Analyzing Vertical Market Structure and Its Implications for Trade Liberalization*

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* Draws on 2004 IATRC Working Paper, Sexton, Sheldon, McCorriston, and Wang

Introduction

- Doha Round of WTO is a “development round”, focus on increasing LDC access to DC markets
- Little attention paid to food marketing system in DCs in analyzing commodity exports of LDCs:
  - Vertical/horizontal structure
  - Increasing consolidation
- Who captures the benefits of tariff reduction when downstream markets are imperfectly competitive?

Globalization and Market Access

- Increasing concentration of global food system harms LDC exporters of commodities, e.g., coffee (Oxfam, 2001)
- LDCs will not benefit from globalization, e.g., Mozambique exports of raw cashew nuts (McMillan, *et al*., 2002)
- Unease over increased international corporate control – calls for global competition policy (Clarke and Evenett, 2003)

Structure of Food Marketing in Developed Countries

- Food manufacturing concentrated in US and EU, e.g., average 3-firm concentration of 67% in EU
- Food retailing concentrated at national level in EU, and at regional and local level in US
- Increasing consolidation via mergers and acquisitions
- Structure of *successive oligopoly/oligopsony*

Trade Liberalization and Industry Consolidation in a Vertically-Related Market

- If markets were competitive, ignoring vertical market structure would not matter
- Only recently have models examining optimal trade policy included imperfect competition (Ishikawa and Spencer, 1999)
- With imperfect competition, incidence of benefits of trade liberalization is important (Figure 1)
- Increasing consolidation in food marketing also affects share of value added received by LDC exporters (Figure 2)

Figure 1: Trade Liberalization and the Vertical Marketing Chain

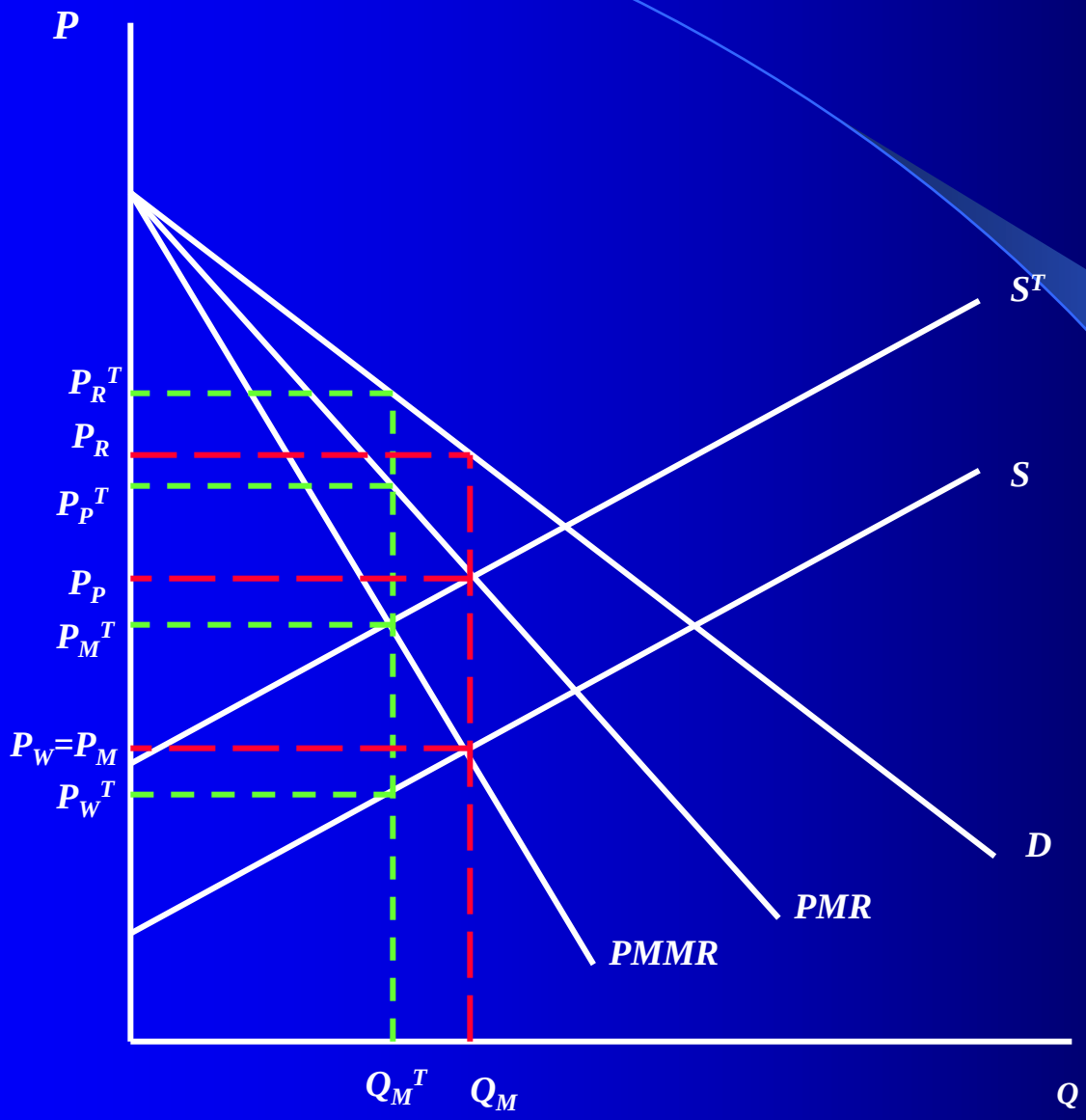
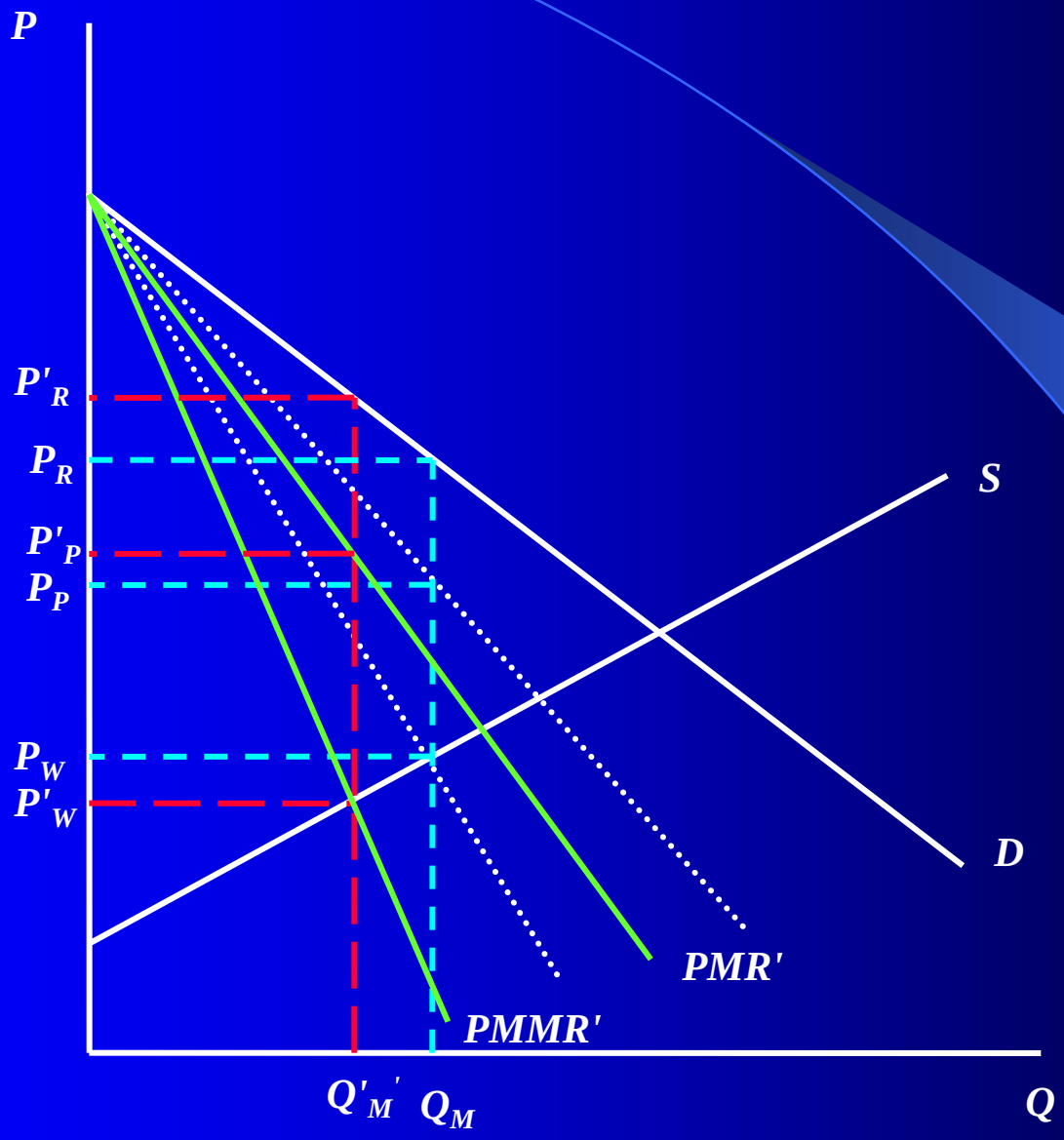


Figure 2: Increased Concentration in the Vertical Marketing Chain



Trade Liberalization and Market Structure

- Use vertical market model to simulate trade liberalization (Sexton and Zhang, 2001)
- Fixed proportions, constant returns technology in processing and retailing
- Linear farm supply and consumer demand
- Competition at processing/retailing levels captured through conjectural elasticity approach

A Model When Downstream Firms May Exercise Market Power

(1) $P^r = D(Q^r, | X)$, Importing country excess demand

(2) $P^f = S(Q^f | Y)$ Exporting country excess supply

- Assume fixed proportions in processing and retailing, in which case, through choice of measurement units we can set $Q^r = Q^w = Q^f = Q$
- Assume CRS in both processing and retailing functions
- Assume processing and retailing firms are identical

(3) $C^w = c^w(V^w)q^f + (P^f + T)q^f$ Processor cost function

(4) $C^r = c^r(V^r)q^w + P^w q^w$ Retailer cost function

Marketers may have both oligopsony and oligopoly power

- Given model structure, results are identical regardless of whether a given degree of market power is exercised by processors or by retailers

- For convenience assume processor market power and retailer perfect competition, the retail price being $P^r=P^w+c^r$

(5) $\pi^w=(D(Q^r)-c^r)q-S(Q^f)q-(c^w+T)q$ Processor profit function

Processor Optimization Condition

(6) $$P^w\left(1-\frac{\xi^w}{\eta_1^w}\right)=P^f\left(1+\frac{\theta^f}{\varepsilon^f}\right)+(c^w+T),$$

$\varepsilon^f=\frac{\partial Q^f}{\partial P^f}\frac{P^f}{Q^f}$ is the market price elasticity of supply of the farm product,

$\eta^w=-\frac{\partial Q^w}{\partial P^w}\frac{P^w}{Q^w}$ is the market price elasticity of derived demand for the processed product

$\theta^f=\frac{\partial Q^f}{\partial q}\frac{q}{Q^f}$, , [0,1] measures the processing firm's degree of oligopsony market power in procuring the farm product

$\xi^w=\frac{\partial Q^w}{\partial q}\frac{q}{Q^w}$, [0,1] measures the processing firm's degree of oligopoly power in selling the processed product.

C^w = per-unit processing costs

T = per-unit tariff

Market Power at Successive Market Stages

- **Successive oligopoly power: processors exercise oligopoly power over retailers, and retailers exercise oligopoly power over consumers. Processors may also exercise oligopsony power over producers.**

(8) $$P^r\left(1-\frac{\xi^r}{\eta^r}\right)=P^w+c^r\,.$$ **Retailer optimization condition**

(10) $$P^w\left(1-\frac{\xi^w}{\eta_2^w}\right)=P^f\left(1+\frac{\theta^f}{\varepsilon^f}\right)+(c^w+T)\,,$$ **Processor optimization condition.**

- **Three market power parameters: ξ^r, ξ^w, and θ^f**

Market Power at Successive Market Stages

- **Successive oligopsony power: processors exercise oligopsony power over producers, retailers exercise oligosony power over processors, and retailers may exercise oligopoly power over consumers.**

(12) $$P^w = P^f\left(1+\frac{\theta^f}{\varepsilon^f}\right)+(c^w+T)\,.$$ **Processor optimization condition**

(14) $$P^r\left(1-\frac{\xi^r}{\eta^r}\right)=P^w\left(1+\frac{\theta^w}{\varepsilon^w}\right)+c^r\,.$$ **Retailer optimization condition**

- **Three market parameters are now: ξ^r, θ^w, and θ^f**

Linear Simulation Model

(1') $Q^r = a - \alpha P^r$, importing country excess demand at retail,

(2') $P^f = b + \beta Q^f$, exporting country inverse farm excess supply.

- At no further loss of generality, make full use of range of normalizations available by setting retail price and output equal to 1.0 at no-tariff competitive equilibrium

$P^r = 1$

$P^f = 1 - c^r - c^w = f$ farm revenue share in perfect competition

$Q^r = Q^w = Q^f = 1.0$ perfect competition output

$$\alpha = \eta_c^r, \quad \beta = \frac{f}{\varepsilon_c^f}, \quad a = 1 + \alpha, \quad b = f - \beta,$$

(2'') $P^f + T = b + \beta Q^f + T$. Introduction of a tariff shifts farm excess supply

Figure 3: Processor Oligopoly and Oligopsony Power

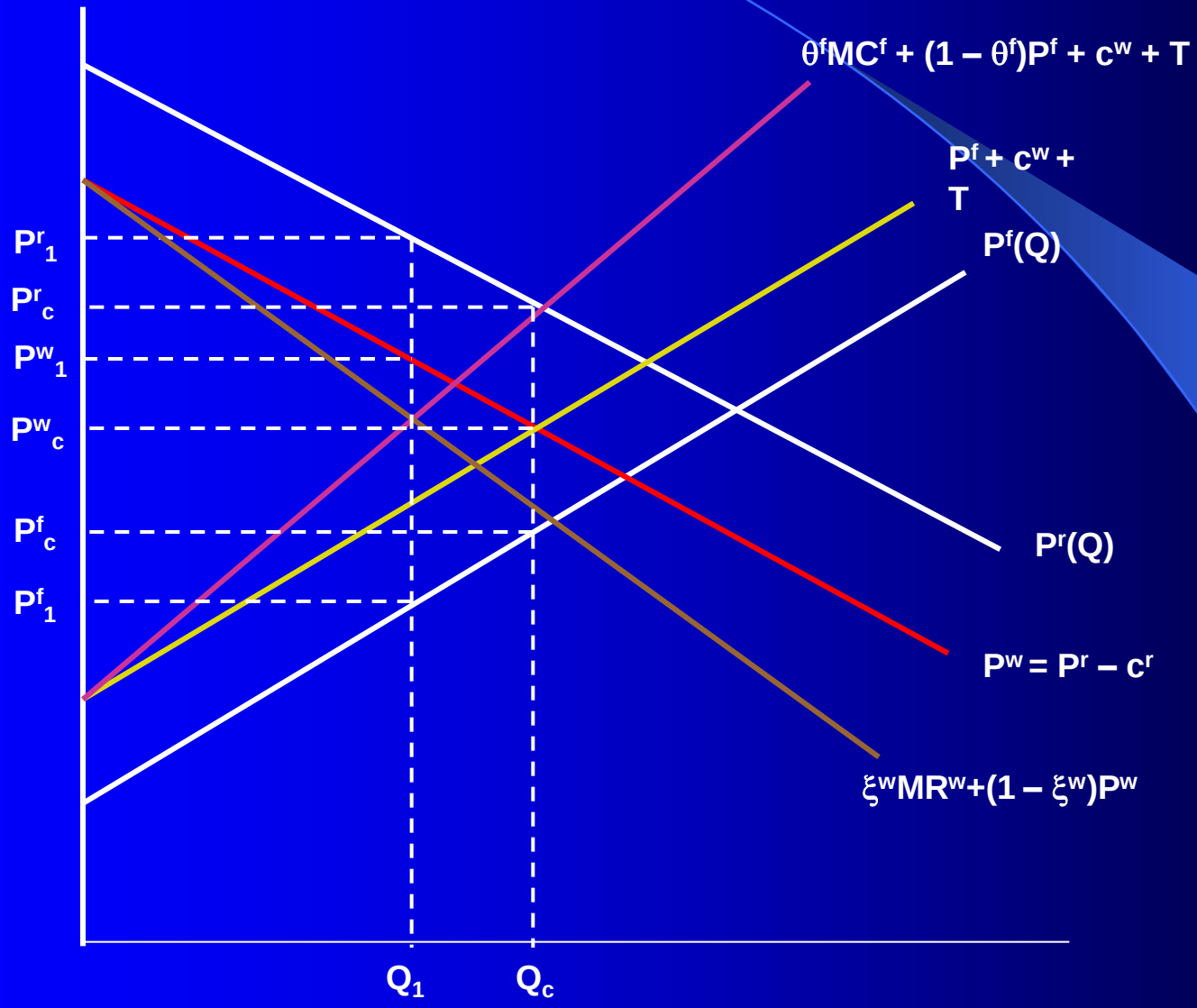


Figure 4: Successive Oligopoly Power with Processor Oligopsony Power

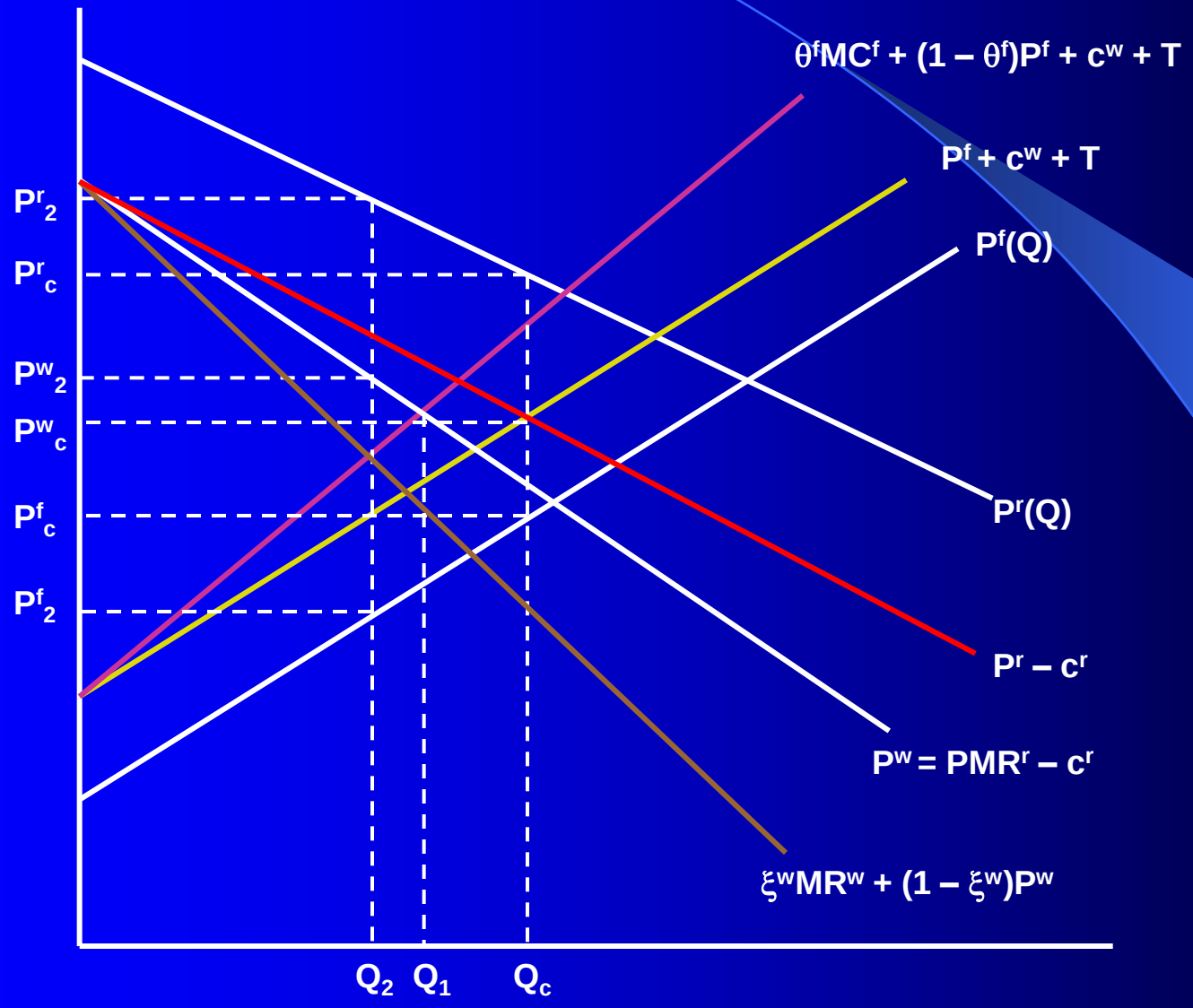
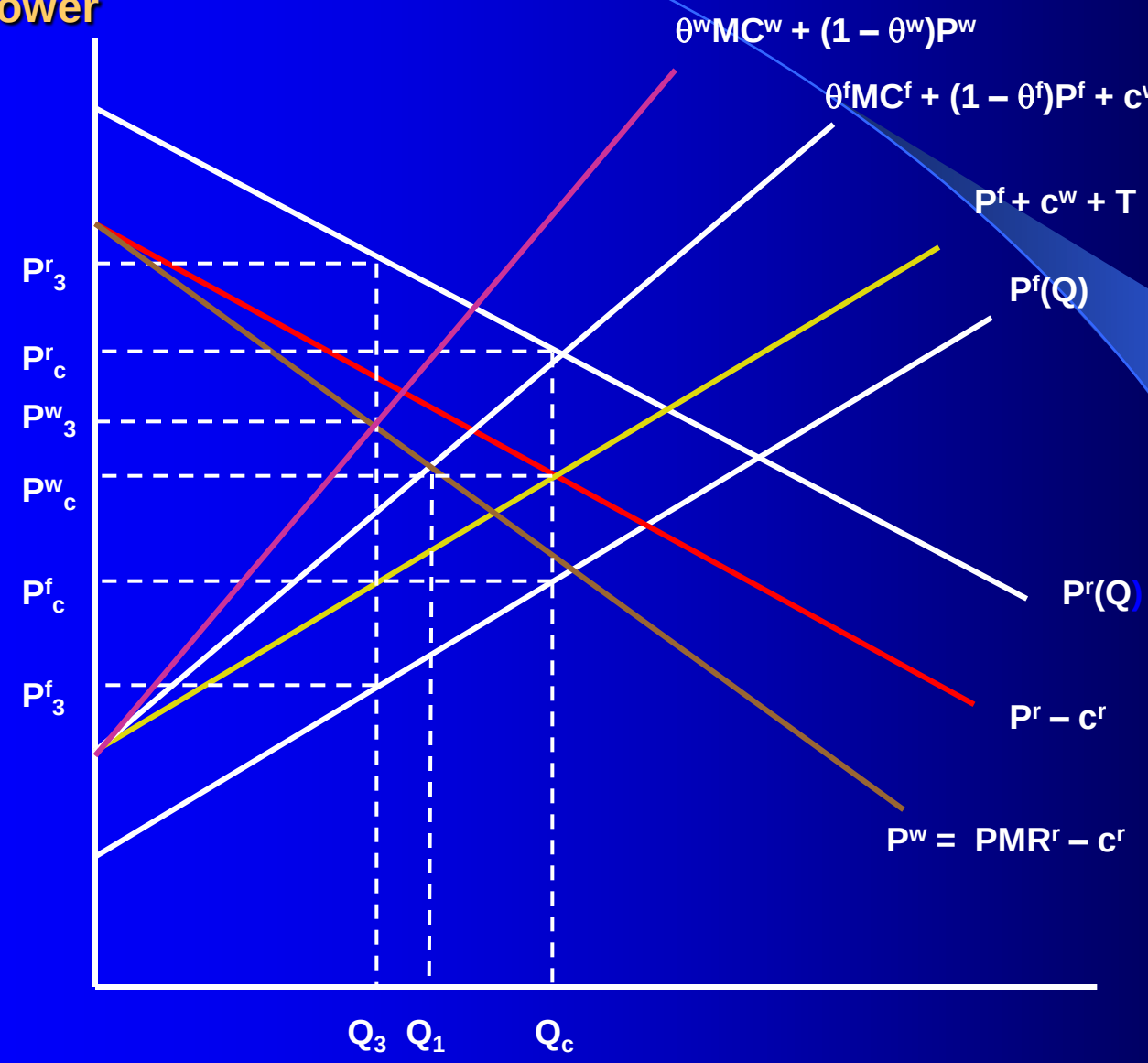


Figure 5: Successive Oligopsony Power with Retailer Oligopoly Power



Model Calibration

- Key market power parameters are ξ^r, ξ^w, θ^f, and θ^w – as these lie in range 0 to 1, simulate over entire unit interval
- Consider equal departures from competition, e.g., in case of successive oligopsony and retailer oligopoly, $\theta^f = \theta^w = \xi^r$
- Farm share of revenue under no tariff competitive equilibrium set at f = 0.5 – when f is small, diminishes impact of oligopsony
- Per-unit tariff at competitive equilibrium set at T=0.2
- Price elasticity of farm supply and retail demand evaluated at no-tariff competitive equilibrium, $\varepsilon^f_c = \eta^r_c = 1$, which, given f = 0.5, implies that $\varepsilon^w_c = 2.0$

Estimated Market Power and Lerner Indices

Study	Industry	Market Power	Lerner Index
Appelbaum (1982)	US textiles US tobacco	0.05 0.40	0.07 0.65
Lopez (1984)	Canadian food processing	0.19	0.50
Schroeter (1988)	US beef-packing: - oligopsony - oligopoly	0.22	0.01 0.04
Karp and Perloff (1989)	Rice export	0.68	0.11
Azzam and Pagoulatos (1990)	US meat (oligopoly) US livestock (oligopsony) US composite meat processing	0.22 0.18	0.46 1.10 0.74
Schroeter and Azzam (1990)	US beef US pork	0.05 0.06	0.55 0.47
Buschena and Perloff (1991)	Philippines coconut oil	0.58	0.89
Wann and Sexton (1992)	US grade pack pears US fruit cocktail	0.08 0.48	0.15 1.41
Deodhar and Sheldon (1995)	German bananas	0.29	0.26
Deodhar and Sheldon (1996)	German bananas	0.20	0.18
Bhuyan and Lopez (1997)	US food industries US tobacco industries	0.18 0.18	0.33 0.33
Wilson (1997)	UK bread manufacturing	0.31	0.84
Genoseve and Mullin (1998)	US sugar industry	0.04	0.05
Steen and Salvanes (1999)	French fresh salmon	0.02-0.05	0.12-0.04
Bettendorf and Verboven (2000)	Dutch coffee roasting	0.02-0.17	0.07-0.54
Gohin and Guyomard (2000)	French food retailing: - dairy products - meat products - other food products	 -0.02 -0.03 0.01	 0.20 0.17 0.12

Figure 6: Effect of Market Power on Producer Welfare

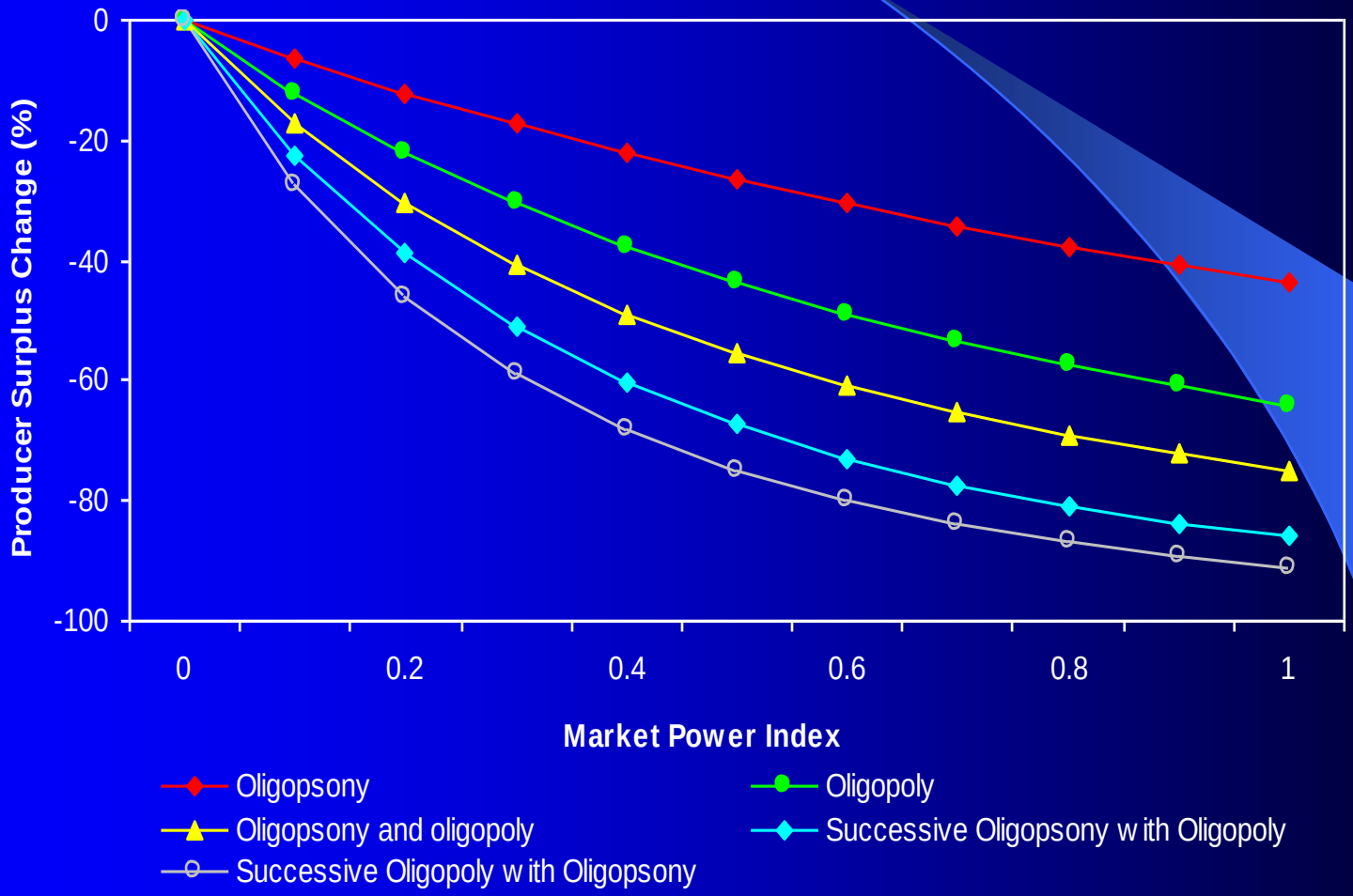


Figure 7: Effect of Market Power on Total Welfare

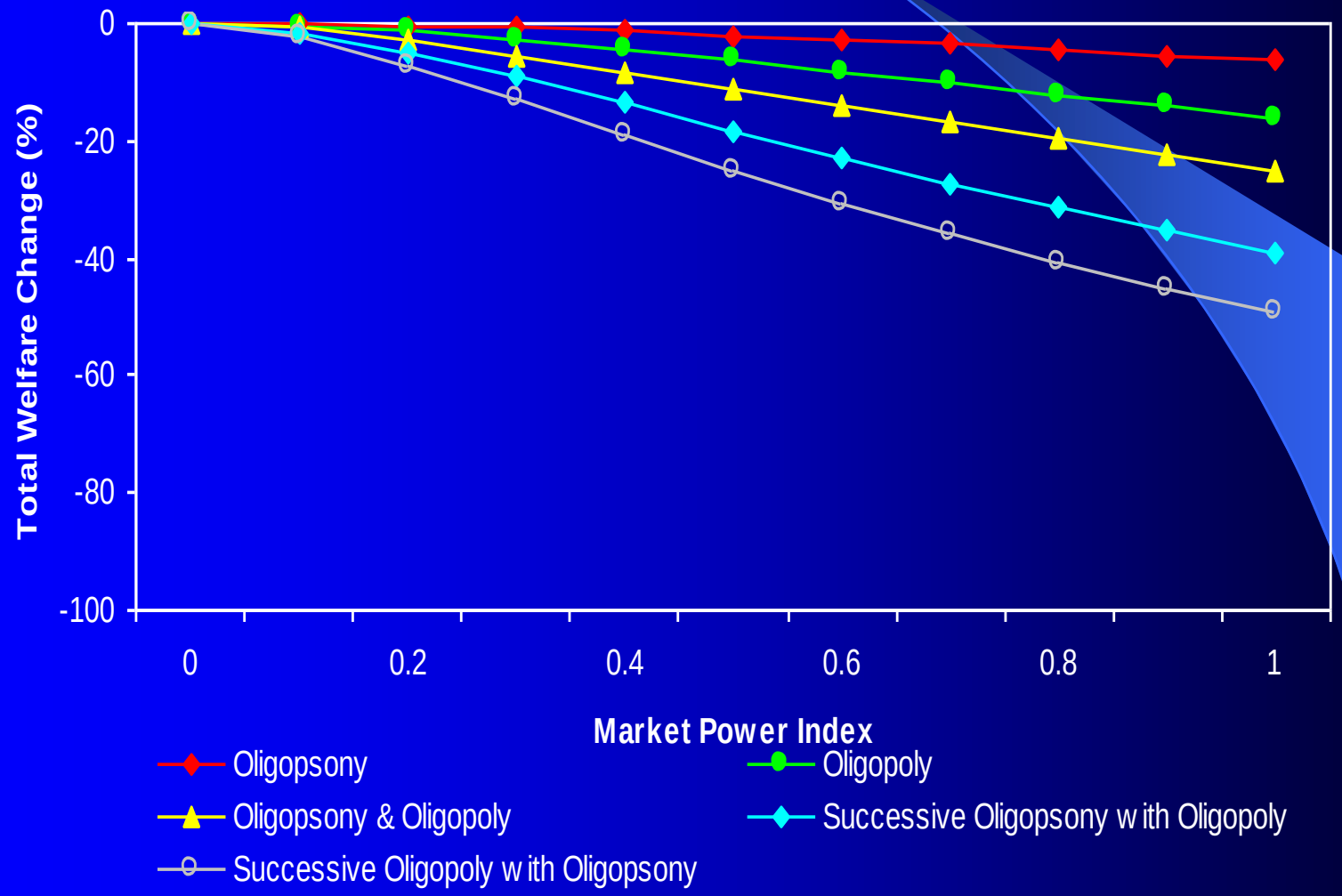


Figure 8: Effect of Market Power on Distribution of Welfare: Processor Oligopsony and Retail Oligopoly

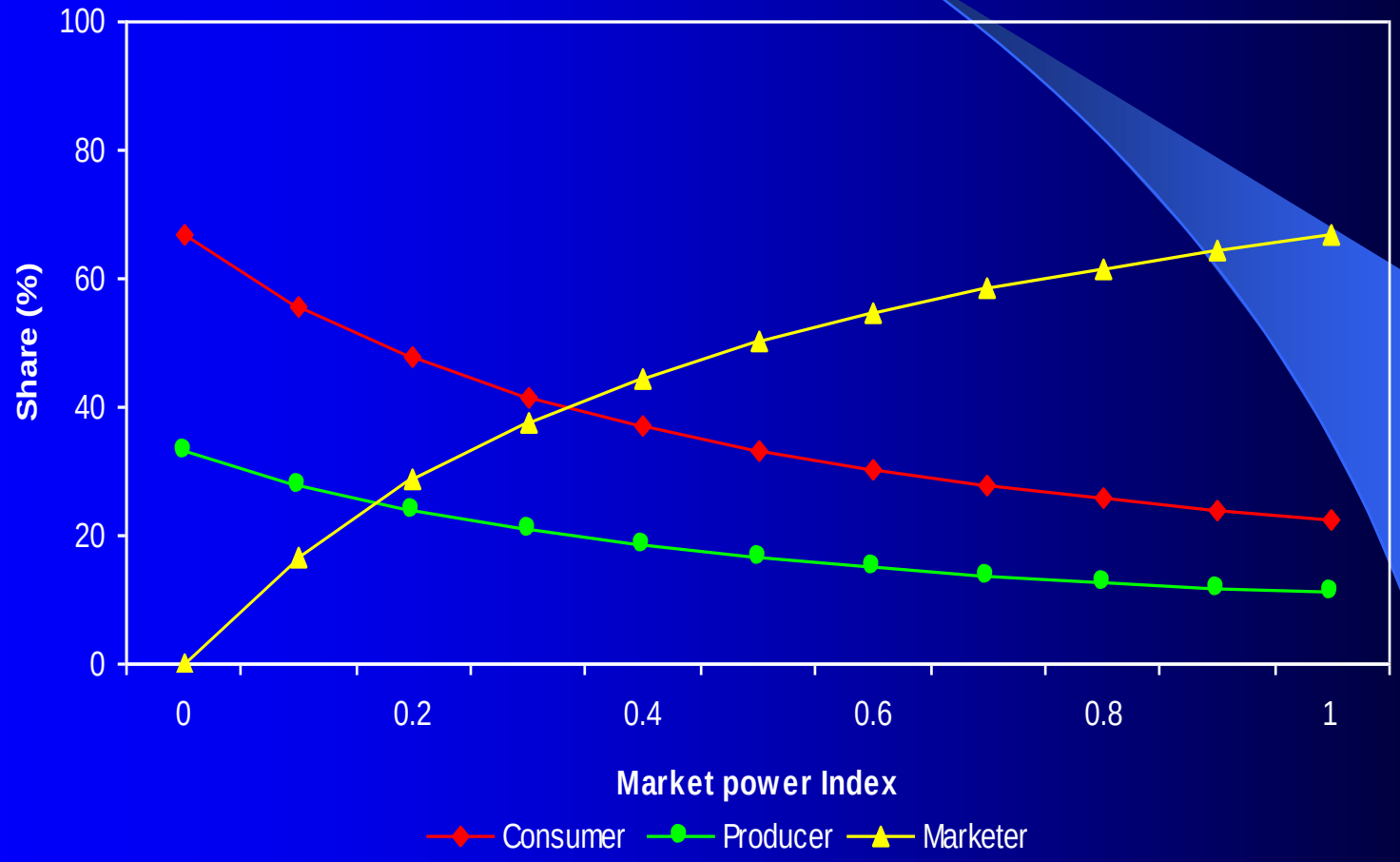


Figure 9: Change in Farm Price from Trade Liberalization

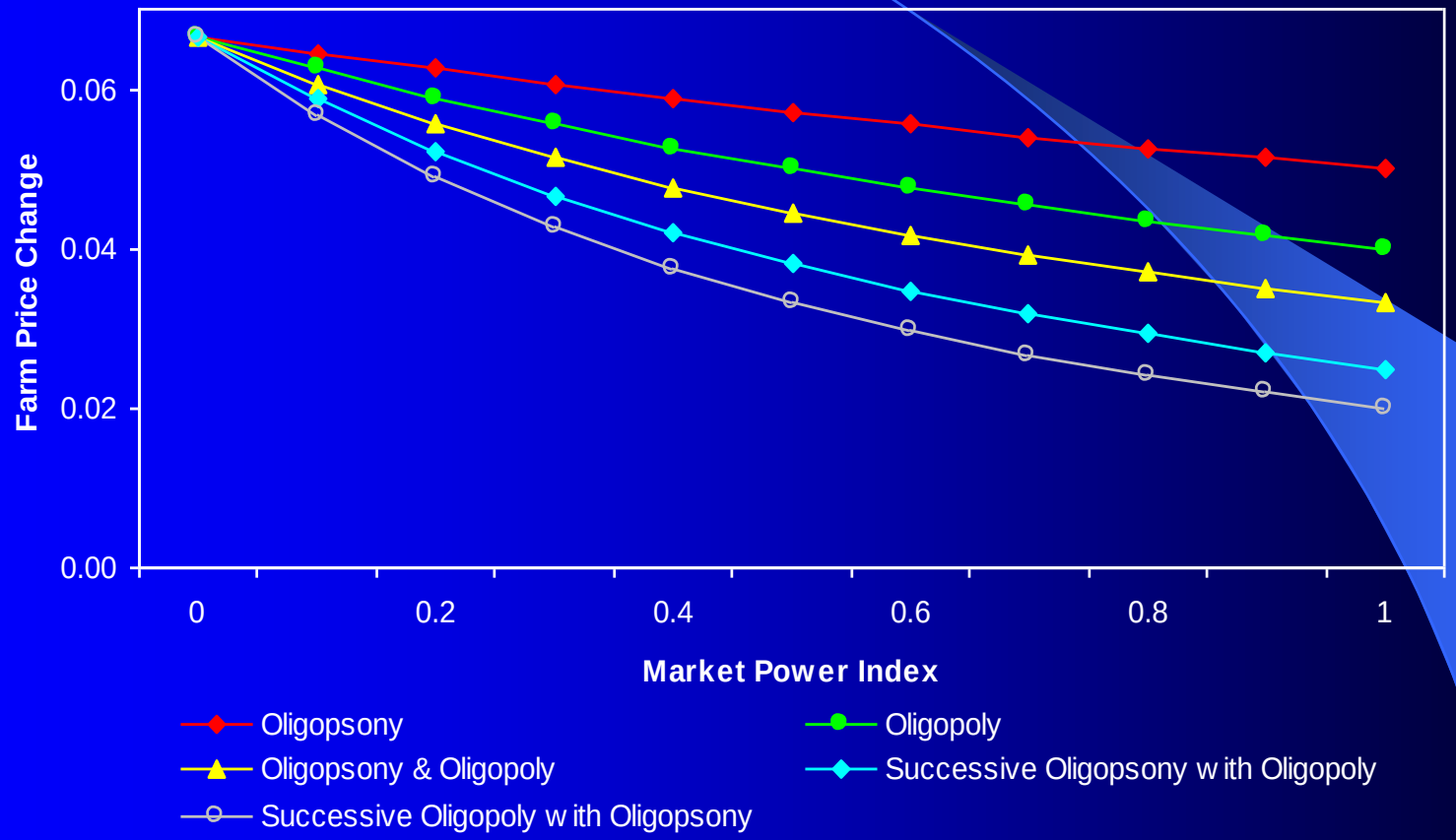


Figure 10: Change in Producer Surplus from Trade Liberalization

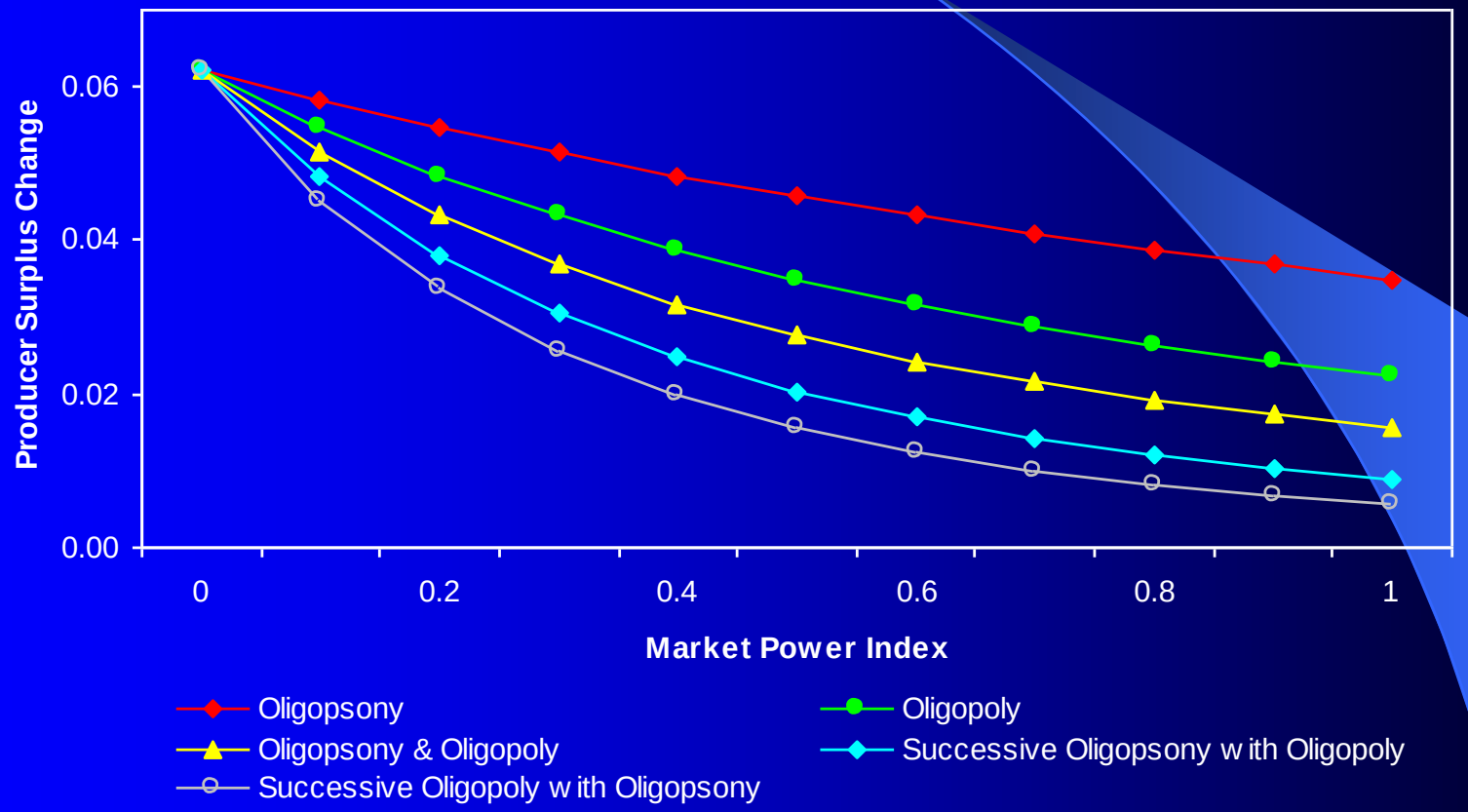


Figure 11: Change in Producer Surplus, Consumer Surplus and Marketers' Profits from Trade Liberalization for Case of Processor Oligopsony and Retail Oligopoly

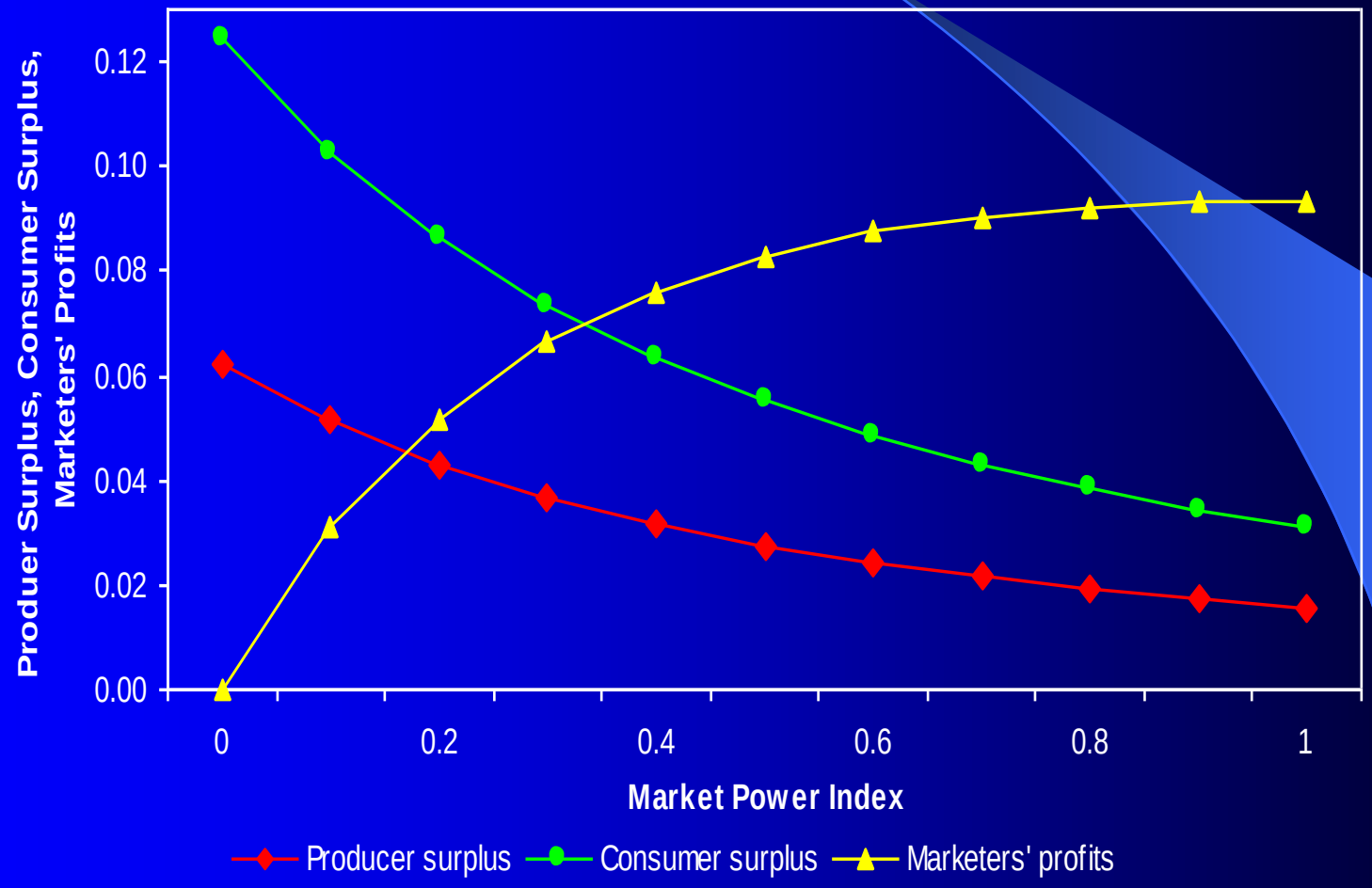
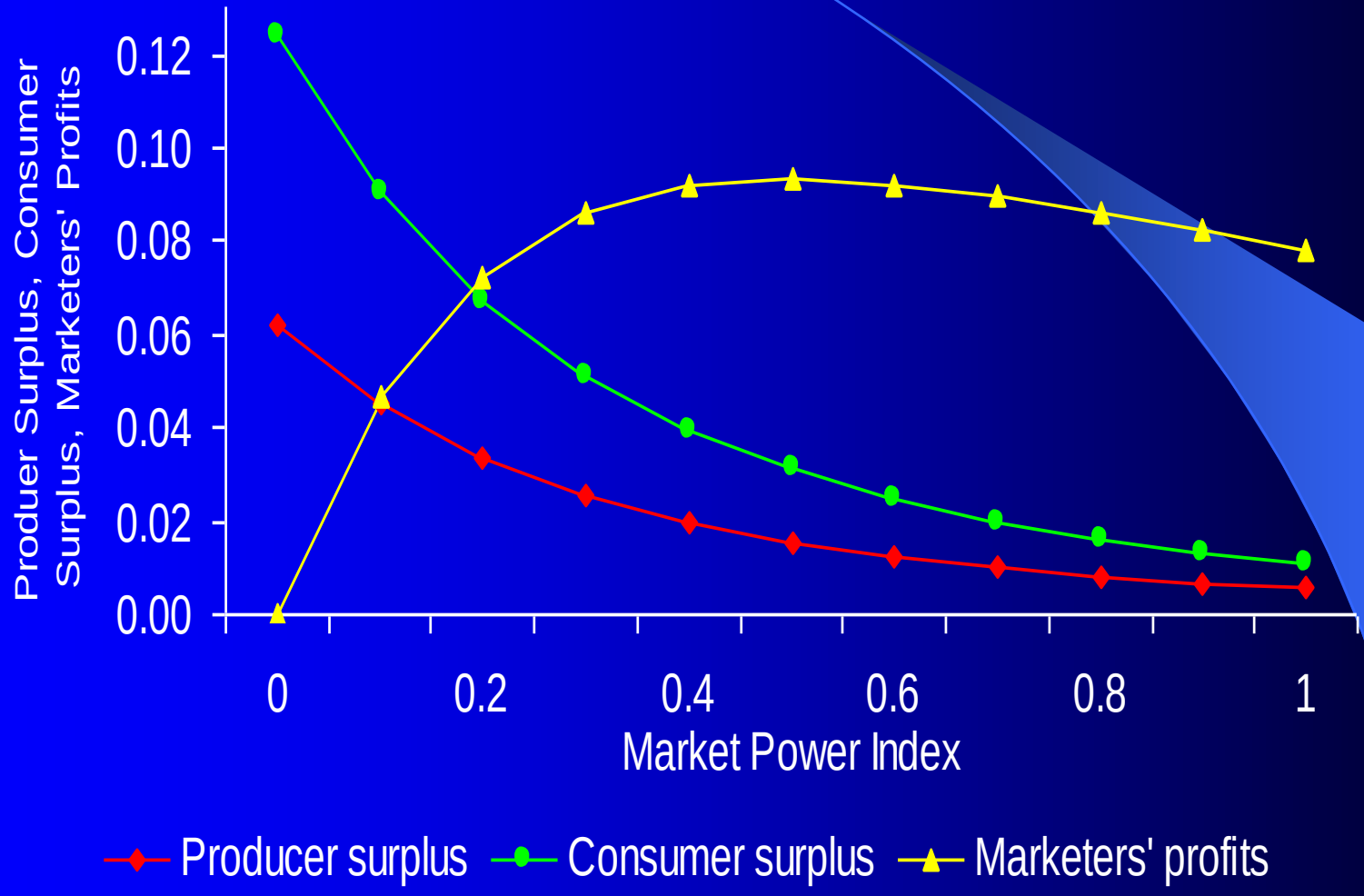


Figure 12: Change in Producer Surplus, Consumer Surplus and Marketers' Profits from Trade Liberalization for Case of Successive Oligopoly with Processor Oligopsony



What does analysis miss?

- Domestic farm sector ignored in DCs
- Tariffs are usually *ad valorem*
- Explicit analysis of tariff escalation
- Rich nature of vertical structures, e.g., vertical restraints

Conclusions

- Structure of food marketing system in DCs matters for who gains from trade liberalization
- Increasing consolidation in food marketing system may reduce share of consumer's "food dollar" going to LDC exporters
- LDC exporters may gain as much from vertical integration into value-adding activities as from trade liberalization