

# Impacts of Radioactive Spill from the Fukushima Disaster on the Japanese Seafood Market

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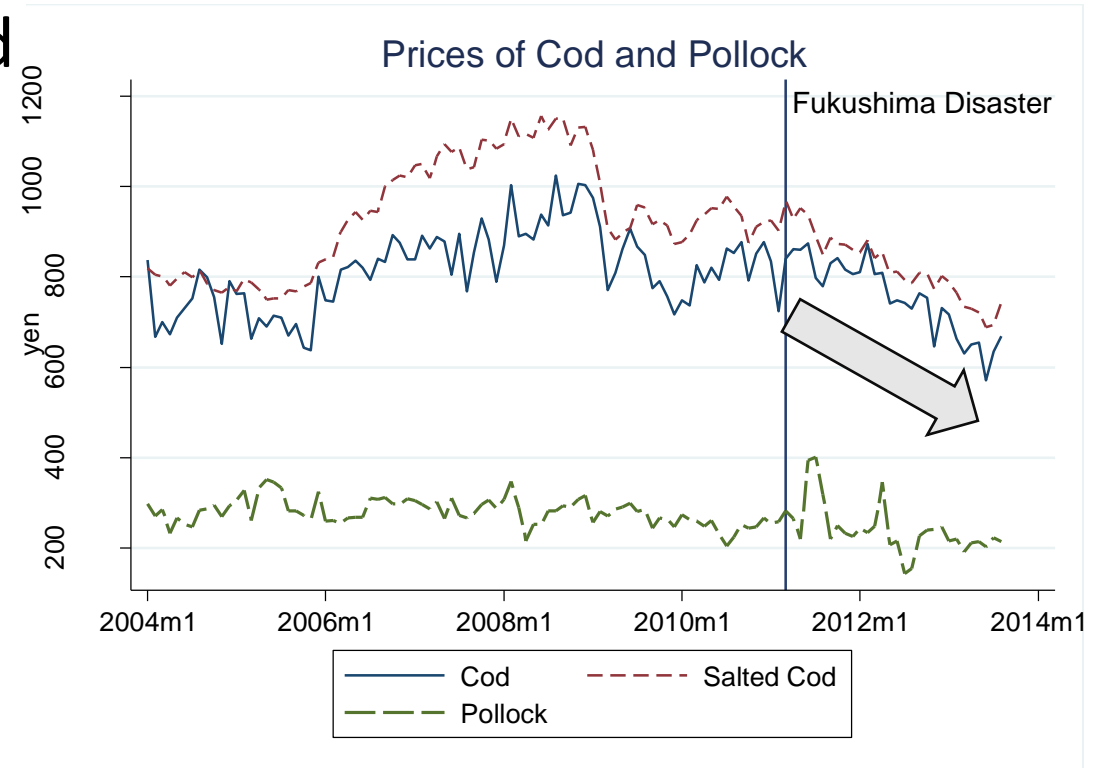
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# Background

- Prices in fresh Cod, and salted cod keep decreasing after Fukushima Disaster
- Consumers are worried about demersal fish because the radioactive materials settle down to sea bottom.



Q. Any negative impacts of radioactive contamination on the Japanese seafood markets?

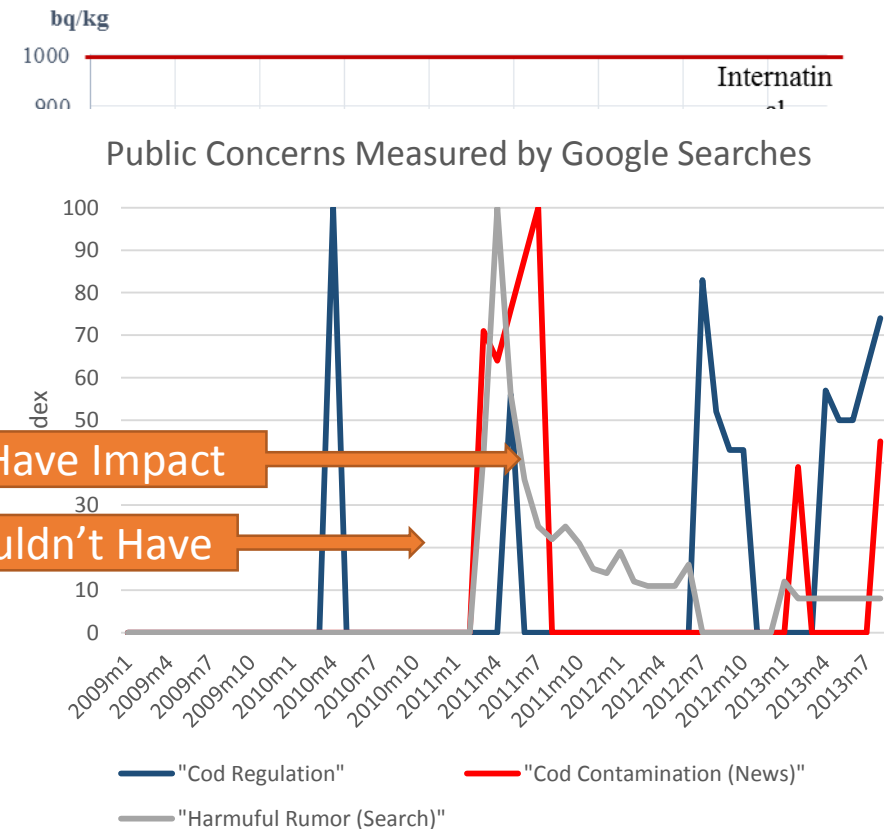
compare the relationship between Cod wholesale price and:

## 1. Radioactivity

- Fisheries Agency of Japan has tested radioactive materials (Cesium 137,134) in seafood for decades (Fishery Agency 2013)

## 2. Public Concern

- Consumers' concern about radioactive contamination skyrocketed after the Fukushima Disaster (Google Trend 2013)



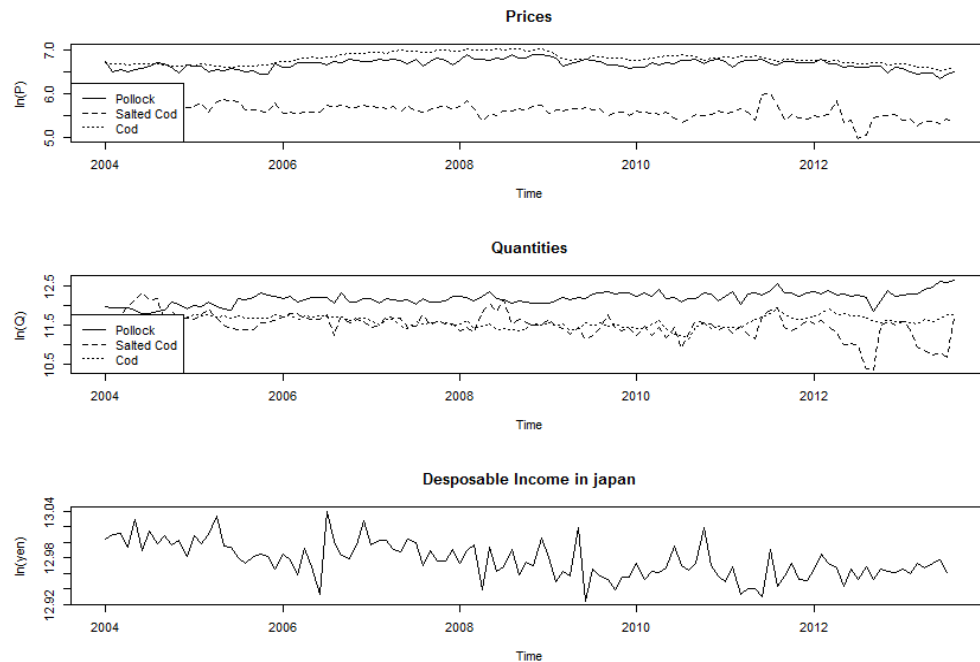
# Data and Variables

## Main Variables: $p$ , $q$ , $y$

$q$ =monthly quantities of fresh cod, salted cod and fresh pollock

$p$ =monthly prices of fresh cod, salted cod and fresh pollock

$y$ =monthly disposable income in Japan



## Radiation Variables

$x1$  = sum of radioactivity in cod in a month

$x2$  = sum of radioactivity in pollock in a month

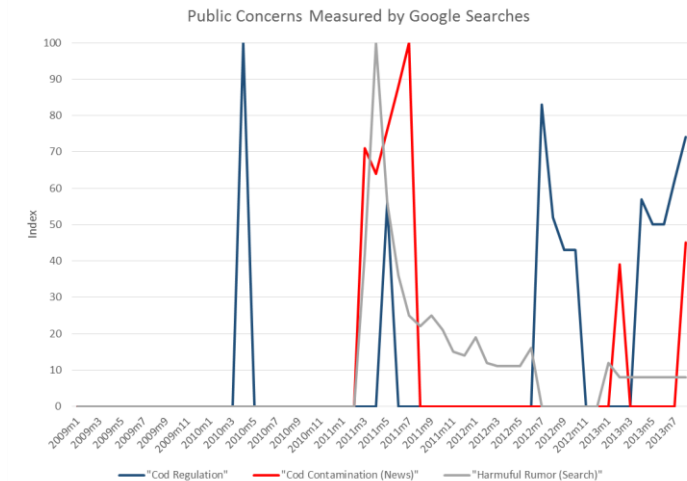
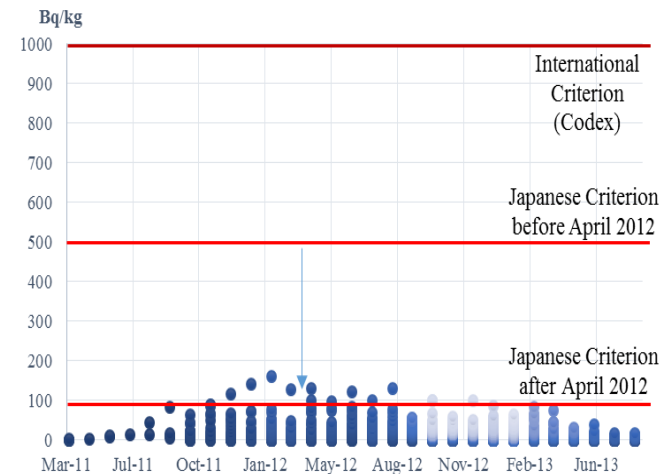
$x3$  = number of operation closed due to radioactivity level

$x4$  = # of News about "Harmful Rumor"

$x5$  = Search result of "Cod" and "Regulation"

$x6$  = Search result of "Cod" and "Contamination"

## Sum of radioactivity in Cod



# Method: Double Log Demand Model

- System equations for cod, salted cod and pollock markets with both price and quantity dependent demand models (DeVoretz and Salvanes, 1993)

$$\bullet \begin{cases} q_t^i = \sum_{l=1}^L (\beta_{11}^i q_{t-l}^i) + \sum_{i=1}^I (\beta_{12}^i p_t^i) + \beta_{13}^i y_t^i + \sum_{z=1} (\beta_{14}^i x_{z,t}^i) + \varepsilon_{1,t}^i \\ p_t^i = \sum_{l=1}^L (\beta_{21}^i p_{t-l}^i) + \sum_{i=1}^I (\beta_{22}^i q_t^i) + \beta_{23}^i y_t^i + \sum_{z=1} (\beta_{24}^i x_{z,t}^i) + \varepsilon_{2,t}^i \end{cases}$$

Impact on  
Demand

Impact on  
Price

$i$  = a product

$t$  = time

$p$  = ln(price )

$x$  = radiation dummy

$\varepsilon$  = error term

$q$  = ln(quantity)

$L$  = Lags

$y$  = ln(disposable income)

# Multiple Structural Break Test (Bai and Perron, 2003)

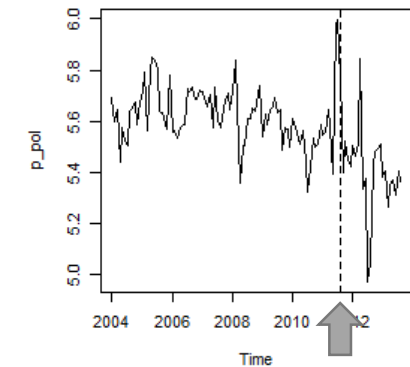
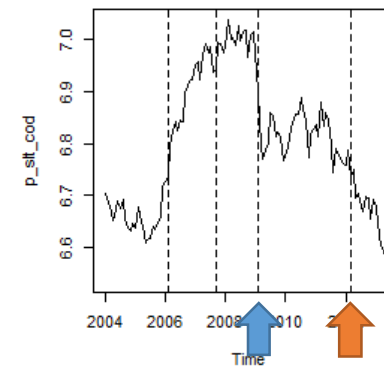
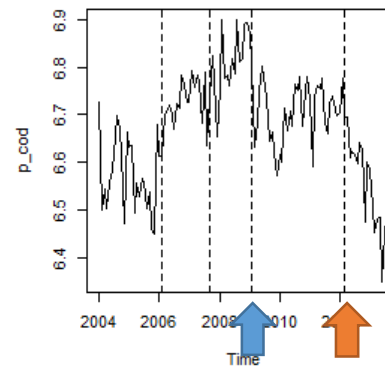
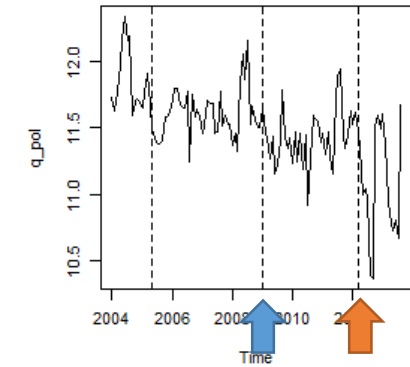
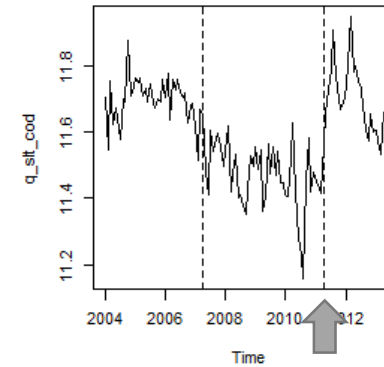
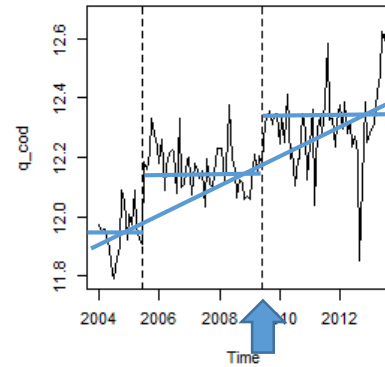
Excluding the effects of the Structural Breaks



More Accurate Analysis

## Detected Several Multiple Breaks

- Lehman Shock (Oct. 2008)
- The Great Earthquake in Mar. 2011
- Standard change from 500Bq to 100 Bq in Japan (Apr. 2012)



# Result 1

## Radiation Dummy

Model 1 (Quantity and Price Dependent Equations with Sum of Radioactivity + Closure Dummy)							
Equations of Quantity				Equations of Price			
VARIABLES	Cod	Slted Cod	Pollock	VARIABLES	Cod	Slted Cod	Pollock
<b>Own Variables</b>				<b>Own Variables</b>			
Lagged Q (Period 1)	0.112* (0.0651)	0.274*** (0.0671)	0.450*** (0.0747)	Q (Period 1)	-0.517*** (0.0477)	-0.00524 (0.0286)	-0.196* (0.106)
Lagged Q (Period 2)	0.129** (0.0637)	0.270*** (0.0680)	0.451*** (0.0745)	Q (Period 2)	-0.510*** (0.0469)	-0.00373 (0.0287)	-0.172* (0.0879)
Lagged Q (Period 3)	0.134** (0.0630)	0.281*** (0.0666)	0.427*** (0.0742)	Q (Period 3)	-0.510*** (0.0466)	-0.00500 (0.0283)	0.245*** (0.0622)
Lagged Q (Period 4)			0.385*** (0.0790)	Q (Period 4)			0.251*** (0.0651)
P (Period 1)	-1.062*** (0.130)	-0.661*** (0.197)	0.384*** (0.146)	Lagged P (Period 1)	0.149*** (0.0567)	0.605*** (0.0556)	0.0516 (0.0911)
P (Period 2)	-1.037*** (0.130)	-0.647*** (0.192)	0.381** (0.148)	Lagged P (Period 2)	0.171*** (0.0552)	0.618*** (0.0539)	0.0105 (0.0924)
P (Period 3)	-1.024*** (0.130)	-0.651*** (0.192)		Lagged P (Period 3)	0.184*** (0.0545)	0.620*** (0.0536)	
P (Period 4)	-1.031*** (0.131)	-0.669*** (0.194)		Lagged P (Period 4)	0.183*** (0.0557)	0.621*** (0.0548)	
P (Period 5)	-1.027*** (0.130)	-0.657*** (0.197)		Lagged P (Period 5)	0.173*** (0.0571)	0.614*** (0.0560)	
<b>Cross Price</b>				<b>Cross Quantity</b>			
Radiation	<b>cod</b>	<b>slted.cod</b>	<b>pollock</b>	Radiation	<b>cod</b>	<b>slted.cod</b>	<b>pollock</b>
Sum of radioactivity (cod)	<u>-0.0660**</u> (0.0303)	<u>-0.0761***</u> (0.0282)	<u>0.241***</u> (0.0641)	Sum of radioactivity (cod)	-0.00266 (0.0222)	0.0161 (0.0124)	-0.0167 (0.0383)
Sum of radioactivity (pollock)	<u>0.978**</u> (0.401)	<u>1.199***</u> (0.416)	<u>0.486</u> (1.277)	Sum of radioactivity (pollock)	-0.0295 (0.267)	-0.0540 (0.154)	-0.0207 (0.688)
Actual Closure (Cod)	-0.0508 (0.0394)	0.0211 (0.0368)		Actual Closure (Cod)	<u>-0.0560**</u> (0.0274)	<u>-0.0235</u> (0.0150)	
Radiation				Radiation			
Sum of radioactivity (cod)	-0.0660** (0.0303)	-0.0761*** (0.0282)	0.241*** (0.0641)	Sum of radioactivity (cod)	-0.00266 (0.0222)	0.0161 (0.0124)	-0.0167 (0.0383)
Sum of radioactivity (pollock)	0.978** (0.401)	1.199*** (0.416)	0.486 (1.277)	Sum of radioactivity (pollock)	-0.0295 (0.267)	-0.0540 (0.154)	-0.0207 (0.688)
Actual Closure (Cod)	-0.0508 (0.0394)	0.0211 (0.0368)		Actual Closure (Cod)	-0.0560** (0.0274)	-0.0235 (0.0150)	
<b>Public Concern</b>				<b>Public Concern</b>			
Constant	21.29*** (5.524)	17.65*** (5.154)	25.53* (13.09)	Constant	12.75*** (3.384)	6.370*** (1.845)	-5.820 (7.026)
Observations	114	114	114	Observations	114	114	114
R-squared	0.757	0.756	0.673	R-squared	0.811	0.962	0.601

Standard errors in parentheses  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

# Result 2

	News for Harmful Rumor (Model 2)		"Cod" and "Reg" (Model 3)		"Cod"&"Contamination" (Model 4)	
	Quantity	Price	Quantity	Price	Quantity	Price
Cod	0.00129*	0.000512	0.00089*	9.81e-05	-0.00020	2.43e-05
Salted Cod	0.000989	0.000286	0.00116**	0.000157	6.26e-07	0.000188
Pollock	-0.000770	0.000657	-0.00189	-0.00199***	0.00101	0.00123***

Cod: "harmful rumor" "Cod Regulation" have positive impact on cod  
 "Cod Contamination" has negative, but insignificant impact on cod

Pollock: Substitution Effect. Positive impact on cod → negative  
 Negative impact on cod → positive



# Conclusion

Q. Any negative radiation impacts on the Japanese seafood markets?

- Yes, the levels of radioactivity in cod **negatively** affected its demand, but **positively** affected that of pollock.
- Actual closure **reduces** cod price.
- But, both impacts are almost negligible (0.01kg and 1.7yen).
  
- Googling (active information collection) basically increases the demand presumably because facing the accurate information would ease alarmist reaction.
- Active information-disclosure may be effective for policy makers to recover economic damage from the Fukushima Disaster.

Thank you!

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