Objective

This study investigates U.S. beef prices to evaluate whether observed changes are consistent with allegations of price-fixing in the beef, chicken, pork, turkey, and egg markets. Initially, I examine long-term consumer price trends from 1996 to 2005 for ground beef relative to comparable, non-collusive categories—namely, ground beef, dried beans, cheddar cheese, and whole milk). Dried beans are selected because they represent the only major protein source not implicated in collusion, whereas cheddar cheese and whole milk are chosen as they both come from cattle and share some production and cost factors with beef. Then, I compare selected U.S. prices with those in Canada. Additionally, I incorporate broader food inflation trends in both countries, as measured by the Consumer Price Index (CPI) and Producer Price Index (PPI). I hypothesize that a disproportionate rise in U.S. beef prices relative to these controls may be due to anti-competitive behavior.

Methodology

Following Clark et al.'s (2024) analytical framework, I conduct summary analyses using U.S. city-wide price averages from Federal Reserve Economic Data and aggregate Canada-wide data series from Statistics Canada. Table 1 presents changes in price indices over time for various North American food categories, revealing substantial price growth for both U.S. and Canadian beef. The latter's high volatility intriguingly suggests collusion in the Canadian beef market, also. Table 2 illustrates a steady rise in U.S. food prices post-2012, as well as a more rapid rise in U.S. food production costs pre-2012.

Table 1

Categories	Years	Price Indices		% Change
		Mean	S.D.	
American Beef	2004	144.68	3.89	
	2008	158.25	3.94	9.38
	2012	203.49	3.97	28.59
	2016	257.74	9.71	26.66
	2020	278.90	20.88	8.21
Canadian Beef	2004	135.60	4.41	
	2008	158.95	7.74	17.22
	2012	223.29	3.87	40.48
	2016	310.52	8.32	39.07
	2020	292.53	16.49	-5.79
American Beans	2004	110.97	1.89	
	2008	184.34	15.27	66.11
	2012	207.55	1.09	12.59
	2016	208.04	7.16	0.24
	2020	207.25	4.01	-0.38
American Milk	2004	117.72	8.41	
	2008	135.77	3.31	15.33
	2012	125.18	1.99	-7.80
	2016	114.86	2.57	-8.25
	2020	118.26	3.70	2.97
American Cheese	2004	112.85	5.49	
	2008	124.61	5.59	10.42
	2012	145.81	3.07	17.01
	2016	138.11	3.64	-5.28
	2020	142.52	3.84	3.20

Table 2

Categories	Years	Price Indices		% Change
		Mean	S.D.	
American Food	2004	112.82	0.86	
	2008	130.43	1.90	15.60
	2012	140.98	0.66	8.09
	2016	149.80	0.21	6.26
	2020	160.98	2.23	7.46
American Food Manufacturing	2004	114.49	2.07	
	2008	138.42	3.01	20.90
	2012	156.13	2.19	12.79
	2016	153.88	1.07	-1.44
	2020	159.96	1.15	3.95

Figures 1A and 1B display price trends across selected U.S. food categories, with the latter zooming in on the 1996–2001 period. Notably, a clear divergence between the prices of ground beef and dried beans begins to emerge near the end of 1999, informing my decision to select 2000 as the base year in Figure 2A. Figure 2B indicates that price growth for beef and its control groups followed a similar trajectory prior to 2000, broadly satisfying the parallel trends assumption required for the difference-in-differences regression analysis I later conduct. Furthermore, the sharp divergence in beef prices after 2000 supports my hypothesis that collusion is present in the market.

Figure 1A

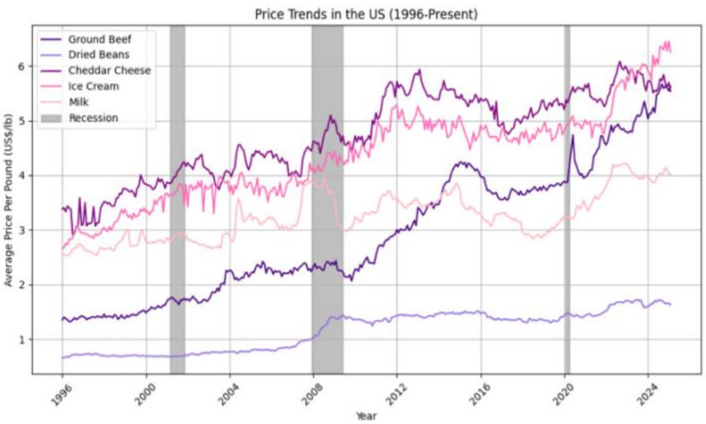


Figure 1B

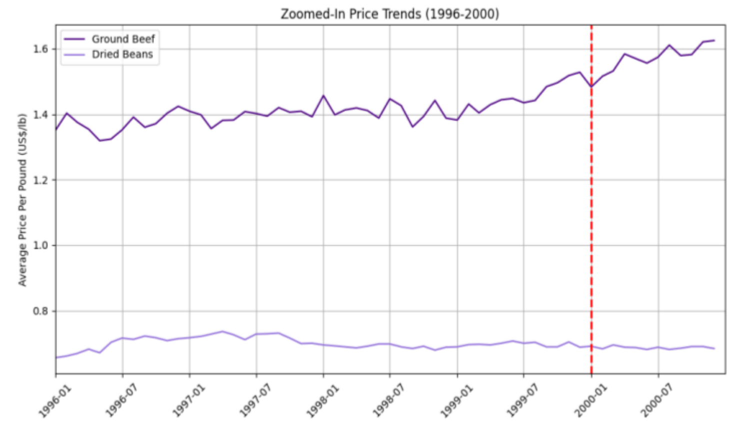


Figure 2A

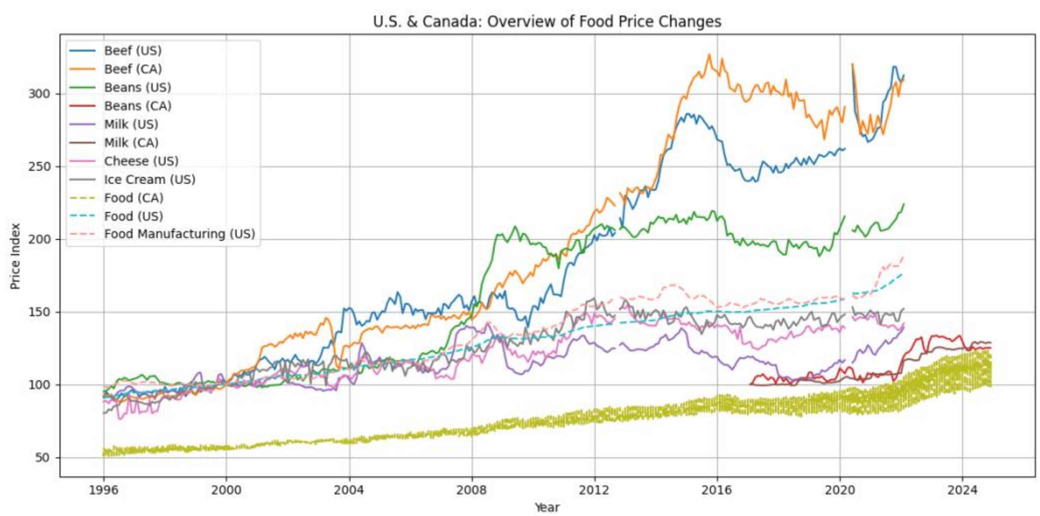
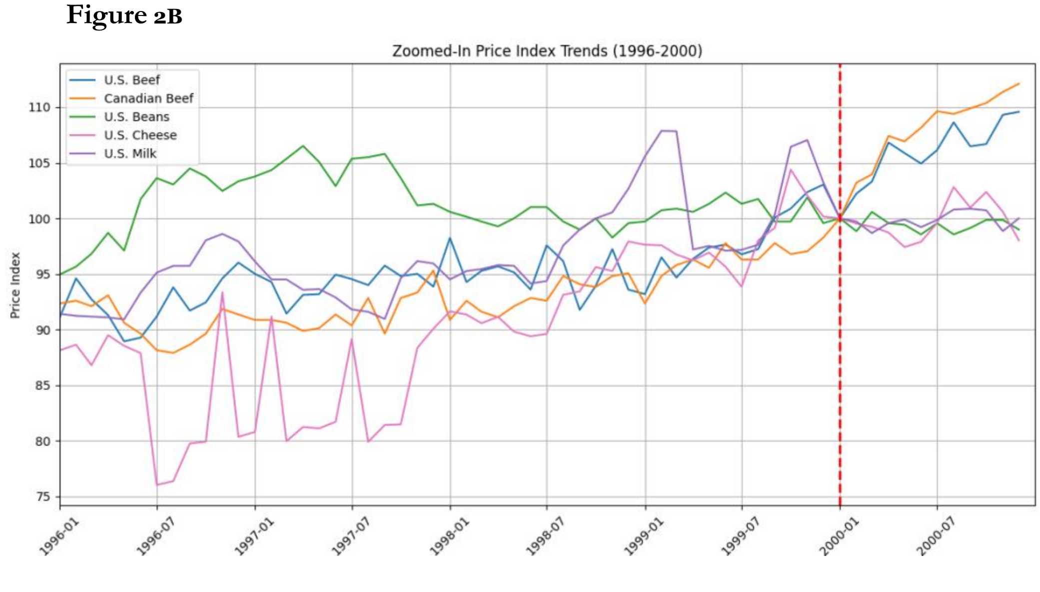


Figure 2B



Although I wanted to include Canadian beans and milk as additional controls, there was limited data available, so I dropped them. Similarly, there seemed to be errors within the Canadian CPI dataset that led to their exclusion from further analysis. Lastly, I chose to drop ice cream as a control given its weaker relevance.

I conduct three logarithmic difference-in-differences regression analyses, defining pre-treatment periods as specific date ranges (2002–2006, 2010–2015, and 2021 onward) wherein I suspect collusion given Figure 2A. The specifications are as follows:

1. U.S. Beef vs. Beans

$$\log(p_{Beef}, t) - \log(p_{Beans}, t) \\ = \alpha + \beta * Collusion_t + \gamma_1 * \Delta\log(FoodCPI_t) + \gamma_2 * \Delta\log(FoodPPI_t) + \varepsilon_t$$

- $\log(p_{Beef}, t)$ and $\log(p_{Beans}, t)$ denote the logged prices of American ground beef and dried beans at time *t*, respectively.
- $Collusion_t$ is a binary indicator set to 1 and 0 for pre-treatment and post-treatment (i.e., suspected collusion) periods, respectively.
- $\Delta\log(FoodCPI_t)$ and $\Delta\log(FoodPPI_t)$ capture changes in the American food consumer and producer price indices.
- α is the intercept term, while β, γ_1, and γ_2 represent the model coefficients.
- ε_t is the error term.

2. U.S. Beef vs. Canadian Beef

$$\log(p_{Beef}, t) - \log(p_{CanadianBeef}, t) \\ = \alpha + \beta * Collusion_t + \gamma_1 * \mathit{\Delta}\log(FoodCPI_t) + \gamma_2 * \mathit{\Delta}\log(FoodPPI_t) + \varepsilon_t$$

- $\log(p_{CanadianBeef}, t)$ is the logged price of Canadian ground beef, serving as the control group.

3. U.S. Beef vs. Dairy

$$\log(p_{Beef}, t) - \log(p_{Dairy}, t) \\ = \alpha + \beta * Collusion_t + \gamma_1 * \mathit{\Delta}\log(FoodCPI_t) + \gamma_2 * \mathit{\Delta}\log(FoodPPI_t) + \varepsilon_t$$

- $\log(p_{CanadianBeef}, t)$ is the logged average price of American fresh, whole milk and cheddar cheese, serving as the control group.

Results

Table 3

Variable	Coefficient	S.E.	p-value
Constant	-0.0025	0.001	0.008*
Collusion	0.0028	0.001	0.032*
Growth of Food CPI	1.1297	0.369	0.002*
Growth of Food PPI	0.4026	0.137	0.003*

Note: *Statistical significance at the 5% level is denoted by an asterisk (*).*

Table 3 reports results from the first regression, indicating that collusion significantly increases the price growth of beef compared to beans. A 1-unit increase in the collusion indicator—which signifies a transition from non-collusive to collusive periods—is associated with a 0.28% increase in the price differential between beef and beans. This suggests that there may have been anti-competitive behavior during the suspected periods. Additionally, food CPI growth has a strong positive effect; overall food inflation contributes to beef becoming relatively more expensive than beans. Food PPI growth is similarly significant but weak. Meanwhile, the negative and significant constant term suggests that, without collusion and inflationary effects, beef prices tend to grow slower than beans prices. Generally, the model is statistically significant and lends support to my hypothesis but explains only 4.8% of the price variation. This emphasizes the importance of other factors affecting beef prices.

Table 4

Variable	Coefficient	S.E.	p-value
Constant	-0.0017	0.001	0.098
Collusion	0.0011	0.001	0.441
Growth in Food CPI	0.8351	0.396	0.035*
Growth in Food PPI	0.4167	0.147	0.005*

Note: *Statistical significance at the 5% level is denoted by an asterisk (*).*

Table 4 presents the results of the second regression. Here, collusion does not seem to significantly impact the relative price growth of American beef compared to Canadian beef, suggesting that any anti-competitive behavior in the U.S. market does not particularly distinguish its price movements from Canadian beef. Food CPI and PPI growth remain significant. The negative, marginally significant constant implies that, when controlling for broader food inflation, U.S. beef prices grow slightly slower than their Canadian counterparts. Although the model is statistically significant, as indicated by the F-statistic, it explains only 3% of the variation. Again, this emphasizes the importance of other factors driving the U.S.-Canadian beef price gap. However, Figures 2A and 2B indicate anti-competitive behavior within the Canadian beef market itself. If collusion is suspected in both treatment and control groups, it is plausible that this model may be underestimating the effect of cartelization by biasing estimates towards 0.

Table 5

Variable	Coefficient	S.E.	p-value
Constant	-0.0014	0.001	0.166
Collusion	0.0031	0.001	0.026*
Growth in Food CPI	0.8683	0.398	0.029*
Growth in Food PPI	-0.0776	0.148	0.600

Note: *Statistical significance at the 5% level is denoted by an asterisk (*).*

Table 5 summarizes the results of the third regression, revealing that shifts from non-collusive to collusive periods are associated with a modest 0.31% increase in the growth differential between beef and dairy prices. Food CPI growth contributes significantly to the widening of this gap, with a 1% rise in the former associated with a 0.87% rise in the latter. Conversely, food PPI growth is not significant; rising food manufacturing costs appear to have a negligible effect. The same is true for the constant term; there is no inherent baseline difference in price growth when controlling for collusion and inflation within the national food industry. Despite the model's overall statistical significance, its low explanatory power of 1.3% points to the relevance of other unobserved factors driving beef price dynamics.

At best, this analysis yields conflicting evidence of anti-competitive behavior in the U.S. beef market. While the regression comparing beef and beans suggests collusion, the one comparing American and Canadian beef does not—although this may be attributable to concurrent cartelization in both markets. Finally, the beef versus dairy regression also weakly indicates collusion.