

Vertical Relationships in the US Infant Formula Market and Its Implications for Welfare

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1. Background and Motivation

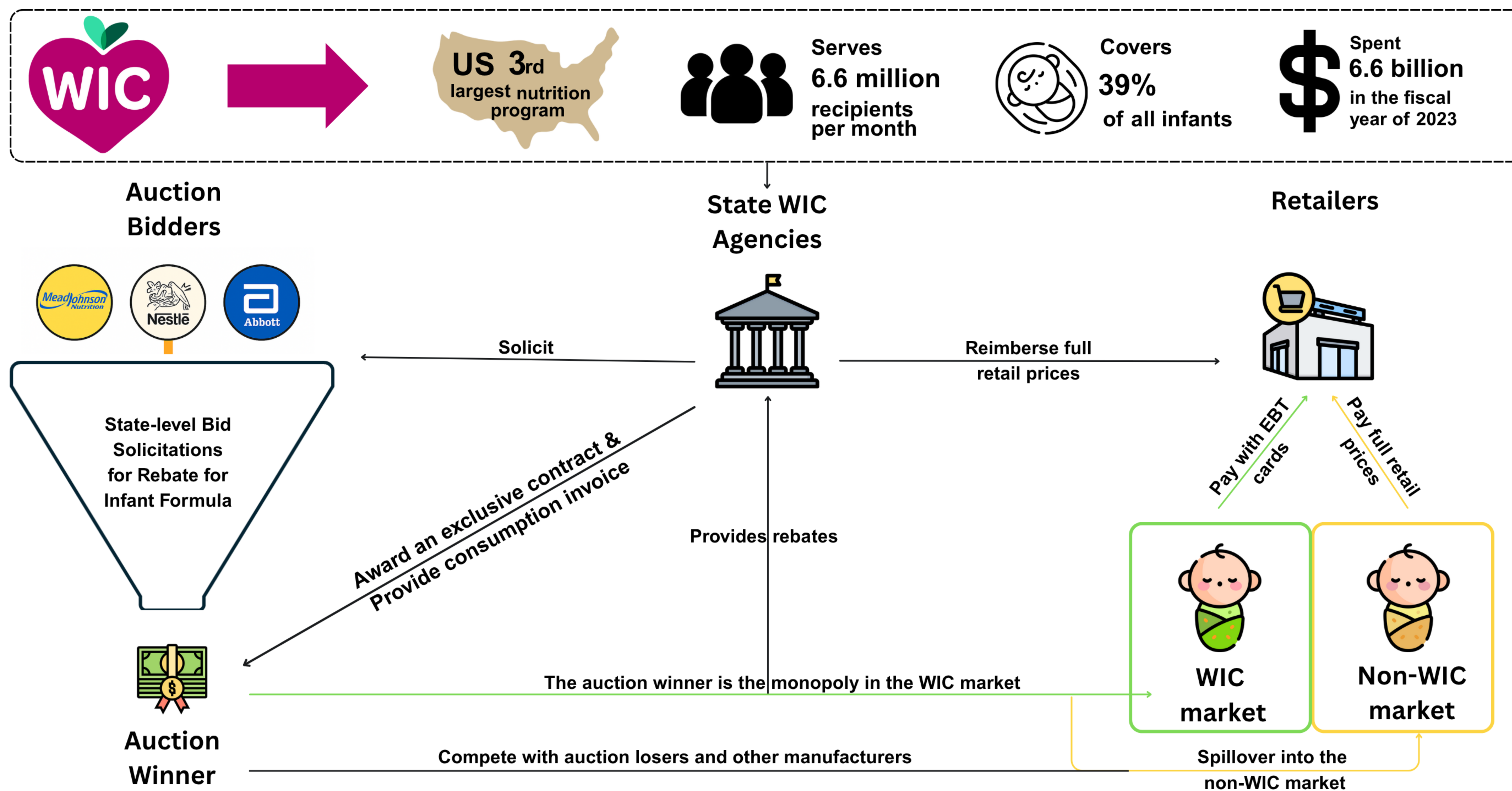


Figure 1: WIC Rebate System and Market Segmentation

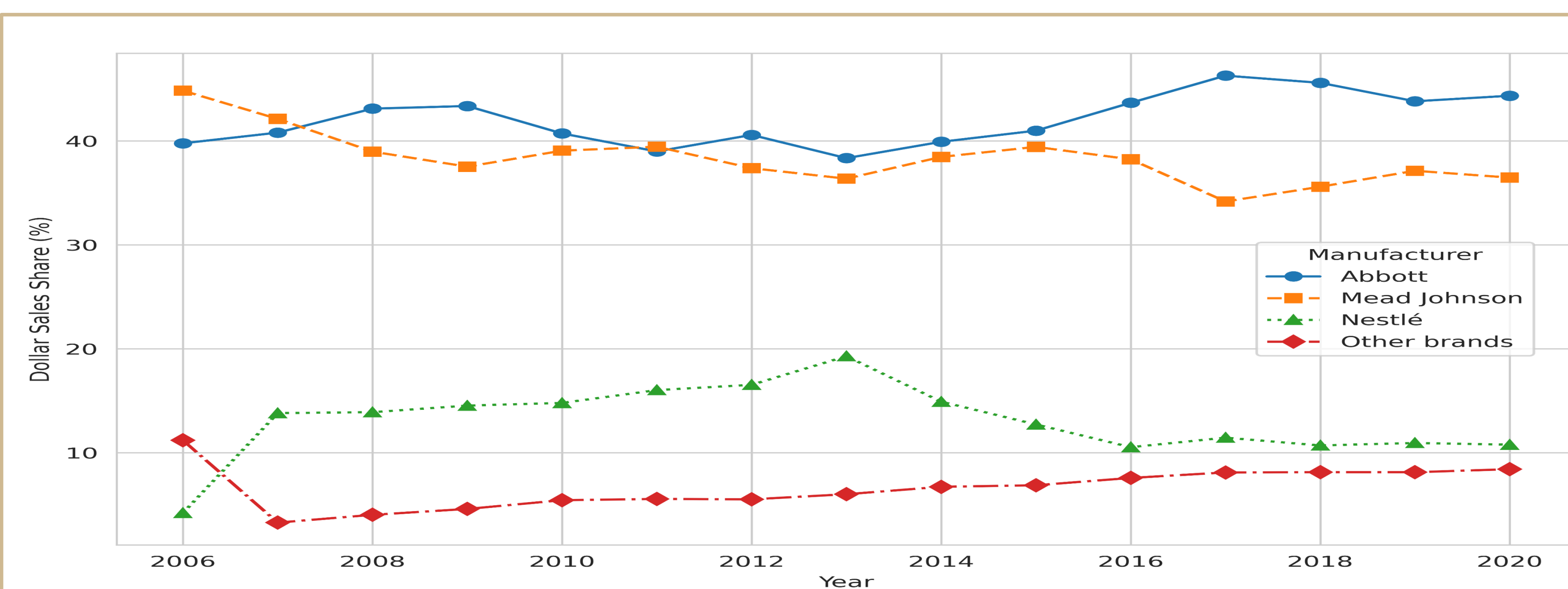


Figure 2: Sales Market Share Trends of Top Three Manufacturers in the U.S. from 2006 to 2020

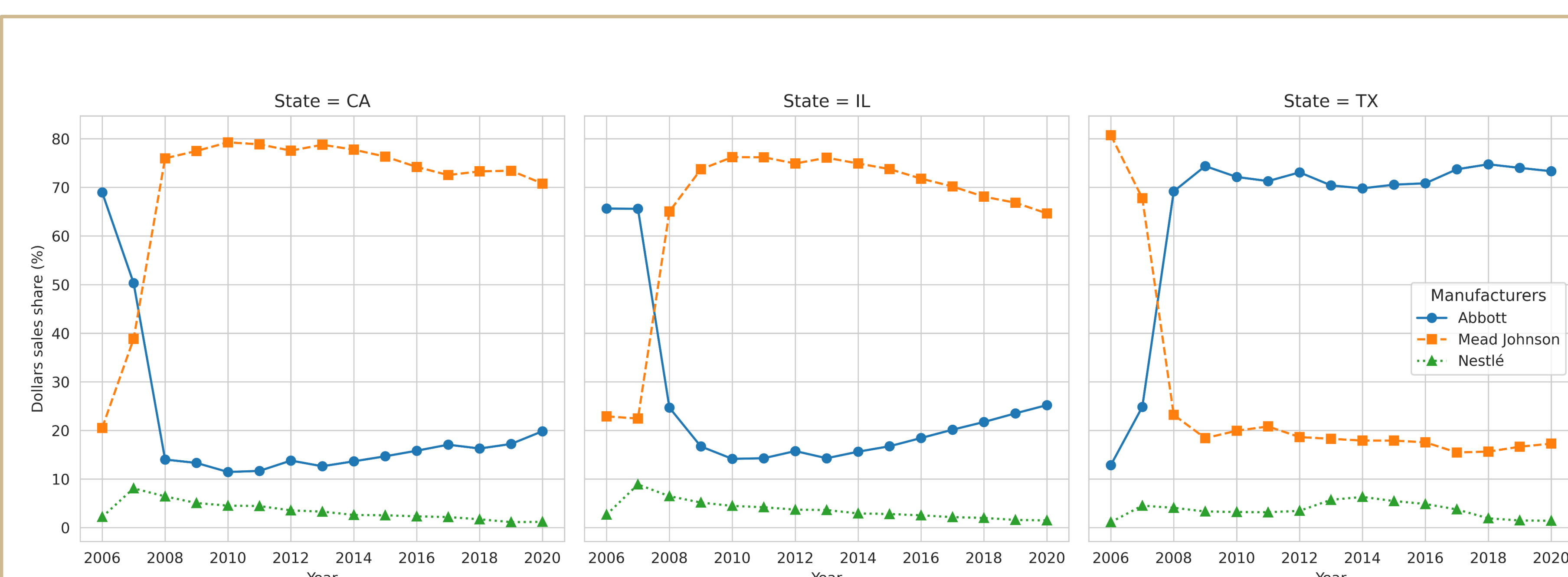


Figure 3: Sales Market Share Trends of Top Three Manufacturers in Three States from 2006 to 2020

- The US infant formula market is highly concentrated.
- These top three manufacturer are also auction winners.
- In 2025, only Abbott and Mead Johnson are awarded WIC contracts.

- State-level data reveal sharp asymmetries driven by WIC auction outcomes.
- The auction winner dominates market, capturing the majority of sales.

2. Research Question

How are infant formula prices set, and what are the implications of this pricing structure for the distribution of surplus across manufacturers, retailers, consumers, and the government?

3. Preliminary Results

Table1: Demand Estimates

	(1) Logit-OLS		(2) Logit-2SLS		(3) BLP	
	coef.	s.e.	coef.	s.e.	coef.	s.e.
Prices	-1.969	(0.294)	-6.456	(2.280)	-13.150	(3.511)
Lactose tolerance	-0.141	(0.030)	-0.010	(0.076)	0.2118	(0.096)
Prebiotics	0.150	(0.032)	0.118	(0.031)	-0.011	(0.352)
Size, medium	0.593	(0.045)	0.445	(0.080)	0.209	(0.114)
Size, large	0.528	(0.046)	0.365	(0.081)	0.115	(0.112)
Income × price					0.414	(1.048)
Education × prebiotics					0.122	(0.757)
No. observations	103,852		103,852		103,852	
State FEs	Yes		Yes		Yes	
Manufacturer FEs	Yes		Yes		Yes	
Retailer FEs	Yes		Yes		Yes	
Year FEs	Yes		Yes		Yes	
Quarter FEs	Yes		Yes		Yes	
Own price elasticity-mean	-0.383		-1.256		-2.559	
Own price elasticity-median	-0.363		-1.190		-2.425	
Diversification outside option-mean	0.631		0.630		0.630	
Diversification outside option-median	0.636		0.636		0.636	

Table2: The Rivers and Vuong (RV) Test Results

Models	T^{RV}					F -statistics					MCS p
	1	2	3	4	5	1	2	3	4	5	
Panel A: NumProd IVs ($d_x = 2$)											
m1. Zero wholesale margin	-3.925	-3.938	-5.314	-4.207	-4.864	100.1 [†]	80.2 [†]	23.1 [†]	11.1 [†]	30.0 [†]	1.00
m2. Zero retail margin		3.439	-3.311	-4.242	2.158		98.7 [†]	191.3 [†]	6.1 [†]	163.3 [†]	0.00
m3. Linear pricing			-4.148	-4.230	-3.311			164.8 [†]	6.2 [†]	132.0 [†]	0.00
m4. Wholesale collusion				-3.549	5.039				78.8 [†]	75.8 [†]	0.00
m5. Retail collusion					3.891					56.2 [†]	0.00
m6. The integration model											0.00
Panel B: Demo IVs ($d_x = 2$)											
m1. Zero wholesale margin	-1.354	-1.355	-1.211	-1.321	-1.326	1.4	1.5	2.2	0.4	2.9	1.00
m2. Zero retail margin		1.081	1.115	-1.309	1.155		2.0	2.6	0.2	2.2	0.43
m3. Linear pricing			1.093	-1.309	1.128			2.7	0.2	2.3	0.46
m4. Wholesale collusion				-1.291	0.254				0.8	2.2	0.22
m5. Retail collusion					1.293					0.6	0.30
m6. The integration model											0.42
Panel C: Cost IVs ($d_x = 1$)											
m1. Zero wholesale margin	0.171	0.048	0.410	-0.728	0.978	1.3	1.8	1.5 [†]	0.6 [†]	1.3 [†]	0.73
m2. Zero retail margin		-0.930	0.288	-0.824	0.292		1.4	0.2	0.4 [†]	0.4	0.95
m3. Linear pricing			0.430	-0.817	0.392			0.4	0.2 [†]	0.6	0.71
m4. Wholesale collusion				-0.794	0.074				0.8	1.2	0.94
m5. Retail collusion					0.777					0.9	0.71
m6. The integration model											1.00
Panel D: Diff IVs ($d_x = 10$)											
m1. Zero wholesale margin	-1.088	-1.060	-0.529	-1.067	-0.568	1.1	1.2	0.7	0.3	1.4	1.00
m2. Zero retail margin		1.037	1.094	-1.058	1.095		1.5	1.8	0.1	1.5	0.64
m3. Linear pricing			1.073	-1.063	1.069			1.8	0.1	1.5	0.63
m4. Wholesale collusion				-1.067	-0.013				0.5	0.6	0.59
m5. Retail collusion					1.067					0.4	0.62
m6. The integration model											0.82

Aggregating Evidence: $M^* = \{0\}$
Step 0: $M_0^* = \{0\}$, $M_1^* = \{1, 2, 3, 4, 5, 6\}$, $M_2^* = \{1, 2, 3, 4, 5, 6\}$, $M_3^* = \{1, 2, 3, 4, 5, 6\}$
Step 1: No conflicting evidence.
Step 2: Smallest MCS is $M^* = \{0\}$, supported by strong instruments.

The first five columns report pair-wise T^{RV} statistics for all pairs of models in the respective row and column. Negative values of the test statistic suggest a better fit of the row model. The second five columns show all the pair-wise F -statistics. \dagger indicates F -statistic above critical value for a best-case power of 0.95. \ddagger means the F -statistics are below the critical values for a worst-case size of 0.075. All other F -statistics are above the critical value for a worst-case size of 0.075. The last column reports MCS p -values for the row model. MCS p -values below 0.05 indicate rejection of a row model.

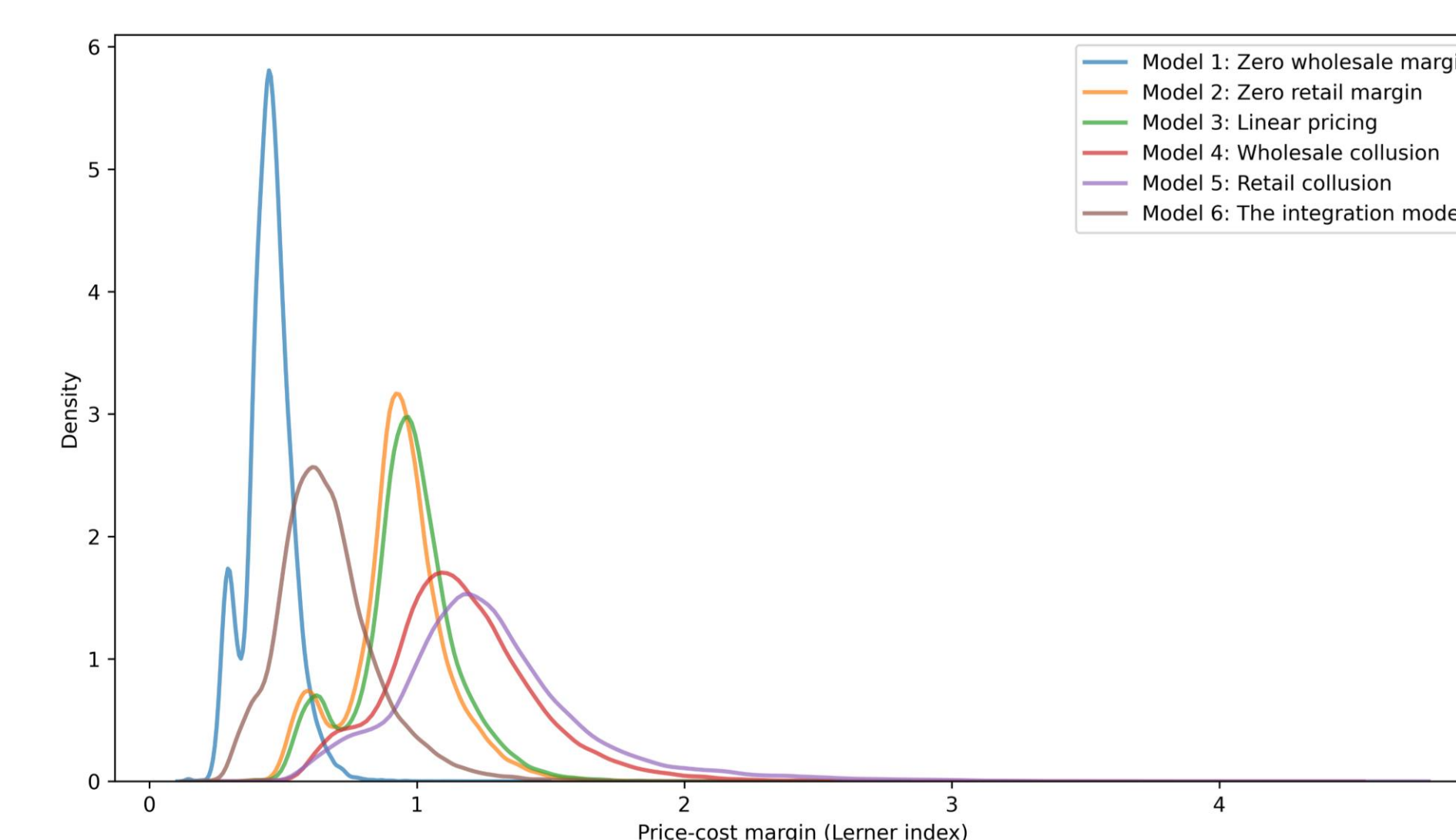


Figure 4: Lerner Index Distributions of All Models

Model 1 (zero wholesale margin), where retailers set final prices and pay manufacturers a fixed fee (wholesale price = marginal cost), is the only one supported by our testing procedures.

4. Counterfactual Analyses

Under the rebate program, when pricing authority shifts from retailers to manufacturers (i.e., going from m1 to m2):

- retail prices/government cost rise by 3.79% on average.
- producer surplus increases by 2.17%.
- consumer surplus drops by 7.44%.
- WIC auction winners generally raise prices more substantially, while non-WIC firms may respond by lowering prices to remain competitive.

Table3: Implications of Firm Conduct

	m1	m2	Changes in percentage
Panel A: Average prices comparison			
Overall	0.196	0.203	3.794
Abbott	0.198	0.207	4.433
Mead Johnson	0.202	0.211	4.032
Nestlé	0.171	0.173	0.738
Panel B: Surplus comparison			
Consumer surplus	66.528	61.579	-7.439
Producer surplus	59.865	61.164	2.170
Abbott	27.323	27.881	2.042
Mead Johnson	23.367	24.015	2.776
Nestlé	9.175	9.268	1.008

Consumer surplus is normalized and reported in utils. Producer surplus is population-normalized gross profits.

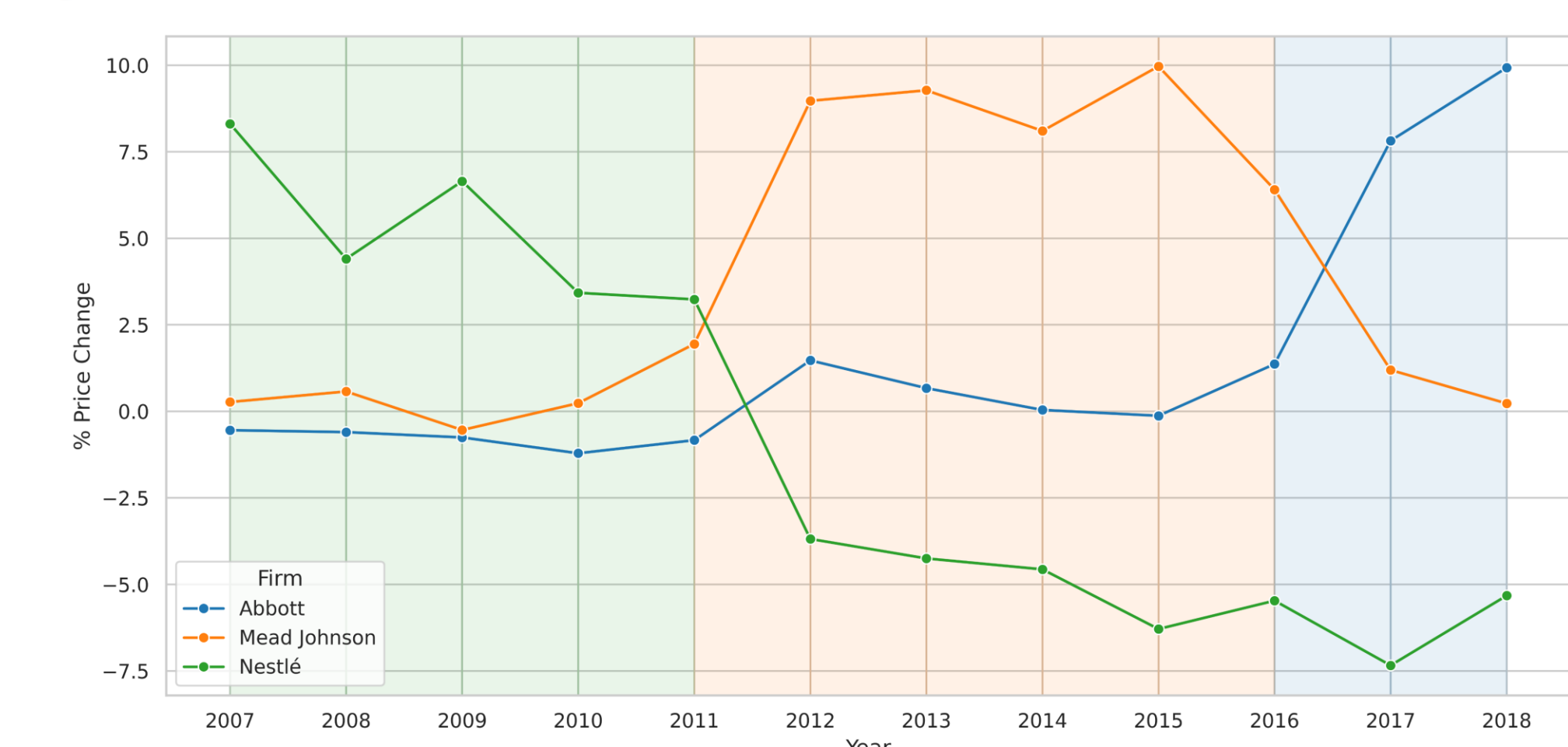


Figure 5: Annual Changes in Average Prices (%) Going from M1 to M2 in MA

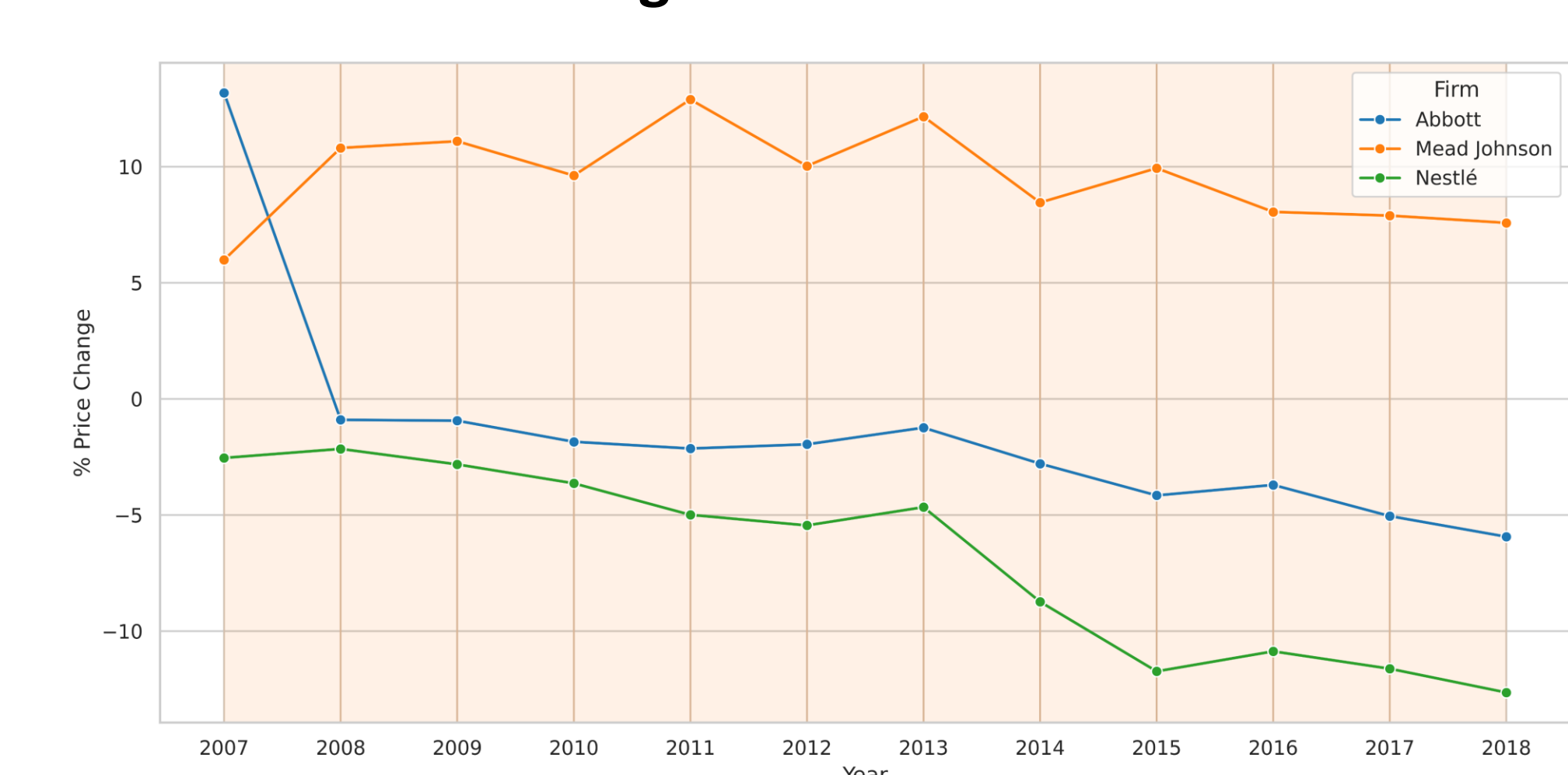


Figure 6: Annual Changes in Average Prices (%) Going from M1 to M2 in CA

Note: The shaded vertical bars Figures 5 and 6 indicate the years during which a manufacturer held the WIC contract in a state. The orange region corresponds to the years when Mead Johnson was the sole WIC auction winner. The blue region marks when Abbott held the WIC contract. The green shaded region indicates years when Nestlé was the sole WIC winner.

Acknowledgement & Data Source

We thank Francisco Scott, Diego S. Cardoso for helpful comments and discussions. We are also grateful to the Food and Nutrition Service staff for providing the infant formula manufacturer bid data and WIC participation data.

Data source: NielsenIQ Consumer Panel and Retail Scanner Data. Researcher(s)' own analyses calculated (or derived) based in part on data from Nielsen Consumer LLC and marketing databases provided through the NielsenIQ Datasets at the Kilts Center for Marketing Data Center at The University of Chicago Booth School of Business. The conclusions drawn from the NielsenIQ data are those of the researcher(s) and do not reflect the views of NielsenIQ. NielsenIQ is not responsible for, had no role in, and was not involved in analyzing and preparing the results reported herein.