibrium Displacement

The simulation model traces how the California market for liquid eggs adjusts to a new equilibrium following forthcoming hen housing restrictions. We characterize the market equilibrium using supply and demand equations of liquid eggs and market equilibrium conditions. We also characterize housing restrictions of Proposition 12 as an exogenous shock in the markets.

We consider a simple set of demand and supply equations in log-linear form for California standard eggs. Equation (A1.1) represents demand in California markets for California standard eggs,

$$(A1.1)\; dlnD = \eta dlnP_r + \beta,$$

where D is the quantity demanded, η is the price elasticity of demand, P_r is the retail price, and β is a parameter describing an exogenous shock in demand. Equation (A1.2) represents the supply of liquid eggs in California,

$$(A1.2)\; dlnS = \epsilon\big(dlnP_f - \kappa\big),$$

where S is the quantity supplied, ϵ is the price elasticity of supply, P_f is the price farms receive, and κ is the change in cost from increasing switching to cage-free in terms of the percentage of the farm price. In addition to these supply and demand equations, equation (A1. 3) represents the relationship between farm prices and restaurant prices,

$$(A1.3)\; dlnP_r = \omega dlnP_f + \gamma,$$

where ω is the farm-to-restaurant multiplicative margin, and γ is an additional segregation cost in terms of the percentage of the restaurant price.

The equilibrium solution to the model for the farm price of liquid eggs is solved using the market clearing condition:

$$(A1.4)\ dlnD = dlnS = dlnQ^*.$$

The term Q^* is the equilibrium quantity. The corresponding solution for the farm price is:

$$(A1.5)\ dlnP_f = \frac{\eta\gamma + \epsilon\kappa + \beta}{\epsilon - \omega\eta}.$$

The other solutions can be directly derived using the solution for the farm price. For example, the percent change in quantity of liquid eggs becomes:

$$(A1.6)\ dlnQ^* = \eta\left(\omega\frac{\eta\gamma + \epsilon\kappa + \beta}{\epsilon - \omega\eta} + \gamma\right) + \beta.$$

Simulation Results

In this section, we conduct simulations by the three sets of regulations: proposed regulations, higher-cost regulations, and lower-cost regulations. When comparing the simulation results across different regulatory alternatives, we note two points. First, as we discussed in the previous section, the exemption policy differs across the proposed, higher-cost, and lower-cost regulations, so the number of liquid eggs affected or "covered" differs in those three sets of regulations. Thus, the total quantities provided in Table A1.1 are not necessary to equal the number of liquid eggs covered under each set of regulations.

In each of the regulation-specific subsections that follow, we provide a table of relevant baseline quantities affected by the proposed regulations and elasticity parameters used in the simulations.

Proposed Regulations

Based on the assumptions described in the previous sections, we first estimate the effects of Proposition 12 under CDFA's proposed regulations.

We report the estimated affected annual quantity of liquid eggs in dozen equivalents in Table A1.3. Baseline quantities for 2020 through 2023 are based on national standard liquid egg requirements. We note that California produces very few liquid eggs; therefore, there is a small effect on California farmers. The effects on consumers are more considerable as consumers are affected through price changes.

Table A1.3. Baseline Quantities of Liquid Eggs Affected by Proposed Proposition 12 Regulations in California and Elasticities

	Unit	2020	2021	2022	2023
Quantity consumed affected, dozen equivalents					
Retail	Mil. dozen	13.7	13.4	13.5	13.7
Food Manufacturing	Mil. dozen	138.7	135.7	136.9	139.2
Foodservice	Mil. dozen	135.8	132.9	134.1	136.3
Total	Mil. dozen	288.2	281.9	284.5	289.3
Quantity produced in California affected, dozen equivalents					
Total	Mil. dozen	3.5	3.4	3.4	3.5
Elasticities					
Elasticity of Supply		∞	∞	∞	∞
Elasticity of Demand		-0.1	-0.15	-0.15	-0.20

Simulation results for 2020, the first year in which the 144 square inch regulation takes effect, are provided in Table A1.4; simulation results for 2021, the second year in which the 144 square inch regulation is in effect, are provided in Table A1.5; simulation results for 2022, the first year in which the cage-free regulation is in effect (and the main year whose economic impacts are required to be evaluated by this SRIA), are provided in Table A1.6; simulation results for 2023, the second year in which the cage-free regulation is in effect, are provided in Table A1.7.

The proposed regulations raise liquid egg prices (wholesale price and retail price) but reduce the quantity consumed of liquid eggs in California from 2020 to 2023, although the magnitudes of those changes differ across those years. Those changes in prices and quantities result in increases in consumer expenditure across those years.

Table A1.4. Impacts of Proposed Proposition 12 Liquid Egg Regulations in 2020

	Unit	Without regulations (national standard)	With regulations (144 square inches)	Change (level)	Change (%)
Quantity of liquid eggs consumed, dozen equivalents					
Retail	Mil. dozen	13.7	13.5	-0.2	-1.6%
Food Manufacturing	Mil. dozen	138.7	136.5	-2.3	-1.6%
Foodservice	Mil. dozen	135.8	133.6	-2.2	-1.6%
Total	Mil. dozen	288.2	283.6	-4.7	-1.6%
Quantity of liquid eggs produced in California, dozen equivalents					
Total	Mil. dozen	3.5	3.4	-0.1	-1.6%
Wholesale price of liquid eggs, $ per dozen equivalents					
Wholesale price	$/dozen	0.52	0.63	0.11	21.0%
Price of liquid egg component of finished products, $ per dozen equivalents					
Retail price	$/dozen	0.95	1.10	0.15	16.3%
Consumer expenditure on liquid egg components of finished products					
Expenditure	Million $	273.8	313.2	39.4	14.4%

Table A1.5. Impacts of Proposed Proposition 12 Liquid Egg Regulations in 2021

	Unit	Without regulations (national standard)	With regulations (144 square inches)	Change (level)	Change (%)
Quantity of liquid eggs consumed, dozen equivalents					
Retail	Mil. dozen	13.4	13.1	-0.3	-2.4%
Food Manufacturing	Mil. dozen	135.7	132.4	-3.3	-2.4%
Foodservice	Mil. dozen	132.9	129.6	-3.2	-2.4%
Total	Mil. dozen	281.9	275.1	-6.9	-2.4%
Quantity of liquid eggs produced in California, dozen equivalents					
Total	Mil. dozen	3.4	3.3	-0.1	-2.4%
Wholesale price of liquid eggs, $ per dozen equivalents					
Wholesale price	$/dozen	0.52	0.63	0.11	21.0%
Price of liquid egg component of finished products, $ per dozen equivalents					
Retail price	$/dozen	0.95	1.10	0.15	16.3%
Consumer expenditure on liquid egg components of finished products					
Expenditure	Million $	267.8	303.8	36.0	13.4%

Table A1.6. Impacts of Proposed Proposition 12 Liquid Egg Regulations in 2022

	Unit	Without regulations (national standard)	With regulations (cage-free)	Change (level)	Change (%)
Quantity of liquid eggs consumed, dozen equivalents					
Retail	Mil. dozen	13.5	12.9	-0.7	-4.8%
Food Manufacturing	Mil. dozen	136.9	130.3	-6.6	-4.8%
Foodservice	Mil. dozen	134.1	127.6	-6.5	-4.8%
Total	Mil. dozen	284.5	270.8	-13.7	-4.8%
Quantity of liquid eggs produced in California, dozen equivalents					
Total	Mil. dozen	3.4	3.2	-0.2	-4.8%
Wholesale price of liquid eggs, $ per dozen equivalents					
Wholesale price	$/dozen	0.52	0.74	0.22	41.6%
Price of liquid egg component of finished products, $ per dozen equivalents					
Retail price	$/dozen	0.95	1.26	0.31	32.2%
Consumer expenditure on liquid egg components of finished products					
Expenditure	Million $	270.3	340.1	69.8	25.8%

Table A1.7. Impacts of Proposed Proposition 12 Liquid Egg Regulations in 2023

	Unit	Without regulations (national standard)	With regulations (cage-free)	Change (level)	Change (%)
Quantity of liquid eggs consumed, dozen equivalents					
Retail	Mil. dozen	13.7	12.8	-0.9	-6.4%
Food Manufacturing	Mil. dozen	139.2	130.3	-9.0	-6.4%
Foodservice	Mil. dozen	136.3	127.5	-8.8	-6.4%
Total	Mil. dozen	289.3	270.7	-18.6	-6.4%
Quantity of liquid eggs produced in California, dozen equivalents					
Total	Mil. dozen	3.5	3.2	-0.2	-6.4%
Wholesale price of liquid eggs, $ per dozen equivalents					
Wholesale price	$/dozen	0.52	0.74	0.22	41.6%
Price of liquid egg component of finished products, $ per dozen equivalents					
Retail price	$/dozen	0.95	1.26	0.31	32.2%
Consumer expenditure on liquid egg components of finished products					
Expenditure	Million $	274.8	340.0	65.1	23.7%

Higher-Cost Regulations

We next estimate the effects of Proposition 12 under a set of higher-cost regulations. We report the estimated affected annual quantity of liquid eggs in dozen equivalents in Table A1.8. Baseline quantities for 2020 through 2023 are based on national standard liquid egg requirements.

Table A1.8. Baseline Quantities of Liquid Eggs Affected by Higher-Cost Proposition 12 Regulations in California and Elasticities

	Unit	2020	2021	2022	2023
Quantity affected, dozen equivalents					
Retail	Mil. dozen	13.7	13.4	13.5	13.7
Food Manufacturing	Mil. dozen	138.7	135.7	136.9	139.2
Foodservice	Mil. dozen	135.8	132.9	134.1	136.3
Total	Mil. dozen	288.2	281.9	284.5	289.3
Quantity produced in California affected, dozen equivalents					
Total	Mil. dozen	3.5	3.4	3.4	3.5
Elasticities					
Elasticity of Supply		∞	∞	∞	∞
Elasticity of Demand		-0.1	-0.15	-0.15	-0.20

Simulation results for 2020, the first year in which the 144 square inch regulation takes effect, are provided in Table A1.9; simulation results for 2021, the second year in which the 144 square inch regulation is in effect, are provided in Table A1.10; simulation results for 2022, the first year in which the cage-free regulation is in effect, are provided in Table A1.11; simulation results for 2023, the second year in which the cage-free regulation is in effect, are provided in Table A1.12.

The higher-cost regulations raise liquid egg prices (wholesale price and retail price) but reduce the quantity consumed of liquid eggs in California from 2020 to 2023. However, the magnitudes of those changes differ across those years. Changes in prices and quantities result in increases in consumer expenditure across those years.

Table A1.9. Impacts of Higher-Cost Proposition 12 Liquid Egg Regulations in 2020

	Unit	Without regulations (national standard)	With regulations (144 square inches)	Change (level)	Change (%)
Quantity of liquid eggs consumed, dozen equivalents					
Retail	Mil. dozen	13.7	13.4	-0.2	-1.7%
Food Manufacturing	Mil. dozen	138.7	136.3	-2.4	-1.7%
Foodservice	Mil. dozen	135.8	133.5	-2.3	-1.7%
Total	Mil. dozen	288.2	283.3	-5.0	-1.7%
Quantity of liquid eggs produced in California, dozen equivalents					
Total	Mil. dozen	3.5	3.4	-0.1	-1.7%
Wholesale price of liquid eggs, $ per dozen equivalents					
Wholesale price	$/dozen	0.52	0.63	0.11	21.0%
Price of liquid egg component of finished products, $ per dozen equivalents					
Retail price	$/dozen	0.95	1.11	0.16	17.3%
Consumer expenditure on liquid egg components of finished products					
Expenditure	Million $	273.8	315.6	41.8	15.2%

Table A1.10. Impacts of Higher-Cost Proposition 12 Liquid Egg Regulations in 2021

	Unit	Without regulations (national standard)	With regulations (144 square inches)	Change (level)	Change (%)
Quantity of liquid eggs consumed, dozen equivalents					
Retail	Mil. dozen	13.4	13.0	-0.3	-2.6%
Food Manufacturing	Mil. dozen	135.7	132.2	-3.5	-2.6%
Foodservice	Mil. dozen	132.9	129.4	-3.4	-2.6%
Total	Mil. dozen	281.9	274.6	-7.3	-2.6%
Quantity of liquid eggs produced in California, dozen equivalents					
Total	Mil. dozen	3.4	3.3	-0.1	-2.6%
Wholesale price of liquid eggs, $ per dozen equivalents					
Wholesale price	$/dozen	0.52	0.63	0.11	21.0%
Price of liquid egg component of finished products, $ per dozen equivalents					
Retail price	$/dozen	0.95	1.11	0.16	17.3%
Consumer expenditure on liquid egg components of finished products					
Expenditure	Million $	267.8	306.0	38.1	14.2%

Table A1.11. Impacts of Higher-Cost Proposition 12 Liquid Egg Regulations in 2022

	Unit	Without regulations (national standard)	With regulations (cage-free)	Change (level)	Change (%)
Quantity of liquid eggs consumed, dozen equivalents					
Retail	Mil. dozen	13.5	12.8	-0.7	-5.0%
Food Manufacturing	Mil. dozen	136.9	130.1	-6.8	-5.0%
Foodservice	Mil. dozen	134.1	127.4	-6.7	-5.0%
Total	Mil. dozen	284.5	270.4	-14.2	-5.0%
Quantity of liquid eggs produced in California, dozen equivalents					
Total	Mil. dozen	3.4	3.2	-0.2	-5.0%
Wholesale price of liquid eggs, $ per dozen equivalents					
Wholesale price	$/dozen	0.52	0.74	0.22	41.6%
Price of liquid egg component of finished products, $ per dozen equivalents					
Retail price	$/dozen	0.95	1.27	0.32	33.2%
Consumer expenditure on liquid egg components of finished products					
Expenditure	Million $	270.3	342.1	71.8	26.6%

Table A1.12. Impacts of Higher-Cost Proposition 12 Liquid Egg Regulations in 2023

	Unit	Without regulations (national standard)	With regulations (cage-free)	Change (level)	Change (%)
Quantity of liquid eggs consumed, dozen equivalents					
Retail	Mil. dozen	13.7	12.8	-0.9	-6.6%
Food Manufacturing	Mil. dozen	139.2	130.0	-9.3	-6.6%
Foodservice	Mil. dozen	136.3	127.3	-9.1	-6.6%
Total	Mil. dozen	289.3	270.1	-19.2	-6.6%
Quantity of liquid eggs produced in California, dozen equivalents					
Total	Mil. dozen	3.5	3.2	-0.2	-6.6%
Wholesale price of liquid eggs, $ per dozen equivalents					
Wholesale price	$/dozen	0.52	0.74	0.22	41.6%
Price of liquid egg component of finished products, $ per dozen equivalents					
Retail price	$/dozen	0.95	1.27	0.32	33.2%
Consumer expenditure on liquid egg components of finished products					
Expenditure	Million $	274.8	341.8	67.0	24.4%

Lower-Cost Regulations

We next estimate the effects of Proposition 12 under a set of lower-cost regulations. We report the estimated affected annual quantity of liquid eggs in dozen equivalents in Table A1.13. Baseline quantities for 2020 through 2023 are based on the national standard liquid egg requirements.

Table A1.13. Baseline Quantities of Liquid Eggs Affected by Proposed Proposition 12 Regulations in California and Elasticities

	Unit	2020	2021	2022	2023
Quantity affected, dozen equivalents					
Retail	Mil. dozen	12.4	12.2	12.3	12.5
Food Manufacturing	Mil. dozen	1.7			
Foodservice	Mil. dozen	1.6			
Total	Mil. dozen	15.7			
Quantity produced in California affected, dozen equivalents					
Total	Mil. dozen	3.5	3.4	3.4	3.5
Elasticities					
Elasticity of Supply		∞	∞	∞	∞
Elasticity of Demand		-0.1	-0.15	-0.15	-0.20

Simulation results for 2020, the first year in which the 144 square inch regulation takes effect, are provided in Table A1.14; simulation results for 2021, the second year in which the 144 square inch regulation is in effect, are provided in Table A1.15; simulation results for 2022, the first year in which the cage-free regulation is in effect, are provided in Table A1.16; simulation results for 2023, the second year in which the cage-free regulation is in effect, are provided in Table A1.17.

The lower-cost regulations raise liquid egg prices (wholesale price and retail price) but reduce the quantity consumed of liquid eggs in California from 2020 to 2023. However, the magnitudes of those changes differ across those years. Those changes in prices and quantities result in increases in consumer expenditure across those years.

Table A1.14. Impacts of Lower-Cost Proposition 12 Liquid Egg Regulations in 2020

	Unit	Without regulations (national standard)	With regulations (144 square inches)	Change (level)	Change (%)
Quantity of liquid eggs consumed, dozen equivalents					
Retail	Mil. dozen	12.4	12.2	-0.2	-1.6%
Food Manufacturing	Mil. dozen	1.7	1.6	0.0	-1.6%
Foodservice	Mil. dozen	1.6	1.6	0.0	-1.6%
Total	Mil. dozen	15.7	15.5	-0.3	-1.6%
Quantity of liquid eggs produced in California, dozen equivalents					
Total	Mil. dozen	3.5	3.4	-0.1	-1.6%
Wholesale price of liquid eggs, $ per dozen equivalents					
Wholesale price	$/dozen	0.52	0.63	0.11	21.0%
Price of liquid egg component of finished products, $ per dozen equivalents					
Retail price	$/dozen	0.95	1.11	0.16	16.2%
Consumer expenditure on liquid egg components of finished products					
Expenditure	Million $	15.0	17.1	2.1	14.3%

Table A1.15. Impacts of Lower-Cost Proposition 12 Liquid Egg Regulations in 2021

	Unit	Without regulations (national standard)	With regulations (144 square inches)	Change (level)	Change (%)
Quantity of liquid eggs consumed, dozen equivalents					
Retail	Mil. dozen	12.2	11.9	-0.3	-2.4%
Food Manufacturing	Mil. dozen	1.6	1.6	0.0	-2.4%
Foodservice	Mil. dozen	1.6	1.6	0.0	-2.4%
Total	Mil. dozen	15.4	15.0	-0.4	-2.4%
Quantity of liquid eggs produced in California, dozen equivalents					
Total	Mil. dozen	3.4	3.3	-0.1	-2.4%
Wholesale price of liquid eggs, $ per dozen equivalents					
Wholesale price	$/dozen	0.52	0.63	0.11	21.0%
Price of liquid egg component of finished products, $ per dozen equivalents					
Retail price	$/dozen	0.95	1.11	0.15	16.2%
Consumer expenditure on liquid egg components of finished products					
Expenditure	Million $	14.7	16.6	2.0	13.4%

Table A1.16. Impacts of Lower-Cost Proposition 12 Liquid Egg Regulations in 2022

	Unit	Without regulations (national standard)	With regulations (cage-free)	Change (level)	Change (%)
Quantity of liquid eggs consumed, dozen equivalents					
Retail	Mil. dozen	12.3	11.7	-0.6	-4.8%
Food Manufacturing	Mil. dozen	1.6	1.6	-0.1	-4.8%
Foodservice	Mil. dozen	1.6	1.5	-0.1	-4.8%
Total	Mil. dozen	15.5	14.8	-0.7	-4.8%
Quantity of liquid eggs produced in California, dozen equivalents					
Total	Mil. dozen	3.4	3.2	0.2	-4.8%
Wholesale price of liquid eggs, $ per dozen equivalents					
Wholesale price	$/dozen	0.52	0.74	0.22	41.6%
Price of liquid egg component of finished products, $ per dozen equivalents					
Retail price	$/dozen	0.95	1.26	0.31	32.1%
Consumer expenditure on liquid egg components of finished products					
Expenditure	Million $	14.8	18.6	3.8	25.8%

Table A1.17. Impacts of Lower-Cost Proposition 12 Liquid Egg Regulations in 2023

	Unit	Without regulations (national standard)	With regulations (cage-free)	Change (level)	Change (%)
Quantity of liquid eggs consumed, dozen equivalents					
Retail	Mil. dozen	12.5	11.7	-0.8	-6.4%
Food Manufacturing	Mil. dozen	1.7	1.6	-0.1	-6.4%
Foodservice	Mil. dozen	1.6	1.5	-0.1	-6.4%
Total	Mil. dozen	15.8	14.8	-1.0	-6.4%
Quantity of liquid eggs produced in California, dozen equivalents					
Total	Mil. dozen	3.5	3.2	-0.2	-6.4%
Wholesale price of liquid eggs, $ per dozen equivalents					
Wholesale price	$/dozen	0.52	0.74	0.22	41.6%
Price of liquid egg component of finished products, $ per dozen equivalents					
Retail price	$/dozen	0.95	1.26	0.31	32.1%
Consumer expenditure on liquid egg components of finished products					
Expenditure	Million $	15.0	18.6	3.6	23.6%

Effect of Proposition 12 Regulations on Exports

Some liquid eggs are exported through California ports. Liquid egg exports are exempt from Proposition 12 regulations in the proposed and lower-cost scenarios, but not in the higher-cost scenario. In 2019, approximately 11.3 million dozen egg equivalents of liquid eggs were exported through California, at an average value of $2.33 per dozen. We forecast baseline liquid egg exports through 2023 that would be affected by Proposition 12 regulations in the higher-cost scenario and report them in Table A1.18 along with relevant supply and demand elasticities. The demand elasticity for exported liquid eggs is extremely elastic as they compete with the world market. For exported liquid eggs, we change the demand elasticity to −20.

Table A1.18. Baseline Quantities of Liquid Egg Exports Affected by Higher-Cost Proposition 12 Regulations in California and Elasticities

	Unit	2020	2021	2022	2023
Quantity affected, dozen equivalents					
Exports	Mil. dozen	10.4	10.2	10.3	10.4
Export price per dozen liquid egg equivalents					
Price	$/dozen	2.33	2.33	2.33	2.33
Elasticities					
Elasticity of Supply		1.0	3.0	∞	∞
Elasticity of Demand		-20	-20	-20	-20

Note that requiring egg exports that pass through California to adhere to the Proposition 12 regulations results in liquid egg prices being prohibitively expensive. That is, exports through California ports would become zero. Producers could easily change to ports in other states to export liquid eggs. Therefore, the new value of exports through California ports for 2020–2023 would be $0.

Appendix 2. Data and Economic Modelling on the Proposition 12 Regulations for an Increase to 43 Square Feet of Confinement Space for Veal Calves Supplying the California Market

The market for veal in California has been distinct from the rest of the United States since 2008 when voters imposed new rules. Regulations established that calves raised for veal meat to be marketed in California must be confined in ways that allow the animals to lie down, stand up, fully extend their limbs, and turn around freely. Producers have complied with these standards by providing 16–20 square feet per calf, depending on the size of the calf. In 2018, by passing Proposition 12, voters changed the rules to establish a new minimum of 43 square feet per calf raised for veal. Notice that these minimums apply to veal consumed in California, no matter where the calf is housed, including in Canada for a significant share of California consumption.

We examine the economic impact of the proposed regulations by CDFA for implementing Proposition 12. Specifically, we analyze the economic effects of the minimum requirement on the usable floor space per calf. We note explicitly that this discussion relates to the law and regulations that apply to whole veal meat and not to other regulations that are being developed to deal with other regulations in Proposition 12. This report does not attempt to isolate the economic impacts of regulation separately from the legal mandate of Proposition 12.

To provide data and context for the economic analysis, we review the required change in regulation and review briefly the market situation and outlook for the market for whole veal meat in California. We provide background information about the quantity demanded and production of whole veal meat. We explain data and parameters that are used for a simulation model. We explain the simulation model that we develop for analyzing the economic effects of the proposed regulations. Finally, we report and discuss the simulation results.

Regulation and Industry Specifics

As of January 1, 2020, any business engaging in the sale of whole veal meat in California has been subject to a change in the definition of "confined in a cruel manner." According to regulations in California Proposition 12, no whole veal meat may come from "covered" veal

calves confined to a space of less than 43 square feet per calf. Proposition 12 specifically states, "an enclosure shall provide a minimum of 43 square feet of usable floor space per calf," for any veal calf defined by the proposed regulations, "that is, or is intended to be, slaughtered at more than 21 days of age or more than 150 pounds in liveweight…"

Veal calves are typically marketed up to 6 months of age and weigh 500 to 700 pounds. We understand that little, if any, veal meat in California comes from calves slaughtered at more than 21 days of age or more than 150 pounds in liveweight. Therefore, the new regulation would not directly affect production in California. The impact is on whole veal meat shipped into California, mostly from New Jersey, Pennsylvania, and Quebec. The affected whole veal meat primarily consists of prime cuts such as loin chops ribs, of which approximately 60% is sold at restaurants and 40% at retail.

Producers of veal must separate calves raised for veal to be sold in California from other calves. Calves designated for California veal market will be raised in housing that meets the 43 square foot requirement, whereas calves destined for other markets will not have this requirement.

Market for whole veal meat in California

We first determine the approximate quantity of whole veal meat to which the proposed regulations would apply to ensure consistency with the law beginning January 1, 2020. This quantity is based on estimates and projections using publicly available data.

The U.S. produced 63.2 million pounds of whole veal meat in 2019, of which California consumed about 12% (7.7 million pounds). Veal consumption in the United States is historically low but has changed little in recent years.

There are no data to indicate that certain ethnicities or groups of people that have a larger or smaller share of the population in California are more or less consume more veal than others. We, therefore, use the per capita volume of consumption is the same in California as in the rest of the United States (roughly 0.2 pounds per year).

According to industry representatives, roughly 60% of whole veal meat is purchased at restaurants, whereas the rest is primarily purchased at retail. Estimating expenditure on whole veal meat at retail is straightforward but determining expenditure at restaurants requires additional considerations. Whole veal meat only represents a portion of a meal—restaurant prices include costs of other ingredients and factors not present in whole veal meat purchased at retail. Based on listed menu prices from restaurants across California, as well as other studies that examine restaurant markups, we have determined that a producer-to-restaurant price markup ratio of 3:1 is appropriate.

The average price paid to producers in 2019 for veal cuts most commonly sold in California (rib and loin chops) was $7.00 per pound, and the average price paid to retailers (restaurants) by consumers was $12.44 ($21) per pound. Based on these values, we estimate 2019 producer revenue from veal sales in California to be $53.4 million and retail (restaurant) revenue to be $38.0 ($96.3) million. Prices and quantities have been stable for the past several years, and we would expect that to remain true if not for Proposition 12 and COVID-19. A summary of California whole veal meat quantities and prices is provided in Table A2.1.

Table A2.1. Value of California whole veal meat consumption, 2019

Total U.S. whole veal meat production (USDA NASS)	63.2 million pounds
California whole veal meat consumption at retail (USDA NASS)	3.1 million pounds
California whole veal meat consumption at restaurants (USDA NASS)	4.6 million pounds
Total California whole veal meat consumption (USDA NASS)	7.7 million pounds
Weighted average price of representative cuts (loins and rips) paid to producers (USDA AMS 1; PSU)	$7.00 per pound
Weighted average retail price of representative cuts (loins and rips) (USDA AMS 2; PSU)	$12.44 per pound
Average restaurant price of whole veal meat	$21 per pound
Total producer value of whole veal meat consumed in California	$53.5 million
Total expenditure on whole veal meat at retail in California	$38.0 million
Total expenditure on whole veal meat at restaurants in California	$96.3 million

In Table A2.2, we list the baseline prices and quantities of whole veal meat consumed in California for 2019 and projected through 2023 if there were no Proposition 12 regulations.

Table A2.2. Whole Veal Meat Quantities and Prices without Proposition 12 Regulations in California

	Unit	2019	2020	2021	2022	2023
Quantity consumed of whole veal meat in California, millions of pounds						
Retail	Mil. lbs.	3.1	4.1	3.4	3.1	2.8
Restaurants	Mil. lbs.	4.6	2.8	3.4	3.7	4.1
Total	Mil. lbs.	7.6	6.9	6.7	6.8	6.9
Retail and Restaurant prices of whole veal meat, $ per pound						
Retail Price	$/lb.	12.44	12.44	12.44	12.44	12.44
Restaurant Price	$/lb.	21.00	21.00	21.00	21.00	21.00

Data and Parameter Values

We provide the values and definitions for all parameters and market data (prices and quantities) used in the model in Table A2.3. Below we describe the parameters, the market data, and their sources in more detail. All parameter values are calibrated based on our expectations of California veal consumption in 2020.

Consumption (D)

The USDA National Agricultural Statistics Service (NASS) provides monthly and annual data on national veal meat production. U.S. veal meat production has been fairly stable since 2016, ranging from 74.4 to 75.8 million pounds in terms of weight after slaughter, or dressing weight (USDA NASS, 2020). Absent of the implementation of Proposition 12, we would not expect the production of veal meat to change substantially in 2020. We assume production and consumption of veal meat in the U.S. are roughly equivalent, and therefore total veal meat production in 2020 is expected to be approximately 75 million pounds. For our analysis, we include only meat from animals over 21 days of age or more than 150 pounds to obtain relevant veal production because proposed regulations only apply to this meat.

Table A2.3. Model Parameters and Market Data: Definitions, Value Specifications, and Descriptions

	Parameter definition	Value	Descriptions
D	Total consumption of whole veal meat in California, millions of pounds	7.7	See *Consumption*
D_{ret}	Whole veal meat purchased at retail in California, millions of pounds	3.1	See *Consumption*
D_{rest}	Whole veal meat consumed away from home in California, millions of pounds	4.6	See *Consumption*
P_ρ	Price paid to producers for whole veal meat, dollars per pound	$7	See *Prices*
P_{ret}	Retail price of whole veal meat, dollars per pound	$12.44	See *Prices*
P_{rest}	Restaurant price of whole veal meat, dollars per pound	$21	See *Prices*
μ_v	Whole veal meat as share of production cost for a restaurant meal	40%	See *Prices*
ω_{ret}	Producer-to-retail markup	80%	See *Markup*
ω_{rest}	Producer-to-restaurant markup	200%	See *Markup*
κ	Percent change in producer price from policy change	30%	See *Producer Cost Increase*
$\gamma_{ret}, \gamma_{rest}$	Percent change in retail and restaurant price from labelling and segregation	0.0	See *Segregation Cost Increase*
$\beta_{ret}, \beta_{rest}$	Demand shift for whole veal meat from policy change	0.0	See *Demand Shift*
η_{ret}	Demand elasticity of whole veal meat at retail	(–3.2, –1.4)	See *Demand Elasticity*
η_{meal}	Demand elasticity of restaurant meals containing whole veal meat	(–1.5, –1.0)	See *Demand Elasticity*
σ_{meal}	Elasticity of substitution between whole veal meat and other meal inputs	0.0	See *Demand Elasticity*
ϵ	Supply elasticity of whole veal meat	(5.0, Inf.)	See *Supply Elasticity*

We estimate whole veal meat production in 2020 to be 63.75 million pounds. To determine expected 2020 whole veal meat consumption in California, we multiply U.S. consumption by California's population share (12.1%), arriving at an estimated 7.7 million pounds.

The majority of veal consumption in California occurs at restaurants. It is necessary to separate the effects of Proposition 12 on retail and restaurant consumption; the two have distinct prices

and price elasticities. Approximately 60% (4.6 million pounds) of whole veal meat in California is consumed at restaurants, and the other 40% (3.1 million pounds) is purchased at retail.

Prices ($P_\rho, P_{ret}, P_{rest}, \mu_v$)

Whole veal meat is sold in a variety of cuts. A number of various cuts are imported in California, but the most typical are loins ribs. The average Free on Board (FOB) price per pound paid to producers was approximately $6 for loins and $8.75 for ribs (USDA AMS 1, 2020). Prices have been extremely stable for several years, and we expect them to remain the same in 2020, all else equal. Loins account for 16% of the meat that comes from a veal calf, whereas ribs account for 9% (PSU 2016). Therefore, the weighted average FOB price paid to producers for ribs and loins is $7 per pound.

The USDA Agricultural Marketing Service (AMS) also provides weekly data on retail prices. Although prices of all cuts are not available each week, and there is some degree of price variation, average retail prices are close to $11 per pound for chops and $15 per pound for ribs (USDA AMS 2, 2020). The weighted average of these prices is $12.43 per pound. Restaurant prices are more difficult to ascertain the price per pound, especially since whole veal meat is just one input of a meal, and the quantity of whole veal meat in a meal is typically not provided. We examined veal prices in various meals across a variety of restaurants in a few major cities in California. Assuming restaurants on average markup the price of a meal at a 3:1 ratio, we estimate that the whole veal meat accounts for 40% of the cost of a meal. For the purpose of estimating our model, we then assume that the restaurant price of the whole veal meat would also be 3 times the price paid to producers ($21).

Markup ($\omega_{ret}, \omega_{rest}$)

Based on producer price data (USDA AMS 1, 2020) and retail price data (USDA AMS 2, 2020), we expect the producer-to-retail markup to be approximately $5.60 (or 80% of the producer price).[1] In our simulations of the effect of the policy change, we consider three cases for the

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[1] Actual estimated markup based on producer and retail prices is $5.44, or 78%. However, we round the retail markup to 80% ($5.60) in our simulations, as we do not expect the markup to be exactly 77%, and we do not have the power in our data to estimate with such precision.

markup. In the first case, we assume that there is no increase in the markup; that is, it stays at $5.60. In the second case, we assume that the producer-to-retail price ratio stays constant—that is, the markup increases by 80% of the producer cost increase. In the third case, we assume that the producer-to-retail markup increase is equal to the midpoint of these two extremes—that is, the markup increases by 40% of the producer cost increase. As described in the *Prices* subsection, the producer-to-restaurant markup is approximately 200%. Once again, we consider the same three cases in response to the policy change—no increase in markup dollars (0% of producer cost increase), constant markup ratio (200% of producer cost increase), and the midpoint (100% of producer cost increase).

Producer Cost Increase (κ)

Proposition 12 will affect any person that engages in commercial sale of whole veal meat in California. Section 1321.1 of the forthcoming regulation states that "an enclosure shall provide a minimum of 43 square feet of usable floor space per calf." This is a 67% increase in space allotted per calf (AVA, 2019), and will result in roughly a 30% increase in production costs.

To obtain the producer cost increase estimate, we interviewed industry representatives and government regulators and collected data from USDA sources. We found no official public data on cost functions for veal. However, we put our best estimates of farm costs together with estimates of segregation costs from other industries. We use a cost of production increase of approximately 30% for veal that is sold in California as the base case. We also conduct stochastic simulations to put a confidence interval around our estimates.

At the time of our interviews in late 2019, industry representatives stated that no whole veal meat producers had pre-existing production process that would meet the standards set forth in California Proposition 12. Therefore, the regulation would increase production costs by roughly 30% for any producer wishing to meet California's new standards.

Segregation Cost Increase ($\gamma_{ret}, \gamma_{rest}$)

Retailers and restaurants may incur additional segregation and labeling costs as a result of Proposition 12. However, this cost is likely close to be small. For our simulations, we assume

there is no increase in such costs for either entity. We include the parameter in the model in case we determine that segregation and labeling cost increases are significantly greater than zero in future research.

Demand Shift ($\beta_{ret}, \beta_{rest}$)

We incorporate a demand shift parameter in our model, but we set the parameter to zero in our simulations. In general, we do not expect the demand for whole veal meat to increase as a result of the policy change. However, there may be substitution in demand between whole veal meat and other premium meats (such as steak) to consider in the future. For simplicity, we omit other meats from our model, and we assume the net of the substitution effects to be zero.

Demand Elasticity ($\eta_{ret}, \eta_{rest}, \sigma_{meal}$)

When we refer to the elasticity of demand, we are specifically referring to the retail and restaurant meal elasticity of demand. Whole veal meat is an extremely small subcategory of beef and meat in general, so there is no recent research that provides demand elasticities for the product. Instead, we look at the demand elasticities of other high-end beef products to inform the parameters for our analysis. Lusk and Tonsor (2016) estimate own-price elasticities of demand for steak ranging from -1.84 to -1.46; Nayga and Capps (1994) estimate the compensated own-price elasticity for veal to be -3.2.[2] Based on these estimates, we vary the own-price elasticity of demand for whole veal meat at retail between -1.4 and -3.2 in our simulations.

Research estimating the elasticity of demand for food away from home is sparse, and research that estimates the elasticity of demand for food away from home that includes veal is nonexistent. Lusk (2017) estimates the own-price elasticity of demand for food away from home to be -1.116; Okrent and Alston (2012) find that across their own and several other studies, the own-price elasticity of demand for food away from home ranges between -1.50 and -0.69 with a mean of -1.02. Based on the generally more elastic own-price elasticity of demand for veal and

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[2] Other estimates of veal or high-end beef cuts are available in Heien and Pompelli (1989), Capps (1989), and Wohlgenant (1989), but these studies are dated relatively to Lusk and Tonsor (2016) and Nayga and Capps (1994). Hence, we focus on the estimates provided by Lusk and Tonsor (2016) and Nayga and Capps (1994).

high-end beef we cited from other studies, we allow the own-price elasticity of demand for restaurant meals containing veal to range from –1.5 to –1.0.

As described below in Section II, whole veal meat is an input for a restaurant meal. We consider the own-price elasticity of demand for the entire meal, not just the whole veal meat input. The own-price elasticity of demand for whole veal meat at restaurants can be decomposed into an elasticity for the entire meal and an elasticity of substitution with other inputs. For simplicity, we assume that whole veal meat cannot be substituted for other inputs as it is the primary component of most meals that contain veal. Therefore, we set the elasticity of substitution to zero in our simulations.

Supply Elasticity (ϵ)

We assume that producers of whole veal meat to have an extremely high own-price elasticity of supply. Calves that are slaughtered for whole veal meat could potentially be raised to be full-grown cows slaughtered for beef.[3] Conversely, calves that are chosen to be raised and slaughtered as adults could instead be chosen to be slaughtered as calves for whole veal meat. Therefore, producers can adjust the quantity of whole veal meat they produce with relative ease. For this reasoning, we allow the own-price elasticity of supply for whole veal meat to range between 5.0 and infinity in our simulations.

Economic Model of the California Veal Industry

The data just presented are used in an economic model to assess implications for changes in prices and quantities, and therefore implications for revenues and expenditures.

We use an equilibrium displacement model, comprised of a set of demand and supply equations in log-linear form as well as market-clearing conditions, to determine the effects of the regulations on prices and quantities in California, as well as the effect on consumer and producer

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[3] Most calves that are slaughtered for whole veal meat are males—females are typically raised as dairy cows, but they could potentially be slaughtered for whole veal meat.

surpluses. We use our simulation model to project the impacts of the regulations under a range of cost shifts and market conditions.

We consider a simple set of demand and supply equations in log-linear form for whole veal meat in California. Equation (A2.1) represents demand in California markets for whole veal meat, equation (A2.2) represents demand in California for whole veal meat at retail, and equation (A2.3) represents demand in California for whole veal meat away from home (restaurants).

$$(A2.1)\ dlnD = \tau dlnD_{ret} + (1 - \tau)dlnD_{rest},$$
$$(A2.2)\ dlnD_{ret} = \eta_{ret}dlnP_{ret} + \eta_{ret,rest}dlnP_{rest} + \beta_{ret},$$
$$(A2.3)\ dlnD_{rest} = \eta_{rest}dlnP_{ret} + \eta_{rest,ret}dlnP_{rest} + \beta_{rest},$$

where the term D is the quantity demanded of whole veal meat at both retail and restaurants, the term D_{ret} is the quantity demanded of whole veal meat at retail, and the term D_{rest} is the quantity demanded of whole veal meat at restaurants. The term τ is the share of whole veal meat sold in California at retail, η_{ret} is the own-price elasticity of demand for whole veal meat at retail, $\eta_{ret,rest}$ the cross-price elasticity of demand for whole veal meat at retail and restaurants, and P_{ret} is the retail price of whole veal meat; η_{rest} is the own-price elasticity of demand for veal meat at restaurants, and P_{rest} is the restaurant price of whole veal meat; β_{ret} and β_{rest} are parameters describing an exogenous shock in demand. For simplicity, we assume that the cross-price elasticities between retail and restaurant whole veal meat are 0 moving forward. It is important to note that veal at restaurants is an input factor for an entire meal. We assume consumers have a measurable own-price elasticity of demand for their entire meal, from which the own-price elasticity of veal can be derived. Using Marshall's Rule, the own-price elasticity of demand for veal at restaurants can be decomposed into an output and substitution effect. That is,

$$(A2.4)\ \eta_{rest} = \mu_v\eta_{meal} - (1 - \mu_v)\sigma_{meal},$$

where μ_v is the share of whole veal meat in the total production cost of the restaurant meal, η_{meal} is the own-price elasticity of demand for a restaurant meal containing whole veal meat,

and σ_{meal} is the elasticity of substitution between whole veal meat and other inputs to the meal. We assume $\sigma_{meal} = 0$, that is, whole veal meat cannot be substituted for other inputs in a meal.

Equation (A2.5) represents the supply of whole veal meat in California,

$$(A2.5) \; dlnS = \epsilon\big(dlnP_\rho - \kappa\big),$$

where ϵ is the price elasticity of supply, P_ρ is the FOB price paid to producers, and κ is the change in cost from increasing enclosure space to 43 square feet in terms of the percentage of the price producers receive. In addition to these supply and demand equations, equations (A2.6) and (A2.7) represents the relationship between producer prices and retail prices,

$$(A2.6) \; dlnP_{ret} = \omega_{ret}dlnP_\rho + \gamma_{ret},$$
$$(A2.7) \; dlnP_{rest} = \omega_{rest}dlnP_\rho + \gamma_{rest}$$

where ω (ω_{rest}) is the producer-to-retailer (producer-to-restaurant) multiplicative margin, and γ_{ret} (γ_{rest}) is an additional segregation and labeling cost at retail (restaurant) in terms of the percentage of the retail (restaurant) price.

The equilibrium solution to the model for the producer price of whole veal meat is solved using the market clearing condition:

$$(A2.8) \; dlnD = dlnS = dlnQ^*.$$

The solution for the producer price is:

$$(A2.8) \; dlnP_\rho^* = \frac{\epsilon\kappa + \tau(\eta_{ret}\gamma_{ret} + \beta_{ret}) + (1 - \tau)(\eta_{rest}\gamma_{rest} + \beta_{rest})}{\epsilon - \omega\eta_{ret}\omega_{ret} - (1 - \tau)\mu_v\eta_{meal}\omega_{rest}}.$$

Other solutions can be directly derived using the solution for the producer price. For example, the equilibrium solution for percent change in the quantity of whole veal meat in California becomes:

$$(A2.9) \ dlnQ^* = \tau\left(\eta_{ret}\left(\omega_{ret}dlnP_\rho^* + \gamma_{ret}\right) + \beta_{ret}\right) + (1-\tau)(\eta_{rest}\left(\omega_{rest}dlnP_\rho^* + \gamma_{rest}\right) + \beta_{rest}).$$

Economic Impacts of Proposition 12 Veal Calf Space Regulations

In constructing our model, we consider increased production costs as well as segregation costs that affect market intermediaries. We allow for potential demand shifts resulting from consumer responses to the change in farm practices. We incorporate data on cost shares and expected cost changes provided to us from industry experts. We borrow supply and demand elasticity estimates from prior research to establish model parameters. Model simulations are based on current data for prices and quantities, and we project outcomes for 2020 and beyond.

The increase in the cost of production of whole veal meat of 30% ($2.10 per pound) affects retail and restaurant prices and thereby the quantity of whole veal meat demanded in California. In turn, that affects quantity produced of whole veal meat to meet California standards.

We use a retail demand elasticity (the percentage reduction in quantity demand for each percentage increase in price) of -2.3 and a restaurant meal demand elasticity of -1.25. A range of elasticities are used in other economic studies of veal and high-end meats—the values we use are close to the average. With these elasticities, a 10% increase in the retail price of whole veal meat would cause a 22.3% decline in quantity purchased at retail; likewise, a 10% increase in the restaurant price of a meal containing whole veal meat would cause a 12.5% decline in the quantity of such meals purchased at restaurants.

We use a supply elasticity of 10 for whole veal meat marketed in California. The supply elasticity implies that the marginal costs of supplying whole veal meat to the market fall by 1% if the quantity of whole veal meat produced for and delivered to the California market declines by 10%. The supply elasticity is highly elastic, as producers of whole veal meat may easily choose to raise the calves to adulthood and eventually slaughter them for beef.

We also apply an assumption about how retail and restaurant prices respond to producer price increases. Two forms of models of food cost markups are common. First, the percentage markup approach assumes that the retail price changes by the same percentage as the producer price change, thus a 30% increase in the delivered producer price would entail a 30% increase in the retail price. This approach is appropriate when per unit retailing costs rise in proportion to the product cost to the retailer. The second approach is that the producer price increase passes through to the retail price in dollars per unit. In that approach, a producer price increase of, say, $2.10 per pound would cause an increase in the retail price of $2.10 per pound, and the dollars of retail markup would not change. This approach is appropriate when retail costs do not necessarily rise when wholesale costs rise. That is, in the present case, the cost of retailing, labor, rents, etc. are not related directly to the producer costs of whole veal meat delivered to the retailer. Under this approach, the percentage change in retail price would be smaller than the percentage change in producer price. For the estimates presented here, we use an assumption between these two approaches. We assume the retail markup rises by an amount halfway between zero and the same percentage change as the producer price.

We use CDFA income per capita forecasts to adjust California veal consumption combined with an income elasticity of 1.0. This elasticity estimate is consistent with the decline in veal production thus far in 2020 (USDA NASS 2020). Furthermore, as restaurants close their doors, consumers have increased spending on meat at grocery and decreased spending away from home (Lusk 2020). Therefore, the typical split of veal consumption, 40% at retail and 60% at restaurants, is not realistic for the next few years. To account for this shift in spending, we change the retail-restaurant split of veal consumption to 60-40 in 2020, 50-50 in 2021, 45-55 in 2022, and 40-60 in 2023.

One other feature of the simulation is important to highlight. We assume that consumers do not respond to the new veal calf space regulation by buying more whole veal meat. That is, the new regulations do not cause the demand curve to shift out.

Proposed Regulations

Based on the assumptions described above, we first estimate the effects of Proposition 12 under CDFA's proposed regulations (as defined in section I). Simulation results for 2020 are provided in Table A2.4; simulation results for 2021 are provided in Table A2.5; simulation results for 2022 are provided in Table A2.6; simulation results for 2023 are provided in Table A2.7.

The proposed regulations raise whole veal meat prices (producer price, retail price, and restaurant price) but reduce the quantity consumed of whole veal meat in California from 2020 to 2023, although the magnitudes differ across those years. Those price and quantity changes result in decreases in consumer expenditure across those years.

Higher-Cost Regulations

We next estimate the effects of Proposition 12 under a set of higher-cost regulations. For this scenario we extend the proposed regulations to include an additional segregation cost, $\gamma = 0.01$, at restaurants/retail to allow products to be scannable by consumers to see a record of Proposition 12 animal confinement certification.

Although ground veal meat is not directly affected by the proposed regulations, extending the higher-cost regulations to apply to ground veal meat does not increase costs. Little, if any, ground veal comes from animals over 21 days or 150 pounds. Ground veal meat does not substitute for other chops produce from veal calves. Therefore, if Californians consume a proportional amount of ground veal to the amount produced by a veal calf, we do not expect there to be an increase in the cost of regulations.

Simulation results for 2020 are provided in Table A2.8; simulation results for 2021 are provided in Table A2.9; simulation results for 2022 are provided in Table A2.10; simulation results for 2023 are provided in Table A2.11.

Like the proposed regulations, the higher-cost regulations raise whole veal meat prices (producer price, retail price, and restaurant price) but reduce the quantity consumed of whole veal meat in California from 2020 to 2023. These price and quantity changes result in decreases in consumer

expenditure across those years. The higher-cost regulations reduce consumer expenditure more than the proposed regulations.

Lower-Cost Regulations

We briefly discuss the effects of Proposition 12 on whole veal meat under a set of lower-cost regulations. We modify the proposed regulations to only include whole veal meat that is sold at retail. Doing so excludes restaurant consumption, 60% of total whole veal meat consumption, from our model. We assume for simplicity that there is no substitution between whole veal meat consumption at home and at restaurants.

Simulation results for 2020 are provided in Table A2.12; simulation results for 2021 are provided in Table A2.13; simulation results for 2022 are provided in Table A2.14; simulation results for 2023 are provided in Table A2.15.

Like the proposed regulations, the lower-cost regulations raise whole veal meat prices (producer price, retail price, and restaurant price) but reduce quantity consumed of whole veal meat in California from 2020 to 2023. Those price and quantity changes result in decreases in consumer expenditure across those years.

Table A2.4. Impacts of Proposed Regulations in 2020 on Whole Veal Meat

	Unit	Without regulations	With regulations (43 sq. ft.)	Change (level)	Change (%)
Quantity consumed of whole veal meat					
Retail	Mil. lbs.	4.1	2.1	-2.0	-48.4%
Restaurant	Mil. lbs.	2.8	2.5	-0.2	-8.9%
Total	Mil. lbs.	6.9	4.7	-2.3	-32.6%
Whole veal meat prices					
Producer price	$/lb	7.00	8.87	1.87	26.7%
Retail price	$/lb	12.44	15.06	2.62	21.1%
Restaurant price	$/lb	21.00	24.74	3.74	17.8%
Producer revenue and retail, restaurant, and total consumer expenditure					
Producer revenue	Million $	48.3	41.3	-7.1	-14.6%
Retail expenditure	Million $	51.5	32.2	-19.4	-37.6%
Restaurant expenditure	Million $	58.0	62.2	4.2	7.3%
Consumer expenditure	Million $	109.5	94.4	-15.1	-13.8%

Table A2.5. Impacts of Proposed Regulations in 2021 on Whole Veal Meat

	Unit	Without regulations	With regulations (43 sq. ft.)	Change (level)	Change (%)
Quantity consumed of whole veal meat					
Retail	Mil. lbs.	3.4	1.7	-1.6	-49.1%
Restaurant	Mil. lbs.	3.4	3.1	-0.3	-9.0%
Total	Mil. lbs.	6.7	4.8	-2.0	-29.1%
Whole veal meat prices					
Producer price	$/lb	7.00	8.90	1.90	27.1%
Retail price	$/lb	12.44	15.10	2.66	21.3%
Restaurant price	$/lb	21.00	24.79	3.79	18.1%
Producer revenue and retail, restaurant, and total consumer expenditure					
Producer revenue	Million $	47.0	42.4	-4.6	-9.8%
Retail expenditure	Million $	41.8	25.8	-16.0	-38.2%
Restaurant expenditure	Million $	70.5	75.8	5.2	7.4%
Consumer expenditure	Million $	112.3	101.6	-10.8	-9.6%

Table A2.6. Impacts of Proposed Regulations in 2022 on Whole Veal Meat

	Unit	Without regulations	With regulations (43 sq. ft.)	Change (level)	Change (%)
Quantity consumed of whole veal meat					
Retail	Mil. lbs.	3.1	1.5	-1.5	-49.4%
Restaurant	Mil. lbs.	3.7	3.4	-0.3	-9.1%
Total	Mil. lbs.	6.8	4.9	-1.8	-27.2%
Whole veal meat prices					
Producer price	$/lb	7.00	8.91	1.91	27.3%
Retail price	$/lb	12.44	15.11	2.67	21.5%
Restaurant price	$/lb	21.00	24.82	3.82	18.2%
Producer revenue and retail, restaurant, and total consumer expenditure					
Producer revenue	Million $	47.5	44.0	-3.5	-7.4%
Retail expenditure	Million $	38.0	23.3	-14.6	-38.6%
Restaurant expenditure	Million $	78.4	84.2	5.8	7.4%
Consumer expenditure	Million $	116.4	107.5	-8.8	-7.6%

Table A2.7. Impacts of Proposed Regulations in 2023 on Whole Veal Meat

	Unit	Without regulations	With regulations (43 sq. ft.)	Change (level)	Change (%)
Quantity consumed of whole veal meat					
Retail	Mil. lbs.	2.8	1.4	-1.4	-49.8%
Restaurant	Mil. lbs.	4.1	3.8	-0.4	-9.2%
Total	Mil. lbs.	6.9	5.2	-1.8	-25.4%
Whole veal meat prices					
Producer price	$/lb	7.00	8.92	1.92	27.5%
Retail price	$/lb	12.44	15.13	2.69	21.6%
Restaurant price	$/lb	21.00	24.84	3.84	18.3%
Producer revenue and retail, restaurant, and total consumer expenditure					
Producer revenue	Million $	48.4	46.0	-2.4	-4.9%
Retail expenditure	Million $	34.4	21.0	-13.4	-38.9%
Restaurant expenditure	Million $	87.1	93.6	6.5	7.5%
Consumer expenditure	Million $	121.5	114.7	-6.9	-5.6%

Table A2.8. Impacts of Higher-Cost Regulations in 2020 on Whole Veal Meat

	Unit	Without regulations	With regulations (43 sq. ft.)	Change (level)	Change (%)
Quantity consumed of whole veal meat					
Retail	Mil. lbs.	4.1	2.1	-2.1	-50.5%
Restaurant	Mil. lbs.	2.8	2.5	-0.3	-9.4%
Total	Mil. lbs.	6.9	4.6	-2.4	-34.0%
Whole veal meat prices					
Producer price	$/lb	7.00	8.86	1.86	26.6%
Retail price	$/lb	12.44	15.17	2.73	22.0%
Restaurant price	$/lb	21.00	24.93	3.93	18.7%
Producer revenue and retail, restaurant, and total consumer expenditure					
Producer revenue	Million $	48.3	40.4	-8.0	-16.5%
Retail expenditure	Million $	51.5	31.1	-20.4	-39.6%
Restaurant expenditure	Million $	58.0	62.4	4.4	7.6%
Consumer expenditure	Million $	109.5	93.5	-16.0	-14.6%

Table A2.9. Impacts of Higher-Cost Regulations in 2021 on Whole Veal Meat

	Unit	Without regulations	With regulations (43 sq. ft.)	Change (level)	Change (%)
Quantity consumed of whole veal meat					
Retail	Mil. lbs.	3.4	1.6	-1.7	-51.2%
Restaurant	Mil. lbs.	3.4	3.0	-0.3	-9.5%
Total	Mil. lbs.	6.7	4.7	-2.0	-30.3%
Whole veal meat prices					
Producer price	$/lb	7.00	8.89	1.89	27.0%
Retail price	$/lb	12.44	15.21	2.77	22.2%
Restaurant price	$/lb	21.00	24.99	3.99	19.0%
Producer revenue and retail, restaurant, and total consumer expenditure					
Producer revenue	Million $	47.0	41.6	-5.4	-11.5%
Retail expenditure	Million $	41.8	24.9	-16.8	-40.3%
Restaurant expenditure	Million $	70.5	76.0	5.4	7.7%
Consumer expenditure	Million $	112.3	100.9	-11.4	-10.2%

Table A2.10. Impacts of Higher-Cost Regulations in 2022 on Whole Veal Meat

	Unit	Without regulations	With regulations (43 sq. ft.)	Change (level)	Change (%)
Quantity consumed of whole veal meat					
Retail	Mil. lbs.	3.1	1.5	-1.6	-51.5%
Restaurant	Mil. lbs.	3.7	3.4	-0.4	-9.6%
Total	Mil. lbs.	6.8	4.9	-1.9	-28.4%
Whole veal meat prices					
Producer price	$/lb	7.00	8.90	1.90	27.2%
Retail price	$/lb	12.44	15.23	2.79	22.4%
Restaurant price	$/lb	21.00	25.01	4.01	19.1%
Producer revenue and retail, restaurant, and total consumer expenditure					
Producer revenue	Million $	47.5	43.2	-4.3	-9.0%
Retail expenditure	Million $	38.0	22.5	-15.4	-40.6%
Restaurant expenditure	Million $	78.4	84.4	6.1	7.7%
Consumer expenditure	Million $	116.4	107.0	-9.4	-8.1%

Table A2.11. Impacts of Higher-Cost Regulations in 2023 on Whole Veal Meat

	Unit	Without regulations	With regulations (43 sq. ft.)	Change (level)	Change (%)
Quantity consumed of whole veal meat					
Retail	Mil. lbs.	2.8	1.3	-1.4	-51.9%
Restaurant	Mil. lbs.	4.1	3.7	-0.4	-9.6%
Total	Mil. lbs.	6.9	5.1	-1.8	-26.5%
Whole veal meat prices					
Producer price	$/lb	7.00	8.91	1.91	27.3%
Retail price	$/lb	12.44	15.24	2.80	22.5%
Restaurant price	$/lb	21.00	25.04	4.04	19.2%
Producer revenue and retail, restaurant, and total consumer expenditure					
Producer revenue	Million $	48.4	45.3	-3.1	-6.4%
Retail expenditure	Million $	34.4	20.3	-14.1	-41.0%
Restaurant expenditure	Million $	87.1	93.9	6.8	7.8%
Consumer expenditure	Million $	121.5	114.2	-7.3	-6.0%

Table A2.12. Impacts of Lower-Cost Regulations in 2020 on Whole Veal Meat

	Unit	Without regulations	With regulations (43 sq. ft.)	Change (level)	Change (%)
Quantity consumed of whole veal meat					
Retail	Mil. lbs.	4.1	2.2	-1.9	-46.0%
Whole veal meat prices					
Producer price	$/lb	7.00	8.78	1.78	25.4%
Retail price	$/lb	12.44	14.93	2.49	20.0%
Producer revenue and consumer expenditure					
Producer revenue	Million $	29.0	19.6	-9.4	-32.3%
Consumer expenditure	Million $	51.5	33.4	-18.1	-35.2%

Table A2.13. Impacts of Lower-Cost Regulations in 2021on Whole Veal Meat

	Unit	Without regulations	With regulations (43 sq. ft.)	Change (level)	Change (%)
Quantity consumed of whole veal meat					
Retail	Mil. lbs.	3.4	1.8	-1.5	-46.0%
Whole veal meat prices					
Producer price	$/lb	7.00	8.78	1.78	25.4%
Retail price	$/lb	12.44	14.93	2.49	20.0%
Producer revenue and consumer expenditure					
Producer revenue	Million $	23.5	15.9	-7.6	-32.3%
Consumer expenditure	Million $	41.8	27.1	-14.7	-35.2%

Table A2.14. Impacts of Lower-Cost Regulations in 2022 on Whole Veal Meat

	Unit	Without regulations	With regulations (43 sq. ft.)	Change (level)	Change (%)
Quantity consumed of whole veal meat					
Retail	Mil. lbs.	3.1	1.6	-1.4	-46.0%
Whole veal meat prices					
Producer price	$/lb	7.00	8.78	1.78	25.4%
Retail price	$/lb	12.44	14.93	2.49	20.0%
Producer revenue and consumer expenditure					
Producer revenue	Million $	21.4	14.5	-6.9	-32.3%
Consumer expenditure	Million $	38.0	24.6	-13.4	-35.2%

Table A2.15. Impacts of Lower-Cost Regulations in 2023 on Whole Veal Meat

	Unit	Without regulations	With regulations (43 sq. ft.)	Change (level)	Change (%)
Quantity consumed of whole veal meat					
Retail	Mil. lbs.	2.8	1.5	-1.3	-46.0%
Whole veal meat prices					
Producer price	$/lb	7.00	8.78	1.78	25.4%
Retail price	$/lb	12.44	14.93	2.49	20.0%
Producer revenue and consumer expenditure					
Producer revenue	Million $	19.4	13.1	-6.3	-32.3%
Consumer expenditure	Million $	34.4	22.3	-12.1	-35.2%

Appendix 3. Data and Economic Modelling on the Proposition 12 Regulation of New Hen Housing Requirements for Shell Eggs Supplying the California Market

California Proposition 12 was passed in November 2018. Among its provisions, Proposition 12 imposed minimum housing requirements for egg layers. California businesses are banned from engaging in the sale within California of covered egg products if those products are ones of egg-laying hens that were confined in a cruel manner.

CDFA proposed a set of regulations for implementing Proposition 12. In the proposed regulations based on statute, the requirement beginning in January 2022 is that all shell eggs can only come from hens kept in cage-free compliant spaces. This appendix analyzes the economic implications of this cage-free requirement for California businesses and consumers. To analyze the economic implications of the regulations, we use a carefully calibrated simulation model.

In this appendix, we first describe the regulations proposed by CDFA. Second, we present a baseline that describes the California shell egg market if there were no regulations. In the analysis, we use the baseline for comparison to the California market with the proposed regulations. Third, we explain the data and parameters used for developing the simulation model. Fourth, we describe the simulation model for analyzing the likely economic effects of the proposed regulations. Fifth, we report and discuss the simulation results.

Regulations

In this section, we describe the regulations of Proposition 12, proposed by CDFA. Besides the proposed package of regulations, CDFA considers two alternative packages of regulations for comparison with and evaluation of the proposed regulations: a package of lower-cost regulations and a package of higher-cost regulations. In this section, after we describe the proposed regulations, we compare those two alternative packages of regulations with the proposed regulations. We focus on the regulations that directly relate to the analysis of this appendix, and we do not provide the full description of regulations proposed by CDFA.

Proposed Regulations

Under the package of proposed regulations, no egg producer or egg handler shall knowingly sell or contract to sell within the state a shell egg for human consumption if it is the product of an egg-laying hen that was confined in an enclosure that fails to comply with certain standards. Specifically, "commencing January 1, 2022, an enclosure shall be a cage-free housing system."

Lower-Cost Regulations

The lower-cost regulations include only raw or pasteurized eggs in the shell, and include only shell eggs sold at the retail level. The lower-cost regulations exempt shell eggs sold in California intended for further processing, preparation, or manufacturing into a combination food product or prepared meal.

Higher-Cost Regulations

Under the higher-cost regulations, covered shell eggs are not exempted even when those products only move through California for sale in another state or country. Moreover, the higher-cost regulations require "consumer-facing labeling for all covered products or prepared foods containing a covered product allowing the end customer to scan a QR code and see record of Prop 12 animal confinement certification and traceability of product back to farm of origin."

Baselines: Quantities and Prices of Shell Eggs in California if There Were No Proposed Regulations

In this section, we use quantities and retail price data to describe the California shell egg market if there were no regulations proposed by CDFA. We use this counterfactual California market as a baseline in comparison to the California market with the proposed regulations. We discuss how we obtain baseline quantities and prices in the Data and Parameters section below.

In 2019, about 656 million dozen eggs were consumed in California. About 80% (or 525 million dozen) of in-shell consumption was from conventional eggs, and the remaining 20% (or 131 million dozen) was from cage-free eggs. We assess that the quantities would increase from 2019 to 2023, considering a mild increasing trend in per capita egg consumption and population

growth in California. We expect an additional increase in in-shell consumption in 2020 because of the effects of COVID-19. Because of COVID-19, many restaurants and other food service businesses have temporarily or permanently closed. Hence, more people buy shell eggs at groceries and consume those eggs at home, resulting in an increase in in-shell consumption in 2020. For more discussion, see *Data on Quantity Consumed in California* in the following section.

In 2019, the conventional egg retail price was $2.20 per dozen, and the cage-free egg retail price was $4.75 per dozen. We expect a price increase in conventional eggs in 2020 because of the interim expansion requirement on usable floor space for hens in egg production (144 square inches per hen). We expect that annual average retail prices would be stable through 2023, although retail prices would vary within each year. For more discussion, see *Prices* in the following section.

This appendix analyzes the effects of proposed regulations that will be implemented from 2022. We see the economic effects of the proposed regulations by 2022 and 2023. We use the 2022 and 2023 baseline quantities and prices to measure the economic effects of the proposed regulations. For discussion of economic effects, see the "Simulation Results" section below.

Table A3.1. Quantities and Retail Prices of Shell Eggs in California, 2019 - 2023

	Unit	2019	2020	2021	2022	2023
Quantity consumed of eggs in California						
Conventional	Mil. dozen	525	548	562	576	590
Cage-free	Mil. dozen	131	138	142	145	149
Total	Mil. dozen	656	686	704	721	739
Retail prices in California						
Conventional	$/dozen	2.20	2.32	2.32	2.32	2.32
Cage-free	$/dozen	4.75	4.75	4.75	4.75	4.75

Data and Parameters

In this section, we describe the data and parameters used in the simulation model. Before describing data and parameters, we explain how we use them in developing the simulation model (see *Calibration Method* below). We then categorize data and parameters into several groups and describe those groups one by one.

Calibration Method

To analyze the likely effects of proposed regulations, we consider two markets: (a) a market without the proposed regulations and (b) a market with the proposed regulations. The former is a reference market to evaluate outcomes (such as prices and quantities) of the market with the proposed regulations. We measure the likely effects by comparing outcomes between the two markets with and without the proposed regulations.

To project market outcomes without the proposed regulations, we use the most recent available data for quantities and prices. To consider income and population changes from 2019 to 2023, we use the California Department of Finance projections for income and population. We provide a detailed explanation of these data.

To simulate market outcomes without the proposed regulations, we consider the interim expansion requirement in the hen housing space before the cage-free requirement. On January 1, 2020, the space minimum for hens supplying eggs to California was increased from 116 to 144 square inches. But this change only applies until January 1, 2022, at which point hens must be in cage-free housing. To reflect the effects of the interim expansion requirement, we use the findings of Sumner et al. (2019). Sumner et al. (2019) developed a simulation model that projected a market equilibrium displacement for the interim expansion requirement. We use their market equilibrium displacement projections to obtain reference values for analysis in this appendix. For more discussion on the simulation model for the interim expansion requirement, see the *Reflection of the Effects of the Interim Expansion Requirement* section below.

To summarize, we project market outcomes without the proposed regulations in the following three steps. First, we collect the most recent egg industry data. Second, we consider changes in

income and population in California over 2019 to 2023. Third, we consider the effects of the interim expansion requirement. The rest of this section focuses on describing how data were obtained.

Data on Quantity Consumed in California

We estimate quantities consumed of conventional (caged) eggs and cage-free eggs in California as follows: we estimate total in-shell consumption of conventional eggs to be 721 million dozen in 2022 and 739 million dozen in 2023 if there were no proposed regulations. The value comes from the following formula. U.S. total egg disappearance is 8,019 million dozen in 2019, as reported by USDA ERS (USDA ERS, 2020a). U.S. total egg disappearance for liquid eggs is about 2.6 billion dozen in 2019 (see Appendix 1). Multiplying in-shell egg disappearance by the share of California population in the United States, estimated at 12.1%, in-shell egg consumption totals 727 million dozen. We assess an increasing trend in in-shell egg consumption (5% from 2019 to 2020, and 2% per year for other years). We also assess population growth in California (0.4% from 2019 to 2020 and 0.5% per year for other years). We also incorporate the effects of the interim expansion requirement implemented in 2020. Then, we obtain the quantities of all shell eggs without the proposed regulations. For research purposes, we need to decompose all shell egg quantity into conventional egg quantity and cage-free egg quantity. We estimate 20 percent of total in-shell egg consumption in California are cage-free eggs, with the remaining 80 percent of shell eggs consumed being standard produced eggs. Specifically, we estimate 145 million dozen eggs in 2022 and 149 million dozen eggs in 2023 are cage-free eggs, and 576 million dozen eggs in 2022 and 590 million dozen eggs in 2023 are conventional eggs.

For our egg consumption projections, we use statistics measuring the growth rates of shell egg consumption, the growth rates of California population, the share of in-shell consumption, and the share of cage-free eggs in total in-shell egg consumption. We obtain those statistics as follows. First, we assess the growth rates of shell egg consumption, considering historical U.S. average per capita consumption of eggs per year (USDA ERS, 2020) and the effects of COVID-19 in 2020. The U.S. average per capita disappearance of eggs has gradually risen for decades. During the period of COVID-19 lockdown in California (after March 15, 2020), people have been reported to consume eggs more frequently at home rather than away from home because

many restaurants and other food service businesses have temporarily or permanently closed in California. Considering these two factors, we assess a 5% increase in in-shell consumption from 2019 to 2020 and a 2% increase per year from 2021 to 2023. Second, we obtain the growth rates of the California population from population projections reported by Department of Finance in California (DoF, 2020). Third, we estimate the share of cage-free eggs in total in-shell egg consumption is 20% in California and 15% outside of California, based on our reviews of hen housing data from USDA AMS and discussions with egg industry members.

Data on Quantity Produced in California

We obtain our estimate of 366 million dozen eggs for California table-egg production as follows: according to the Egg Safety and Quality Management Program within the California Department of Food and Agriculture (CDFA), the egg-laying hen population in California was 15.41 million in 2019 (CDFA ESGM, 2019). Also, according to the CDFA 2017-2018 California Agricultural Statistics Review, the average number of eggs produced per layer is about 23.75 eggs per month (CDFA, 2018). Those two values imply that total annual egg production in California is about 366 million dozen.

Among table eggs produced in California, annually, about 4.6 million dozen are used for liquid eggs, according to CDFA. After considering the liquid egg use, about 361.4 million dozen are used for in-shell consumption in 2019.

For research purposes, we need to decompose the total shell egg quantity into conventional and cage-free eggs. Data from USDA and CDFA support the simplifying assumption that California produces cage-free eggs in the same proportion as California consumption (20%).

Based on the procedure described, we estimate that California will produce about 317 million dozen conventional eggs in 2022 and 325 million dozen in 2023. We estimate that California will produce 80 million dozen cage-free eggs in 2022 and 82 million dozen in 2023. Notice that these values reflect the market situation without implementation of proposed regulations.

In 2019 production was 361.4 million dozen and consumption was 656 million dozen. We obtain our market share estimates based on the 2019 data.

Prices

We assess the farm price for conventional eggs at $1.28 per dozen and the farm price for cage-free eggs at $1.55 per dozen in 2022 and 2023. We also assess the retail price for conventional eggs at $2.32 per dozen and the retail price for cage-free eggs at $4.75 per dozen. Those are average annual prices, and we expect them to remain stable through 2023.

To estimate farm prices, we use historical farm and retail data from the Egg Industry Center (Ibarburu, 2019) and wholesale prices from the USDA AMS (AMS 3). The retail prices are our best estimates after discussions with industry people. We also reflect the likely effects of the interim expansion requirement (from 116 to 144 square inches of usable floor space per hen).

Table A3.2. Assessed Quantities and Prices in the California Market in 2022 and 2023 if Proposed Regulations Were Not Implemented

	Unit	2022	2023
Quantity consumed of shell eggs in California			
Conventional	Mil. dozen	576	590
Cage-free	Mil. dozen	145	149
Total	Mil. dozen	721	739
Quantity produced of shell eggs in California			
Conventional	Mil. dozen	317	325
Cage-free	Mil. dozen	80	82
Total	Mil. dozen	397	407
Farm prices in California			
Conventional	$/dozen	1.28	1.28
Cage-free	$/dozen	1.55	1.55
Retail prices in California			
Conventional	$/dozen	2.32	2.32
Cage-free	$/dozen	4.75	4.75

Note: For detailed calculations, interpretation, and source, see the subsections about quantities and prices in the text.

Farm-to-Retail Markup

Differencing the farm and retail prices described above, we assess the farm-to-retail markup of conventional eggs at $1.04 per dozen and that of cage-free eggs at $3.20 per dozen eggs.

When we discuss simulation results below, we consider several cases when the farm-to-retail markup of cage-free eggs falls after the proposed regulations (the cage-free housing requirement) are implemented. Specifically, we consider three cases: no change, a 10% decrease ($0.32 per dozen), and a 20% decrease ($0.64 per dozen). We expect that the retail cost for cage-free eggs might decrease based on the following reasoning: first, retailers would avoid additional costs caused by labeling and segregating cage-free eggs separately from conventional eggs. Second, shelf spacing costs for cage-free eggs may decrease when only cage-free eggs are available. Retailers often allocate more shelf space per unit quantity for cage-free eggs than conventional eggs. Cage-free eggs are typically packaged in quantities of 6 or 12 eggs, while conventional eggs are often packaged in quantities of 18 or more eggs. When cage-free eggs become a new standard type of eggs, cage-free eggs would be packaged in larger quantities, resulting in a decrease in shelf spacing costs per unit quantity of eggs.

Demand Elasticities

We use own- and cross-price elasticities of demand for conventional eggs and cage-free eggs in our simulation model. When the proposed regulations are implemented, many consumers who used to buy conventional eggs must switch to cage-free eggs and pay a higher price. In response to a higher price of eggs, some consumers would replace egg consumption with consumption of other meat products. Such behavioral changes among consumers who face a price change by the proposed regulations are reflected in the model through own- and cross-price elasticities of demand for conventional eggs and cage-free eggs. For more discussion, see the modeling section below.

We assess adjust elasticities in 2022 and 2023 to reflect that consumers would not be able to adjust fully to a price change by the proposed regulations in the first year of implementation

(2022), but would be able to adjust to a price change in the second year of implementation (2023).

For demand elasticities in 2022, we assess the own-price elasticity of demand for conventional eggs at -0.2 and for cage-free eggs at -0.29. We use 0.1 for the cross-price elasticity of demand for conventional eggs in response to cage-free egg price changes. We use 0.19 for the corresponding cross-price elasticity of demand for cage-free eggs in response to conventional egg price changes.

For demand elasticities in 2023, our model reflects that consumers have more opportunities to adjust to a price change by the proposed regulations. Specifically, we assess the own-price elasticity of demand for conventional eggs at -0.3 and for cage-free eggs at -0.39. We use 0.1 for the cross-price elasticity of demand for conventional eggs in response to cage-free egg price changes. We use 0.19 for the corresponding cross-price elasticity of demand for cage-free eggs in response to conventional egg price changes.

To obtain estimates of demand elasticities, we begin with the own-price elasticity of demand for all eggs from Sumner et al. (2011), who reviewed existing estimates and suggested an own-price elasticity of demand for all eggs of -0.2. Second, we assess the value of -0.3 for the own-price elasticity of demand for conventional eggs based on our review of the relevant literature. In the evaluation, we also consider that the demand for conventional eggs and cage-free eggs would be more elastic than the demand for all eggs as an aggregate category because consumers can substitute between the two types of eggs in response to a relative price change. Third, given elasticity estimates of all eggs and conventional eggs, we obtain other own- and cross-price elasticities of demand, implied by the relationship between individual product demands and aggregate demand. The relationship is based on a weakly separable preference assumption, which comes from consumer theory in economics.

The simulation model also reflects a change in egg demand when cage-free becomes the new standard for eggs. When cage-free eggs become the new standard egg category, consumers must pay a higher price for egg consumption than before the proposed regulations. In response to such

a high egg price, consumers would substitute other meat products (beef, pork, and chicken) for eggs more frequently. Hence, we expect that demand for eggs would become more elastic when cage-free becomes the new standard eggs. Specifically, for egg category demand, we use an own-price elasticity of demand of -0.2 in 2022 and -0.3 in 2023. We allow consumers to have more opportunities to adjust to the proposed regulations in 2023 than in 2022.

Supply Elasticities

We expect that supply elasticities for conventional and cage-free eggs would be highly elastic, based on the following reasons. First, producers have adequate time to adjust to the proposed regulations. Second, in egg production, most costs are feed, pullets, and labor (Matthews and Sumner, 2015), and farms can adjust the quantities of those inputs from the well-established markets in response to the proposed regulations. Third, California accounts for a minor proportion of the U.S. market, which implies that the supply-side of the U.S. market could flexibly adjust to the proposed regulations in California. Based on the reasoning above, we expect that an infinitely elastic supply to the California market would be a good approximation for both conventional and cage-free eggs.

Reflection of the Effects of the Interim Expansion (144-square-inch) Requirement

As mentioned at the beginning of this section, to complete the calibration of the model that describes the market without the proposed regulations, we consider the interim expansion requirement in hen housing space.

To reflect the effects of the interim expansion requirement, we use the findings of Sumner et al. (2019). Sumner et al. (2019) developed a simulation model that projected an equilibrium displacement of the California shell egg market for the interim expansion requirement. The simulation results indicate a 6.8% increase in farm price, a 5.4% increase in the retail price, and a 1% decrease in the quantity of conventional eggs. These changes in prices and quantities result in a 4.1% increase in retailer revenue and consumer expenditure. For a more detailed discussion about the simulation model and results, see Sumner et al. (2019).

We use simulation results of the interim expansion requirement to calibrate market outcomes that reflect the California shell egg market with the interim expansion requirement but without the cage-free housing requirement. The calibrated market outcomes for quantities and prices are reported in Table A3.2.

Table A3.3. Parameters: Definitions and Value Specifications

Definition	Year	Value
Farm-to-retail markup of conventional eggs		$1.04/dozen
Farm-to-retail markup of cage-free eggs		$3.20/dozen
Own-price elasticity of demand for conventional eggs	2022	-0.2
Own-price elasticity of demand for conventional eggs	2023	-0.3
Cross-price elasticity of demand for conventional eggs in response to cage-free eggs price changes	2022	0.1
Cross-price elasticity of demand for conventional eggs in response to cage-free eggs price changes	2023	0.1
Own-price elasticity of demand for cage-free eggs	2022	-0.29
Own-price elasticity of demand for cage-free eggs	2023	-0.39
Cross-price elasticity of demand for cage-free eggs in response to conventional egg price changes	2022	0.19
Cross-price elasticity of demand for cage-free eggs in response to conventional egg price changes	2023	0.19
Own-price elasticity of demand for cage-free eggs when only cage-free eggs are available	2022	-0.2
Own-price elasticity of demand for cage-free eggs when only cage-free eggs are available	2023	-0.3
Supply elasticity to the California market of conventional eggs		∞
Supply elasticity to the California market of cage-free eggs		∞

Note: For detailed calculations, interpretation, and source, see the subsections about farm-to-retail markup, demand elasticities, and supply elasticities in the text.

Simple Model for Analyzing the Likely Effects of Proposed Regulations on the California Shell Egg Market

The simulation model traces how the California market for shell eggs adjusts to a new market equilibrium following the proposed regulations. Beginning January 1, 2022, the proposed regulations, and the Prop 12 statutes, require California farms to raise egg-laying hens in cage-

free housing, as well as out-of-state farms when those farms' eggs are sold in California. Moreover, the regulations require other agents in the supply chain of shell eggs not to engage in the sale of shell eggs within California if those eggs come from farms that do not comply with the housing restrictions.

The option of purchasing of conventional eggs will reduce to zero after December 31, 2021. Although many California consumers would make the switch to buying cage-free eggs, we expect that California retailers would not pay a significantly higher price for cage-free eggs, considering that California accounts for only a small proportion of total U.S. egg sales. That is, the retail cage-free egg price (P_r^{CF*}) would be the farm price (P_f^{CF*}) plus per-unit retailing cost (c_r^{CF}):

$$(A3.1) \ P_r^{CF*} = P_f^{CF*} + c_r^{CF}.$$

The superscript *CF* denotes cage-free eggs. The subscript *r* denotes retail, and *f* denotes farms. We put an asterisk on farm price to emphasize the flexible supply response to price changes, described above. Similarly, we put an asterisk on retail price to underline that the retail price changes mainly by a retailing cost change rather than a farm price change.

Retailing costs include labeling, stocking, and displaying cage-free eggs. We expect retailing costs for cage-free eggs might decrease when the proposed regulations are implemented, based on the following reasoning: first, retailers would avoid additional costs caused by labeling and segregating cage-free eggs separately from conventional eggs. Second, shelf spacing costs for cage-free eggs may decrease when only cage-free eggs are available. Retailers often allocate more shelf space per unit quantity for cage-free eggs than conventional eggs. Mostly, cage-free eggs are packaged in quantities of 6 or 12 eggs, while conventional eggs are often packaged in quantities of 18 eggs or more. When cage-free eggs become the new standard type of eggs, cage-free eggs would have a larger package size, resulting in a decrease in shelf spacing costs per unit quantity of eggs. Before the proposed regulations are implemented, it is uncertain how much the retailing costs would change, so we consider several scenarios in terms of the retailing cost changes by the proposed regulations in the Simulation Results section, below.

Equation (A3.2) represents demand in California markets for conventional eggs,

$$(A3.2) \begin{cases} d \ln Q_d^C = \eta^C \cdot d \ln P_r^C + \eta^{C,CF} \cdot d \ln P_r^{CF} & \text{if } P_r^C < P_r^{CF}, \\ \qquad\qquad Q_d^C = 0 & \text{if } P_r^C \geq P_r^{CF}. \end{cases}$$

The superscript C denotes conventional eggs, and CF denotes cage-free eggs. The subscript d denotes a demand relationship, and r denotes retail. The variable Q is quantity, and P is price. The coefficient η^C reflects the own-price elasticity of demand for conventional eggs. The coefficient $\eta^{C,CF}$ reflects the cross-price elasticity of demand for conventional eggs in response to a price change of cage-free eggs. For the sake of simplicity, we assume that demand elasticities are stable within a reasonable price range. However, the demand for conventional eggs reduces to zero if the retail price of conventional eggs equals or is higher than the retail price of cage-free eggs. That is, we assume that California consumers would prefer cage-free eggs to conventional eggs, given the same prices.

Equation (A3.3) represents demand in California markets for cage-free eggs,

$$(A3.3) \begin{cases} d \ln Q_d^{CF} = \eta^{CF,0} \cdot d \ln P_r^{CF} + \eta^{CF,C} \cdot d \ln P_r^C & \text{if } P_r^C < P_r^{CF} \\ \qquad Q_d^{CF,1} = Q_d^{CF,type1} + Q_d^{CF,type2} & \text{if } P_r^C = P_r^{CF} \\ \qquad d \ln Q_d^{CF} = \eta^{CF,1} \cdot d \ln P_r^{CF} & \text{if } P_r^C > P_r^{CF} \end{cases}$$

The notation is consistent with the previous equations. The coefficient $\eta^{CF,0}$ reflects the own-price elasticity of demand for cage-free eggs when both conventional eggs and cage-free eggs are available. The coefficient $\eta^{CF,C}$ is the cross-price elasticity of demand for cage-free eggs in response to conventional egg price changes. The coefficient $\eta^{CF,1}$ reflects the own-price elasticity of demand for cage-free eggs when only cage-free eggs are available owing to the proposed regulations based on Prop 12 statute.

The first relation in (A3.3) reflects cage-free egg demand without the proposed regulations. However, the third relation reflects cage-free egg demand when only cage-free eggs are available

at retail owing to the proposed regulations. For the sake of simplicity, we assume that demand elasticities are robust within a reasonable price range.

The second relation in (A3.3) reflects that consumers who used to buy conventional eggs begin buying cage-free eggs when the proposed regulations are implemented. The term $Q_d^{CF,type1}$ is the quantity demanded of cage-free eggs by consumers who would buy conventional eggs if the retail price of conventional eggs were lower than that of cage-free eggs. The quantity is determined by the first relation in (A3.3) when the two types of eggs become priced identically, given the assumption that consumers prefer cage-free eggs to conventional eggs at the same prices. The term $Q_d^{CF,type2}$ is the quantity demanded of cage-free eggs, determined by the first relation in (A3.3).

Combining the relations above, we can determine the market equilibrium prices and quantities when the proposed regulations are implemented. As we discussed (A3.1) above, considering that California accounts for a small proportion of the U.S. egg sales, farm price and added retailing costs determine the market equilibrium prices and, therefore, quantities. Comparing the market equilibrium outcomes without the proposed regulations, we can measure the effects of the proposed regulations on the market prices and quantities. Given the differences in market prices and quantities, we can measure changes in revenue and expenditure.

Simulation Results

In this section, we simulate the likely effects of the regulations proposed by CDFA.

For the analysis in this appendix, we look at the impacts of the regulations for two specific 12-month periods: January to December for calendar years 2022 and 2023. In response to the proposed regulations, producers and consumers would behave differently in 2022 and 2023. In 2022, the first year of implementation, producers would have fewer opportunities to adjust fully to new hen housing regulations. Similarly, one year would not be long enough for consumers to adjust fully to the new egg market in which they must buy cage-free eggs and pay a substantially higher price for egg consumption. However, in 2023, the second year of implementation, producers, and consumers would have more opportunities to adjust to the proposed regulations.

To consider potential differences in behaviors of producers and consumers, we perform separate simulations for 2022 and 2023.

Besides the proposed package of regulations, CDFA considers two additional packages of regulations: a package of lower-cost regulations and a package of higher-cost regulations. We simulate the effects of other packages after we discuss the proposed package of regulations.

Proposed Regulations

Under the proposed regulations, and Prop 12 statute, no egg producer or egg handler shall knowingly sell or contract to sell within the state a shell egg or liquid egg for human consumption if it is the product of an egg-laying hen that was confined in an enclosure that fails to comply with certain standards. Specifically, "commencing January 1, 2022, an enclosure shall be a cage-free housing system." Hence, the economic effects of proposed regulations come mainly from producers being unable to supply conventional eggs to the California market, and consumers being unable to buy conventional eggs at retail.

Table A3.4 reports the likely effects of the proposed regulations in 2022. From 2022, the quantity consumed and quantity produced of conventional eggs become zero in California. Many consumers who used to buy conventional eggs now buy cage-free eggs. However, some consumers who used to buy conventional eggs do not buy cage-free eggs because of a much higher retail price of cage-free eggs, resulting in about a 13% decrease in the total quantity consumed of all eggs. More California farms begin producing cage-free eggs, but the total quantity of eggs produced falls by about 13% because conventional egg production is not allowed. These changes in quantities and prices result in an estimated 1.3% (or $7 million) increase in farm revenue, a 1.3% (or $12 million) increase in retailer expenditure, and a 47.4% (or $960 million) increase in consumer expenditure in California.

Table A3.5 reports the likely effects of the proposed regulations in 2023. The proposed regulations require that shell eggs used in food manufacturing or restaurants must be Prop 12 compliant. As in 2022, conventional eggs are not available at retail and food service in California in 2023. However, compared to 2022 (13% decrease in the quantity consumed of all eggs),

consumers have more opportunities to adjust to a high price increase owing to the proposed regulations, resulting in a 21% decrease in the total quantity consumed of all eggs. The total quantity of eggs produced falls by about 21%. These changes in quantities and prices result in an 8.4% (or $46 million) decrease in farm revenue, an 8.4% (or $83 million) decrease in retailer expenditure, and a 33.2% (or $691 million) increase in consumer expenditure in California. Farm revenue and retailer expenditure fall despite higher farm and retail prices for eggs because consumers substantially reduce egg consumption in response to such a high price increase.

In the modeling section, we discuss that the farm-to-retail markup of cage-free eggs may fall when the proposed regulations are implemented. Retailers potentially reduce labeling, stocking, and displaying costs for cage-free eggs because conventional eggs are not available. However, it is uncertain how much the farm-to-retail markup would fall, so we consider several scenarios. The farm-to-retail markup is $3.20 per dozen, as we saw in Table A3.3. Now we allow changes in the farm-to-retail markup to be either -10% (-$0.32 per dozen) or -20% (-$0.64 per dozen). When determining the change in quantities, prices, revenue, and expenditure, we use the same estimates for other parameters provided above (Table A3.3).

Tables A3.6 and A3.7 report the simulation results when the farm-to-retail markup falls by 10% owing to the proposed regulations. Table A3.6 is for 2022, and Table A3.7 is for 2023. In comparison with the case of no change in absolute markup (Table A3.4), the changes in directions for quantities and prices are the same, but relatively more cage-free eggs are produced and consumed.

Tables A3.8 and A3.9 report the simulation results when the farm-to-retail markup falls by 20% owing to the proposed regulations. Table A3.8 is for 2022, and Table A3.9 is for 2023. The results are similar to the cases of a 10% decrease in markup. However, consumers face a much lower cage-free egg price.

Lower-Cost Regulations
The lower-cost regulations differ in the exemption policy. That is, while the proposed regulations include shell eggs used in food manufacturing or restaurants, the lower-cost regulations exempt

shell eggs sold in California intended for further processing, preparation, or manufacturing into a combination food product or prepared meal or sold at a restaurant. For simplicity, we assume no demand substitution between consumption at home and consumption away from home, which results in a robust egg quantity demanded at food service in response to price changes at retail.

To reflect the change in the exemption policy, we need data on the share of food service in quantity of shell eggs consumed. We obtain the share of food service in shell egg consumption of 10.5% from Urner Barry (2020).

Table A3.10 reports the 2022 simulation results under the lower-cost regulations. Notice that the quantity consumed and the quantity produced of conventional eggs do not reduce to zero in California because conventional eggs are sold in food service. However, the quantity consumed of conventional eggs falls by about 89.5% because conventional eggs are not available at retail. The quantity produced of conventional eggs falls by about 89.5%, but the quantity produced of cage-free eggs rises by about three times. These changes in quantities and prices result in a 1.1% (or about $6 million) increase in farm expenditure, a 1.1% (or about $11 million) increase in retailer expenditure, and a 42.4% (or about $859 million) increase in consumer expenditure in California.

Table A3.11 reports the 2023 simulation results under the lower-cost regulations. As in 2022, conventional eggs are available at food service in 2023. Compared to 2022, consumers have more opportunities to adjust to a high price increase owing to the regulations, resulting in a 19% decrease in the total quantity consumed of eggs. The total quantity of eggs produced falls by about 19%. These changes in quantities and prices result in a 7.6% (or $41 million) decrease in farm revenue, a 7.6% (or $75 million) decrease in retailer expenditure, and a 29.8% (or $618 million) increase in consumer expenditure in California. Farm revenue and retailer expenditure fall despite the higher farm and retail prices for eggs because consumers substantially reduce egg consumption in response to such a high price increase.

As in the previous subsection (*Proposed Regulations*), we provide additional simulation results when the farm-to-retail markup falls with the lower-cost regulations.

Tables A3.12 and A3.13 report the simulation results when the farm-to-retail markup falls by 10% ($0.32 per dozen) owing to the lower-cost regulations. Table A3.12 is for 2022, and Table A3.13 is for 2023. The changes in directions for quantities and prices are the same as the case of no change in absolute farm-to-retail markup, but more cage-free eggs are produced and consumed.

Tables A3.14 and A3.15 report the simulation results when the farm-to-retail markup falls by 20% ($0.64 per dozen) owing to the lower-cost regulations. Table A3.14 is for 2022, and Table A3.15 is for 2023. The results are similar to the cases of a 10% decrease in markup. However, consumers face a much lower cage-free egg price.

Higher-Cost Regulations

The first cost-relevant difference between the higher-cost regulations and the proposed regulations is that, under the higher-cost regulations, covered shell eggs are not exempt even when those products only move through California for sale in another state or country. We estimate that the quantity of shell eggs moving through California would be very small, roughly 13.6 million dozen (and about $9.1 million export revenue), based on the quantity of exported shell eggs from California to other countries. Under the higher-cost regulations, these exported shell eggs must be cage-free eggs. To our knowledge, proper data are not available to identify the share of cage-free eggs in total exported eggs. We expect that the share of cage-free eggs in exported shell eggs would be very small, considering that cage-free eggs are not popular in other countries. If the higher-cost regulations were implemented, we expect that the quantity exported of shell eggs from California would reduce to close to zero because (a) the farm price of cage-free eggs is substantially higher than that of conventional eggs and (b) California accounts for a very small proportion of world shell egg trade.

The second cost-relevant difference between the higher-cost regulations and the proposed regulations is that the higher-cost package requires "consumer-facing labeling for all covered products or prepared foods containing a covered product allowing the end customer to scan a QR code and see record of Prop 12 animal confinement certification and traceability of product back

to farm of origin." For such labeling, certification, and traceability, we assess all the aggregate costs through the supply chain at about a 1% increase in retail price. In this subsection, we focus on the cost effects from labeling, certification, and traceability, additionally required by the higher-cost regulations package.

Table A3.16 reports the 2022 simulation results under the higher-cost regulations. Under the higher-cost regulations, as in the proposed regulations, conventional eggs are not sold at retail and food service. The other results are also close to those of the proposed regulations. However, the magnitude of the effects of the higher-cost regulations on farm revenue, retailer expenditure, and consumer expenditure becomes slightly different because of additional labeling, certification, and traceability costs. That is, additional costs raise cage-free egg retail prices, which causes a decrease in farm revenue and retailer expenditure and an increase in consumer expenditure, compared to the corresponding proposed regulations. Specifically, the quantity consumed and produced of cage-free eggs more than triples, and the retail price of cage-free eggs rises by 0.7%. Compared to the case without regulations, farm revenue rises by 1.1% (or $6 million), and retailer revenue rises by 1.1% (or $11 million). Consumer expenditure increases by 48.2% (or about $976 million).

Table A3.17 reports the 2023 simulation results under the higher-cost regulations. Compared to 2022, consumers have more opportunities to adjust to a high price. When we see the regulation effects (that is, compared to the case without regulations), farm revenue falls by 8.6% (or $47 million), retailer revenue falls by 8.6% (or $85 million), and consumer expenditure rises by 33.9% (or about $704 million).

As we did in the previous subsection (*Proposed Regulations*), here we provide additional simulation results when the farm-to-retail markup falls with the higher-cost regulations.

Tables A3.18 and A3.19 report the simulation results when the farm-to-retail markup falls by 10% ($0.32 per dozen) with the higher-cost regulations. Table A3.18 is for 2022, and Table A3.19 is for 2023. The changes in directions for quantities and prices are the same as the case of

no change in absolute farm-to-retail markup, but more cage-free eggs are produced and consumed.

Tables A3.20 and A3.21 report the simulation results when the farm-to-retail markup falls by 20% ($0.64 per dozen) with the lower-cost regulations. Table A3.20 is for 2022, and Table A3.21 is for 2023. The results are similar to the cases of a 10% decrease in markup. However, consumers face a, even lower cage-free egg price.

Table A3.4. Impacts of Proposed Shell Egg Regulations in 2022: No Change in Absolute Farm-to-Retail Markup

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed of eggs in California					
Conventional	Mil. dozen	576	0	-576	-100.0%
Cage-free	Mil. dozen	145	629	483	332.4%
Total	Mil. dozen	721	629	-92	-12.8%
Quantity produced of eggs in California					
Conventional	Mil. dozen	317	0	-317	-100.0%
Cage-free	Mil. dozen	80	346	266	332.4%
Total	Mil. dozen	397	346	-51	-12.8%
Conventional egg prices in California					
Farm price	$/dozen	1.28	not available	not applicable	not applicable
Retail price	$/dozen	2.32	not available	not applicable	not applicable
Cage-free egg prices in California					
Farm price	$/dozen	1.55	1.55	0.00	0.0%
Retail price	$/dozen	4.75	4.75	0.00	0.0%
Farm revenue, retailer expenditure, and consumer expenditure in California					
Farm revenue	Million $	530	537	7	1.3%
Retailer expenditure	Million $	962	975	12	1.3%
Consumer expenditure	Million $	2,026	2,986	960	47.4%

Table A3.5. Impacts of Proposed Shell Egg Regulations in 2023: No Change in Absolute Farm-to-Retail Markup

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed of eggs in California					
Conventional	Mil. dozen	590	0	-590	-100.0%
Cage-free	Mil. dozen	149	583	434	291.0%
Total	Mil. dozen	739	583	-157	-21.2%
Quantity produced of eggs in California					
Conventional	Mil. dozen	325	0	-325	-100.0%
Cage-free	Mil. dozen	82	321	239	291.0%
Total	Mil. dozen	407	321	-86	-21.2%
Conventional egg prices in California					
Farm price	$/dozen	1.28	not available	not applicable	not applicable
Retail price	$/dozen	2.32	not available	not applicable	not applicable
Cage-free egg prices in California					
Farm price	$/dozen	1.55	1.55	0.00	0.0%
Retail price	$/dozen	4.75	4.75	0.00	0.0%
Farm revenue, retailer expenditure, and consumer expenditure in California					
Farm revenue	Million $	543	497	-46	-8.4%
Retailer expenditure	Million $	986	903	-83	-8.4%
Consumer expenditure	Million $	2,077	2,768	691	33.2%

Table A3.6. Impacts of Proposed Shell Egg Regulations in 2022: 10% Decrease in Absolute Farm-to-Retail Markup

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed of eggs in California					
Conventional	Mil. dozen	576	0	-576	-100.0%
Cage-free	Mil. dozen	145	637	492	338.3%
Total	Mil. dozen	721	637	-84	-11.6%
Quantity produced of eggs in California					
Conventional	Mil. dozen	317	0	-317	-100.0%
Cage-free	Mil. dozen	80	351	271	338.3%
Total	Mil. dozen	397	351	-46	-11.6%
Conventional egg prices in California					
Farm price	$/dozen	1.28	not available	not applicable	not applicable
Retail price	$/dozen	2.32	not available	not applicable	not applicable
Cage-free egg prices in California					
Farm price	$/dozen	1.55	1.55	0.00	0.0%
Retail price	$/dozen	4.75	4.43	-0.32	-6.7%
Farm revenue, retailer expenditure, and consumer expenditure in California					
Farm revenue	Million $	530	544	14	2.6%
Retailer expenditure	Million $	962	988	25	2.6%
Consumer expenditure	Million $	2,026	2,823	797	39.3%

Table A3.7. Impacts of Proposed Shell Egg Regulations in 2023: 10% Decrease in Absolute Farm-to-Retail Markup

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed of eggs in California					
Conventional	Mil. dozen	590	0	-590	-100.0%
Cage-free	Mil. dozen	149	594	445	298.9%
Total	Mil. dozen	739	594	-145	-19.6%
Quantity produced of eggs in California					
Conventional	Mil. dozen	325	0	-325	-100.0%
Cage-free	Mil. dozen	82	327	245	298.9%
Total	Mil. dozen	407	327	-80	-19.6%
Conventional egg prices in California					
Farm price	$/dozen	1.28	not available	not applicable	not applicable
Retail price	$/dozen	2.32	not available	not applicable	not applicable
Cage-free egg prices in California					
Farm price	$/dozen	1.55	1.55	0.00	0.0%
Retail price	$/dozen	4.75	4.43	-0.32	-6.7%
Farm revenue, retailer expenditure, and consumer expenditure in California					
Farm revenue	Million $	543	507	-36	-6.6%
Retailer expenditure	Million $	986	921	-65	-6.6%
Consumer expenditure	Million $	2,077	2,633	556	26.8%

Table A3.8. Impacts of Proposed Shell Egg Regulations in 2022: 20% Decrease in Absolute Farm-to-Retail Markup

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed of eggs in California					
Conventional	Mil. dozen	576	0	-576	-100.0%
Cage-free	Mil. dozen	145	646	500	344.1%
Total	Mil. dozen	721	646	-75	-10.5%
Quantity produced of eggs in California					
Conventional	Mil. dozen	317	0	-317	-100.0%
Cage-free	Mil. dozen	80	355	275	344.1%
Total	Mil. dozen	397	355	-42	-10.5%
Conventional egg prices in California					
Farm price	$/dozen	1.28	not available	not applicable	not applicable
Retail price	$/dozen	2.32	not available	not applicable	not applicable
Cage-free egg prices in California					
Farm price	$/dozen	1.55	1.55	0.00	0.0%
Retail price	$/dozen	4.75	4.11	-0.64	-13.5%
Farm revenue, retailer expenditure, and consumer expenditure in California					
Farm revenue	Million $	530	551	21	4.0%
Retailer expenditure	Million $	962	1,001	38	4.0%
Consumer expenditure	Million $	2,026	2,654	627	31.0%

Table A3.9. Impacts of Proposed Shell Egg Regulations in 2023: 20% Decrease in Absolute Farm-to-Retail Markup

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed of eggs in California					
Conventional	Mil. dozen	590	0	-590	-100.0%
Cage-free	Mil. dozen	149	606	457	306.8%
Total	Mil. dozen	739	606	-133	-18.0%
Quantity produced of eggs in California					
Conventional	Mil. dozen	325	0	-325	-100.0%
Cage-free	Mil. dozen	82	334	252	306.8%
Total	Mil. dozen	407	334	-73	-18.0%
Conventional egg prices in California					
Farm price	$/dozen	1.28	not available	not applicable	not applicable
Retail price	$/dozen	2.32	not available	not applicable	not applicable
Cage-free egg prices in California					
Farm price	$/dozen	1.55	1.55	0.00	0.0%
Retail price	$/dozen	4.75	4.11	-0.64	-13.5%
Farm revenue, retailer expenditure, and consumer expenditure in California					
Farm revenue	Million $	543	517	-26	-4.7%
Retailer expenditure	Million $	986	940	-47	-4.7%
Consumer expenditure	Million $	2,077	2,491	414	20.0%

Table A3.10. Impacts of Lower-Cost Shell Egg Regulations in 2022: No Change in Absolute Farm-to-Retail Markup

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed of eggs in California					
Conventional	Mil. dozen	576	60	-515	-89.5%
Cage-free	Mil. dozen	145	578	433	297.5%
Total	Mil. dozen	721	638	-83	-11.5%
Quantity produced of eggs in California					
Conventional	Mil. dozen	317	33	-284	-89.5%
Cage-free	Mil. dozen	80	318	238	297.5%
Total	Mil. dozen	397	351	-46	-11.5%
Conventional egg prices in California					
Farm price	$/dozen	1.28	1.28	0.00	0.0%
Retail price	$/dozen	2.32	2.32	0.00	0.0%
Cage-free egg prices in California					
Farm price	$/dozen	1.55	1.55	0.00	0.0%
Retail price	$/dozen	4.75	4.75	0.00	0.0%
Farm revenue, retailer expenditure, and consumer expenditure in California					
Farm revenue	Million $	530	536	6	1.1%
Retailer expenditure	Million $	962	973	11	1.1%
Consumer expenditure	Million $	2,026	2,886	859	42.4%

Table A3.11. Impacts of Lower-Cost Shell Egg Regulations in 2023: No Change in Absolute Farm-to-Retail Markup

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed of eggs in California					
Conventional	Mil. dozen	590	62	-528	-89.5%
Cage-free	Mil. dozen	149	537	388	260.4%
Total	Mil. dozen	739	599	-140	-19.0%
Quantity produced of eggs in California					
Conventional	Mil. dozen	325	34	-291	-89.5%
Cage-free	Mil. dozen	82	296	214	260.4%
Total	Mil. dozen	407	330	-77	-19.0%
Conventional egg prices in California					
Farm price	$/dozen	1.28	1.28	0.00	0.0%
Retail price	$/dozen	2.32	2.32	0.00	0.0%
Cage-free egg prices in California					
Farm price	$/dozen	1.55	1.55	0.00	0.0%
Retail price	$/dozen	4.75	4.75	0.00	0.0%
Farm revenue, retailer expenditure, and consumer expenditure in California					
Farm revenue	Million $	543	502	-41	-7.6%
Retailer expenditure	Million $	986	912	-75	-7.6%
Consumer expenditure	Million $	2,077	2,695	618	29.8%

Table A3.12. Impacts of Lower-Cost Shell Egg Regulations in 2022: 10% Decrease in Absolute Farm-to-Retail Markup

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed of eggs in California					
Conventional	Mil. dozen	576	60	-515	-89.5%
Cage-free	Mil. dozen	145	586	440	302.7%
Total	Mil. dozen	721	646	-75	-10.4%
Quantity produced of eggs in California					
Conventional	Mil. dozen	317	33	-284	-89.5%
Cage-free	Mil. dozen	80	322	242	302.7%
Total	Mil. dozen	397	356	-41	-10.4%
Conventional egg prices in California					
Farm price	$/dozen	1.28	1.28	0.00	0.0%
Retail price	$/dozen	2.32	2.32	0.00	0.0%
Cage-free egg prices in California					
Farm price	$/dozen	1.55	1.55	0.00	0.0%
Retail price	$/dozen	4.75	4.43	-0.32	-6.7%
Farm revenue, retailer expenditure, and consumer expenditure in California					
Farm revenue	Million $	530	542	12	2.4%
Retailer expenditure	Million $	962	985	23	2.4%
Consumer expenditure	Million $	2,026	2,734	708	34.9%

Table A3.13. Impacts of Lower-Cost Shell Egg Regulations in 2023: 10% Decrease in Absolute Farm-to-Retail Markup

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed of eggs in California					
Conventional	Mil. dozen	590	62	-528	-89.5%
Cage-free	Mil. dozen	149	548	399	267.5%
Total	Mil. dozen	739	610	-130	-17.5%
Quantity produced of eggs in California					
Conventional	Mil. dozen	325	34	-291	-89.5%
Cage-free	Mil. dozen	82	301	219	267.5%
Total	Mil. dozen	407	336	-71	-17.5%
Conventional egg prices in California					
Farm price	$/dozen	1.28	1.28	0.00	0.0%
Retail price	$/dozen	2.32	2.32	0.00	0.0%
Cage-free egg prices in California					
Farm price	$/dozen	1.55	1.55	0.00	0.0%
Retail price	$/dozen	4.75	4.43	-0.32	-6.7%
Farm revenue, retailer expenditure, and consumer expenditure in California					
Farm revenue	Million $	543	511	-32	-5.9%
Retailer expenditure	Million $	986	928	-58	-5.9%
Consumer expenditure	Million $	2,077	2,570	493	23.7%

Table A3.14. Impacts of Lower-Cost Shell Egg Regulations in 2022: 20% Decrease in Absolute Farm-to-Retail Markup

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed of eggs in California					
Conventional	Mil. dozen	576	60	-515	-89.5%
Cage-free	Mil. dozen	145	593	448	308.0%
Total	Mil. dozen	721	654	-68	-9.4%
Quantity produced of eggs in California					
Conventional	Mil. dozen	317	33	-284	-89.5%
Cage-free	Mil. dozen	80	327	246	308.0%
Total	Mil. dozen	397	360	-37	-9.4%
Conventional egg prices in California					
Farm price	$/dozen	1.28	1.28	0.00	0.0%
Retail price	$/dozen	2.32	2.32	0.00	0.0%
Cage-free egg prices in California					
Farm price	$/dozen	1.55	1.55	0.00	0.0%
Retail price	$/dozen	4.75	4.11	-0.64	-13.5%
Farm revenue, retailer expenditure, and consumer expenditure in California					
Farm revenue	Million $	530	549	19	3.6%
Retailer expenditure	Million $	962	997	34	3.6%
Consumer expenditure	Million $	2,026	2,578	552	27.2%

Table A3.15. Impacts of Lower-Cost Shell Egg Regulations in 2023: 20% Decrease in Absolute Farm-to-Retail Markup

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed of eggs in California					
Conventional	Mil. dozen	590	62	-528	-89.5%
Cage-free	Mil. dozen	149	558	409	274.6%
Total	Mil. dozen	739	620	-119	-16.1%
Quantity produced of eggs in California					
Conventional	Mil. dozen	325	34	-291	-89.5%
Cage-free	Mil. dozen	82	307	225	274.6%
Total	Mil. dozen	407	341	-66	-16.1%
Conventional egg prices in California					
Farm price	$/dozen	1.28	1.28	0.00	0.0%
Retail price	$/dozen	2.32	2.32	0.00	0.0%
Cage-free egg prices in California					
Farm price	$/dozen	1.55	1.55	0.00	0.0%
Retail price	$/dozen	4.75	4.11	-0.64	-13.5%
Farm revenue, retailer expenditure, and consumer expenditure in California					
Farm revenue	Million $	543	520	-23	-4.2%
Retailer expenditure	Million $	986	945	-42	-4.2%
Consumer expenditure	Million $	2,077	2,438	361	17.4%

Table A3.16. Impacts of Higher-Cost Shell Egg Regulations in 2022: No Change in Absolute Farm-to-Retail Markup

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed of eggs					
CA standard	Mil. dozen	576	0	-576	-100.0%
Cage-free	Mil. dozen	145	628	482	331.9%
Total	Mil. dozen	721	628	-93	-12.9%
Quantity produced of eggs					
CA standard	Mil. dozen	317	0	-317	-100.0%
Cage-free	Mil. dozen	80	346	266	331.9%
Total	Mil. dozen	397	346	-51	-12.9%
Conventional egg prices					
Farm price	$/dozen	1.28	not available	not applicable	not applicable
Retail price	$/dozen	2.32	not available	not applicable	not applicable
Cage-free egg prices					
Farm price	$/dozen	1.55	1.55	0.00	0.0%
Retail price	$/dozen	4.75	4.78	0.03	0.7%
Farm revenue, retailer expenditure, and consumer expenditure in California					
Farm revenue	Million $	530	536	6	1.1%
Retailer expenditure	Million $	962	973	11	1.1%
Consumer expenditure	Million $	2,026	3,003	976	48.2%

Table A3.17. Impacts of Higher-Cost Shell Egg Regulations in 2023: No Change in Absolute Farm-to-Retail Markup

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed of eggs					
CA standard	Mil. dozen	590	0	-590	-100.0%
Cage-free	Mil. dozen	149	581	432	290.2%
Total	Mil. dozen	739	581	-158	-21.3%
Quantity produced of eggs					
CA standard	Mil. dozen	325	0	-325	-100.0%
Cage-free	Mil. dozen	82	320	238	290.2%
Total	Mil. dozen	407	320	-87	-21.3%
Conventional egg prices					
Farm price	$/dozen	1.28	not available	not applicable	not applicable
Retail price	$/dozen	2.32	not available	not applicable	not applicable
Cage-free egg prices					
Farm price	$/dozen	1.55	1.55	0.00	0.0%
Retail price	$/dozen	4.75	4.78	0.03	0.7%
Farm revenue, retailer expenditure, and consumer expenditure in California					
Farm revenue	Million $	543	496	-47	-8.6%
Retailer expenditure	Million $	986	901	-85	-8.6%
Consumer expenditure	Million $	2,077	2,781	704	33.9%

Table A3.18. Impacts of Higher-Cost Shell Egg Regulations in 2022: 10% Decrease in Absolute Farm-to-Retail Markup

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed of eggs					
CA standard	Mil. dozen	576	0	-576	-100.0%
Cage-free	Mil. dozen	145	636	491	337.7%
Total	Mil. dozen	721	636	-85	-11.8%
Quantity produced of eggs					
CA standard	Mil. dozen	317	0	-317	-100.0%
Cage-free	Mil. dozen	80	350	270	337.7%
Total	Mil. dozen	397	350	-47	-11.8%
Conventional egg prices					
Farm price	$/dozen	1.28	not available	not applicable	not applicable
Retail price	$/dozen	2.32	not available	not applicable	not applicable
Cage-free egg prices					
Farm price	$/dozen	1.55	1.55	0.00	0.0%
Retail price	$/dozen	4.75	4.46	-0.29	-6.1%
Farm revenue, retailer expenditure, and consumer expenditure in California					
Farm revenue	Million $	530	543	13	2.5%
Retailer expenditure	Million $	962	986	24	2.5%
Consumer expenditure	Million $	2,026	2,839	813	40.1%

Table A3.19. Impacts of Higher-Cost Shell Egg Regulations in 2023: 10% Decrease in Absolute Farm-to-Retail Markup

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed of eggs					
CA standard	Mil. dozen	590	0	-590	-100.0%
Cage-free	Mil. dozen	149	593	444	298.1%
Total	Mil. dozen	739	593	-146	-19.7%
Quantity produced of eggs					
CA standard	Mil. dozen	325	0	-325	-100.0%
Cage-free	Mil. dozen	82	327	245	298.1%
Total	Mil. dozen	407	327	-80	-19.7%
Conventional egg prices					
Farm price	$/dozen	1.28	not available	not applicable	not applicable
Retail price	$/dozen	2.32	not available	not applicable	not applicable
Cage-free egg prices					
Farm price	$/dozen	1.55	1.55	0.00	0.0%
Retail price	$/dozen	4.75	4.46	-0.29	-6.1%
Farm revenue, retailer expenditure, and consumer expenditure in California					
Farm revenue	Million $	543	506	-37	-6.8%
Retailer expenditure	Million $	986	920	-67	-6.8%
Consumer expenditure	Million $	2,077	2,647	570	27.4%

Table A3.20. Impacts of Higher-Cost Shell Egg Regulations in 2022: 20% Decrease in Absolute Farm-to-Retail Markup

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed of eggs					
CA standard	Mil. dozen	576	0	-576	-100.0%
Cage-free	Mil. dozen	145	645	499	343.5%
Total	Mil. dozen	721	645	-76	-10.6%
Quantity produced of eggs					
CA standard	Mil. dozen	317	0	-317	-100.0%
Cage-free	Mil. dozen	80	355	275	343.5%
Total	Mil. dozen	397	355	-42	-10.6%
Conventional egg prices					
Farm price	$/dozen	1.28	not available	not applicable	not applicable
Retail price	$/dozen	2.32	not available	not applicable	not applicable
Cage-free egg prices					
Farm price	$/dozen	1.55	1.55	0.00	0.0%
Retail price	$/dozen	4.75	4.14	-0.61	-12.8%
Farm revenue, retailer expenditure, and consumer expenditure in California					
Farm revenue	Million $	530	550	20	3.9%
Retailer expenditure	Million $	962	999	37	3.9%
Consumer expenditure	Million $	2,026	2,671	645	31.8%

Table A3.21. Impacts of Higher-Cost Shell Egg Regulations in 2023: 20% Decrease in Absolute Farm-to-Retail Markup

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed of eggs					
CA standard	Mil. dozen	590	0	-590	-100.0%
Cage-free	Mil. dozen	149	605	456	306.0%
Total	Mil. dozen	739	605	-134	-18.1%
Quantity produced of eggs					
CA standard	Mil. dozen	325	0	-325	-100.0%
Cage-free	Mil. dozen	82	333	251	306.0%
Total	Mil. dozen	407	333	-74	-18.1%
Conventional egg prices					
Farm price	$/dozen	1.28	not available	not applicable	not applicable
Retail price	$/dozen	2.32	not available	not applicable	not applicable
Cage-free egg prices					
Farm price	$/dozen	1.55	1.55	0.00	0.0%
Retail price	$/dozen	4.75	4.14	-0.61	-12.8%
Farm revenue, retailer expenditure, and consumer expenditure in California					
Farm revenue	Million $	543	516	-27	-4.9%
Retailer expenditure	Million $	986	938	-49	-4.9%
Consumer expenditure	Million $	2,077	2,506	429	20.7%

Appendix 4. Data and Economic Modelling on the Proposition 12 Proposed Regulations for Breeding Sows Supplying the California Market

California Proposition 12 was passed in November 2018. According to Proposition 12, California businesses will be banned from engaging in the sale within California of whole pork meat that is the meat of a covered animal who was confined in a cruel manner, or is the meat of immediate offspring of a covered animal who was confined in a cruel manner.

CDFA proposed a set of regulations for implementing Proposition 12. This report focuses on the economic implications for Californian businesses and consumers of those regulations proposed by CDFA. To analyze the economic implications of the proposed regulations, we use a carefully calibrated simulation model.

In this appendix, we begin by describing the regulations proposed by CDFA. Second, we present a baseline that describes the California pork market if there were no proposed regulations. In the analysis, we use the baseline for comparison to the California market with the proposed regulations. Third, we explain the data and parameters used for the simulation model. Fourth, we describe the simulation model for analyzing the likely economic effects of the proposed regulations. Fifth, we report and discuss the simulation results.

Regulations

In this section, we describe the regulations proposed by CDFA. Besides the proposed package of regulations, CDFA considers two alternative packages of regulations for comparison with and evaluation of the proposed regulations: a package of lower-cost regulations and a package of higher-cost regulations. In this section, first, we describe the proposed regulations on pork supply to California. Second, we compare the two alternative packages of regulations with the proposed regulations. In this section, we focus on the regulations that directly relate to the analysis of this appendix, and we do not provide the full description of regulations proposed by CDFA.

Proposed Regulations

Under the proposed regulations, based on Prop 12 statute, neither the pork producer, nor pork handler shall knowingly sell or contract to sell whole pork meat for human consumption in the state if it is the product or offspring of a breeding sow that was confined in an enclosure that fails to comply with certain standards. The standards include "the enclosure shall not prevent a breeding pig from lying down, standing up, fully extending its limbs, or turning around freely" and "an enclosure shall provide a minimum of 24 square feet of usable floor space per pig."

Here "whole pork meat" means any uncooked cut of pork that is comprised entirely of pork meat, except for seasoning, curing agents, coloring, flavoring, preservatives, and similar meat additives. Here the word "uncooked" means not ready-to-eat in the condition sold, offered for sale, or otherwise distributed. In this appendix, for convenience, we define "other pork meat" as pork meat that does not satisfy the definition of "whole pork meat" under the corresponding regulations. Under the proposed regulations, based on Prop 12 statute, other pork meat includes cooked pork meat and combination food products (including soups, sandwiches, pizzas, hot dogs, or similar processed or prepared food products) that are comprised of more than pork meat.

Lower-Cost Regulations

The lower-cost regulations differ from the proposed regulations in their exemption policy. That is, the lower-cost regulations exempt raw pork meat sold in California intended for further processing, preparation, or manufacturing into a combination food product or prepared meal.

Higher-Cost Regulations

First, under the higher-cost regulations, covered pork products include ground pork and their products. Hence, under the higher-cost regulations, "whole pork meat" includes ground pork. Second, under the higher-cost regulations, covered pork products are not exempted even when those products only move through California for sale in another state or country. Third, the higher-cost package requires "consumer facing labeling for all covered products or prepared foods containing a covered product allowing the end customer to scan a QR code and see record of Prop 12 animal confinement certification and traceability of product back to farm of origin."

Baselines: Quantities and Prices of Pork in California if There Were No Regulations

In this section, we use quantity and retail price data to describe the California pork market if there were no regulations proposed by CDFA. We use this counterfactual California pork market as a baseline in comparison to the California pork market with the proposed regulations. We discuss how we obtain baseline quantities and prices in the Data and Parameters section.

In this section, we provide two baselines. First, we provide one baseline when whole pork meat does not include ground pork. Second, we provide another baseline when whole pork meat includes ground pork. In the previous section, we describe three packages of regulations: proposed regulations, lower-cost regulations, and higher-cost regulations. The former definition of whole pork meat is for the proposed regulations and lower-cost regulations. The latter definition of whole pork meat is for the higher-cost regulations.

Table A4.1 reports the baseline quantities when whole pork meat does not include ground pork. In 2019, 2,094 million pounds of pork were consumed in California. About 58% (or 1,205 million pounds) of pork consumption was from whole pork meat, and the remaining 42% (or 889 million pounds) of pork consumption was from other pork meat. As defined in the previous section, here, other pork meat is pork meat that does not satisfy the definition of whole pork meat under Prop 12 statute. For example, other pork meat includes cooked pork and combination food products using pork meat as an ingredient.

Table A4.2 reports the baseline quantities when whole pork meat includes ground pork. Under the revised definition, in 2019, about 77% (or 1,618 million pounds) of pork consumption was from whole pork meat, and the remaining 23% (or 476 million pounds) of pork consumption was from other pork meat.

We assess that the quantities would change from 2019 to 2023, considering income and population variations in California. Specifically, we expect a substantial decrease in pork consumption in 2020 because of the effects of COVID-19. For more discussion, see *Quantity Consumed* in the following section.

Table A4.1 reports the baseline retail prices when whole pork meat does not include ground pork. In 2019, the average annual retail price was about $3.30 per pound for whole pork meat and $3.78 per pound for other pork meat.

Table A4.2 reports the baseline retail prices when whole pork meat includes ground pork. Retail prices of whole pork meat and other pork meat depend on the definition of whole pork meat. Specifically, under the revised definition, in 2019, the average annual retail price was about $3.35 per pound for whole pork meat and $4.00 per pound for other pork meat.

We expect that annual average retail prices would be stable through 2023 based on related data and pork industry information, although retail prices would vary within each year. For more discussion, see *Prices* in the following section.

Table A4.1. Annual Quantities and Average Retail Prices of Pork in California When Whole Pork Meat Does Not Include Ground Pork, 2019 – 2023

	Unit	2019	2020	2021	2022	2023
Quantity consumed of pork in California						
Whole pork meat	Mil. lbs.	1,205	1,149	1,137	1,145	1,159
Other pork meat	Mil. lbs.	889	847	838	844	854
Total	Mil. lbs.	2,094	1,996	1,975	1,989	2,013
Retail prices in California						
Whole pork meat	$/lb.	3.30	3.30	3.30	3.30	3.30
Other pork meat	$/lb.	3.78	3.78	3.78	3.78	3.78

Note: Here "other pork meat" is defined as pork meat that does not satisfy the definition of "whole pork meat" under Prop 12 statute. For example, "other pork meat" includes cooked pork meat and combination food products (including soups, sandwiches, pizzas, hot dogs, or similar processed or prepared food products) that are comprised of more than pork meat. For detailed calculation and sources, see the subsections *Quantities Consumed* and *Prices* in the text.

Table A4.2. Annual Quantities and Average Retail Prices of Pork in California When Whole Pork Meat Includes Ground Pork, 2019 – 2023

	Unit	2019	2020	2021	2022	2023
Quantity consumed of pork in California						
Whole pork meat	Mil. lbs.	1,618	1,543	1,526	1,537	1,556
Other pork meat	Mil. lbs.	476	454	449	452	457
Total	Mil. lbs.	2,094	1,996	1,975	1,989	2,013
Retail prices in California						
Whole pork meat	$/lb.	3.35	3.35	3.35	3.35	3.35
Other pork meat	$/lb.	4.00	4.00	4.00	4.00	4.00

Note: Here "other pork meat" is defined as pork meat that does not satisfy the definition of "whole pork meat" under Prop 12 statute. For example, "other pork meat" includes cooked pork meat and combination food products (including soups, sandwiches, pizzas, hot dogs, or similar processed or prepared food products) that are comprised of more than pork meat. For detailed calculations and sources, source see the subsections *Quantities Consumed* and *Prices* in the text.

Data and Parameters

In this section, we describe the data and parameters used in the simulation model.

Quantity Consumed

The CDFA regulations, and Prop 12 statute, require that no pork producer or pork handler shall knowingly sell or contract to sell whole pork meat for human consumption in the state if it is the product of a breeding pig that was confined in an enclosure that prevents a breeding pig from lying down, standing up, fully extending its limbs, or turning around freely or shall not provide a minimum of 24 square feet of usable floor space per pig.

Whole pork meat means any uncooked cut of pork that is comprised entirely of pork meat, except for seasoning, curing agents, coloring, flavoring, preservatives, and similar meat additives. Here the word, "uncooked" means not ready-to-eat in the condition sold, offered for sale, or otherwise distributed. As discussed in the previous section, for convenience, we use the term "other pork meat" to indicate pork meat that does not satisfy the definition of whole pork meat under the Prop 12 statute. For example, "other pork meat" includes cooked pork meat and combination food products that use pork meat as an ingredient. Although there are many pork products, for our research purposes it suffices to aggregate those products into two categories: whole pork meat and other pork meat.

We assess the total quantity consumed of all pork at about 1,989 million pounds in 2022 and 2,013 million pounds in 2023. The quantity estimates come from the following formula. We assess per capita consumption of pork in California at 52.4 pounds per Californian per year, using the corresponding U.S. value in 2019 (USDA ERS, 2020a). Given the 2019 value, we project per capita consumption of pork in 2022 and 2023 using income projection data, reported by California Department of Finance (DoF, 2020). Finally, multiplying by the CA population each year (DoF, 2020), we obtain the total quantity of all pork in 2022 and 2023.

Given the quantity estimates of all pork, we estimate quantities of whole pork meat and other pork meat. Notice that we consider two definitions of whole pork meat. Under the proposed regulations and the lower-cost regulations, whole pork meat does not include ground pork. However, under the higher-cost regulations, whole pork meat includes ground pork. Based on discussion with industry members, we assess the share of whole pork meat in pork consumption is about 58% when whole pork meat does not include ground pork and 77% when whole pork meat includes ground pork.

Under the definition that whole pork meat does not include ground pork, we assess the total quantity consumed of whole pork meat is about 1,145 million pounds in 2022 and 1,159 million pounds in 2023. We also assess the total quantity consumed of other pork meat is about 844 million pounds in 2022 and 854 million pounds of 2023.

Under the definition that whole pork meat includes ground pork, we assess the total quantity consumed of whole pork meat is about 1,537 million pounds in 2022 and 1,556 million pounds in 2023. We also assess the total quantity consumed of other pork meat is about 452 million pounds in 2022 and 457 million pounds of 2023.

Prices

The simulation model (we will see in the next section) needs data for hog prices, wholesale prices of whole pork meat and other pork meat, and retail prices of whole pork meat and other pork meat.

Based on the 2018 value in USDA ERS (2020b), we assess the average annual price per pound of hogs to be $0.79. Notice that the quantity unit is based on retail weight rather than hog weight. We assess that annual average hog prices will remain stable from 2018 to 2023, based on related data and discussion with pork industry members.

We assess the wholesale price of whole pork meat is $1.20 per pound and that of other pork meat is $1.68 per pound in 2022 and 2023, under the definition that whole pork meat does not include ground pork. We also assess the wholesale price of whole pork meat is $1.26 per pound and that of other pork meat is $1.91 per pound in 2022 and 2023, under the definition that whole pork meat includes ground pork. Notice that, as discussed above, under the proposed regulations and the lower-cost regulations, whole pork meat does not include ground pork. However, under the higher-cost regulations, whole pork meat includes ground pork.

We assess wholesale prices as follows: to our knowledge, there are no proper statistics for wholesale prices for whole pork meat and other pork meat separately, although the wholesale price of all pork is available from USDA ERS (2020b). Hence, we assume a reasonable relationship among wholesale prices of all pork, whole pork meat, and other pork meat, and we use the relationship to estimate the wholesale prices of whole pork meat and other pork meat, given the wholesale price of all pork (2018 value), as follows: first, we consider the wholesale price of all pork as an average of wholesale prices of whole pork meat and other pork meat, weighted by quantity shares. Second, we assume that the retail price is the sum of the corresponding wholesale price and the retailing costs. Third, we assume that the retailing costs per pound are identical between whole pork meat and other pork meat.

Notice that each of the three assumptions above can be expressed as an equation, which implies that we have a system of three equations with three unknowns (wholesale price of whole pork meat, wholesale price of other pork meat, and retailing costs per pound). Solving the system of equations, we obtain annual average wholesale prices for whole pork meat and other pork meat. We assess that annual average wholesale prices will remain stable in from 2018 to 2023, based on our review of related data and discussion with pork industry members.

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We estimate the retail price for whole pork meat to be $3.30 per pound and for other pork meat to be $3.78 per pound when whole pork meat does not include ground pork under the proposed regulations. However, we estimate the price to be $3.35 per pound for whole pork meat and $4.00 per pound for other pork meat when whole pork meat includes ground pork under the higher-cost regulations. These prices are our current best estimates based on a review of USDA retail data and discussion with industry members. We assess that annual average retail prices will remain stable from 2018 to 2023.

Table A4.3. Assessed Annual Quantities and Average Prices in the California Market in 2022 and 2023 if Whole Pork Meat Does Not Include Ground Pork

	Unit	2022	2023
Quantity consumed in California			
Whole pork meat	Million lbs.	1,145	1,159
Other pork meat	Million lbs.	844	854
Total	Million lbs.	1,989	2,013
Farm Price of Hogs	$/lb.	0.79	0.79
Wholesale prices in California			
Whole pork meat	$/lb.	1.20	1.20
Other pork meat	$/lb.	1.68	1.68
Retail prices in California			
Whole pork meat	$/lb.	3.30	3.30
Other pork meat	$/lb.	3.78	3.78

Note: Under the proposed regulations and the lower-cost regulations, whole pork meat does not include ground pork. Here "other pork meat" is defined as pork meat that does not satisfy the definition of "whole pork meat" under Prop 12 statute. For example, "other pork meat" includes cooked pork meat and combination food products (including soups, sandwiches, pizzas, hot dogs, or similar processed or prepared food products) that are comprised of more than pork meat. For detailed calculations and sources, see the subsections about quantities and prices in the text.

Table A4.4. Assessed Annual Quantities and Average Prices in the California Market in 2022 and 2023 if Whole Pork Meat Includes Ground Pork

	Unit	2022	2023
Quantity consumed in California			
Whole pork meat	Million lbs.	1,537	1,556
Other pork meat	Million lbs.	452	457
Total	Million lbs.	1,989	2,013
Farm Price of Hogs	$/lb.	0.79	0.79
Wholesale prices in California			
Whole pork meat	$/lb.	1.26	1.26
Other pork meat	$/lb.	1.91	1.91
Retail prices in California			
Whole pork meat	$/lb.	3.35	3.35
Other pork meat	$/lb.	4.00	4.00

Note: Under the higher-cost regulations, whole pork meat includes ground pork. Here "other pork meat" is defined as pork meat that does not satisfy the definition of "whole pork meat" under Prop 12 statute. For example, "other pork meat" includes cooked pork meat and combination food products (including soups, sandwiches, pizzas, hot dogs, or similar processed or prepared food products) that are comprised of more than pork meat. For detailed calculations and sources, see the subsections about quantities and prices in the text.

Farm Cost Increase

According to the housing regulations, hog farms shall not prevent a breeding pig from lying down, standing up, fully extending its limbs, or turning around freely, which prevents hog farms from using gestation crates if offspring from those sows supply meat destined to the California market. Farrowing crates are still allowed to be used for breeding sow housing during the five days before expected farrowing date and while the sow is nursing piglets. Hog farms must allow breeding pigs at least 24 square feet per pig of usable floor space and therefore hog farms may adopt a group housing system to meet housing regulations. Based on discussion with farmers and industry members, we assess that currently, most farms use gestation crates or allow about 20 square feet of usable floor space for group-housed breeding sows, and it would be costly to meet the Prop 12 requirements. In this sub-section, we describe how we assess farm cost increases that compliant farms would face on average.

To estimate farm cost increases owing to the housing regulations, we begin with capital recovery costs for converting operations. We assess the capital recovery costs at about 16% of the total cost of producing weanling pigs, based on USDA data (USDA, 2019) and the production cost

data from the Ontario Ministry of Agriculture, Food and Rural Affairs. To achieve an increase of usable floor space per sow from 20 to 24 square feet, facility costs per sow would rise by about 20%, accounting for a reduction of the number of sows in housing systems. Hence, we assess an increase in capital costs owing to the regulations of about 4% of the total cost of producing weanling pigs. Next, we assess an increase in feed cost per pig of approximately 6% of the total cost of producing weanling pigs, which is our best estimate after discussion with farmers and industry members. The increase in feed cost per pig would mainly come from higher sow mortality and less efficient breeding in new housing systems. Finally, we assess an increase in other costs of about 5% of the total cost of producing weanling pigs because of the need for more labor and health care per sow, which is our best estimate based on discussion with farmers and industry members. Combining all three components above, we obtain a 15% increase in total costs per weanling pig for converting housing systems. Using an average cost of about $33 per weanling pig, we obtain a cost increase of approximately $5 per weanling pig. Using an average retail weight of 160.8 pounds of pork per pig, we obtain a cost increase of about $0.03 per pound of pork (retail weight).

Hogs from compliant farms must be identified to assure that whole pork meat from compliant hogs can be segregated and labeled separately from whole pork meat from non-compliant hogs. We expect that such identification of compliant hogs would minimally affect farm production costs because there is little difference in housing and feeding between compliant and non-compliant hogs.

Overall, we assess the total additional costs to farms owing to the proposed regulations are about $0.03 per pound of pork (retail weight).

Processing Cost Increase
Because California accounts for only a small proportion of the total U.S. and Canada pork consumption, we expect that most processors would acquire and process both compliant and non-compliant hogs if processors acquire compliant hogs. These processors would have additional costs to assure that whole pork meat from compliant hogs can be sold in the California market. Given realities of pork processing in the industry, processors would need to segregate

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and process compliant hogs in groups at different times from non-compliant hogs to assure that only compliant hogs are used in processing for whole pork meat destined to the California market.

The additional processing costs come from separating holding pens, having more complicated but less flexible schedules of processing, having time intervals between processing compliant hogs and processing non-compliant hogs, requiring more storage space for stocking compliant whole pork meat separately from other pork meat, and labeling and shipping compliant whole pork meat separately from other pork meat. Based on discussion with farmers and industry members, we estimate all additional processing costs are about $15 per compliant hog slaughtered. For comparison, see Sumner and Zuijdwijk (2019), who discuss segregation costs and implications in the context of Country of Origin Labeling.

This processing cost increase would apply to whole pork meat from the compliant hogs. We assess the total retail meat weight to be 160.8 pounds per hog (Pork Checkoff, 2017). If whole pork meat does not include ground pork (then 57.6% of retail meat is whole pork meat), the added processing cost is $15/93 = $0.16 per pound of a compliant hog. However, if whole pork meat includes ground pork (then 77.3% of retail meat is whole pork meat), the added processing cost is $15/124 = $0.12 per pound of a compliant hog. These costs add to the wholesale price of whole pork meat in California.

Besides additional processing costs for slaughtering hogs and producing pork products, we expect that extra costs would occur during handling and distributing pork products throughout the downstream of the pork supply chain. After discussions with industry members, we assess these additional costs through the downstream to be about $0.05 per pound of pork (retail weight).

Overall, we assess the total additional costs from farms to retail by the proposed regulations to be $0.21 per pound of pork (retail weight) if whole pork meat does not include ground pork and $0.17 per pound of pork (retail weight) if whole pork meat includes ground pork.

Demand Elasticities

The proposed regulations will raise production costs in the pork supply chain, and retailers would raise retail prices to reflect such additional production costs. In response to a higher pork price, consumers would give up pork consumption or substitute other meat products (beef and chicken, for example) for pork products. Such behavioral changes among consumers who face a price change by the proposed regulations are reflected in the model through own- and cross-price elasticities of demand for whole pork meat and other pork meat. For more discussion, see the modeling section below.

We assess elasticities for 2022 and 2023 to reflect that consumers would not be able to adjust fully to a price change by the proposed regulations in the first year of implementation (2022) but would be able to adjust to the price change in the second year of implementation (2023).

We also assess elasticities for two definitions of whole pork meat. Under the proposed regulations and the lower-cost regulations, whole pork meat does not include ground pork. However, under the higher-cost regulations, whole pork meat includes ground pork. We expect that whole pork meat demand would be less elastic when whole pork meat includes ground pork because consumers have fewer opportunities to substitutes for whole pork meat.

When whole pork meat does not include ground pork, first, for demand elasticities in 2022, we assess the own-price elasticity of demand for whole pork meat to be -0.45 and for other pork meat to be -0.47. We use 0.11 for the cross-price elasticity of demand for whole pork meat in response to other pork meat price changes. We also use 0.13 for the corresponding cross-price elasticity of demand for other pork meat in response to whole pork meat price changes. Second, for demand elasticities in 2023, we assess the own-price elasticity of demand for whole pork meat to be -0.9 and for other pork meat to be -0.94. We use 0.22 for the cross-price elasticity of demand for whole pork meat in response to other pork meat price changes. We also use 0.26 for the corresponding cross-price elasticity of demand for other pork meat in response to whole pork meat price changes.

When whole pork meat includes ground pork, first, for demand elasticities in 2022, we assess the own-price elasticity of demand for whole pork meat to be -0.4 and for other pork meat to be -0.51. We use 0.06 for the cross-price elasticity of demand for whole pork meat in response to other pork meat price changes. We also use 0.17 for the corresponding cross-price elasticity of demand for other pork meat in response to whole pork meat price changes. Second, for demand elasticities in 2023, we assess the own-price elasticity of demand for whole pork meat to be -0.8 and for other pork meat to be -1.02. We use 0.12 for the cross-price elasticity of demand for whole pork meat in response to other pork meat price changes. We also use 0.34 for the corresponding cross-price elasticity of demand for other pork meat in response to whole pork meat price changes.

We assess elasticities above as follows. First, we begin with an own-price elasticity of demand of -0.68 for all pork products from the study by Okrent and Alston (2011). The value of -0.68 is close to values used by Buhr (2005) and Wohlgenant and Haidacher (1989). Next, based on our review of the relevant literature, we assess the own-price elasticity of demand for whole pork meat to be about -0.9 if whole pork meat does not include ground pork. The demand for whole pork meat would be more elastic than that for all pork products because consumers could substitute between whole pork meat and other pork meat in response to a price change of whole pork meat. For other demand elasticities, we use a relationship among demand elasticities. According to consumer theory in economics, demand elasticities of individual goods can be characterized by the corresponding aggregate good's demand elasticity, the elasticity of substitution among individual goods, and revenue shares of individual goods. In our context, demand elasticities of whole pork meat and other pork meat can be characterized by demand for all pork products, the elasticity of substitution between whole pork meat and other pork meat, and the corresponding revenue shares. Given demand elasticities of all pork and whole pork meat and revenue shares calculated by price and quantity data, we obtain an own-price elasticity of -0.94 for other pork meat, a cross-price elasticity of 0.22 for whole pork meat in response to other pork meat price, and a cross-price elasticity of 0.26 for other pork meat in response to whole pork meat price if whole pork meat does not include ground pork.

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We expect that the own-price elasticity of whole pork meat would become more elastic when whole pork meat includes ground pork because consumers would have fewer opportunities to substitute other pork meat for whole pork meat. To reflect the change in demand elasticity, we assess the own-price elasticity of whole pork meat to be -0.8 when whole pork meat includes ground pork. Similar to the procedure described in the previous paragraph, we obtain an own-price elasticity -1.02 for other pork meat, a cross-price elasticity of 0.12 for whole pork meat in response to other pork meat price, and a cross-price elasticity of 0.34 for other pork meat in response to whole pork meat price if whole pork meat does not include ground pork.

Table A4.5. Parameters When Whole Pork Meat Does Not Include Ground Pork

Definition	Year	Value
Farm cost increase by the housing regulations	2022 and 2023	$0.03/lb.
Cost increase in processing whole pork meat by the regulations	2022 and 2023	$0.21/lb.
Own price elasticity of demand for whole pork meat	2022	-0.45
Own price elasticity of demand for whole pork meat	2023	-0.9
Cross price elasticity of demand for whole pork meat in response to other pork meat price changes	2022	0.11
Cross price elasticity of demand for whole pork meat in response to other pork meat price changes	2023	0.22
Own price elasticity of demand for other pork meat	2022	-0.47
Own price elasticity of demand for other pork meat	2023	-0.94
Cross price elasticity of demand for other pork meat in response to whole pork meat price changes	2022	0.13
Cross price elasticity of demand for other pork meat in response to whole pork meat price changes	2023	0.26
Price elasticity of compliant hog supply	2022	4
Price elasticity of compliant hog supply	2023	9
Elasticity of transformation at the processing stage between whole pork meat and other pork meat	2022 and 2023	1

Note: Under the proposed regulations and the lower-cost regulations, whole pork meat does not include ground pork. Here "other pork meat" is defined as pork meat that does not satisfy the definition of "whole pork meat" under Prop 12 statute. For example, "other pork meat" includes cooked pork meat and combination food products (including soups, sandwiches, pizzas, hot dogs, or similar processed or prepared food products) that are comprised of more than pork meat. For detailed calculations and sources, see the subsections about farm cost increase, processing cost increase, demand elasticities, and supply elasticities in the text.

Table A4.6. Parameters When Whole Pork Includes Ground Pork

Definition	Year	Value
Farm cost increase by the housing regulations	2022 and 2023	$0.03/lb.
Processing cost increase by the regulations	2022 and 2023	$0.17/lb.
Own price elasticity of demand for whole pork meat	2022	-0.4
Own price elasticity of demand for whole pork meat	2023	-0.8
Cross price elasticity of demand for whole pork meat in response to other pork meat price changes	2022	0.06
Cross price elasticity of demand for whole pork meat in response to other pork meat price changes	2023	0.12
Own price elasticity of demand for other pork meat	2022	-0.51
Own price elasticity of demand for other pork meat	2023	-1.02
Cross price elasticity of demand for other pork meat in response to whole pork meat price changes	2022	0.17
Cross price elasticity of demand for other pork meat in response to whole pork meat price changes	2023	0.34
Price elasticity of compliant hog supply	2022	4
Price elasticity of compliant hog supply	2023	9
Elasticity of transformation at the processing stage between whole pork meat and other pork meat	2022 and 2023	1

Note: Under the higher-cost regulations, whole pork meat includes ground pork. Here other pork meat is defined as pork meat that does not satisfy the definition of whole pork meat under Prop 12 statute. For example, other pork meat includes cooked pork meat and combination food products (including soups, sandwiches, pizzas, hotdogs, or similar processed or prepared food products) that are comprised of more than pork meat. For detailed calculations, interpretation and source see the subsections about farm cost increase, processing cost increase, demand elasticities, and supply elasticities in the text.

Supply Elasticities

To obtain the estimate of price elasticity of hogs whose pork is destined to the California market, first, we consider the price elasticity of supply of all hogs in North America (the United States and Canada). The price elasticity of hogs depends on the length of time that hog farms are allowed to adjust to a price change. As the time horizon is expanded, hog supply becomes more elastic because hog farms have more opportunities to adjust hog production to a price change. Second, we also consider that the supply of hogs whose pork is destined to the California market would be more elastic than the supply for all hogs in North America because California accounts for only a small proportion of the total quantity demanded of hogs in North America.

Combining two points in the previous paragraph, we assess the supply elasticity of hogs destined to the California market to be about 4 in 2022 and 9 in 2023. These assessed supply elasticities

are consistent with a range of estimates suggested and used by existing papers studying the pork industry in the literature of agricultural economics (for example, Lemieux and Wohlgenant, 1989; Wohlgenant, 1993; Brester, Marsh, and Atwood, 2004; Lusk and Anderson, 2004; Saitone, Sexton, and Sumner, 2015).

Pork processors produce whole pork meat and other pork meat using compliant hogs. In the model described in the following section, pork processors are allowed to adjust production proportions of whole pork meat in response to a relative price change of whole pork meat. We assume the elasticity of transformation between whole pork meat and other pork meat is 1.0. It is uncertain how much pork processors could adjust production proportions of whole pork meat when the regulations are implemented. However, we find the simulation results are robust to a range of changes in the elasticity of transformation, although we do not report those results in this appendix.

Simulation Model for Analyzing the Likely Effects of Sow Housing Regulations
We develop a simulation model for analyzing the likely effects of the regulations proposed by CDFA. The simulation model traces how the California market for pork adjusts to a new market equilibrium following the forthcoming proposed regulations. We characterize the market equilibrium using supply and demand functions of pork and market equilibrium conditions. We also characterize the housing restrictions of the proposed regulations as a farm cost increase and a processing cost increase in the pork supply chain.

Equation (A4.1) represents the supply of hogs that comply with the housing restrictions, written in a log-differential form:

$$(A4.1)\ d \ln Q_f^s = \epsilon \cdot \left(d \ln P_f - \kappa\right),$$

where the subscript f denotes a relationship about farms, and the superscript s denotes a relationship about supply. The variable Q_f^s is the quantity supplied of compliant hogs, and P_f is the farm price of compliant hogs. The quantity is converted to a per pound of pork basis (retail weight). The parameter ϵ is the price elasticity of compliant hog supply, and the parameter κ is

the change in farm costs derived from allowing for 24 square feet per pig of usable floor space in terms of a percentage of the farm price.

Pork processors produce pork products from compliant hogs. Equation (A4.2) represents the supply of aggregate pork products. Equation (A4.3) represents a relationship between compliant hog price and the aggregate pork price:

$$(A4.2)\ d\ln Q_p^s = d\ln Q_f^d,$$
$$(A4.3)\ d\ln P_p = sh_f \cdot d\ln P_f.$$

The notations are consistent with those above. The subscript p denotes pork processors (all intermediary agents between farms and retailers, including slaughter plants and further processors). The superscript d denotes a demand relationship. The variable Q_p^s is the quantity supplied of aggregate pork products (retail weight equivalent), and Q_f^d is the quantity demanded for compliant hogs (retail weight equivalent). The variable P_p is the price of aggregate pork products. The term sh_f is the share of hog price in the aggregate pork price.

Pork processors usually produce multiple pork products. Although multiple pork products are produced, for our research purposes, it suffices to aggregate those products into two categories such as whole pork meat and other pork meat because the proposed regulations restrict sales of only whole pork meat along the pork supply chain. Hence, in modeling, pork processors are assumed to produce whole pork meat and other pork meat, given compliant hogs. Equation (A4.4) represents the supply of whole pork meat, and Equation (A4.5) represents the supply of other pork meat from slaughtered compliant hogs. Equation (A4.6) represents a relationship among prices of slaughtered hog carcass, whole pork meat, and other pork meat.

$$(A4.4)\ d\ln Q_p^{F,s} = d\ln Q_p^d + \sigma \cdot \left(d\ln P_p^F - d\ln P_p\right),$$
$$(A4.5)\ d\ln Q_p^{N,s} = d\ln Q_p^d + \sigma \cdot \left(d\ln P_p^N - d\ln P_p\right),$$
$$(A4.6)\ d\ln P_p = sh_{rev}^F \cdot d\ln P_p^F + sh_{rev}^N \cdot d\ln P_p^N.$$

The superscript F denotes whole pork meat, and N denotes other pork meat. The variable $Q_p^{F,s}$ is the quantity supplied of whole pork meat, and $Q_p^{N,s}$ is the quantity supplied of other pork meat from processors. The variable P_p^F is the wholesale price of whole pork meat, and P_p^N is the wholesale price of other pork meat. The variable Q_p^d is the quantity demanded of processors for aggregate pork. The term sh_{rev}^F is the share of whole pork meat in total revenue, and sh_{rev}^N is the corresponding share of other pork meat. The parameter σ is the elasticity of transformation between whole pork meat and other pork meat.

Although pork processors can reorganize proportions of whole pork meat and other pork meat produced, we expect that these two types of products are not perfectly transformable into each other because of at least two reasons. First, processing facilities for whole pork meat differ from those for other pork meat, and it would be costly to transform different types of facilities into each other. Second, characteristics differ across parts of a hog carcass, and some parts would be more appropriate for whole pork meat than other pork meat (or more appropriate for other pork meat than whole pork meat). Such imperfect transformation between whole pork meat and other pork meat is represented by the elasticity of transformation parameter, σ, in Equations (A4.4) and (A4.5) above. For simplicity, we assume a constant elasticity (specifically, 1) of transformation within a reasonable production range. Before the housing restrictions are implemented, it is uncertain how flexibly pork processors may adjust production proportions of whole pork meat and other pork meat in response to the effects of the regulations. However, we find the simulation results are robust to a range of changes in elasticity of transformation, although we do not report those results in this appendix.

We expect that whole pork meat from compliant hogs would be provided only within California because (a) it is costly to comply with the housing restrictions, and (b) there is little evidence that consumers would be willing to pay more for compliant whole pork meat than non-compliant whole pork meat. Formally, Equation (A4.7) represents the demand for compliant whole pork meat:

$$(A4.7) \; d \ln Q_p^{F,d} = d \ln Q_r^{F,s}.$$

The notations are consistent with those above. The variable $Q_p^{F,d}$ is the quantity demanded for compliant whole pork meat, and $Q_r^{F,s}$ is the quantity supplied of whole pork meat at retail and food service in California. For simplicity, we assume no loss at the retailing stage.

Contrary to the case of compliant whole pork meat, we expect that a substantial proportion of other pork meat from compliant hogs would be provided outside California. As mentioned above, because of imperfect transformation in processing between whole pork meat and other pork meat, at least a substantial proportion of hog carcass from a compliant hog must be used for other pork meat. Also, the proposed regulations will not restrict sales in California of other pork meat from non-compliant hogs if that other pork meat is made outside California. Because there is little evidence that final consumers are willing to pay more for other pork meat (for example, cooked pork) from compliant hogs than those from non-compliant hogs, retailers would not differentiate other pork meat in terms of compliant hogs or non-compliant hogs. Hence, we expect that other pork meat would be distributed across the United States regardless of whether other pork meat comes from compliant hogs, which implies that a proportion of other pork meat from compliant hogs would be supplied outside California.

As mentioned above, pork production costs would rise because the housing restrictions would raise hog production costs and, sequentially, would raise the farm price of hogs. In addition to a higher hog price, we expect that the proposed regulations would raise pork processing costs for compliance (See *Processing Cost Increase* above).

Processors would attempt to transfer costs to retailers by raising pork prices. However, we expect that compliant pork processors would hardly raise other pork meat price because (a) California accounts for only a small proportion of the U.S. total other pork meat consumption and (b) there is little evidence that consumers would be willing to pay more for compliant other pork meat than non-compliant one. In modeling, for simplicity, we assume that the wholesale price of other pork meat would not change, which is written as $d \ln P_p^N = 0$. Hence, pork processors would transfer those production costs increments by raising only wholesale price of whole pork meat.

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Formally, Equation (A4.8) represents the relationship between retail price and wholesale price of whole pork meat. Equation (A4.9) is the corresponding one of other pork meat:

$$(A4.8)\ d \ln P_r^F = s^F \cdot \left(d \ln P_p^F + \gamma\right),$$
$$(A4.9)\ d \ln P_r^N = s^N \cdot d \ln P_p^N = 0.$$

The notations are consistent with those above. The variable P_p^F is the wholesale price of whole pork meat and P_r^F is the wholesale price of other pork meat at retail and food service. The price paid by consumers at restaurants and other food service is an implicit price that reflects the cost of a meal and is unobservable. We assume that (a) the cost of pork as an ingredient is equivalent to the corresponding retail pork price, and (b) consumers' response to pork price changes is identical at retail and food service. The term s^F is the share of the wholesale price of whole pork meat in the corresponding retail price. The term s^N is the share of the wholesale price of other pork meat in the corresponding retail price. The parameter γ represents the production costs increments in processing by the proposed regulations, written as a percentage change in the wholesale price.

Equation (A4.9) represents the demand for whole pork meat at retail and food service, while Equation (A4.10) represents the demand for other pork meat at retail and food service in California:

$$(A4.9)\ d \ln Q_r^{F,d} = \eta^F \cdot d \ln P_r^F + \eta^{FN} \cdot d \ln P_r^N,$$
$$(A4.10)\ d \ln Q_r^{N,d} = \eta^N \cdot d \ln P_r^N + \eta^{NF} \cdot d \ln P_r^F.$$

The notations are consistent with those above. The variable $Q_r^{F,d}$ is the quantity demanded for whole pork meat, and $Q_r^{N,d}$ is the quantity demanded for other pork meat at retail and food service in California. The variable P_r^F is the retail price of whole pork meat, and P_r^N is the retail price of other pork meat in California. The parameter η^F is the own-price elasticity of demand for whole pork meat. The parameter η^N is the own-price elasticity of demand for other pork meat. The parameter η^{FN} is the cross-price elasticity of demand for whole pork meat in response

to other pork meat price changes. The parameter η^{NF} is the cross-price elasticity of demand for other pork meat in response to whole pork meat price changes.

Combining the relations above and market clearing conditions, we determine the market equilibrium displacement of prices and quantities when the proposed regulations are implemented. Given the equilibrium displacement in market prices and quantities, we can measure changes in producer revenues and consumer expenditures.

Simulation Results

In this section, we simulate the likely effects of the regulations proposed by CDFA for implementing Proposition 12.

For the simulations, we look at the effects of the regulations for two specific years: 2022 and 2023. We provide simulation results for 2022 and 2023 because producers and consumers would have different opportunities to adjust to the proposed regulations. In 2022, the first year of implementation, producers would have fewer opportunities to adjust to the proposed regulations. Similarly, one year would not be long enough for consumers to adjust fully to a substantially higher price for pork consumption. However, in 2023, the second year of implementation, producers and consumers would have more opportunities to adjust to the proposed regulations. To consider such potential differences in behaviors of producers and consumers, we provide simulation results separately for 2022 and 2023.

Besides the proposed regulations, CDFA considers two alternative packages of regulations: a package of lower-cost regulations and a package of higher-cost regulations. We simulate the effects of other packages after we discuss the effects of the proposed regulations.

Proposed Regulations

Under the proposed regulations, neither the pork producer nor pork handler shall knowingly sell or contract to sell whole pork meat for human consumption in the state if it is the product of a breeding pig that was confined in an enclosure that fails to comply with certain standards. The standards include "the enclosure shall not prevent a breeding pig from lying down, standing up,

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fully extending its limbs, or turning around freely" and "an enclosure shall provide a minimum of 24 square feet of usable floor space per pig." Here "whole pork meat" means any uncooked cut of pork, excluding ground pork, that is comprised entirely of pork meat, except for seasoning, curing agents, coloring, flavoring, preservatives, and similar meat additives. Here the word, "uncooked" means not ready-to-eat in the condition sold, offered for sale, or otherwise distributed.

As discussed above, we assess $0.03 per pound of farm cost increase and $0.21 of whole pork meat processing cost increase owing to these regulations (See the subsections *Farm Cost Increase* and *Processing Cost Increase* above).

Table A4.7 reports the likely effects of the proposed regulations in 2022. The quantity consumed of whole pork meat falls (by -3.3%), and the retail price of whole pork meat rises by 7.4% due to the proposed regulations. However, the quantity consumed of other pork meat slightly rises by 1.0% due to the proposed regulations because consumers substitute other pork meat for whole pork meat in response to the price increase of whole pork meat. As discussed in the modeling section above, the prices of other pork meat would not change because California accounts for only a small proportion of the total U.S. market and the prices of other pork meat would be determined by supplies from other regions unaffected by the regulations.

The changes in whole pork meat dominate the changes in other pork meat, so, in terms of all pork, the quantity consumed falls due to the regulations. These changes in quantities and prices result in an 8.5% increase in retailer and food service expenditure in California and a 2.5% increase in consumer expenditure in California.

We assess that the proposed regulations would barely affect hog production in California, because the hog farming industry is very small. Most pork products consumed in California come from hogs raised outside of California. In California, the small hog farming industry is specialized to serve certain specific pockets of demand. Therefore, we expect that the proposed regulations will have minimal effects on the California small hog farming industry.

Table A4.8 reports the likely effects of the proposed regulations in 2023. Consumers now have more opportunities to reduce whole pork meat consumption in response to higher whole pork prices from the proposed regulations. Specifically, the quantity consumed of whole pork meat falls by 6.7%, and the retail price of whole pork meat rises by 7.5%. The changes in whole pork meat dominate the changes in other pork meat, so, in terms of all pork, the quantity consumed falls due to the regulations. These changes in quantities and prices result in a 7.3% increase in retailer and food service expenditure in California and a 1.2% increase in consumer expenditure in California.

As discussed in the subsections *Farm Cost Increase* and *Processing Cost Increase* above, we assess that the proposed regulations raise farm cost by $0.03 per pound of a hog (retail weight) and raise processing costs by $0.21 per pound of whole pork meat. Although these estimates are our best ones after reviewing related data and discussion with industry members, it is uncertain how much farm costs would increase before regulations are implemented.

Hence, we consider two more cases: first, we consider the case that the regulation-driven farm cost increase is realized at $0.04 per pound of a hog (retail weight) rather than our best estimate ($0.04 per pound of a hog, retail weight). In percentage terms, $0.04 per pound of a hog is a 33% higher farm cost increase than our best estimate ($0.03 per pound of a hog, retail weight). Tables A4.9 and A4.10 report the simulation results. Table A4.9 is for 2022, and Table A4.10 is for 2023. The changes in directions for quantities and prices are the same as the simulation results under our best estimate of the farm cost increase, but Californians consume less whole pork meat. Specifically, consumer expenditure now rises by about 2.6% (or $184 million) in 2022 and 1.2% (or $87 million) in 2023. The increase in consumer expenditure is smaller in 2023 because consumers have more opportunities to adjust to price changes.

Second, we consider the case that the regulation-driven processing cost increase is realized at $0.28 per pound of whole pork meat rather than our best estimate ($0.21 per pound of whole pork meat). In percentage terms, $0.28 per pound of whole pork meat is a 33% higher processing cost increase than our best estimate ($0.21 per pound of whole pork meat). Tables A4.11 and A4.12 report the simulation results. Table A4.11 is for 2022, and Table A4.12 is for 2023. The

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changes in directions for quantities and prices are the same as the simulation results under our best estimate of the farm cost increase, but the magnitudes change. Specifically, consumer expenditure now rises by about 3.2% (or $220 million) in 2022 and 1.4% (or $100 million) in 2023. The increase in consumer expenditure is smaller in 2023 because consumers have more opportunities to adjust to price changes.

Lower-Cost Regulations

From the proposed regulations, the lower-cost regulations differ in the exemption policy. That is, the lower-cost regulations exempt raw pork meat sold in California intended for further processing, preparation or manufacturing into a combination food product or prepared meal. Hence, under the change in the definition of covered pork products, the lower-cost regulations would affect the sales of whole pork meat at retail (grocery stores) rather than at food service. For simplicity, we assume that changes at retail would rarely affect food service.

To reflect the lower-cost regulations, we need the share of food service in quantity consumed of whole pork meat and that of other pork meat. We obtain the share of food service in pork consumption, from USDA ERS (Lin et al., 2016), and we assess the share of food service in whole pork meat consumption at 24% and that in other pork meat at 19%.

Table A4.13 reports the simulation results in 2022 under the lower-cost regulations. The retail price of whole pork meat rises by 7.4% at grocery stores due to the lower-cost regulations. As a result, the quantity consumed of whole pork meat (at grocery stores and food service, in total) falls by 2.5%. The changes in directions for quantities and prices are the same as those of the proposed regulations, but the change magnitudes (absolute values) are smaller. Changes in quantities and prices result in a 6.5% increase in retailer and food service expenditure in California and a 2.1% increase in consumer expenditure in California.

Table A4.14 reports the simulation results in 2023 under the lower-cost regulations. The retail price of whole pork meat rises by 7.5% at groceries due to the lower-cost regulations. As a result, the quantity consumed of whole pork meat (at groceries and food service, in total) falls by 5.1%. The changes in directions for quantities and prices are the same as those of the proposed

regulations, but the changes in magnitudes (absolute values) are smaller. Changes in quantities and prices result in a 5.4% increase in retailer and food service expenditure in California and a 0.8% increase in consumer expenditure in California.

As we did in the previous subsection (*Proposed Regulations*), we additionally provide simulation results when the regulation-driven farm cost increase is realized at $0.04 per pound of a hog (retail weight) rather than our best estimate ($0.03 per pound of a hog, retail weight). In percentage terms, $0.04 per pound of a hog is a 33% higher farm cost increase than our best estimate ($0.03 per pound of a hog, retail weight). Tables A4.15 and A4.16 report the simulation results. Table A4.15 is for 2022, and Table A4.16 is for 2023. The changes in directions for quantities and prices are the same as the simulation results under our best estimate of the farm cost increase, but Californians consume less whole pork meat.

As we did in the previous subsection (*Proposed Regulations*), we provide simulation results when the regulation-driven processing cost increase is realized at $0.28 per pound of whole pork meat rather than our best estimate ($0.21 per pound of whole pork meat). In percentage terms, $0.28 per pound of whole pork meat is a 33% higher processing cost increase than our best estimate ($0.21 per pound of whole pork meat). Tables A4.17 and A4.18 report the simulation results. Table A4.17 is for 2022, and Table A4.18 is for 2023. The changes in directions for quantities and prices are the same as the simulation results under our best estimate of the processing cost increase, but Californians consume less whole pork meat.

Higher-Cost Regulations

From the proposed regulations, the first difference under higher-cost regulations is that now covered pork products include ground pork and their products. Because of this difference, whole pork meat now accounts for about 77.3% (from 57.6% before) in total consumption. As discussed in the modeling section above, pork processors transfer production cost increments through raising only whole pork meat. Hence, the quantity increase of whole pork meat results in a lower processing cost increase in terms of per quantity unit basis (from $0.21 to $0.17 per pound of whole pork meat).

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The second difference is that, under the higher-cost regulations, covered pork products are not exempted even when those products only move through California for sale in another state or country. We understand that some pork may come to California to be redistributed to other regions, and one main channel would be exports to other countries through California ports. In 2019, pork product exports through California ports were about $2.44 billion (or about 822 thousand metric tons), which is equivalent to about 85% of the total California retailer expenditure on pork products in terms of value.

Pork exporters facing the higher-cost regulations would have two likely strategies. The first strategy would be to comply with California rules. For pork exporters who decide to comply with California rules, exporting costs would increase substantially. The second strategy would be to divert exports from California ports to ports in other west coast U.S. states. We expect that pork exporters would be much more likely to choose the second strategy (diverting to other ports) in order to avoid the substantially higher costs of complying with California regulations versus neighboring states' regulations.

Although pork product exports through California may change under the higher-cost regulations, we expect that the export change would minimally affect pork distribution within California. By diverting exports to other west-coast ports, pork exporters could face a small change in exporting costs, which would result in minimal changes to the retail pork distribution market in California. Hence, we do not include the effects of the higher-cost regulations on retail pork distribution in California.

The third difference is that the higher-cost package requires "consumer facing labeling for all covered products or prepared foods containing a covered product allowing the end customer to scan a QR code and see record of Prop 12 animal confinement certification and traceability of product back to farm of origin." For such labeling, certification, and traceability, we assess all aggregate costs through the supply chain to be about a 1% increase in retail price.

Table A4.19 reports the simulation results in 2022 under the higher-cost regulations. The quantity consumed of whole pork meat falls (by 2.8%), and the retail price of whole pork meat

rises (by 6.9%) owing to the production cost increases from the regulations. The changes in directions for quantities and prices are the same as the case of the proposed regulations, while the changes in magnitudes (absolute values) increase. Changes in quantities and prices result in a 9.1% increase in retailer and food service expenditure in California and a 3.2% increase in consumer expenditure in California.

Table A4.20 reports the simulation results in 2023 under the higher-cost regulations. The quantity consumed of whole pork meat falls (by 5.6%), and the retail price of whole pork meat rises (by 7.0%) owing to the production cost increases from the regulations. The changes in directions for quantities and prices are the same as the case of the proposed regulations, while the changes in magnitudes (absolute values) increase. Changes in quantities and prices result in a 7.3% increase in retailer and food service expenditure in California and a 1.4% increase in consumer expenditure in California.

As we did in the previous subsection (*Proposed Regulations*), we additionally provide simulation results when the regulation-driven farm cost increase is realized at $0.04 per pound of a hog (retail weight) rather than our best estimate ($0.03 per pound of a hog, retail weight). In percentage terms, $0.04 per pound of a hog is a 33% higher farm cost increase than our best estimate ($0.03 per pound of a hog, retail weight). Tables A4.21 and A4.22 report the simulation results. Table A4.21 is for 2022, and Table A4.22 is for 2023. The changes in directions for quantities and prices are the same as the simulation results under our best estimate of the farm cost increase, but Californians consume less whole pork meat.

As we did in the previous subsection (*Proposed Regulations*) we also provide simulation results when the regulation-driven processing cost increase is realized at $0.23 per pound of whole pork meat rather than our best estimate ($0.17 per pound of whole pork meat). In percentage terms, $0.23 per pound of pork is a 33% higher processing cost increase than our best estimate ($0.17 per pound of pork). Tables A4.23 and A4.24 report the simulation results. Table A4.23 is for 2022, and Table A4.24 is for 2023. The changes in directions for quantities and prices are the same as the simulation results under our best estimate of processing cost increase, but Californians consume less whole pork meat.

Table A4.7. Impacts of Proposed Pork Regulations in 2022

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed in California					
Whole pork meat	Million lbs.	1,145	1,107	-38	-3.3%
Other pork meat	Million lbs.	844	852	8	1.0%
Total	Million lbs.	1,989	1,959	-30	-1.5%
Wholesale prices in California					
Whole pork meat	$/lb.	1.20	1.44	0.24	20.3%
Other pork meat	$/lb.	1.68	1.68	0.00	0.0%
Retail prices in California					
Whole pork meat	$/lb.	3.30	3.54	0.24	7.4%
Other pork meat	$/lb.	3.78	3.78	0.00	0.0%
Retail expenditure and consumer expenditure in California					
Retail expenditure	Million $	2,793	3,030	237	8.5%
Consumer expenditure	Million $	6,964	7,138	174	2.5%

Table A4.8. Impacts of Proposed Pork Regulations in 2023

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed in California					
Whole pork meat	Million lbs.	1,159	1,081	-78	-6.7%
Other pork meat	Million lbs.	854	874	20	2.3%
Total	Million lbs.	2,013	1,955	-58	-2.9%
Wholesale prices in California					
Whole pork meat	$/lb.	1.20	1.45	0.25	20.5%
Other pork meat	$/lb.	1.68	1.68	0.00	0.0%
Retail prices in California					
Whole pork meat	$/lb.	3.30	3.55	0.25	7.5%
Other pork meat	$/lb.	3.78	3.78	0.00	0.0%
Retail expenditure and consumer expenditure in California					
Retail expenditure	Million $	2,827	3,032	206	7.3%
Consumer expenditure	Million $	7,048	7,131	83	1.2%

Table A4.9. Impacts of Proposed Pork Regulations in 2022: 33% Higher Farm Cost Increase by Regulations than Our Best Estimate

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed in California					
Whole pork meat	Million lbs.	1,145	1,105	-40	-3.5%
Other pork meat	Million lbs.	844	853	9	1.0%
Total	Million lbs.	1,989	1,958	-32	-1.6%
Wholesale prices in California					
Whole pork meat	$/lb.	1.20	1.46	0.26	21.4%
Other pork meat	$/lb.	1.68	1.68	0.00	0.0%
Retail prices in California					
Whole pork meat	$/lb.	3.30	3.55	0.26	7.8%
Other pork meat	$/lb.	3.78	3.78	0.00	0.0%
Retail expenditure and consumer expenditure in California					
Retail expenditure	Million $	2,793	3,043	250	8.9%
Consumer expenditure	Million $	6,964	7,148	184	2.6%

Note. Table A4.7 reports the corresponding simulation results under our best estimate of farm cost increase.

Table A4.10. Impacts of Proposed Pork Regulations in 2023: 33% Higher Farm Cost Increase by Regulations than Our Best Estimate

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed in California					
Whole pork meat	Million lbs.	1,159	1,076	-82	-7.1%
Other pork meat	Million lbs.	854	875	21	2.4%
Total	Million lbs.	2,013	1,952	-62	-3.1%
Wholesale prices in California					
Whole pork meat	$/lb.	1.20	1.46	0.26	21.7%
Other pork meat	$/lb.	1.68	1.68	0.00	0.0%
Retail prices in California					
Whole pork meat	$/lb.	3.30	3.56	0.26	7.9%
Other pork meat	$/lb.	3.78	3.78	0.00	0.0%
Retail expenditure and consumer expenditure in California					
Retail expenditure	Million $	2,827	3,043	216	7.7%
Consumer expenditure	Million $	7,048	7,135	87	1.2%

Note. Table A4.8 reports the corresponding simulation results under our best estimate of farm cost increase.

Table A4.11. Impacts of Proposed Pork Regulations in 2022: 33% Higher Processing Cost Increase by Regulations than Our Best Estimate

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed in California					
Whole pork meat	Million lbs.	1,145	1,097	-49	-4.2%
Other pork meat	Million lbs.	844	855	10	1.2%
Total	Million lbs.	1,989	1,951	-38	-1.9%
Wholesale prices in California					
Whole pork meat	$/lb.	1.20	1.51	0.31	25.9%
Other pork meat	$/lb.	1.68	1.68	0.00	0.0%
Retail prices in California					
Whole pork meat	$/lb.	3.30	3.61	0.31	9.4%
Other pork meat	$/lb.	3.78	3.78	0.00	0.0%
Retail expenditure and consumer expenditure in California					
Retail expenditure	Million $	2,793	3,093	300	10.7%
Consumer expenditure	Million $	6,964	7,184	220	3.2%

Note. Table A4.7 reports the corresponding simulation results under our best estimate of farm cost increase.

Table A4.12. Impacts of Proposed Pork Regulations in 2023: 33% Higher Processing Cost Increase by Regulations than Our Best Estimate

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed in California					
Whole pork meat	Million lbs.	1,159	1,060	-99	-8.6%
Other pork meat	Million lbs.	854	879	25	2.9%
Total	Million lbs.	2,013	1,939	-74	-3.7%
Wholesale prices in California					
Whole pork meat	$/lb.	1.20	1.51	0.31	26.1%
Other pork meat	$/lb.	1.68	1.68	0.00	0.0%
Retail prices in California					
Whole pork meat	$/lb.	3.30	3.61	0.31	9.5%
Other pork meat	$/lb.	3.78	3.78	0.00	0.0%
Retail expenditure and consumer expenditure in California					
Retail expenditure	Million $	2,827	3,082	255	9.0%
Consumer expenditure	Million $	7,048	7,147	100	1.4%

Note. Table A4.8 reports the corresponding simulation results under our best estimate of farm cost increase.

Table A4.13. Impacts of Lower-Cost Pork Regulations in 2022

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed in California					
Whole pork meat	Million lbs.	1,145	1,116	-29	-2.5%
Other pork meat	Million lbs.	844	850	6	0.7%
Total	Million lbs.	1,989	1,967	-23	-1.1%
Wholesale prices in California					
Whole pork meat at groceries	$/lb.	1.20	1.44	0.24	20.3%
Whole pork meat at food service	$/lb.	1.20	1.20	0.00	0.0%
Other pork meat	$/lb.	1.68	1.68	0.00	0.0%
Retail prices in California					
Whole pork meat at groceries	$/lb.	3.30	3.54	0.24	7.4%
Whole pork meat at food service	$/lb.	3.30	3.30	0.00	0.0%
Other pork meat	$/lb.	3.78	3.78	0.00	0.0%
Retail expenditure and consumer expenditure in California					
Retail expenditure	Million $	2,793	2,974	181	6.5%
Consumer expenditure	Million $	6,964	7,097	133	1.9%

Table A4.14. Impacts of Lower-Cost Pork Regulations in 2023

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed in California					
Whole pork meat	Million lbs.	1,159	1,100	-59	-5.1%
Other pork meat	Million lbs.	854	867	13	1.5%
Total	Million lbs.	2,013	1,966	-47	-2.3%
Wholesale prices in California					
Whole pork meat at groceries	$/lb.	1.20	1.45	0.25	20.6%
Whole pork meat at food service	$/lb.	1.20	1.20	0.00	0.0%
Other pork meat	$/lb.	1.68	1.68	0.00	0.0%
Retail prices in California					
Whole pork meat at groceries	$/lb.	3.30	3.54	0.25	7.5%
Whole pork meat at food service	$/lb.	3.30	3.30	0.00	0.0%
Other pork meat	$/lb.	3.78	3.78	0.00	0.0%
Retail expenditure and consumer expenditure in California					
Retail expenditure	Million $	2,827	2,979	153	5.4%
Consumer expenditure	Million $	7,048	7,103	55	0.8%

Table A4.15. Impacts of Lower-Cost Pork Regulations in 2022: 33% Higher Farm Cost Increase by Regulations than Our Best Estimate

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed in California					
Whole pork meat	Million lbs.	1,145	1,115	-31	-2.7%
Other pork meat	Million lbs.	844	851	7	0.8%
Total	Million lbs.	1,989	1,965	-24	-1.2%
Wholesale prices in California					
Whole pork meat at groceries	$/lb.	1.20	1.46	0.26	21.5%
Whole pork meat at food service	$/lb.	1.20	1.20	0.00	0.0%
Other pork meat	$/lb.	1.68	1.68	0.00	0.0%
Retail prices in California					
Whole pork meat at groceries	$/lb.	3.30	3.55	0.26	7.8%
Whole pork meat at food service	$/lb.	3.30	3.30	0.00	0.0%
Other pork meat	$/lb.	3.78	3.78	0.00	0.0%
Retail expenditure and consumer expenditure in California					
Retail expenditure	Million $	2,793	2,984	191	6.8%
Consumer expenditure	Million $	6,964	7,104	140	2.0%

Note. Table A4.13 reports the corresponding simulation results under our best estimate of farm cost increase.

Table A4.16. Impacts of Lower-Cost Pork Regulations in 2023: 33% Higher Farm Cost Increase by Regulations than Our Best Estimate

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed in California					
Whole pork meat	Million lbs.	1,159	1,096	-63	-5.4%
Other pork meat	Million lbs.	854	868	13	1.6%
Total	Million lbs.	2,013	1,964	-50	-2.5%
Wholesale prices in California					
Whole pork meat at groceries	$/lb.	1.20	1.46	0.26	21.8%
Whole pork meat at food service	$/lb.	1.20	1.20	0.00	0.0%
Other pork meat	$/lb.	1.68	1.68	0.00	0.0%
Retail prices in California					
Whole pork meat at groceries	$/lb.	3.30	3.56	0.26	7.9%
Whole pork meat at food service	$/lb.	3.30	3.30	0.00	0.0%
Other pork meat	$/lb.	3.78	3.78	0.00	0.0%
Retail expenditure and consumer expenditure in California					
Retail expenditure	Million $	2,827	2,988	161	5.7%
Consumer expenditure	Million $	7,048	7,105	57	0.8%

Note. Table A4.14 reports the corresponding simulation results under our best estimate of farm cost increase.

Table A4.17. Impacts of Lower-Cost Pork Regulations in 2022: 33% Higher Processing Cost Increase by Regulations than Our Best Estimate

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed in California					
Whole pork meat	Million lbs.	1,145	1,108	-37	-3.2%
Other pork meat	Million lbs.	844	852	8	0.9%
Total	Million lbs.	1,989	1,960	-29	-1.5%
Wholesale prices in California					
Whole pork meat at groceries	$/lb.	1.20	1.51	0.31	25.9%
Whole pork meat at food service	$/lb.	1.20	1.20	0.00	0.0%
Other pork meat	$/lb.	1.68	1.68	0.00	0.0%
Retail prices in California					
Whole pork meat at groceries	$/lb.	3.30	3.61	0.31	9.4%
Whole pork meat at food service	$/lb.	3.30	3.30	0.00	0.0%
Other pork meat	$/lb.	3.78	3.78	0.00	0.0%
Retail expenditure and consumer expenditure in California					
Retail expenditure	Million $	2,793	3,021	228	8.2%
Consumer expenditure	Million $	6,964	7,131	167	2.4%

Note. Table A4.13 reports the corresponding simulation results under our best estimate of farm cost increase.

Table A4.18. Impacts of Lower-Cost Pork Regulations in 2023: 33% Higher Processing Cost Increase by Regulations than Our Best Estimate

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed in California					
Whole pork meat	Million lbs.	1,159	1,083	-76	-6.5%
Other pork meat	Million lbs.	854	870	16	1.9%
Total	Million lbs.	2,013	1,954	-60	-3.0%
Wholesale prices in California					
Whole pork meat at groceries	$/lb.	1.20	1.51	0.31	26.2%
Whole pork meat at food service	$/lb.	1.20	1.20	0.00	0.0%
Other pork meat	$/lb.	1.68	1.68	0.00	0.0%
Retail prices in California					
Whole pork meat at groceries	$/lb.	3.30	3.61	0.31	9.5%
Whole pork meat at food service	$/lb.	3.30	3.30	0.00	0.0%
Other pork meat	$/lb.	3.78	3.78	0.00	0.0%
Retail expenditure and consumer expenditure in California					
Retail expenditure	Million $	2,827	3,016	190	6.7%
Consumer expenditure	Million $	7,048	7,112	65	0.9%

Note. Table A4.14 reports the corresponding simulation results under our best estimate of farm cost increase.

Table A4.19. Impacts of Higher-Cost Pork Regulations in 2022

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed in California					
Whole pork meat	Million lbs.	1,537	1,495	-43	-2.8%
Other pork meat	Million lbs.	452	457	5	1.2%
Total	Million lbs.	1,989	1,952	-37	-1.9%
Wholesale prices in California					
Whole pork meat	$/lb.	1.26	1.45	0.20	15.8%
Other pork meat	$/lb.	1.91	1.91	0.00	0.0%
Retail prices in California					
Whole pork meat	$/lb.	3.35	3.59	0.23	6.9%
Other pork meat	$/lb.	4.00	4.00	0.00	0.0%
Retail expenditure and consumer expenditure in California					
Retail expenditure	Million $	2,793	3,046	253	9.1%
Consumer expenditure	Million $	6,964	7,189	225	3.2%

Table A4.20. Impacts of Higher-Cost Pork Regulations in 2023

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed in California					
Whole pork meat	Million lbs.	1,556	1,469	-87	-5.6%
Other pork meat	Million lbs.	457	468	11	2.4%
Total	Million lbs.	2,013	1,938	-76	-3.8%
Wholesale prices in California					
Whole pork meat	$/lb.	1.26	1.46	0.20	15.9%
Other pork meat	$/lb.	1.91	1.91	0.00	0.0%
Retail prices in California					
Whole pork meat	$/lb.	3.35	3.59	0.23	7.0%
Other pork meat	$/lb.	4.00	4.00	0.00	0.0%
Retail expenditure and consumer expenditure in California					
Retail expenditure	Million $	2,827	3,032	205	7.3%
Consumer expenditure	Million $	7,048	7,144	96	1.4%

Table A4.21. Impacts of Higher-Cost Pork Regulations in 2022: 33% Higher Farm Cost Increase by Regulations than Our Best Estimate

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed in California					
Whole pork meat	Million lbs.	1,537	1,493	-45	-2.9%
Other pork meat	Million lbs.	452	458	6	1.2%
Total	Million lbs.	1,989	1,950	-39	-2.0%
Wholesale prices in California					
Whole pork meat	$/lb.	1.26	1.47	0.21	16.7%
Other pork meat	$/lb.	1.91	1.91	0.00	0.0%
Retail prices in California					
Whole pork meat	$/lb.	3.35	3.60	0.24	7.2%
Other pork meat	$/lb.	4.00	4.00	0.00	0.0%
Retail expenditure and consumer expenditure in California					
Retail expenditure	Million $	2,793	3,060	267	9.6%
Consumer expenditure	Million $	6,964	7,200	236	3.4%

Note. Table A4.19 reports the corresponding simulation results under our best estimate of farm cost increase.

Table A4.22. Impacts of Higher-Cost Pork Regulations in 2023: 33% Higher Farm Cost Increase by Regulations than Our Best Estimate

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed in California					
Whole pork meat	Million lbs.	1,556	1,465	-91	-5.8%
Other pork meat	Million lbs.	457	469	11	2.5%
Total	Million lbs.	2,013	1,934	-79	-3.9%
Wholesale prices in California					
Whole pork meat	$/lb.	1.26	1.47	0.21	16.8%
Other pork meat	$/lb.	1.91	1.91	0.00	0.0%
Retail prices in California					
Whole pork meat	$/lb.	3.35	3.60	0.24	7.3%
Other pork meat	$/lb.	4.00	4.00	0.00	0.0%
Retail expenditure and consumer expenditure in California					
Retail expenditure	Million $	2,827	3,044	217	7.7%
Consumer expenditure	Million $	7,048	7,147	100	1.4%

Note. Table A4.20 reports the corresponding simulation results under our best estimate of farm cost increase.

Table A4.23. Impacts of Higher-Cost Pork Regulations in 2022: 33% Higher Processing Cost Increase by Regulations than Our Best Estimate

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed in California					
Whole pork meat	Million lbs.	1,537	1,485	-53	-3.4%
Other pork meat	Million lbs.	452	459	7	1.5%
Total	Million lbs.	1,989	1,943	-46	-2.3%
Wholesale prices in California					
Whole pork meat	$/lb.	1.26	1.51	0.25	20.2%
Other pork meat	$/lb.	1.91	1.91	0.00	0.0%
Retail prices in California					
Whole pork meat	$/lb.	3.35	3.64	0.29	8.6%
Other pork meat	$/lb.	4.00	4.00	0.00	0.0%
Retail expenditure and consumer expenditure in California					
Retail expenditure	Million $	2,793	3,116	323	11.6%
Consumer expenditure	Million $	6,964	7,240	276	4.0%

Note. Table A4.19 reports the corresponding simulation results under our best estimate of farm cost increase.

Table A4.24. Impacts of Higher-Cost Pork Regulations in 2023: 33% Higher Processing Cost Increase by Regulations than Our Best Estimate

	Unit	Without regulations	With regulations	Change (level)	Change (%)
Quantity consumed in California					
Whole pork meat	Million lbs.	1,556	1,449	-107	-6.9%
Other pork meat	Million lbs.	457	471	13	2.9%
Total	Million lbs.	2,013	1,920	-94	-4.7%
Wholesale prices in California					
Whole pork meat	$/lb.	1.26	1.51	0.25	20.3%
Other pork meat	$/lb.	1.91	1.91	0.00	0.0%
Retail prices in California					
Whole pork meat	$/lb.	3.35	3.64	0.29	8.6%
Other pork meat	$/lb.	4.00	4.00	0.00	0.0%
Retail expenditure and consumer expenditure in California					
Retail expenditure	Million $	2,827	3,087	260	9.2%
Consumer expenditure	Million $	7,048	7,160	113	1.6%

Note. Table A4.20 reports the corresponding simulation results under our best estimate of farm cost increase.

Appendix 5. Economy-wide Impact of the Proposed Regulations Using IMPLAN

Modeling and Measuring the Economic Linkages and Contributions

This SRIA utilizes well-known input-output (I-O) analysis to quantify the potential economic impacts of Proposition-12-related regulations on the included animal protein product industries in California. I-O analysis is the most common and straightforward methodology for estimating the effects of an economic event occurring on a set of sectors over the entire economy of a region. I-O analysis uses quantitative data of an economic event affecting, in this case the California shell-egg, veal and pork industries, to determine how this external shock interacts with the other industries, sectors and institutions (such as households and government) within a region's economy. The methodology accounts for the array of economic transactions between each industry and other sectors of the economy, and the magnitude of impact these transactions have on the rest of the economy.

I-O analysis is useful because of its ability to reach beyond the direct economic effects of an external economic event, in this case Proposition 12, over included animal protein producing sectors, and incorporates the ripple effects that occur within California's economy. I-O models trace the effects of an industry to the economy and account for economy-wide responses to changes in industry output that may be caused by any sort of influence such as regulatory change, a shift in production technology and methods, or other quantitative changes in sector's output demand.

The ripple effects within I-O analysis are computed as multipliers and reflect the magnitude of an impact in the economy from a unit change in output from an industry. In this report, multipliers identify the interdependence between the included animal protein product industries in California and other parts of the California economy. By employing a series of fixed ratios from the I-O model, it is possible to create a set of multipliers that quantify a range of economic impacts from industry output to the number of jobs supported, income paid to labor, and state GDP, for example.

Four types of multipliers by economic measures

For the California animal protein product industries regulated under Proposition 12, our analysis focuses on four multipliers for specific economic measures namely; (1) value of output (measured by sales revenue), (2) labor income, (3) total value added to state GDP, and (4) employment or the number of jobs supported. Each of these measures has a specific technical definition.

The value of output multiplier constitutes the base multiplier from which all other multipliers are derived (IMPLAN 2020). The value of output is comprised by the product between the unit price and a number of units produced. And its multiplier represents the overall increase of value of output in the economy as a result of an increase in the output of a target sector, which is the sector that experiences the economic event or external shock. Such sectors, in this study would be egg, pork and veal production. For example, an increase in value of shell-egg output by California egg farms is comprised of either an increase in on-farm egg production at the farm price, an increase in the farm price for the quantity produced, or both. Likewise, changes in the value of output for egg-processing plants is comprised of the prices of processed products multiplied by the quantities of each product manufactured, where the prices of produced products are affected by the costs of inputs including eggs from the farm. A limitation of the value of output measure for the California animal protein industries is the potential for double counting the value of farm production by California farms. Obviously, the output value of processed animal protein products includes the value of commodities purchased from California farms along with the value of all other inputs used in manufacturing animal protein products.

The labor income to sector output ratio provides the ratio of what is paid out as compensation to a) hired labor, b) contracted labor and c) earnings of business proprietors, to total value of output. The employment income multiplier represents the share of output value earned by labor and management employed in an industry, whether hired employees or owner-operators. The labor income multiplier indicates the amount of labor expenses in the entire economy as a result of each dollar spent on labor income in the target sector, namely shell eggs, pork and veal.

Value added is that portion of output value not used to purchase inputs from other sectors of the economy. In the case of California animal protein industries, purchased inputs include feed, equipment or veterinary services. That means value added is the output value that is contributed by the workers and capital within the industries above the value of what is purchased and therefore contributed by other sectors. The animal protein industries' value added is its economic contribution above the cost of goods and services that were purchased from other sectors and were therefore already measured as the outputs of those sectors. For example, this methodology recognizes that hogs purchased from farms is the major input cost item for pork processors. So, when measuring the value added contribution of processing we must "net-out" the value of the hogs purchased (and other purchases such as equipment and packaging materials) before assigning the value that was added in the processing stage. Value added is an industry's contribution to the size of the California economy, with no double counting of output that is transferred from one link of the supply chain to the next. The value added to value of output ratio provides the share of sector output that is value added. The value-added multiplier is the amount supported (or generated) of value added for every dollar spent in the target sector(s).

The employment direct multiplier estimates the number of jobs in an industry per million dollars in value of output. It includes all jobs and does not distinguish between part-time or seasonal employment within an industry. These jobs include business owners and family members who share in entrepreneurial income as well as full-time and part-time hired workers and contracted workers. The employment total multiplier provides the number of jobs supported (or generated) in the economy as a result of one additional job in the target sectors.

Direct, Indirect and Induced Effects

Besides using data to establish the four categories of multipliers described, I-O analysis classifies economy-wide impacts for each of the multipliers as direct, indirect or induced. Each of these concepts apply to each industry and to each of the four categories of multipliers described above.

Direct impacts are changes in economic measures that occur directly within the industry being examined. For example, when California shell-egg gross output (sales) rises by $1 million, the direct effect is to add $1 million to the value of output for the state's economy. When a pork

processing plant adds a shift of another 200 workers, the direct employment effect is 200 jobs, that is the direct multipliers are 1.0 for each category.

Indirect impacts are the changes that occur through purchases of input goods and services from supporting industries. For example, if hog farms produce more hogs, farms also likely buy more feed, use more electricity and hire additional hauling services. For the industries that sell to hog farms, these impacts cause increases in output, jobs, worker compensation and value added. Then each of these industries all buy more goods and services from yet further sectors and so forth. Our economy-wide data set has quantitative measures of all these relationships, as the effects of purchases ripple through the California economy.

Induced impacts measure changes in the economy caused by changes in consumption expenditures that result from changes in labor income in the California animal protein industry and supporting industries. The induced impacts are considered a second-round effect, and measure how each other industry is affected by added consumption purchases by people earning additional income caused by the direct and indirect effects. For example, egg, pork or veal producers that receive a higher price may pay employees higher wages or offer more work hours. These workers, including the entrepreneur, spend some of their added incomes at local grocery stores, barbershops, car dealers and so on. These local firms have workers of their own who may also earn more and spend their additional income on goods and services. Workers also pay more taxes and provide more support for government services such as schools. Thus, as with indirect effects, the induced effects from egg, hog and veal economic activity ripple through the whole economy of California.

Total impacts are the sum of direct, indirect and induced impacts. These apply to all four multipliers types: value of output, labor income, value added and employment. Box 5.1 concisely defines each of the multipliers measured and the classification of impacts across the economy.

I-O modeling and analysis is not without limitations. Like all economic modeling, the I-O model used to produce this report represents an abstraction of the real world and depends upon assumptions that may be imperfect. Furthermore, the accuracy of results and analysis hinges on

the reliability of the raw data used to model economic activity. The I-O modeling system used for this report is IMPLAN (IMpact analysis for PLANning), originally developed by the USDA Forest Service. Using multiple data sources, the IMPLAN group develops a comprehensive model of the U.S economy and the economies of each U.S. state, county and other geographic and political boundaries. Although the IMPLAN group provides a valuable tool for conducting economic impact assessment and provides good insight on the U.S. national economy, the representation of specific industries in smaller, more localized geographic areas within the IMPLAN database is challenging. To increase the accuracy of modeling specific industries in specific locations IMPLAN allows users to modify the model with locally available data to better represent the industry and geographic region under study.

Economy-wide Impacts of the Proposed Regulations and Alternatives

Impacts for eggs are assessed by applying multipliers in Table 5.1 of the main SRIA to the simulation results above in Appendix Chapters 1.

We also assess the economy-wide impact of reduced exports of pork in the high cost regulations on jobs and economic activity in California ports.

Other economy-wide impacts from changes in cost of veal and pork produced outside California are limited. They are assessed by recognizing that higher retail revenue is offset by payments for wholesale product shipped into California. Moreover, higher costs to consumers for pork and veal are offset by lower expenditures on other food. This indirect consumer impact is beyond the scope of our economy-wide assessment. Overall food expenditures will be roughly unchanged and could result in slightly lower expenditures but higher quantities purchase of food other than pork and veal. We note that more than half of substitute meats, such as beef, are also shipped into California from other states.

Box 5.1. Using Input-Output Models to Measure Economy-wide Impacts and Contributions

Input-output models link the magnitude of changes in an industry or segment of the economy to the associated changes in all the other industries and institutions such as households and government throughout the economy. Moreover, income generated by this economic expansion will be spent on other services from groceries to new cars to schoolteachers. Input-output models and the associated data on economic linkages in the economy provide the tools and information to quantify these impacts as "multiplier effects" without leaving out impacts or double counting. Impacts are generally classified as direct, indirect and induced effects.

Direct Effects: Direct effects are impacts directly within the affected industry. For example, hiring 10 workers to feed hogs has a direct employment effect of 10 jobs.

Indirect Effects: Indirect effects are the changes in industries outside the directly affected industry through purchases from supporting industries of input goods and services. For example, producing more hogs may entail purchase of additional feed, buying more transport services, and these input suppliers have purchases of their own that ripple further.

Induced Effects: Induced effects are economic ripples that result from added consumption generated by the added income spent by those with income from the direct and indirect effects. For example, pork processor employees spend their incomes at local grocery stores, auto dealerships and barbershops and these local firms have workers whose expenditures ripple further, creating additional economic activity. The sum of direct, indirect and induced impacts comprises the full impact or contribution of an industry on the California economy. We report the contributions using four economic measures.

Value of Output: The value of direct output or service contribution of an industry or segment. For example, the direct value of dairy farm output is simply the market value of milk produced and for milk processors it is the total market value for the dairy products they sell.

Labor Income: The compensation received by hired employees, contract workers and entrepreneurs (owner-operators) who work in an industry.

Value Added: Value added is the measure of salaries and wages, proprietor income and profit minus business taxes. It is that proportion of value of output contributed by labor and capital within the sector. An industry's value added is the economic contribution of a sector above the cost of goods and services purchased from other sectors. Value added is the industry's contribution to the size of the California economy.

Employment: Employment is defined as the number of jobs including part-time or seasonal employment. This includes self-employment and unpaid family workers.

Appendix 6. Text of Proposition 12

Health and Safety Code - HSC DIVISION 20. MISCELLANEOUS HEALTH AND SAFETY PROVISIONS [24000 -26250] (Division 20 enacted by Stats. 1939, Ch. 60.) CHAPTER 13.8. Farm Animal Cruelty [25990 -25994] (Chapter 13.8 added November 4, 2008, by initiative Proposition 2, Sec. 3.)

Section 25990. Prohibitions. In addition to other applicable provisions of law:

(a) A farm owner or operator within the state shall not knowingly cause any covered animal to be confined in a cruel manner.

(b) A business owner or operator shall not knowingly engage in the sale within the state of any of the following:

(1) Whole veal meat that the business owner or operator knows or should know is the meat of a covered animal who was confined in a cruel manner.

(2) Whole pork meat that the business owner or operator knows or should know is the meat of a covered animal who was confined in a cruel manner, or is the meat of immediate offspring of a covered animal who was confined in a cruel manner.

(3) Shell egg that the business owner or operator knows or should know is the product of a covered animal who was confined in a cruel manner.

(4) Liquid eggs that the business owner or operator knows or should know are the product of a covered animal who was confined in a cruel manner. (Amended November 6, 2018, by initiative Proposition 12, Sec. 3. Effective December 19, 2018.)

Section 25991. Definitions. For the purposes of this chapter, the following terms have the following meanings:

(a) "Breeding pig" means any female pig of the porcine species kept for the purpose of commercial breeding who is six months or older or pregnant.

(b) "Business owner or operator" means any person who owns or controls the operations of a business.

(c) "Cage-free housing system" means an indoor or outdoor controlled environment for egg-laying hens within which hens are free to roam unrestricted; are provided enrichments that allow them to exhibit natural behaviors, including, at a minimum, scratch areas, perches, nest boxes, and dust bathing areas; and within which farm employees can provide care while standing within the hens' usable floorspace. Cage-free housing systems include, to the extent they comply with the requirements of this subdivision, the following:

(1) Multitiered aviaries, in which hens have access to multiple elevated platforms that provide hens with usable floorspace both on top of and underneath the platforms.

(2) Partially slatted systems, in which hens have access to elevated flat platforms under which manure drops through the flooring to a pit or litter removal belt below.

(3) Single-level all-litter floor systems bedded with litter, in which hens have limited or no access to elevated flat platforms.

(4) Any future systems that comply with the requirements of this subdivision.

(d) "Calf raised for veal" means any calf of the bovine species kept for the purpose of producing the food product described as veal.

(e) "Confined in a cruel manner" means any one of the following acts:

(1) Confining a covered animal in a manner that prevents the animal from lying down, standing up, fully extending the animal's limbs, or turning around freely.

(2) After December 31, 2019, confining a calf raised for veal with less than 43 square feet of usable floorspace per calf.

(3) After December 31, 2021, confining a breeding pig with less than 24 square feet of usable floorspace per pig.

(4) After December 31, 2019, confining an egg-laying hen with less than 144 square inches of usable floorspace per hen.

(5) After December 31, 2021, confining an egg-laying hen with less than the amount of usable floorspace per hen required by the 2017 edition of the United Egg Producers' Animal Husbandry

Guidelines for U.S. Egg-Laying Flocks: Guidelines for Cage-Free Housing or in an enclosure other than a cage-free housing system.

(f) "Covered animal" means any calf raised for veal, breeding pig, or egg-laying hen who is kept on a farm.

(g) "Egg-laying hen" means any female domesticated chicken, turkey, duck, goose, or guineafowl kept for the purpose of egg production.

(h) "Enclosure" means a structure used to confine a covered animal or animals.

(i) "Farm" means the land, building, support facilities, and other equipment that are wholly or partially used for the commercial production of animals or animal products used for food or fiber; and does not include live animal markets, establishments at which mandatory inspection is provided under the Federal Meat Inspection Act (21 U.S.C. Sec. 601 et seq.), or official plants at which mandatory inspection is maintained under the federal Egg Products Inspection Act (21 U.S.C. Sec. 1031 et seq.).

(j) "Farm owner or operator" means any person who owns or controls the operations of a farm.

(k) "Fully extending the animal's limbs" means fully extending all limbs without touching the side of an enclosure, or another animal.

(l) "Liquid eggs" means eggs of an egg-laying hen broken from the shells, intended for human food, with the yolks and whites in their natural proportions, or with the yolks and whites separated, mixed, or mixed and strained. Liquid eggs do not include combination food products, including pancake mixes, cake mixes, cookies, pizzas, cookie dough, ice cream, or similar processed or prepared food products, that are comprised of more than liquid eggs, sugar, salt, water, seasoning, coloring, flavoring, preservatives, stabilizers, and similar food additives.

(m) "Person" means any individual, firm, partnership, joint venture, association, limited liability company, corporation, estate, trust, receiver, or syndicate.

(n) "Pork meat" means meat, as defined in Section 900 of Title 3 of the California Code of Regulations as of August 2017, of a pig of the porcine species, intended for use as human food.

(o) "Sale" means a commercial sale by a business that sells any item covered by this chapter, but does not include any sale undertaken at an establishment at which mandatory inspection is provided under the Federal Meat Inspection Act (21 U.S.C. Sec. 601 et seq.), or any sale undertaken at an official plant at which mandatory inspection is maintained under the federal Egg Products Inspection Act (21 U.S.C. Sec. 1031 et seq.). For purposes of this section, a sale shall be deemed to occur at the location where the buyer takes physical possession of an item covered by Section 25990.

(p) "Shell egg" means a whole egg of an egg-laying hen in its shell form, intended for use as human food.

(q) "Turning around freely" means turning in a complete circle without any impediment, including a tether, and without touching the side of an enclosure or another animal.

(r) "Uncooked" means requiring cooking prior to human consumption.

(s) "Usable floorspace" means the total square footage of floorspace provided to each covered animal, as calculated by dividing the total square footage of floorspace provided to the animals in an enclosure by the number of animals in that enclosure. In the case of egg-laying hens, usable floorspace shall include both groundspace and elevated level flat platforms upon which hens can roost, but shall not include perches or ramps.

(t) "Veal meat" means meat, as defined in Section 900 of Title 3 of the California Code of Regulations as of August 2017, of a calf raised for veal intended for use as human food.

(u) "Whole pork meat" means any uncooked **cut** of pork, including bacon, ham, chop, ribs, riblet, loin, shank, leg, roast, brisket, steak, sirloin, or cutlet, that is comprised entirely of pork meat, except for seasoning, curing agents, coloring, flavoring, preservatives, and similar meat additives. Whole pork meat does not include combination food products, including soups, sandwiches, pizzas, hotdogs, or similar processed or prepared food products, that are comprised of more than pork meat, seasoning, curing agents, coloring, flavoring, preservatives, and similar meat additives.

(v) "Whole veal meat" means any uncooked cut of veal, including chop, ribs, riblet, loin, shank, leg, roast, brisket, steak, sirloin, or cutlet, that is comprised entirely of veal meat, except for seasoning, curing agents, coloring, flavoring, preservatives, and similar meat additives. Whole veal meat does not include combination food products, including soups, sandwiches, pizzas, hotdogs, or similar processed or prepared food products, that are comprised of more than veal meat, seasoning, curing agents, coloring, flavoring, preservatives, and similar meat additives. (Amended November 6, 2018, by initiative Proposition 12, Sec. 4. Effective December 19, 2018.)

Section 25992. Exceptions. This chapter shall not apply:

(a) During medical research.

(b) During examination, testing, individual treatment, or operation for veterinary purposes.

(c) During transportation.

(d) During rodeo exhibitions, state or county fair exhibitions, 4-H programs, and similar exhibitions.

(e) During the slaughter of a covered animal in accordance with the provisions of Chapter 6 (commencing with Section 19501) of Part 3 of Division 9 of the Food and Agricultural Code, relating to humane methods of slaughter, and other applicable law and regulations.

(f) To a breeding pig during the five-day period prior to the breeding pig's expected date of giving birth, and any day that the breeding pig is nursing piglets.

(g) During temporary periods for animal husbandry purposes for no more than six hours in any 24-hour period, and no more than 24 hours total in any 30-day period. (Amended November 6, 2018, by initiative Proposition 12, Sec. 5. Effective December 19, 2018.)

Section 25993. Enforcement.

(a) The Department of Food and Agriculture and the State Department of Public Health shall jointly promulgate rules and regulations for the implementation of this act by September 1, 2019.

(b) Any person who violates any of the provisions of this chapter is guilty of a misdemeanor, and upon conviction thereof shall be punished by a fine not to exceed one thousand dollars ($1,000) or by imprisonment in the county jail for a period not to exceed 180 days or by both such fine and imprisonment. In addition, a violation of subdivision (b) of Section 25990 constitutes unfair competition, as defined in Section 17200 of the Business and Professions Code, and is punishable as prescribed in Chapter 5 (commencing with Section 17200) of Part 2 of Division 7 of the Business and Professions Code.

(c) The provisions of this chapter relating to cruel confinement of covered animals and sale of products shall supersede any conflicting regulations, including conflicting regulations in Chapter 6 (commencing with Section 40601) of Subdivision 6 of Division 2 of Title 22 of the California Code of Regulations. (Amended November 6, 2018, by initiative Proposition 12, Sec. 6. Effective December 19, 2018.)

Section 25993.1.
It shall be a defense to any action to enforce subdivision (b) of Section 25990 that a business owner or operator relied in good faith upon a written certification by the supplier that the whole veal meat, whole pork meat, shell egg, or liquid eggs at issue was not derived from a covered

animal who was confined in a cruel manner, or from the immediate offspring of a breeding pig who was confined in a cruel manner. (Added November 6, 2018, by initiative Proposition 12, Sec. 7. Effective December 19, 2018.)

Section 25994. Construction of Chapter.

The provisions of this chapter are in addition to, and not in lieu of, any other laws protecting animal welfare, including the California Penal Code. This chapter shall not be construed to limit any state law or regulations protecting the welfare of animals, nor shall anything in this chapter prevent a local governing body from adopting and enforcing its own animal welfare laws and regulations. (Added November 4, 2008, by initiative Proposition 2, Sec. 3. Operative January 1, 2015, by Sec. 5 of Prop. 2.)

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