

1. Summary statistics and correlation coefficients.

VARIABLE	N	MEAN	ST DEV	MINIMUM	MAXIMUM
QB	63	70.2270	10.2176	54.00	94.60
RPB	63	504.5333	78.2120	365.90	688.50
RPP	63	369.6889	61.6642	291.10	538.30
RPC	63	173.1698	57.2032	112.00	310.70
RDPI	63	28816.83	7812.16	15134	44538

	LQB	LRPB	LRPP	LRPC	LRDPI
LQB	1.0	0.3841	0.7111	0.6528	-0.6906
LRPB		1.0	0.8023	0.6952	-0.4714
LRPP			1.0	0.8654	-0.7073
LRPC				1.0	-0.9143
LRDPI					1.0

Plot. And then some discussion.

$$y_t = 6.4612 - 0.2712 x_{1t} + 0.9957 x_{2t} - 0.4063 x_{3t} - 0.4237 x_{4t} + e_t$$

(1.4199)	(0.1261)	(0.1621)	(0.1446)	(0.1124)	se
(0.0001)	(0.0357)	(0.0001)	(0.0067)	(0.0004)	p

$$R^2 = 0.6859 \quad F_{4,58} = 31.66 \quad P\text{-Value} = 0.0001 \quad \sigma = 0.0834$$

Interpretation: Elasticities. Ceteris paribus.

Pork, Chicken, and Income significant. Beef least significant.
Overall regression significant.

R^2 : real beef price, pork price, chicken price, and disposable income explain 69% of the variation in per capita beef consumption.

3. Chicken and Income are not as expected - wrong sign. Beef is as expected and significant. Pork is as expected but large.

4. $H_0: \beta_2 = \beta_3$. $F_{1,58} = 28.44$ ($t = \sqrt{28.44}$) $p\text{-value} = 0.0001$ Reject null.

5. $H_0: \beta_2 = \beta_3 = \beta_4 = 0$. $F_{3,58} = 33.13$ $p\text{-value} = 0.0001$ Reject null.

$$6. \quad y_{1986} = 6.4612 - 0.2712 \ln(452.7) + 0.9957 \ln(370.5) - 0.4063 \ln(163.9) - 0.4237 \ln(26867) = ? \rightarrow \text{PCC} = 73.5946 \text{ lb/cap}$$

$$y_{1993} = 6.4612 - 0.2712 \ln(437.1) + 0.9957 \ln(311.5) - 0.4063 \ln(132.6) - 0.4237 \ln(28673) = ? \rightarrow \text{PCC} = 66.2832 \text{ lb/cap}$$

$$\text{Total change} = (66.2832 - 73.5946) = -7.3114 \text{ lb/cap}$$

Along demand curve

$$y_{1993} = 6.4612 - 0.2712 \ln(\mathbf{437.1}) + 0.9957 \ln(370.5) - 0.4063 \ln(163.9) - 0.4237 \ln(26867) = ? \rightarrow \text{PCC} = 74.2643 \text{ lb/cap}$$

$$\text{Change} = (74.2643 - 73.5946) = +0.6697$$

Shift in demand curve

$$y_{1993} = 6.4612 - 0.2712 \ln(452.7) + 0.9957 \ln(\mathbf{311.5}) - 0.4063 \ln(\mathbf{132.6}) - 0.4237 \ln(\mathbf{28673}) = ? \rightarrow \text{PCC} = 65.6855 \text{ lb/cap}$$

$$\text{Change} = (65.6855 - 73.5946) = -7.9091$$

So $+0.6697 - 7.9091 = -7.2394 \neq -7.3114$ but it is very close...

Using elasticities and G&P is also acceptable but communication...

$$7. \quad \ln(66.7) = 6.4612 - 0.2712 x_{1,1998} + 0.9957 \ln(320.5) - 0.4063 \ln(137.9) - 0.4237 \ln(31436)$$

$$x_{1,1998} = 5.9541 \rightarrow \text{Real Beef Price 1998} = 385.322 \text{ ¢/lb}$$

$$\ln(59.6) = 6.4612 - 0.2712 x_{1,2010} + 0.9957 \ln(307.3) - 0.4063 \ln(124.7) - 0.4237 \ln(36180)$$

$$x_{1,2010} = 6.1591 \rightarrow \text{Real Beef Price 2010} = 473.01 \text{ ¢/lb}$$

$$8. \quad H_0: \beta_1 + \beta_2 + \beta_3 + \beta_4 = 0. \quad F_{1,58} = 0.34 \quad \text{p-value} = 0.5619 \quad \text{Fail to reject.}$$

$$9. \quad y_t = 5.6372 - 0.2913 x_{1t} + 1.0081 x_{2t} - 0.3512 x_{3t} - 0.3657 x_{4t} + e_t$$

(0.1457)	(0.1208)	(0.1598)	(0.1087)	(0.0521)	
(0.0001)	(0.0189)	(0.0001)	(0.0020)	(0.0001)	se
					p

$$R^2 = 0.6840 \quad F_{3,59} = 42.58 \quad \text{P-Value} = 0.0001 \quad \sigma = 0.0829$$

Wrong income & cross price. But maybe less so. More reasonable cross-price and own-price. Some very modest effective improvement in the model results.

10. $y_t = -1.2327 - 0.7813 x_{1t} + 0.0754 x_{2t} + 0.2187 x_{3t} + 0.9005 x_{4t}$

(2.1170)	(0.1807)	(0.1962)	(0.2099)	(0.2129)	se
(0.5629)	(<.0001)	(0.7022)	(0.3022)	(<.0001)	p

+ 11.0534 D_t + 0.6954 $D_t x_{1t}$ + 0.0456 $D_t x_{2t}$ - 0.2603 $D_t x_{3t}$ - 1.4411 $D_t x_{4t}$

(2.4760)	(0.2068)	(0.2671)	(0.2596)	(0.2283)	se
(<.0001)	(0.0014)	(0.8651)	(0.3207)	(<.0001)	p

$R^2 = 0.9057$ $F_{9,53} = 56.59$ P-Value = 0.0001 $\sigma = 0.0478$

$H_0: \gamma_0 = \gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = 0$. $F_{5,59} = 24.73$ P-Value = 0.0001 Reject.

Strong structural change. Income (less) and Beef (more inelastic).

11. 1960-1980 $\sigma_1 = 0.017230$ df = (21-5) = 16
 1981-2022 $\sigma_2 = 0.10371$ df = (42-5) = 37

$F_{37,16} = 2.60300$ P-Value = 0.021573 Reject but...

12. $y_t = -4.7935 - 0.1706 x_{1t} + 0.2458 x_{2t} - 0.1099 x_{3t} + 0.9562 x_{4t}$

(1.7807)	(0.0821)	(0.1124)	(0.1125)	(0.1879)	se
(0.0094)	(0.0423)	(0.0330)	(0.3331)	(<.0001)	p

- 0.00131 t - 0.00078178 t^2 + 0.00000813 t^3 + e_t

(0.0083)	(0.0002)	(0.000002)		se
(0.8748)	(0.0001)	(0.0001)		p

$R^2 = 0.9209$ $F_{7,55} = 91.47$ P-Value = 0.0001 $\sigma = 0.04296$

$H_0: \beta_5 = \beta_6 = \beta_7 = 0$. $F_{3,55} = 54.47$ P-Value = 0.0001 Reject.

Are the trend variables significant? Yes.

13. Demand is decreasing at an increasing rate early in the sample, decreases most strongly in the middle of the sample, and then decreases at a decreasing rate late in the sample.

Derivative of y with respect to the year variable.

$$\partial y / \partial t = - 0.00131 - (2)0.00078178 t + (3)0.00000813 t^2 = \text{set} = 0$$

What years are the direction changes in the trend?

First before 1960 (1951) and second after 2022 (2057). Which agrees with the PCC data? No, too early and too late but the middle is reasonable.

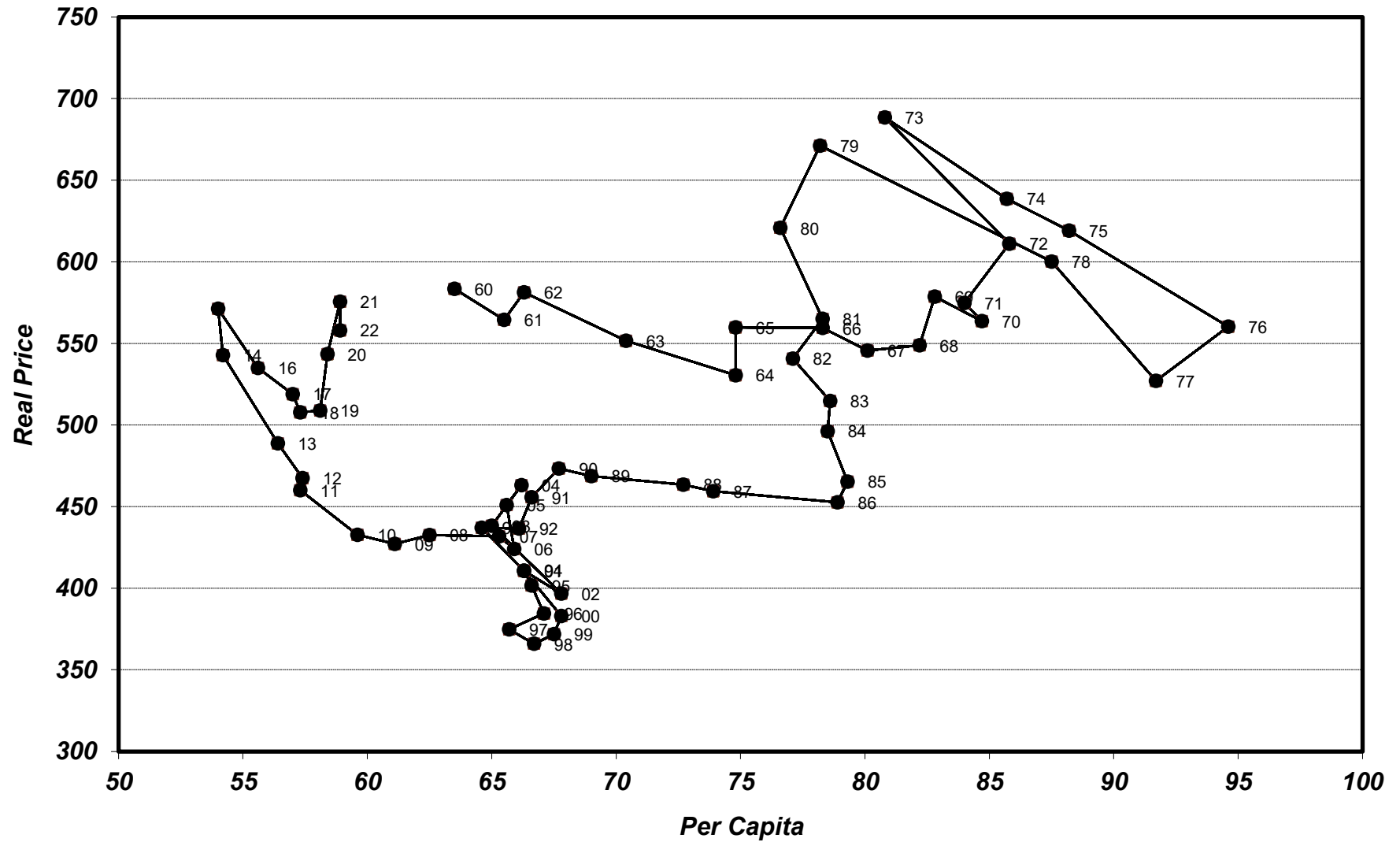
Constant	6.3369	5.6423	-6.0479	-6.0479
Beef B	-0.2583	-0.2683	-0.1729	-0.1729
Pork B	1.0045	1.0115	0.2605	0.2605
Chicken B	-0.4147	-0.3713	-0.1721	-0.1721
Income B	-0.4202	-0.3719	1.1156	1.1156
Trend			-0.0067	-0.0067
TrendSq			-0.0008	-0.0008
TrendCb			0.0000	0.0000

PBeef

1986	345.7614	5.845749
1993	482.8674	6.179742
1998	385.3218	5.954079
2010	473.0136	6.159124

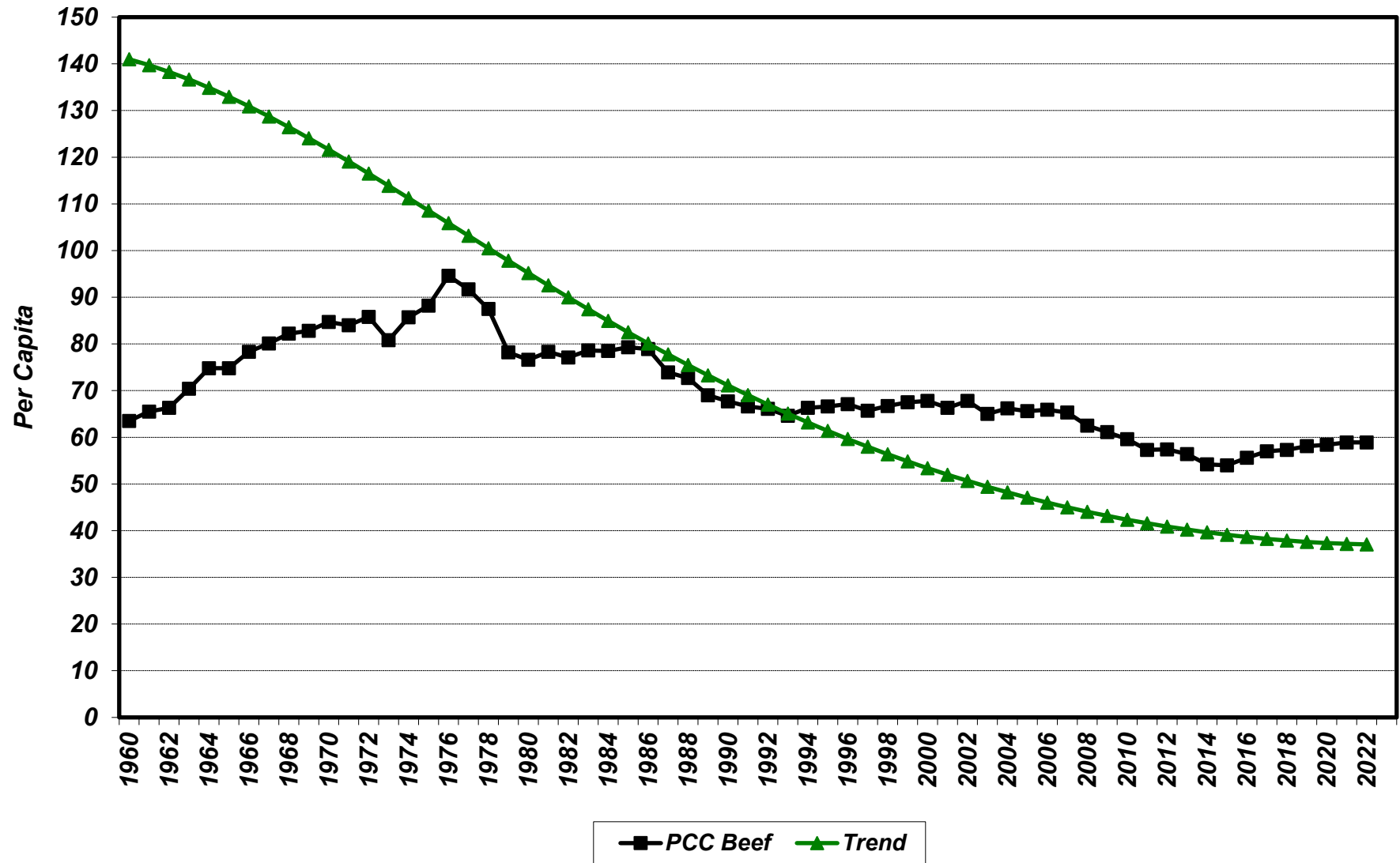
Function		Sum of Parts			
Both	QBeef				
1986	73.5946				
1993	66.2832				
ChgQB	-7.3114				
Along	QBeef	PBeef			
1986	73.5946	-15.6			
1993	74.2643	-0.0351			
ChgQB	0.6697	0.6529			
Shift	QBeef	PPork	PChicken	Income	
1986	73.5946	-59	-31.3	1806	4.298572
1993	65.6855	-0.1735	-0.2119	0.0651	4.184879
ChgQB	-7.9091	-6.8170	-11.4732	6.5911	-1.9350
Check	-7.2394	-6.1641			
Error	-0.0720	-0.4944			

Beef Price and Consumption

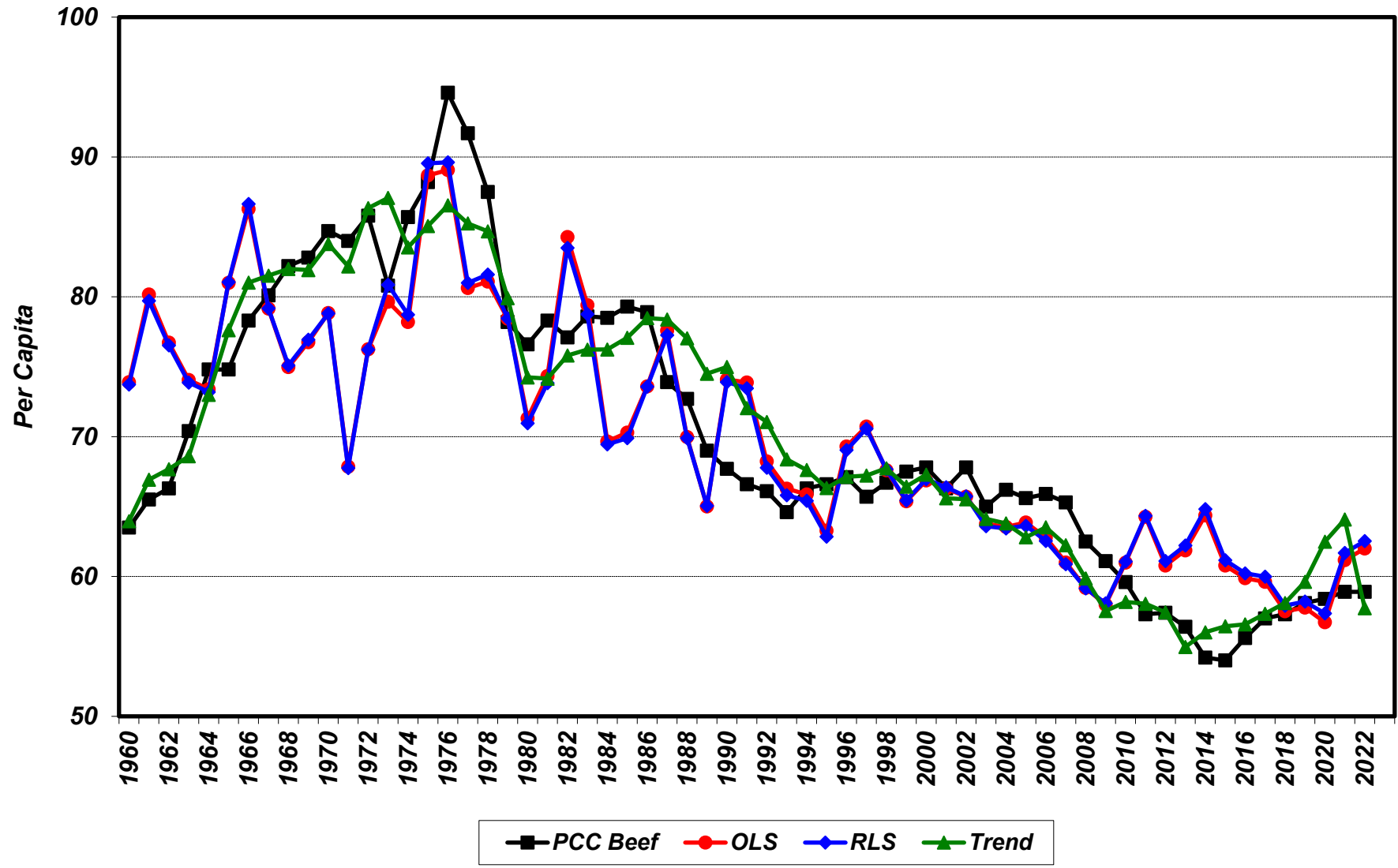


	B1	B2	B3	B4
a	-1	-1	-1	
X	-0.29125	1.00809	-0.35115	-0.36569
B1	0.01456	-0.00798	-0.00378	
B2	-0.00798	0.02552	-0.01283	
B3	-0.00378	-0.01283	0.01182	
B4				0.00272
		se	0.052154	
		t-stat	-7.01179	
		n-(k+1)	59	
		p-value	2.58E-09	

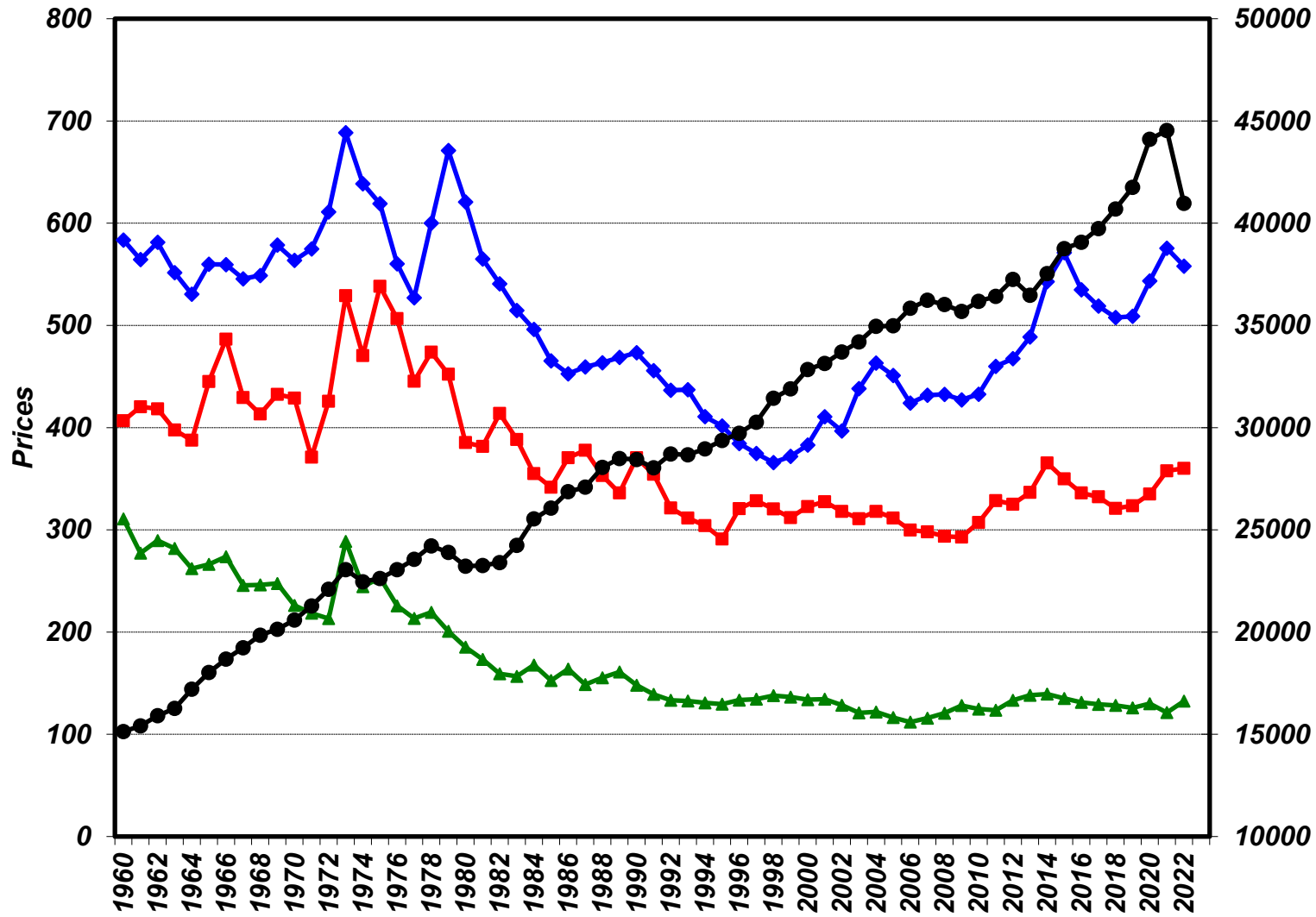
Beef Price and Consumption



Beef Price and Consumption



Real Prices and Real Income



Per Capita Consumption

