Estimating Market Power Exertion under Bilateral Imperfect Competition

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Background

• Food processing and retailing industries increasingly concentrated .

• Empirical models have not been flexible enough to consider the full range of bilateral relationship between buyers and sellers.

Objective

• Develop a market power estimation procedure for bilateral imperfect competition between retailers and processors.

• Test true market power estimation model against alternative model.

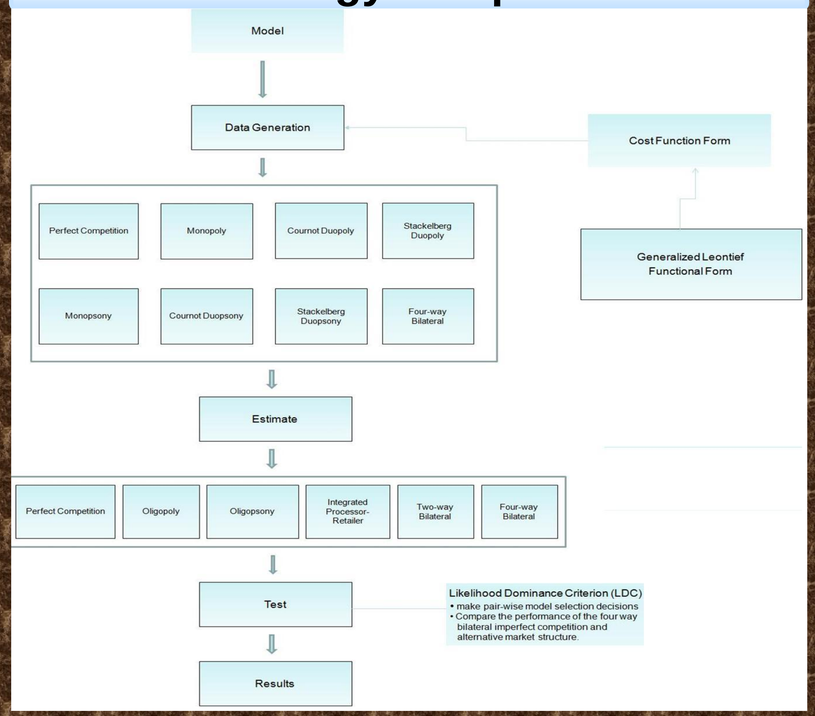
Extension from previous studies

• Previous NEIO methods assume only on one-side of market transactions.

• Consider bilateral relationship between sellers and buyers for potential oligopoly/oligopsony market power exertion.

• Monte Carlo simulation to test for estimation bias from inappropriately modeling market structures.

Methodology and procedure



Data generating equation

	Equations
Perfect competition	$P^p = P^f + a_{11}w + a_{22}v + 2a_{12}(wv)^{\frac{1}{2}} + 2y^p(b_1w + b_2v) + t(c_1w + c_2v)$ $L=a_{11} + a_{12}(v/w)^{\frac{1}{2}} + y^p b_1 + tc_1$ $K=a_{22} + a_{12}(w/v)^{\frac{1}{2}} + y^p b_2 + tc_2$ $P^r = P^p + r_{11}w_1 + r_{22}v + 2r_{12}(w_1v)^{\frac{1}{2}} + 2y^r(d_1w_1 + d_2v) + t(g_1w_1 + gv)$ $L_1=r_{11} + r_{12}(v/w_1)^{\frac{1}{2}} + y^r d_1 + tg_1$ $K=r_{22} + r_{12} * (w_1/v)^{\frac{1}{2}} + y^r d_2 + tg_2$
Four way bilateral imperfect competition	$P^p = P^f + a_{11}w + a_{22}v + 2a_{12}(wv)^{\frac{1}{2}} + 2y^p HP(b_1w + b_2v) + t(c_1w + c_2v) - \frac{(1+\phi_3)HP}{\varepsilon_d^p} + \frac{(1+\phi_2)HP}{\varepsilon_s^f}$ $L=a_{11} + a_{12}(v/w)^{\frac{1}{2}} + y^p HPb_1 + tc_1$ $K=a_{22} + a_{12}(w/v)^{\frac{1}{2}} + y^p HPb_2 + tc_2$ $P^r = P^p + r_{11}w_1 + r_{22}v + 2r_{12}(w_1v)^{\frac{1}{2}} + 2y^r HR(d_1w_1 + d_2v) + t(g_1w_1 + g_2v) - \frac{(1+\phi_3)HR}{\varepsilon_d^r} + \frac{(1+\phi_4)HR}{\varepsilon_s^p}$ $L_1=r_{11} + r_{12}(v/w_1)^{\frac{1}{2}} + y^r HRd_1 + tg_1$ $K=r_{22} + r_{12}(w_1/v)^{\frac{1}{2}} + y^r HRd_2 + tg_2$

Econometric specification

Simulated (true) market structure	True market power parameter (ϕ)	95% CI: Two way bilateral Imperfect competition Bias	CI	Four way bilateral Imperfect competition Bias	CI
Perfect competition	$\phi_1 = 0$	0.1415	(0.0191,0.1687)	0.2440	(0.1660,0.3753)
	$\phi_2 = 0$			0.3337	(0.2742,0.4173)
	$\phi_3 = 0$	0.0349	(0.0002,0.1329)	0.0525	(0.0082,0.0752)
	$\phi_4 = 0$			0.0291	(0.0152,0.0453)
Stackelberg duopoly	$\phi_1 = 0.4$	0.0122	(0.0033,0.4234)	0.2354	(0.1622,0.1643)
	$\phi_2 = 0.4$			-0.0114	(-0.4073,0.4104)
	$\phi_3 = 0.4$	0.3872	(0.0135,0.4013)	-0.3673	(-0.0262,0.0356)
	$\phi_4 = 0.4$			-0.3836	(-0.0133,0.0171)
Monopsony	$\phi_1 = 1$	0.8096	(0.0724,0.8253)	0.7311	(0.2648,0.8174)
	$\phi_2 = 1$			-0.5592	(-0.2401,0.5929)
	$\phi_3 = 1$	0.1721	(-0.2048,0.3054)	0.4827	(0.4135,0.5493)
	$\phi_4 = 1$			-0.5055	(-0.4093 ,0.5580)
Four way bilateral Imperfect competition	$\phi_1 = 0.2$	0.4448	(0.2173,0.6595)	-	-
	$\phi_2 = 0.2$			-	-
	$\phi_3 = 0.2$	0.0598	(-0.1388,0.1414)	-	-
	$\phi_4 = 0.2$			-	-

ϕ_1: Processor oligopoly market power parameter, ϕ_2: Processor oligopsony market power parameter
ϕ_3: Retailer oligopoly market power parameter, ϕ_4: Retailer oligopoly market power parameter
Stackelberg duopoly is industrial level market power parameter

Results

Econometric specification

Simulated (true) market structure	Perfect competition N	A	I	Monopolistic power N	A	I	Monopsonistic power N	A	I	Integrated processor-retailer N	A	I	Two way bilateral imperfect competition N	A	I	Four way bilateral imperfect competition N	A	I
Perfect competition[a]	-	-	-	1000	0	0	1000	0	0	1000	0	0	1000	0	0	1000	0	0
Monopoly[b]	1000	0	0	-	-	-	1000	0	0	1000	0	0	1000	0	0	1000	0	0
Cournot duopoly[b]	1000	0	0	-	-	-	1000	0	0	1000	0	0	1000	0	0	1000	0	0
Stackelberg duopoly[b]	1000	0	0	-	-	-	1000	0	0	1000	0	0	1000	0	0	1000	0	0
Monopsony[c]	1000	0	0	1000	0	0	-	-	-	1000	0	0	1000	0	0	1000	0	0
Cournot duopsony[c]	1000	0	0	1000	0	0	-	-	-	1000	0	0	1000	0	0	1000	0	0
Stackelberg duopsony[c]	1000	0	0	1000	0	0	-	-	-	1000	0	0	1000	0	0	1000	0	0
Four way bilateral imperfect competition[d]	1000	0	0	1000	0	0	1000	0	0	1000	0	0	1000	0	0	-	-	-

N-choose null model over alternative model, A-choose alternative model over null model, I-indecisive
[a] H_o is the perfect competition specification
[b] H_o is the monopolistic power specification
[c] H_o is the monopsonistic power specification
[d] H_o is the four way bilateral imperfect competition specification

Econometric specification

Simulated (true) market structure	True market power parameter (ϕ)	95% CI: Monopoly Bias	CI	Monopsony Bias	CI
Perfect competition	$\phi_1 = 0$	0.2857	(0.2315, 0.3552)	0.36948	(0.0378,0.7773)
Stackelberg duopoly	$\phi_1 = 0.4$	0.6214	(0.4243,1.0645)	-0.2631	(-0.3766,0.3943)
Monopsony	$\phi_3 = 1$	0.3732	(0.1637,0.4285)	-	-
Four way bilateral imperfect competition	$\phi_1 = \phi_2 = \phi_3 = \phi_4 = 0.2$	0.4243	(0.3511,0.6843)	0.7409	(0.6310,0.8531)

ϕ_1: Processor oligopoly market power parameter, ϕ_2: Processor oligopsony market power parameter
ϕ_3: Retailer oligopoly market power parameter, ϕ_4: Retailer oligopoly market power parameter
Stackelberg duopoly is industrial level market power parameter

Conclusions

• Likelihood Dominance Criterion (LDC) reject the alternative in favor of the null model specification 100% of the time.

• Results show that in most cases erroneous market structure modeling results in biased market power parameter estimates.

• A few exceptions were found when true Stackelberg duopoly, monopsony, and four way bilateral data were tested against alternative market structure models.

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