

**“Brexit: Why did the ‘chlorinated chicken’
cross the pond?”**

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Motivation

- **Considerable public concern expressed about UK food safety standards post-Brexit – most notably with respect to imports of chlorine-washed chicken**
- **Concern has intensified with discussion of UK-US free trade agreement (FTA) and statements by UK government officials such as Liam Fox,**
“...Liam Fox mocks concerns over chlorine-washed chicken and insists it is just a ‘detail’ of trade deal with US...” (*The Telegraph*, July 24, 2017)
- **Debate recently intensified with comments by Woody Johnson, US ambassador to UK,**
“...Inflammatory and misleading terms like ‘chlorinated chicken’ ... are deployed to cast American farming in the worst possible light...”(*The Telegraph*, March 2, 2019)

“Toxic trade deals....”



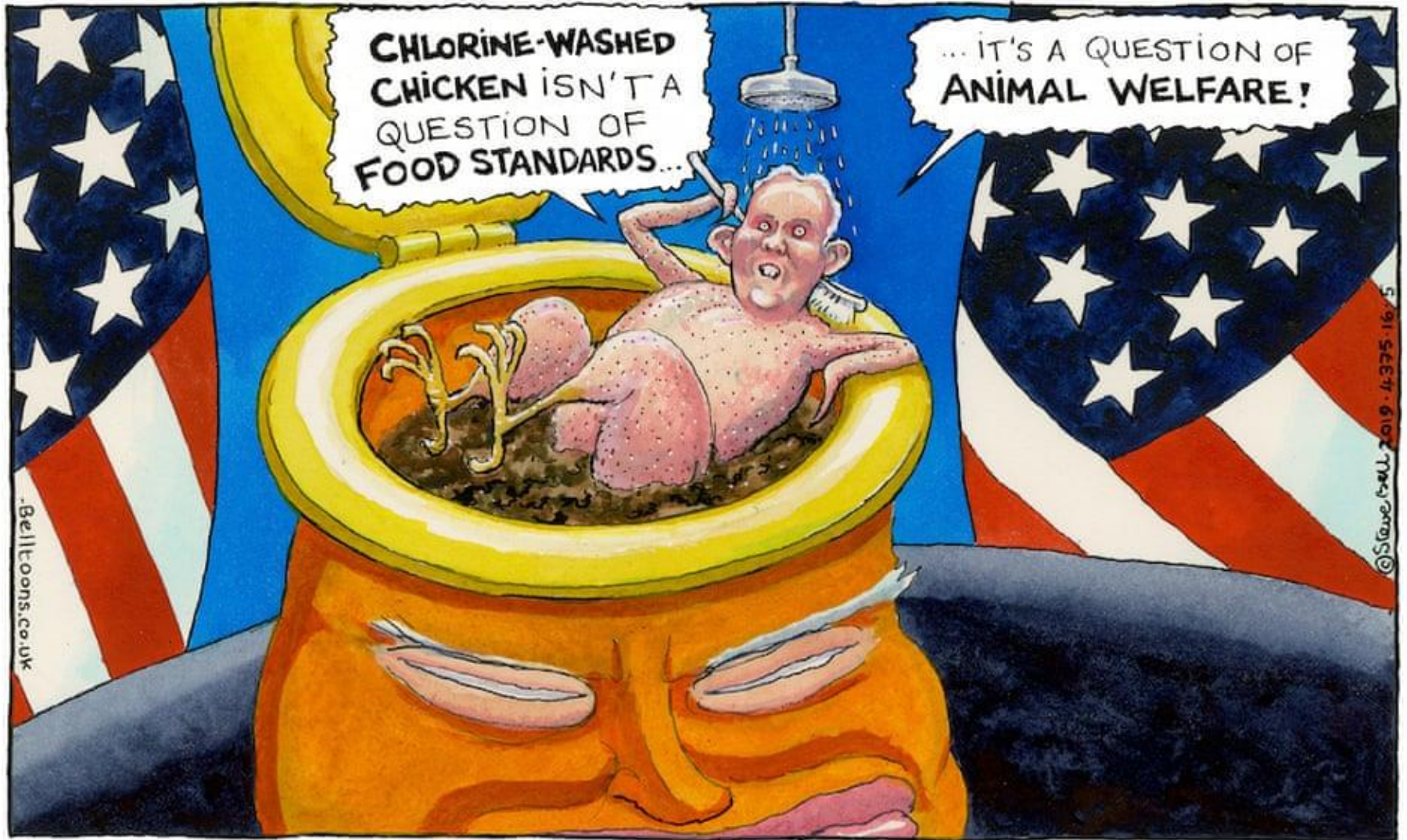
“Just a detail of trade negotiations....”



Chicken production: EU vs. US standards

- **EU standards based on link between animal welfare (flock density) and food safety (lower risk of disease and contamination)**
- **EU processors only allowed to decontaminate poultry carcasses with cold air and water, US processors use chlorine solutions to kill bacteria**
- **Long-running dispute between EU and US over use of pathogen reduction treatments (PRTs) in poultry processing – banned by EU in 1997**
- **US filed case at WTO in 2009 when EU did not allow import of PRT-treated poultry**

“Food safety vs. animal welfare....”



Processed chicken becomes a credence good?

- **WTO case never moved forward, but US clear it seeks removal of UK non-tariff barriers to agricultural trade in any future FTA (USTR, February, 2019)**
- **Market could go from one where consumers know with certainty that chicken is not “chlorinated” to one where chicken is a *credence* good**
- **UK consumers have signaled opposition to US imports, and firms state they will maintain reputation for “high-quality” (*The Grocer*, December 3, 2018)**
- **What is potential for private certification and role of external pressure on UK poultry processing sector?**

Credence goods and activists

- Agricultural economists have focused on supply of credence goods via mandatory labeling and third-party certification (Bonroy and Constantos, 2015)
- Also literature analyzing interaction through *private politics* of firms who are “socially responsible” and activists (Baron, 2003; Baron and Diermeir, 2007)
- Key papers: Fedderson and Gilligan (2001), Bottega and DeFreitas (2009), and Baron (2009)
- Adapt Baron (2011) to case where firms may supply “high-quality” good (non-chlorinated chicken) in presence of activist

Structure of model

- **Low and high-quality chicken sold to continuum of consumers, uniformly distributed in terms of willingness to pay for credence good**
- **Firms can form “club” to set and certify standard for high-quality good, club members incurring convex fixed costs and higher marginal costs**
- **Activist applies social pressure to firms concerning poultry processing methods**
- **Given standard, firms producing high-quality compete in Nash-Cournot game, low-quality being supplied competitively via imports**

Consumers

- Continuum of consumers with mass N , consumers being of type $w \in [0, \bar{w}]$, uniformly distributed over preferences for high-quality

- Willingness to pay for high-quality:

$$u = w_0 + ws$$

where s is standard, and $s \in [0, \bar{s}]$, \bar{s} is upper bound

- Competitive price of low-quality is world price p_0 , where $p_0 < w_0$
- Price of high-quality $p(s)$ set in market for credence good

Firms

- n identical firms produce high-quality, with marginal costs $c(s)$ and fixed costs $K(s)$:

- $c(s) = c_0 + \gamma s, \gamma > 0$ and $K(s) = \frac{1}{2}ks^2$

- Processor i earns profits of:

$$\Pi_i(s) = (p - c_0 - \gamma s)q_i - \frac{1}{2}ks^2$$

where $p = p(q_s)$ is market price of high-quality good, q_i is output of firm i , and $q_s = \sum_{i=1}^n q_i$ is total output

- Low-quality sells at $p_0 = c_0$

Poultry processing equilibrium

- A consumer buys high-quality if:

$$w_0 + ws - p(s) \geq w_0 - p_0$$

- q_s depends on consumer who is indifferent between high and low-quality, $w(s) \equiv (p_s - p_0) / s$, so that:

$$q_s = N \left(1 - \frac{w(s)}{\bar{w}} \right)$$

- Inverse demand for high-quality is:

$$p_s = p_0 + s\bar{w} \left(1 - \frac{q_s}{N} \right)$$

Poultry processing equilibrium

- Firm i maximizes operating profit:

$$\pi_i(s) = \left[s\bar{w} \left(1 - \frac{q_s}{N}\right) - \gamma s \right] q_i$$

- Optimal quantity and price being respectively:

$$q_i^*(s) = \frac{N(\bar{w} - \gamma)}{(n+1)\bar{w}} \quad \text{and} \quad p^*(s) = c_0 + \gamma s + \frac{(\bar{w} - \gamma)s}{n+1}$$

- If $w \geq w^*(s)$, consumers buy high-quality, where:

$$w^*(s) = \frac{(\bar{w} + n\gamma)}{n+1}$$

Club standards

- In absence of activist, firms can form club to set s that maximizes $\Pi_i(s)$, optimal standard being:

$$s^* = \frac{N(\bar{w} - \gamma)^2}{(n + 1)\bar{w}k}$$

where s^* is increasing in willingness to pay \bar{w} and size of market N , and decreasing in marginal and fixed costs γ and k , and number of firms in club n

- As n increases, $s^* \rightarrow 0$, market for high-quality forced to competitive price p_0 , i.e., oligopolistic rents required for firms rationally to supply credence good

Activist and standards

- Objective of activist is to seek standard $s_A > s$, and if firms in club do not accede, subject them to campaign and possible boycott
- Club can counter campaign via contest
- Outcome is function of campaign expenditures of activist and club, a and r , probability of success being:

$$\rho = \frac{\beta a}{\beta a + r}$$

where $\beta > 0$ reflects brand equity of firms in club that could be damaged by an activist campaign

Club and impact of activist

- Expected profit of club firms is:

$$E\Pi_s = \rho n\Pi_i(s_A) + (1 - \rho)n\Pi_i(s) - r$$

their stake being:

$$\Delta\Pi_s(s, s_A) = n(s_A - s) \left[-\frac{N(\bar{w} - \gamma)^2}{(n+1)^2 \bar{w}} + \frac{1}{2}k(s + s_A) \right]$$

- Stake is positive if $s_A > s^*$, i.e., net effect of higher standard s_A is to decrease club profits
- The higher is standard demanded by activist, greater incentive for club to contest campaign

Activist and response of club

- Expected utility of activist:

$$EU_A = \rho s_A q_s^*(s_A) + (1 - \rho) s q_s^*(s) - a$$

their stake being:

$$\Delta S = \frac{nN}{(n+1)\bar{w}} (\bar{w} - \gamma)(s_A - s)$$

- Stake is increasing in willingness to pay and size of market, \bar{w} and N , but decreasing in standard s that club would otherwise set

Probability of campaign success

- Probability campaign succeeds is:

$$\rho^*(s) = \frac{\beta N(\bar{w} - \gamma)}{\beta N(\bar{w} - \gamma) + \frac{1}{2}k(n+1)\bar{w}(s + s_A) - \frac{N(\bar{w} - \gamma)^2}{n+1}}$$

- Probability of successful campaign, $\rho^*(s)$:
 - (i) Decreases in both s and s_A
 - (ii) Decreases in size of club n
 - (iii) Increases in size of market N , willingness to pay for high-quality \bar{w} , and club brand equity β
 - (iv) Decreases in marginal and fixed costs, γ and k

Optimal standard

- Optimal standard s^o is:

$$\frac{dE\Pi_s}{ds} \Big|_{s = s^o} = -2[1 - p^*(s^o)] \frac{d\rho(s^o)}{ds} \Delta\Pi_s(s, s_A) + [1 - p^*(s^o)]^2 \frac{d\Pi_s(s^o)}{ds} = 0$$

where first term is *contest* effect and second is *product market* effect

- Optimal standard s^o :
 - (i) Increases in s_A , β , \bar{w} , and N
 - (ii) Decreases in n , γ and k

Welfare implications

- Higher willingness to pay for non-chlorinated chicken means greater incentive for club to set high standard
- Role of activist critical, especially if club chooses standard below current mandatory EU standard
- Assuming chlorinated chicken is safe, potential for increase in welfare, i.e., consumers unwilling to pay for chicken under current standards can purchase low-price imported US chicken
- UK's future trading arrangement will affect tradeoff between size of market N and level of competition n in setting of standard by club, i.e., soft vs. hard Brexit