



Economic Effects of Post-Harvest Treatment Requirements for Oysters

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Motivation

- Forms of oyster consumption
 - ✓ Shucked, cooked
 - ✓ Halfshell, cooked
 - ✓ Halfshell, raw
- Cases of *Vibrio vulnificus* from oysters consumed raw
- CPSI petitioned FDA to require post-harvest treatment of oysters
- Post-harvest treatment options
 - ✓ Cryogenic IQF
 - ✓ Cool pasteurization
 - ✓ Hydrostatic pressure

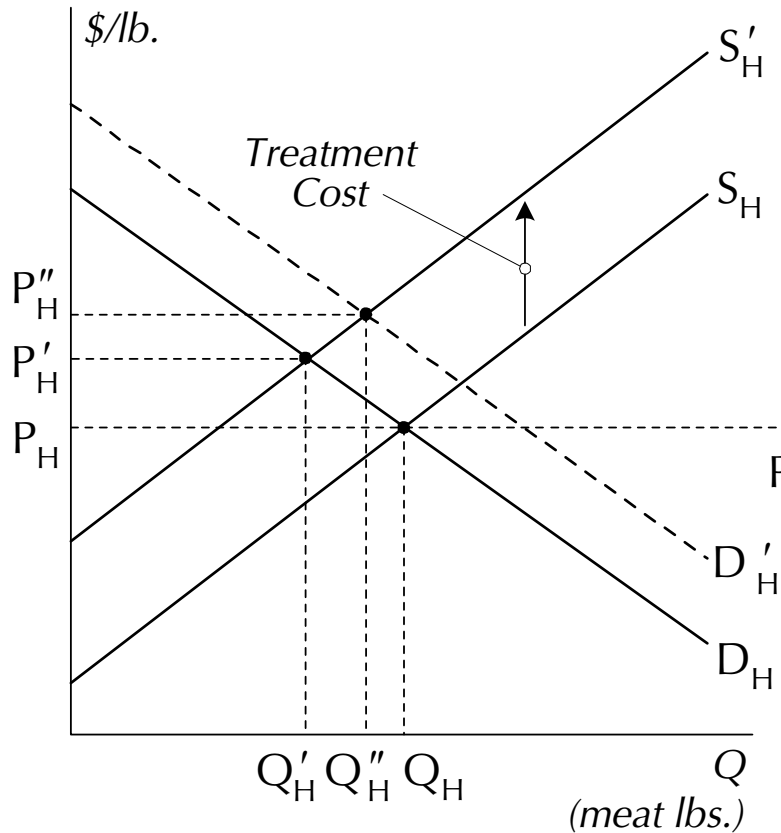
Objectives

- Evaluate potential economic effects of requiring post-harvest treatment of oysters
- Treatment requirement options:
 - ✓ Raw halfshell only versus raw halfshell and shucked
 - ✓ All regions versus the Gulf region only
- Assume requirements affect both shucked and halfshell Gulf oysters

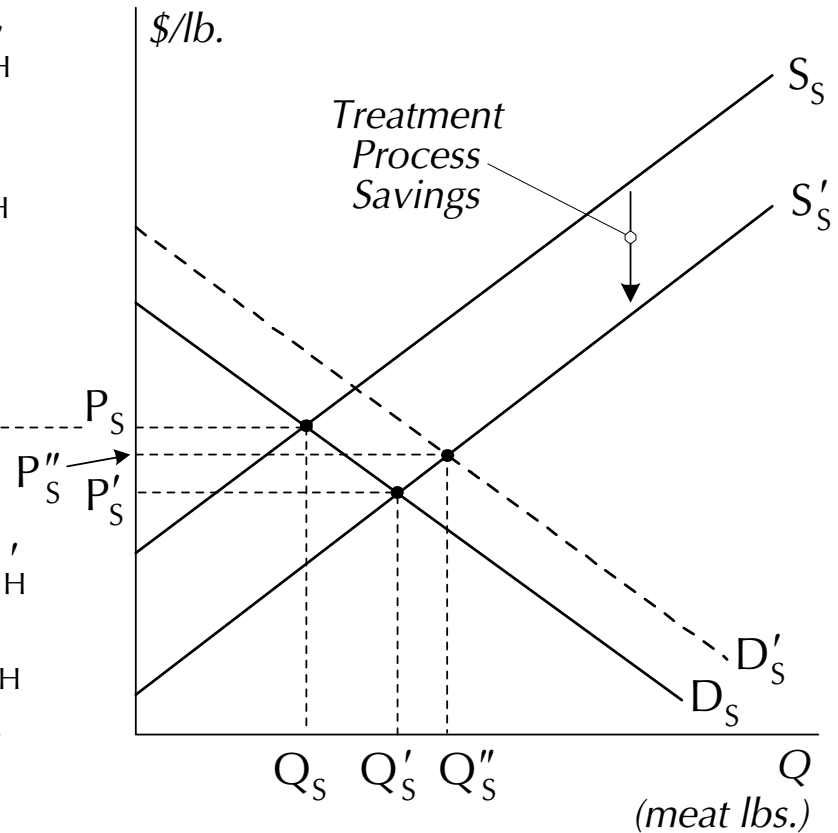
Evaluation Steps

- Supply-side effects — treatment costs and feasibility
- Demand-side effects — consumer WTP for treated oysters
- Interregional equilibrium displacement model
- Estimate changes in:
 - ✓ Prices
 - ✓ Quantities
 - ✓ Revenue
 - ✓ Employment
 - ✓ Consumer surplus
 - ✓ Producer surplus

Wholesale Market Effects of Treatment Requirements



Halfshell Market



Shucked Market

Model Assumptions

- Perfectly competitive markets
- Four oyster harvesting and processing regions
 - ✓ Atlantic \Leftrightarrow Gulf
 - ✓ Atlantic \Leftrightarrow Northeast
 - ✓ Gulf \Leftrightarrow Pacific
- Shellstock may be shipped to other regions for processing
- International trade is unaffected by treatment requirements

Equilibrium Conditions in the Gulf Market

- Wholesale shucked oyster market

$$Q_S^D (P_{S'}^G, P_{S'}^A, P_{S'}^P, P_{H'}^G, TP_S^G) = Q_S^S (P_{S'}^G, P_{H'}^G, P_O^G, TC_S^G)$$

- Wholesale halfshell oyster market

$$Q_H^D (P_{H'}^G, P_{H'}^A, P_{H'}^P, P_{S'}^G, TP_H^G) = Q_H^S (P_{H'}^G, P_{S'}^G, P_O^G, TC_H^G)$$

- Shellstock market

$$Q_O^G (P_O^G) = Q_S^G + Q_H^G$$

H=halfshell, S=shucked, O=shellstock,
G=Gulf, A=Atlantic, P=Pacific

Complete Model

- Totally differentiate equilibrium conditions and convert to elasticity form
 - ✓ Four regions
- Model estimates the following:
 - ✓ $\Delta P, \Delta Q$ — wholesale shucked market
 - ✓ $\Delta P, \Delta Q$ — wholesale raw halfshell market
 - ✓ ΔP — harvest shellstock market
 - ΔQ — harvest shellstock market

Data Requirements

- Baseline regional industry data
- Elasticity estimates
 - ✓ Within region own-price and cross-price elasticities of demand
 - ✓ Interregional cross-price elasticities of demand
 - ✓ Within region own-price and cross-price elasticities of supply
- Treatment costs → Supply effects
- Consumer WTP → Demand effects

Post-Harvest Treatment Costs (I)

- Costs of treatment include:
 - ✓ Plant expansion (annualized)
 - ✓ Capital equipment and installation (annualized)
 - ✓ Operating and maintenance (labor, energy, materials)
 - ✓ Royalties
- Costs potentially offset by:
 - ✓ Shucking yield increases
 - ✓ Reduced shucking labor

Post-Harvest Treatment Costs (II)

Per-Unit Treatment Cost Estimates (medium or average size processes)

	Shucked		Halfshell	
	\$10/Hour Wage Rates	\$15/Hour Wage Rates	\$10/Hour Wage Rates	\$15/Hour Wage Rates
Cryogenic IQF				
Cost per oyster	na	na	\$0.139	\$0.177
Cost per pound (meat)	—	—	\$5.461	\$6.954
Cool Pasteurization				
Cost per oyster	-\$0.001	\$0.002	\$0.035	\$0.043
Cost per pound (meat)	-\$0.039	\$0.079	\$1.375	\$1.689
Hydrostatic Pressure				
Cost per oyster	-\$0.029	-\$0.028	\$0.033	\$0.036
Cost per pound (meat)	-\$1.139	-\$1.100	\$1.296	\$1.414

Demand Effects of Treatment (I)

- Taste tests:
 - ✓ For all three treatments, reduced frequency of consumption
- Restaurant managers:
 - ✓ Serving only cooked oysters:
3/6 somewhat likely to serve treated
 - ✓ Serving untreated raw oysters:
6/7 expect no effect of treatment on sales
 - ✓ Serving treated raw oysters:
6/7 say patrons indifferent
- Company experiences:
 - ✓ Higher wholesale prices received for treated oysters (raw halfshell and shucked)

Demand Effects of Treatment (II)

Demand Shift Estimates for Treated Oysters

Process	Shucked	Halfshell
Cryogenic IQF	na	33%
Cool Pasteurization	15%	15%
Hydrostatic Pressure	10%	20%

Demand shift = change in willingness-to-pay relative to current prices

Model Results: Gulf Requirements (I)

	Percentage Changes for Region			
	Atlantic	Gulf	Northeast	Pacific
Cool Pasteurization Process				
Quantities				
Halfshell (output)	1.6	-4.7	0.2	1.5
Shucked (output)	0.4	1.9	0.1	0.3
Shellstock (input)	0.7	-1.0	0.2	0.6
Prices				
Halfshell (output)	1.1	10.0	0.2	1.1
Shucked (output)	0.5	1.4	0.1	0.5
Shellstock (input)	1.1	-1.7	0.3	0.9
Plant Employment	0.4	30.1	0.1	0.4
Hydrostatic Pressure Process				
Quantities				
Halfshell (output)	1.3	-6.4	0.0	1.3
Shucked (output)	-1.3	8.4	-0.2	-1.3
Shellstock (input)	-0.7	1.8	0.0	-0.8
Prices				
Halfshell (output)	0.3	8.5	0.0	0.2
Shucked (output)	-0.8	-5.7	-0.1	-0.8
Shellstock (input)	-1.1	3.0	0.0	-1.3
Plant Employment	-1.2	-28.3	-0.1	-1.2

Model Results: Gulf Requirements (II)

	U.S. Total	Region			
		Atlantic (\$1,000s)	Gulf (\$1,000s)	Northeast (\$1,000s)	Pacific (\$1,000s)
Cool Pasteurization Process					
Producer Surplus					
Halfshell (output)	-1,157.4	108.9	-1,439.1	19.9	152.9
Shucked (output)	623.5	42.5	523.1	0.7	57.2
Consumer Surplus					
Halfshell (output)	-5,240.2	110.5	-5,524.0	14.7	158.6
Shucked (output)	19.8	-30.7	89.3	-0.2	-38.6
Net Surplus Change	-5,754.3	231.2	-6,350.7	35.1	330.1
Hydrostatic Pressure Process					
Producer Surplus					
Halfshell (output)	-1,722.9	91.2	-1,948.2	2.8	131.3
Shucked (output)	1,983.0	-158.9	2,361.8	-1.3	-218.6
Consumer Surplus					
Halfshell (output)	-5,635.3	141.6	-5,989.3	5.1	207.3
Shucked (output)	4,095.0	-55.6	4,219.1	-0.7	-67.8
Net Surplus Change	-1,280.2	18.3	-1,356.6	5.9	52.2

Conclusions: Gulf Requirements

- Small (sometimes negative) per-unit costs
- Demand either unaffected or potentially increases
- Small price and quantity changes
- Large (+ or –) employment changes
- Net surplus decreases in the Gulf, increases in other regions

Unresolved Issues

- Can small plants comply with treatment requirements?
 - ✓ Available space
 - ✓ Access to financial resources
 - ✓ Technical capabilities
 - ✓ Sufficient volume
- What role will cooperative treatment facilities play?
 - ✓ Ownership and organization
 - ✓ Location
- Do these processes work for other oyster species?