IO Problem Set 3

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1 Question 1

We estimate the 4 specifications, as desired.

Constant	-2.99	-2.74	-2.85	-2.61
	(0.11)	(0.09)	(0.11)	(0.09)
Price	-10.12	-28.95	-11.31	-29.40
	(0.88)	(0.99)	(0.88)	(0.96)
Sugar	0.05	-0.02	0.05	-0.02
	(0.004)	(0.003)	(0.004)	(0.003)
Mushy	0.05	0.49	0.04	0.50
	(0.05)	(0.04)	(0.05)	(0.04)
Specification	OLS	OLS	IV	IV
Brand FE	N	Y	N	Y

2 Question 2

We can calculate estimated markups in a straightforward fashion. As described in class, we compute cross-price derivatives of demand and define $\hat{\Omega}$ s.t. $\hat{\Omega}_{jr} = \begin{cases} -\frac{\partial s_{jt}}{\partial p_{rt}}, \text{firm f produces j and r} \\ 0, \text{o.w.} \end{cases}$.
We then compute markups as $\hat{b} = \hat{\Omega}^{-1}\hat{s}_{jt}$. Then, $\hat{mc} = \hat{p} - \hat{b}$ where $\hat{p}$ is the price. Results are below.

Mean Markups	0.117	0.041	0.105	0.040
Median Markups	0.115	0.040	0.103	0.040
St. Dev Markups	0.014	0.005	0.013	0.005
Mean MC	0.009	0.085	0.021	0.085
Median MC	0.008	0.083	0.020	0.084
St. Dev MC	0.034	0.030	0.033	0.030
Specification	OLS	OLS	IV	IV
Brand FE	N	Y	N	Y

3 Question 3

We compute the equilibrium prices and quantities post-merger using the following procedure:

1. Initialize price vector p_0 (decent guess is old prices)
2. Compute $\hat{\delta}_{jt} = \hat{\alpha}p_0 + x_{jt}\hat{\beta} + \hat{\xi}$
3. Compute $\hat{s}_{ijt}$ using $\hat{\Pi}, \hat{\Sigma}, \hat{\delta}$ for individuals $i \in \{1, \ldots, 20\}$

4. Aggregate market shares $\hat{s}_{jt} = \frac{1}{20}\sum_{i=1}^{20} \hat{s}_{ijt}$

5. Compute derivatives $\frac{\partial s_{jt}}{\partial p_{kt}}$ and form $\hat{\Omega}$

6. Using new predicted markups $\hat{b} = \hat{\Omega}^{-1}\hat{s}_{jt}$, update prices $p_1 = \hat{mc} + \hat{b}$

7. Check for convergence. If $||p_1 - p_0||$ <tol, stop. Otherwise set $p_0 = p_1$ and return to step 2.

Results follow. First: Post-Nabisco merger:

Mean Prices	0.126	0.129	0.126	0.129
Median Prices	0.124	0.127	0.124	0.127
St. Dev Prices	0.029	0.029	0.029	0.029
Mean Market Shares	0.020	0.024	0.020	0.024
Median Market Shares	0.011	0.008	0.011	0.008
St. Dev Market Shares	0.026	0.051	0.025	0.050
Specification	OLS	OLS	IV	IV
Brand FE	N	Y	N	Y

Next, GM-Quaker merger:

Mean Prices	0.130	0.132	0.130	0.132
Median Prices	0.128	0.130	0.128	0.130
St. Dev Prices	0.030	0.030	0.030	0.030
Mean Market Shares	0.020	0.022	0.020	0.022
Median Market Shares	0.011	0.008	0.011	0.008
St. Dev Market Shares	0.026	0.048	0.025	0.047
Specification	OLS	OLS	IV	IV
Brand FE	N	Y	N	Y

Overall, OLS and IV results are quite similar.

4 Question 4

We are assuming product characteristics (including marginal cost) remain constant. This doesn't seem to be a very good assumption as mergers are typically defended under the argument that the merger will reduce marginal costs. It also excludes the possibility that the merged firms can combine technology (in the case of cereal, perhaps crossover products would be an example). Without prior information on the likely effects of the mergers in these dimensions, our model would have to be far expanded to accurately predict the effects of the merger accounting for the endogeneity of product characteristics and production efficiencies.

5 Question 5

Here we run the full model. Coefficient and interaction terms are reported:

	Coefficient	Int: Income	Int: Income^2	Int: Age	Int: Child
Constant	-5.59	0.47	2.61	0.56	0.28
	(0.16)	(0.34)	(0.73)	(0.22)	(0.45)
Price	-31.42	3.10	13.30	-0.49	0.33
	(1.70)	(0.59)	(0.58)	(0.074)	(0.452)
Sugar	0.045	-0.143	-0.57	-0.035	-0.001
	(0.01)	(0.55)	(0.77)	(0.53)	(0.28)
Mushy	0.73	0.52	1.36	0.37	-0.47
	(0.07)	(0.37)	(1.33)	(0.09)	(0.44)

6 Question 6

We recompute 2) using results from 5):

Mean Markups	0.04
Median Markups	0.04
St. Dev Markups	0.01
Mean MC	0.08
Median MC	0.08
St. Dev MC	0.03

Markups and MC estimates are fairly in line with Brand FE specifications from before, as expected.

7 Question 7

We recompute 3) using results from 5):

Mean Prices	0.13	0.14
Median Prices	0.13	0.13
St. Dev Prices	0.03	0.04
Mean Market Shares	0.01	0.001
Median Market Shares	0.01	0.001
St. Dev Market Shares	0.02	0.02

The full model predicts higher prices than other specifications, with lower market shares as a natural consequence.

8 Question 8: pyBLP

I have had time to play around some with PyBLP, but unfortunately not nearly enough time to complete both the first part of this problem set and the python portion. I will submit some python code but I haven't been able to match the exact same exercises as part 5-7.