

The Economic Impacts of the California Cage-System Regulations: A Critical Analysis

Brian D. Wright, PhD

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1. Introduction

I have been retained on behalf of the Association of California Egg Farmers to draft a report analyzing a study by Joseph H. Haslag entitled “California Cage-System Regulations: The Economic Impacts on Prices, State Government Expenses and Welfare Losses.” That study was included in a December 4, 2017 filing in the United States Supreme Court in *State of Missouri et al. v. State of California*, No. 220148.

2. Dr. Haslag’s Report

Haslag’s report addresses the economic impacts of certain California requirements for eggs produced and sold in California. California Health and Safety Code §§ 25990-25994 require that egg-laying chickens in California be housed in a manner that permits them to lie down, stand up, extend their wings fully, and turn around freely. Sections 25995-25996.3 forbid the sale in California of any shell egg produced by a hen housed in a manner that restricts such movement. Regulations adopted by the California Department of Food and Agriculture specify that all shelled eggs sold in California must be the product of an egg-laying hen that was confined in an enclosure providing at least 116 square inches of space per hen. Haslag refers to the requirements of these California measures, which took effect January 1, 2015, as the “California Cage-System Regulations.” I shall reference them below as the “CCSR.”

Haslag states (p. A-5) that the purpose of his report “is to quantify the impact that the California cage-system regulations would have on the price of eggs.” The egg market is treated as a national market (p. A-2); the egg type is undefined. Haslag assumes competitive production and distribution throughout the market, and that there will be no changes in consumer preference for eggs. To attempt to quantify the impact of the CCSR, he first estimates the long run increase in total cost of production to produce eggs outside of California to meet his estimate of the shortfall of layer hens in California. He presents two estimates of that total cost (\$228 million and \$912 million), based on what he takes to be estimates of the increased cost per bird per year, \$10 and \$40 (pp. A-23 and A-24). Assuming a competitive market with no abnormal profit, he equates (p. A-24) long run total cost changes with long run total expenditure by consumers of eggs (i.e., he assumes that the price of eggs will rise by an amount sufficient to cover cost changes). Taking into account a minor demand response to the estimated higher price of eggs, he estimates (p. A-25) that “total national expenditures on eggs *will have increased by at least \$227 million and possibly by as much as \$911 million* because of these California Laws.”

Haslag divides his projection of the total increase in national expenditure on eggs by a figure he presents as the total number of eggs produced in the United States (p. A-24). Critically, this number does not represent just CCSR-compliant eggs sold in California. Although Haslag does not define the term “eggs,” he apparently means to include all chicken eggs of any kind produced in the United States, regardless of whether they are CCSR-compliant. The result is his projection of the increase in the long run average cost per egg produced in the United States (0.23 cents per egg for the lower bound and 0.9 cents per egg for the upper bound (p. A-24)). Assuming again a competitive market with no abnormal profit, he equates this long run change

in the national average cost per egg with movements in the long run average price. He therefore concludes that the CCSR have caused national egg prices to increase between 0.23 cents and 0.9 cents per egg, or 2.8 to 11.3 cents per dozen (pp. A-24 and A-25).

Haslag calculates two measures of the implications of the California cage-space regulations for six states, five of which are plaintiffs in the *State of Missouri et al. v. State of California* lawsuit. First, Haslag estimates the effects of the CCSR on prison costs in the six states, assuming that per capita egg consumption is the same for each prisoner as for the nationally representative consumer. He also assumes that Departments of Corrections in these states acquire the same type of eggs as the general U. S. population, and purchase those eggs at the same retail prices as the nationally representative consumer. He estimates for the six states (Alabama, Iowa, Kentucky, Missouri, Nebraska, and Oklahoma) the aggregate increase in prison costs implied by his lower estimate of increase in the national average price of eggs (2.8 cents per dozen) to be \$75,000 per year (p. A-27). For the upper estimate, 11.3 cents per dozen, the estimate is \$300,000 per year (p. A-27). Further, assuming a constant prison population, and a constant national price differential due to the CCSR, he projects the discounted present value of increased annual egg expenditures over the next twenty-five years to be between \$1.2 million and \$4.9 million (p.A-32).

Second, Haslag computes the “welfare” impact on consumers in the six states due to his calculation of the increase in the national average egg price induced by the CCSR. For this analysis, he constructs a “hypothetical person” (p. A-33) who spends a share of income on eggs equal to the average expenditure share of eggs of a national sample of 128,437 households, which is roughly 0.11 percent. He then states (p. A-34) that “[b]ased on the investment necessary to import eggs to the California market, we know that the price of eggs increased by between 1.73 percent and 5.12 percent because of the regulations requiring larger cage systems for egg-laying hens.” He infers that if the price increases 1.73 percent, this national “representative consumer” would be “indifferent between the California cage-system regulations and the control setting” if the income of the “representative household” is increased by \$0.75 per household (p. A-35). If the price increases 5.12 percent, his estimate of the welfare cost of the price increase is \$3 per year (p. A-37). He also presents higher estimates of the welfare cost for households in the lowest quintile of the income distribution.

Haslag’s analysis of the effects of the CCSR on national egg prices is rife with problems which make his conclusions regarding costs of the CCSR to prison systems and to consumers totally unreliable. I attach a list of some of these as an Appendix to this document. I could discuss these and other serious problems of fact, interpretation, and economic logic at length. However, a fundamental flaw lies at the very heart of Haslag’s analysis, rendering these otherwise serious problems irrelevant. To this I now turn.

3. The Fatal Flaw

The fundamental problem with Haslag’s analysis is that it assumes, with no theoretical or empirical justification, that all egg consumers (including state prison systems) must face the

same price increase after the CCSR for all eggs, whether or not those eggs are CCSR-compliant, ignoring the segmentation of the national consumer market by the ban on production and import of non-compliant shell eggs that is the essential effect of the implementation of the California regulations. Absent this baseless assumption of a single national price for “eggs,” the other errors, no matter how serious, are irrelevant to this case, since they do not affect consumers in the plaintiff states.

In other words, Haslag’s methodology implicitly assumes that the long run average egg price rises by an equal amount in each state, sufficient to cover his estimate of the increase in “total national expenditures on eggs” due to the CCSR. Under this approach, Californians and all others must face the same long run egg price increase after implementation of the CCSR. Haslag makes this assumption even though some egg producers outside of California have not changed their production methods and the California regulations do not apply to eggs produced and sold outside of California and therefore do not increase the cost of production for those eggs. Haslag’s analysis recognizes this point when he assumes that all of the cost increase due to the CCSR is related to the increased cost for production of imports of CCSR eggs into California (pp. A-22 to A-24), which he estimates to constitute two-thirds of California consumption (p. A-19). Nonetheless, he spreads this cost evenly over all eggs produced in the United States, increasing the price of eggs nationwide.

It follows that, under Haslag’s analysis, California egg consumers do not cover the full estimated cost of imported CCSR eggs, but rather only a modest share, equal to the share of Californians in the national population. The remainder of his estimate of the cost of achieving CCSR compliance for egg sales in California would be borne by egg consumers in other states. Haslag’s analysis thus assumes that increased prices on non-California sales would subsidize producers of eggs imported into California for compliance with the CCSR. This assumption runs counter to basic principles of economics.

The California regulations do not constrain egg producers outside of California who elect not to sell eggs into California. As *Kansas City Star* Editorial Board notes “Missouri egg producers don’t have to sell to Californians. Farmers here are quite free to stack their hens as they do now and sell the eggs here, or in states without the restrictions. California’s citizens have not told Missouri how to produce eggs. They have told Missouri to meet a higher standard of animal care if they want to sell eggs in their state.”¹ Nor have California regulations constrained out-of-state consumers. Those consumers have a choice about whether to purchase CCSR-compliant eggs or non-CCSR-compliant eggs (hereinafter “conventional” eggs), and many continue to prefer the latter because they are cheaper. As one 2017 national market report put it: “... while the industry is preparing to flood the market with cage-free product, what consumers still overwhelmingly choose to buy are the cheaper, battery-farmed options [W]hile pressure

¹ *Why did Missouri AG Josh Hawley file an unnecessary egg lawsuit?*, The Kansas City Star (Dec. 6, 2017), <http://www.kansascity.com/opinion/editorials/article188416614.html> (accessed 27 Feb. 2018).

campaigns have succeeded in convincing businesses and the public that the battery farming system needs to change, people are not yet willing to vote with their wallets.”²

The ability of producers to continue to use less expensive production methods that are not compliant with the CCSR for sales outside of California constrains the ability of producers to raise their prices for sales outside of California. As long as there are competitors with lower cost structures in the market, no producer can cover the extra costs of CCSR production by selling eggs at higher prices to consumers who do not value the CCSR rules, unless, as in California, the state has effectively excluded lower-cost competition from the market, by enforcing the CCSR rules for producers and importers of eggs. Basic economic principles dictate that competitive egg producers outside of California cannot sell conventional eggs to consumers outside of California at prices that exceed their cost, as Haslag has assumed will occur. Further, if a farmer using CCSR-compliant production methods tried to charge Missouri consumers 2.8 to 11.3 cents more per dozen in order to cover its costs of producing CCSR-compliant eggs, the Missouri consumer who at the given premium prefers cheaper eggs would simply buy conventional eggs from a producer not selling to California. CCSR-compliant producers selling in California must recover any additional costs by charging California consumers the full cost difference.

Haslag’s assumption that the cost of CCSR compliance is spread over all egg sales through an increase in egg prices nationwide also cannot be reconciled with the state of the egg market within California. Californians can buy only from California producers or out-of-state producers that are compliant with the CCSR. Maintaining Haslag’s assumption of competition, were the prices these producers received from Californians persistently less than their long run average cost of CCSR-compliant production, (i.e., if California consumers were only covering a *portion* of the total cost increase), all CCSR producers would eventually cease production, rather than produce at a large loss per egg. In the long run we would see negligible California shell egg production in the data. Further, since other CCSR-compliant producers outside of California would also face a loss, they would also cease producing CCSR-compliant eggs. Rather than sell CCSR-compliant eggs for below-cost prices, non-California producers would elect to sell conventional eggs for above-cost prices outside of California. Thus, if Haslag were right, and the cost of CCSR compliance were somehow spread over the price of all eggs (whether or not CCSR-compliant), we would observe negligible shell egg consumption in California and negligible CCSR-compliant egg production across the nation, after a temporary interval of market chaos. But that obviously has not occurred.

Contrary to Haslag’s key assumption, economic theory dictates that the cost of CCSR compliance will cause an increase in the price of only CCSR-compliant eggs. Economic principles indicate that the California regulations will result in market segmentation, with the long run average price of eggs increasing in California to cover the cost of production of CCSR eggs. In the long run, the prices of conventional eggs outside of California will be unaffected. California

² Vanessa Wong, *Egg makers are freaked out by the cage-free future*, CNBC (Mar. 22, 2017), <https://www.cnbc.com/2017/03/22/egg-makers-are-freaked-out-by-the-cage-free-future.html> (accessed 27 Feb. 2018).

consumers will pay prices that reflect the cost of CCSR-compliant production methods, and consumers of conventional eggs outside of California will continue to pay prices that reflect the cost of the conventional production methods. Haslag's own economic assumptions about competition, and the fact of market segmentation in this case, lead to the conclusion that, after implementation of the CCSR, the long run California price of the conventional standard "white large" shell eggs should increase relative to the long run price of similarly graded eggs sold outside California by an amount sufficient to cover the average cost increase due to the CCSR. If so, there is no reason to believe consumers in the plaintiff states suffered any long run harm of the types reported by Haslag because the costs imposed by the CCSR have been passed on only to California consumers.

In short, there is no basis in economic theory for Haslag's assumption that the average price of all eggs should rise by the same amount in all regions as a result of the increased cost of producing a subset of those eggs – those produced in California or for the California market.

4. Evidence from Observed Market Price Differentials

Haslag's assumption that the cost of CCSR compliance caused an increase in all egg prices nationwide does not rest on any empirical analysis of actual egg prices. In this report, I conduct the empirical analysis Haslag never undertakes (and cannot, using only his national egg price data from the Bureau of Labor Statistics). I investigate the relevant history of egg prices before and after the implementation of the CCSR for evidence of any actual price differentials that might have emerged after implementation of the CCSR.³

As explained above, economic theory predicts that the California regulations should have caused prices to rise for shell eggs sold in California but not eggs sold outside of California. Economic theory implies that in the long run differences in prices between two regions for similar eggs should approximately equal long run differences in marginal cost, given positive production in both regions. Given competition, these equilibrium differences should also approximate long run average cost differences, if production is active in both regions. It is not our task here to provide the definitive estimate of the effect of the CCSR on shell egg prices. The goal is to confirm whether actual price data are consistent with the market segmentation that economic theory predicts. As explained below, the available price data are, in fact, consistent with market segmentation, and inconsistent with a single national price increase for eggs, CCSR-compliant or not, after implementation of the CCSR.

Evidence from recent data.

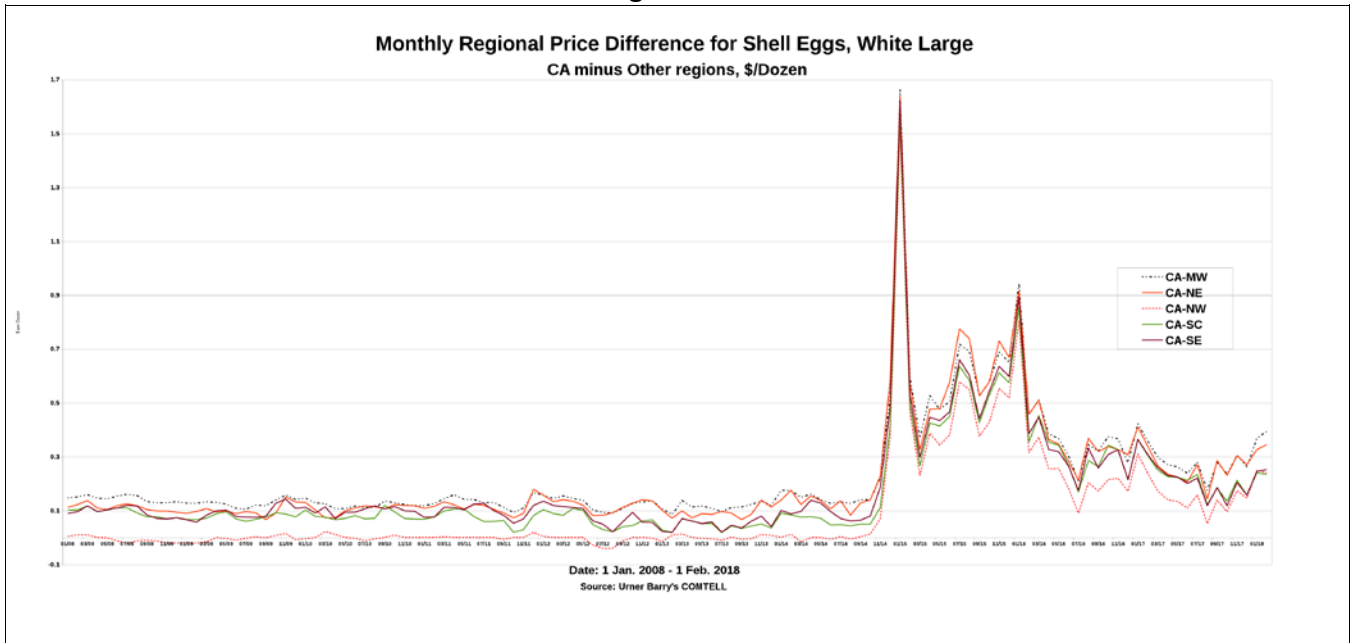
We are fortunate to have data on actual market transactions for shell eggs monthly by region, and for California as a separate state, from Urner Barry, the industry standard price reference,

³ The BLS egg price index includes all types of grade A eggs, accessed 27 Feb. 2018, https://data.bls.gov/timeseries/APU0000708111?data_tool=XGtable.

through February 2018.⁴ I calculate the average price differential for whole white shell eggs between the California and the five other regions, and assess how it changed between sample intervals January 2008 through November 2014, and April 2016 through February 2018. Since I want to assess equilibrium price changes, I exclude the period between December 2014 through March 2016, within which the egg markets were disrupted by the failure of a California court challenge to the CCSR, by implementation of the CCSR, and then by the onset of the avian flu epidemic in the Midwest.

Figure 1 below provides a visual presentation of these price differences since January 2008 by month.

Figure 1



The data in the figure are summarized in Table 1 below.

⁴ Urner Barry publishes wholesale egg price quotations based on actual transactions that are widely relied upon in the setting of spot and long-term contracts. Urner Barry, *Market Reporting Guidelines* (Dec. 15, 2016), http://www.urnerbarry.com/UB_Market_Reporting_Guidelines_121516.pdf (accessed 28 Feb. 2018).

**Table 1: Average Monthly Regional Price Difference for Shell Eggs,
White Large (\$/Dozen)**

Time Period	CA-MW	CA-NE	CA-NW	CA-SC	CA-SE
Jan. 2008 – Nov. 2014	0.13	0.11	0.00	0.07	0.09
Apr. 2016 – Feb. 2018	0.31	0.29	0.18	0.25	0.24
Difference of two periods	0.18	0.18	0.18	0.18	0.15

Source: Urner Barry's COMTELL

The price data show that before implementation of the California regulations, egg prices in California were from \$.07 to \$.13 higher than egg prices in four of the five other regions and were roughly the same as prices in the Northwest region. After implementation of the California regulations, California prices increased relative to prices in the other regions, as predicted by economic theory. Relative to prices in four of the regions, the net increase is exactly the same, \$0.18 per dozen; relative to the fifth, the Southeast region, the increase is \$0.15 per dozen. The emergence of these similar price differentials following implementation of the CCSR contradicts Haslag's assumption that the burden of higher cost due to the CCSR was shared equally by California and the other regions, via a uniform national price increase.

Previous studies.

In addition to conducting the price analysis set forth above, I also consider the more recent of two studies of the effect of the CCSR on California egg prices co-authored by agricultural economist Jayson L. Lusk. Mullaly and Lusk 2017, using scanner data from January 2011 to July 2016, found price effects varying widely for different post-CCSR sample intervals. Their preferred estimate is \$0.19 per dozen increase for California consumers, using a post-CCSR sample interval of March 2016 to December 2016, avoiding the chaotic period spanning January 2015 through March 2016 associated with the actual implementation of the CCSR, a period which also includes the onset of the avian flu epidemic in the Midwest.⁵

Measuring the implications of a market-segmenting change for long run price differences is a challenge, especially if only limited data are available after the change. Average price differences in a short sample can deviate widely from long run average cost differences. Mullaly and Lusk's preferred estimate that the California regulations caused egg prices in California to increase by \$0.19 per dozen, however, is consistent with my findings set forth above.

Note that, in line with the theory of segmented competitive markets discussed above, Mullaly and Lusk do not even contemplate the possibility that non-California consumers carry some of

⁵ Mullaly, C. and J. L. Lusk, "The Impact of Restrictions on Farm Animal Housing on Egg Prices, Consumer Welfare, and Production in California," *American Journal of Agricultural Economics* (2017), <https://doi.org/10.1093/ajae/aax049>.

the burden of financing California consumption. In fact, Mullaly and Lusk (2017) use the price in other states as a control for their difference in differences estimation. A “key assumption” of their entire analysis (p. 11) is that the California regulations will not have an effect on egg prices outside of California. They measure the impact of the CCSR on California prices by comparing how California prices diverge from prices outside of California after the implementation of the CCSR.

Continued California production.

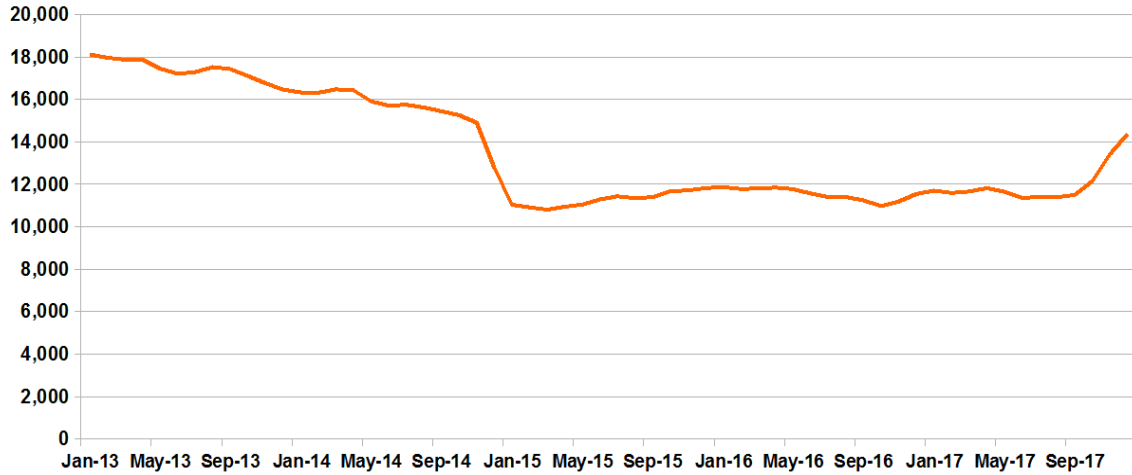
The positive price differentials that emerge for California as shown above are consistent with market segmentation and flatly inconsistent with Haslag’s assumption of a constant nationwide egg price increase after the CCSR, but they do not of themselves establish that California prices have risen sufficiently to cover the long run average cost increase due to the CCSR. If California production were declining and producers were exiting the industry, that would suggest that long run average cost might not be covered by the California market price. However, if California production capacity has remained stable or grown recently, then that is evidence that, on the whole, the price increase has been sufficient to cover the whole of the increased cost of production of CCSR eggs for the California market.

Figure 2 below establishes that the number of layers in California has remained stable since the end of the chaotic period around the year 2015, and indeed layer numbers have recently increased sharply, approaching their levels in late 2014. In addition, a huge new cage-free facility has been initiated near Wasco, California with a planned peak capacity of more than 36 million eggs per month.⁶ This news of expansion is strong evidence that the California egg industry is more than covering long run costs.

⁶ Steven Mayer, *Which comes first, the chicken, the egg or the egg-production facility?*, Bakersfield.com (Feb. 20, 2017), http://www.bakersfield.com/news/which-comes-first-the-chicken-the-egg-or-the-egg/article_470470b3-8666-53db-880c-59a7bcf071e5.html (accessed 27 Feb. 2018).

Figure 2
California Table Egg Layers

Flocks 30,000 and Above (1,000 layers)



Date: Jan. 2013 - Dec. 2017

Source: USDA NASS Chickens and Eggs report

5. Conclusion

Haslag's assumption that the California cage-system regulations raise prices of eggs nationwide, whether or not the eggs are CCSR-compliant, is contrary to economic logic, and contradicted by the facts of the segmented egg marketplace in the United States. His argument that consumers in other states were harmed by the CCSR has neither theoretical support nor empirical justification.

Appendix

Additional Problems with Haslag's Analysis

- 1) He considers no data on actual price changes after implementation of the CCSR in California or any other region or state. His sole source of egg price data is the national price series from the Bureau of Labor Statistics, which by definition cannot reveal differences between the California price and the price of eggs consumed elsewhere, after the national market is segmented by the CCSR.
- 2) Haslag presents his two alternate estimates of production cost changes, \$10 and \$40 per layer per year, to be variable costs including the cost of feed, attributable to annual egg production. (See Haslag p. A-6 and footnote 2.) These estimates, which drive the whole cost differential analysis of the cost of CCSR, are, unfortunately, accountants' estimates, reported in 2010, of the capital cost of the change in housing to comply with the CCSR.⁷ He misinterprets them as variable costs including the cost of feed, attributable to annual egg production. (See Haslag p. A-6 and footnote 2.) He reports no other input costs.⁸
- 3) Haslag claims (p. A-21 and A-24) that in a 2015 "deposition" Dr. Dermot Hayes concluded that the CCSR would increase production costs by 8.51 cents per dozen, "solidly within the range" of Haslag's own estimates. Assuming Haslag is referring to the 2015 declaration by Dr. Hayes submitted in *Missouri ex rel. Koster v. Harris*, No. 14-17111 (9th Cir. 2017) (Dkt. Entry 7-3), this figure appears to come from Hayes' Table 1, p.5 and "compares production costs in California and in Iowa for birds housed with 116 square inches per bird." (See Hayes (2015), p.4.) Hayes discusses the difference in cost between the states under CCSR-compliant cage housing, not the increase in cost due to the CCSR.
- 4) In calculating his increase in "total national expenditures on eggs," Haslag ignores the increased cost imposed on domestic California producers by the CCSR; he considers only the cost to producers outside of California for the eggs they produce for import into California.
- 5) We have evidence from invitations for bids and other sources that several states (including Missouri, Alabama and Nebraska) use breaker egg products for feeding prisoners; these are not covered by the CCSR.
- 6) Haslag's calculations of welfare effects appear erroneous, using estimates of number of eggs consumed per capita nationally that are inconsistent with those used for prisons, confusing figures per household and per capita, and making an erroneous conversion of a price differential to a percentage.

⁷ "The second major cost impact of the new regulation is that compliance will require substantial investment in new or retrofitted housing facilities. Based on information provided by farm accountants, a new or converted non-cage housing facility costs in the range of \$10–40 per bird." (Sumner et al. (2010, p. 434).)

⁸ A recent paper implies that the increased annualized cost of capital per bird incurred to build an enriched cage system compliant with the CCSR is of order of \$1.60 per bird at a 10 percent discount rate; this is reported to constitute the major share of the total annual cost difference for this type of system. (See Matthews and Sumner (2017 Table 2 p. 556 and Table 4 p. 557).)