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## IDENTIFICATION OF MARKET POWER IN BILATERAL OLIGOPOLY: THE BRAZILIAN WHOLESALE MARKET OF UHT MILK

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# Presentation Structure

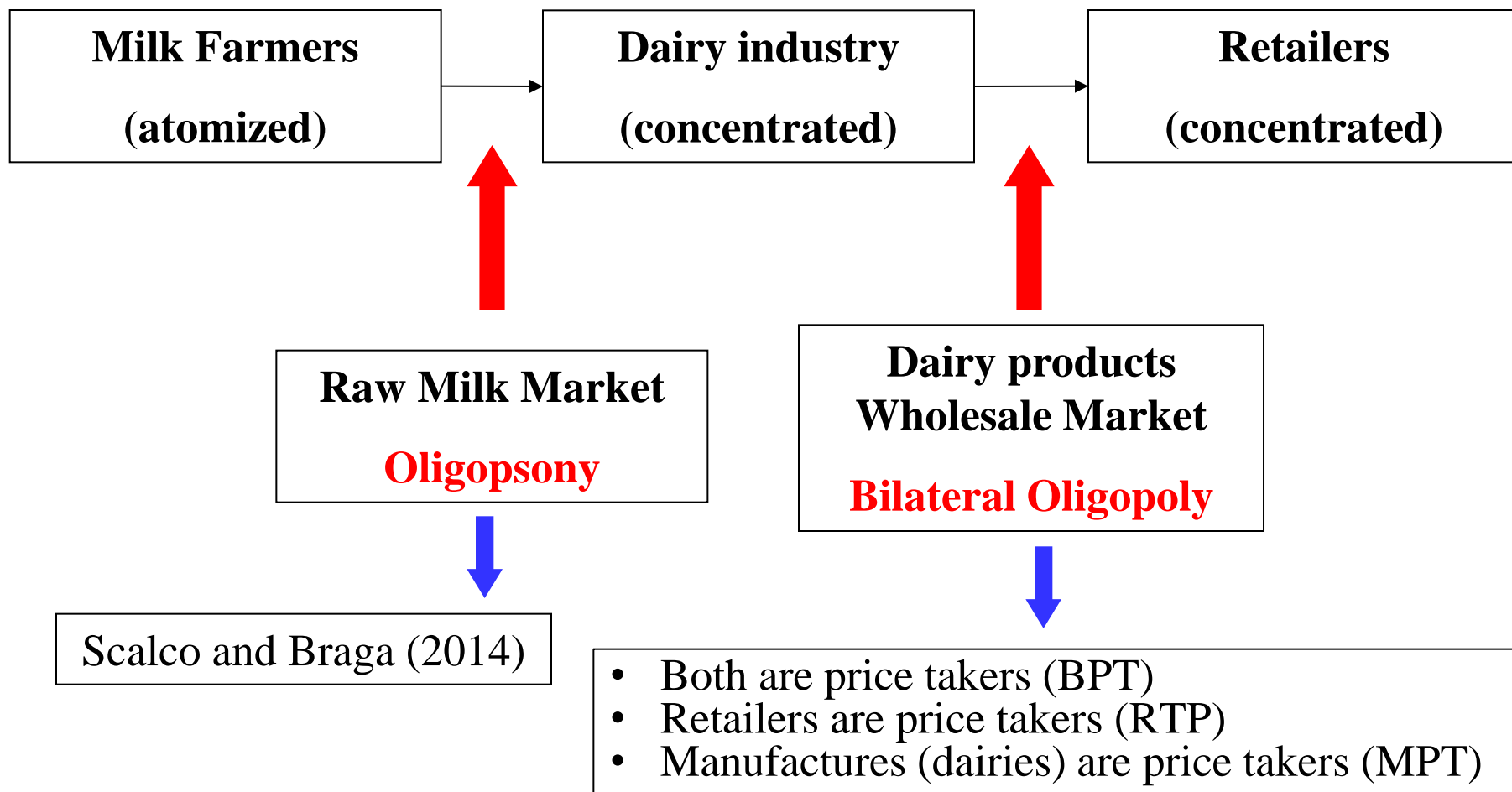


1. Context
2. Research Problem
3. Theoretical Model
4. Empirical Model
5. Results
6. Final Comments
7. Challenges Future



- Macroeconomic Changes early 1990s
  - Market desregulation; Trade liberalization; economic stabilization;
- Changes in the dairy sector
  - Increasing competition; Increased imports; Entry of multinational companies; Retail sector becomes important; Mergers and acquisitions;
- Mergers and Acquisitions
  - Dairies:
    - Parmalat, Nestlé, Fleischmann-Royal e Danone (early 1990s);
    - LeitBom, Elegê, Bom Gosto; Perdigão and Sadia (early 2000s);
    - Bom Gosto e LeitBom – LBR Lácteos (2010).
  - Retailers:
    - Companhia Brasileira de Distribuição (CBD); Carrefour; SONAE; Wal-Mart

# 1. Market Structure



## 2. Research Problem



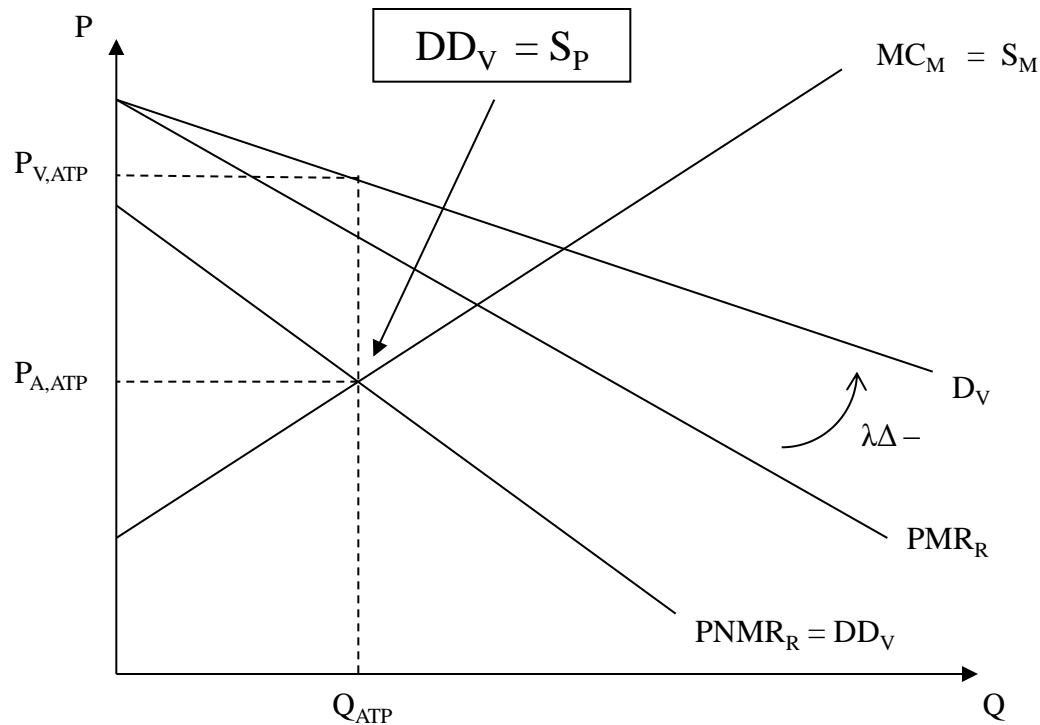
- Research Problem
  - Is there market power in the wholesale market for UHT milk??
- Why UHT (Ultra-High-Temperature) Milk ?
  - Very important “*Commodity*” to dairy sector;
  - determines prices along the entire supply chain;
  - homogeneous product.



# 3. Theoretical Model



- Bilateral Oligopoly Theoretical Model (Schroeter *et al.* 2000)
- Both Price Takers (BPT)

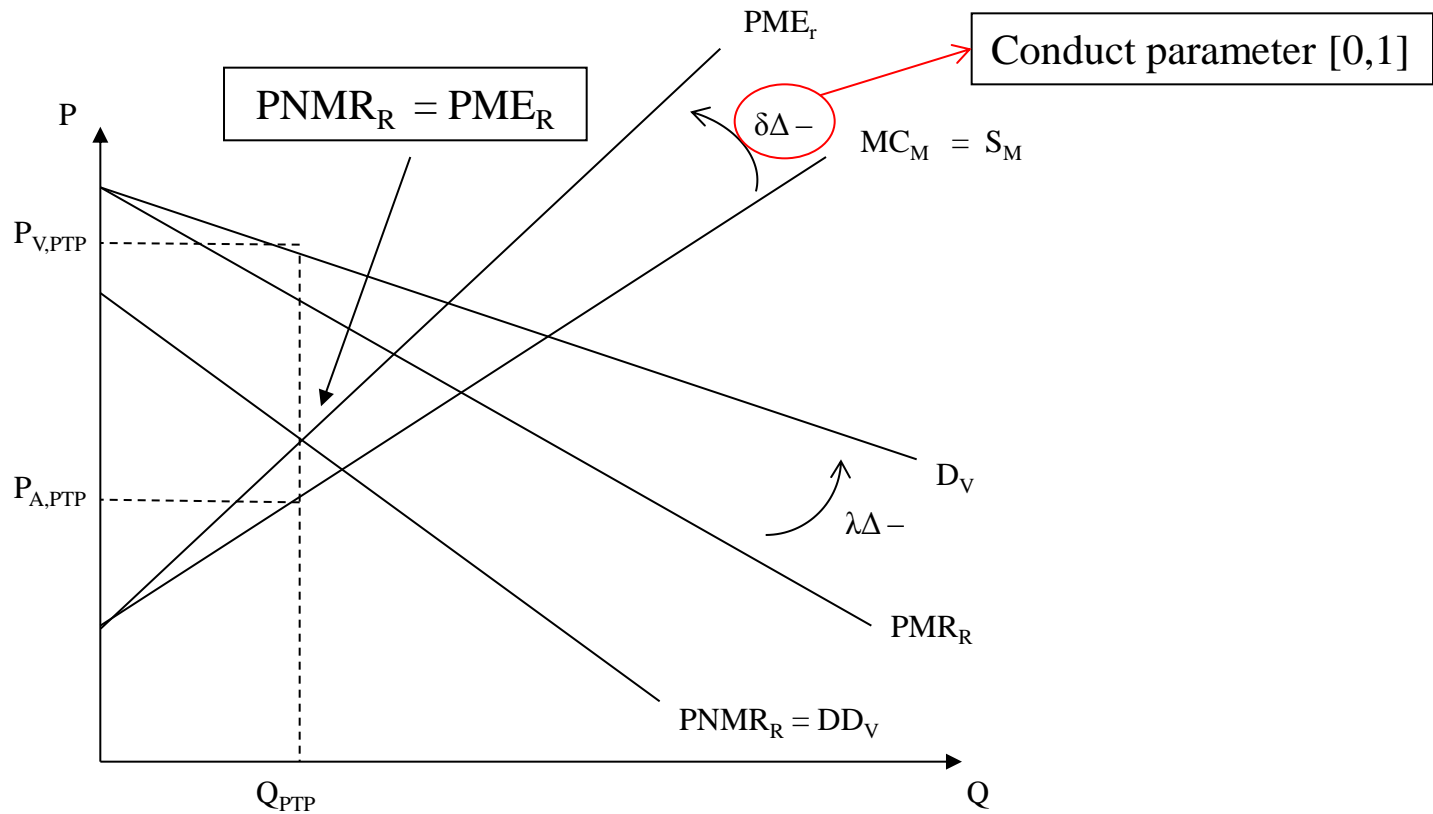


Fonte: Schroeter et al. (2000)

# 3. Theoretical Model



- Manufactures (Dairies) are Price Takers (MPT)

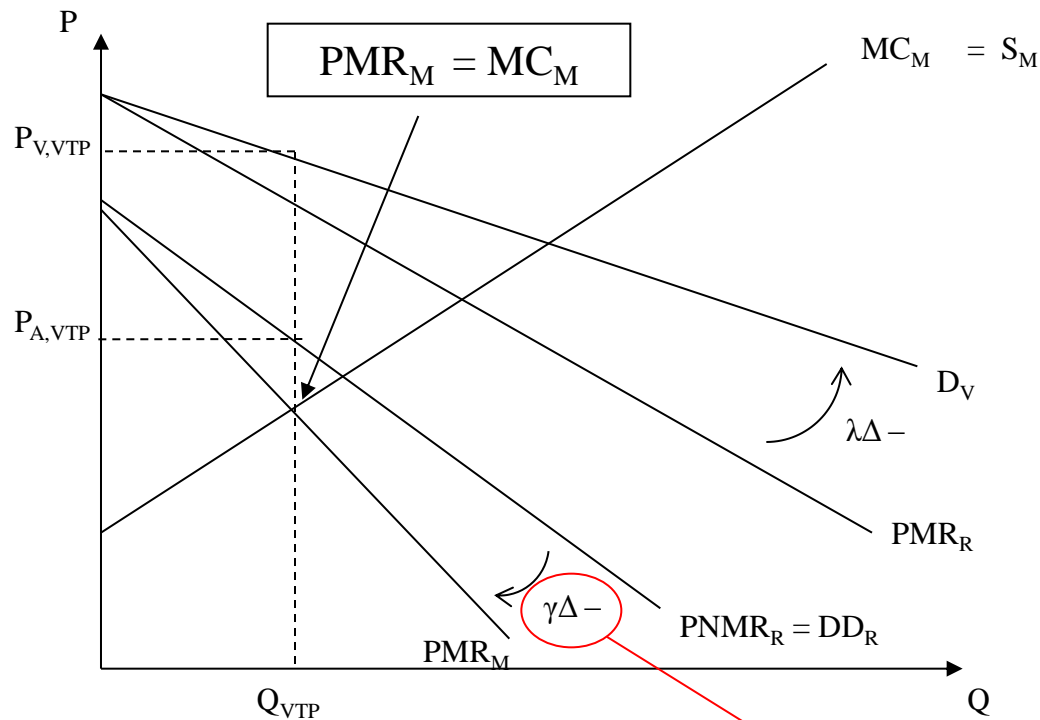


Fonte: Schroeter et al. (2000)

# 3. Theoretical Model



- Retailers are Price Takers (RTP)



Fonte: Schroeter et al. (2000) → Conduct parameter [0,1]



## 4. Empirical Model



- Equilibrium Solutions

- Case 1: BPT

$$p_V + [\lambda(\alpha_1 + \alpha_3 Z_3) - (b_1 + c_1) - c_3 V_3] Q - (b_0 + c_0) - b_2 W_2 - c_2 V_2 = (\mu + \eta)$$

$$p_V - [\alpha_1 + \alpha_3 Z_3] Q - \alpha_0 - \alpha_2 Z_2 = \epsilon$$

$$p_A - [c_1 + c_3 V_3] Q - c_0 - c_2 V_2 = \mu$$

- Case 2: MPT

$$p_V + [\lambda(\alpha_1 + \alpha_3 Z_3) - (b_1 + (1 + \delta)c_1) - (1 + \delta)c_3 V_3] Q - (b_0 + c_0) - b_2 W_2 - c_2 V_2 = (\mu + \eta)$$

$$p_V - [\alpha_1 + \alpha_3 Z_3] Q - \alpha_0 - \alpha_2 Z_2 = \epsilon$$

$$p_A - [c_1 + c_3 V_3] Q - c_0 - c_2 V_2 = \mu$$

## 4. Empirical Model



- Equilibrium Solutions

- Case 3: RPT

$$\begin{aligned} p_V + [(\gamma + \lambda(1 + \gamma))(\alpha_1 + \alpha_3 Z_3) - (b_1(1 + \gamma) + c_1) - c_3 V_3] Q - (b_0 + c_0) - b_2 W_2 - c_2 V_2 &= (\mu + \eta) \\ p_V - [\alpha_1 + \alpha_3 Z_3] Q - \alpha_0 - \alpha_2 Z_2 &= \epsilon \\ p_A - [(\gamma(1 + \lambda))(\alpha_1 + \alpha_3 Z_3) - (\gamma b_1 + c_1) + c_3 V_3] Q - c_0 - c_2 V_2 &= \mu \end{aligned}$$

- Case 4: Nested Model (NST)

$$\begin{aligned} p_V + [(\gamma + \lambda(1 + \gamma))(\alpha_1 + \alpha_3 Z_3) - (b_1(1 + \gamma) + (1 + \delta)c_1) - c_3(1 + \delta)V_3] Q - (b_0 + c_0) - b_2 W_2 - c_2 V_2 &= (\mu + \eta) \\ p_V - [\alpha_1 + \alpha_3 Z_3] Q - \alpha_0 - \alpha_2 Z_2 &= \epsilon \\ p_A - [(\gamma(1 + \lambda))(\alpha_1 + \alpha_3 Z_3) - (\gamma b_1 + c_1) + c_3 V_3] Q - c_0 - c_2 V_2 &= \mu \end{aligned}$$



- Generalized Method of Moments (GMM)

<b>Retailers' demand function</b>		
<b>Variable</b>	<b>Description</b>	<b>Source</b>
$pr$	Monthly mean price of UHT milk liter sold in retail market (in R\$)	DIEESE
$Q$	Monthly acquired quantity of cold <i>in natura</i> milk, <i>in natura</i> not cold milk and transfer of cooling units/other units of same company.	PTL/IBGE
$Z2$	Monthly GNP, in millions of R\$, projected by the Central Bank of Brazil (BACEN)	BACEN
$Z3$	Variation index of added price of fruit juice price, obtained through the IPCA.	IBGE
<b>Marginal cost function of retailers and dairy companies</b>		
$pw$	Monthly mean price of wholesale UHT milk liter, in R\$.	CEPEA/ ESALQ
$W2$	Mean price charged per liter of diesel in distributors in each state, in R\$/liter	ANP
$V2$	Monthly mean price of <i>in natura</i> milk liter received by milk producer, in R\$/liter	CEPEA/ES ALQ
$V3$	Time trend	
<b>Additional instrumental variables</b>		
$Lr$	Mean salary per worker in retail food market, drink and tobacco, in R\$.	RAIS/MT E
$IPL$	International price index of dairy products ( <i>IPL</i> ) – price index calculated based on a weighted price average of butter, whole and skimmed powdered milk, cheese and casein. The weight is done by the world average of exports performed between 1998 and 2000. (Base 1998-2000 = 100).	FAO

# 5. Results



Parameters	BPT	MPT	RPT	NST
$a_0$	-0.279 (0.552)	-0.594 (0.547)	-0.280 (0.671)	0.304 (0.667)
$a_1$	$-8.72 \times 10^{-7*}$ ( $5.00 \times 10^{-7}$ )	$-8.00 \times 10^{-7}$ ( $4.98 \times 10^{-7}$ )	$-8.72 \times 10^{-7*}$ ( $5.03 \times 10^{-7}$ )	$-8.70 \times 10^{-7*}$ ( $5.20 \times 10^{-7}$ )
$a_2$	$-1.05 \times 10^{-6}$ ( $1.35 \times 10^{-6}$ )	$-8.52 \times 10^{-7}$ ( $1.29 \times 10^{-6}$ )	$-1.05 \times 10^{-6}$ ( $1.37 \times 10^{-6}$ )	$-9.51 \times 10^{-7}$ ( $1.33 \times 10^{-6}$ )
$a_3$	$1.23 \times 10^{-8}$ ( $8.10 \times 10^{-9}$ )	$1.58 \times 10^{-8**}$ ( $7.89 \times 10^{-9}$ )	$1.23 \times 10^{-8}$ ( $8.05 \times 10^{-9}$ )	$1.24 \times 10^{-8}$ ( $9.23 \times 10^{-9}$ )
$b_0$	-2.102*** (0.385)	-1.670*** (0.351)	-2.100*** (0.386)	-1.660*** (0.336)
$b_1$	$-1.08 \times 10^{-6}$ ( $1.69 \times 10^{-6}$ )	$-1.20 \times 10^{-6}$ ( $1.63 \times 10^{-6}$ )	$-1.08 \times 10^{-6}$ ( $1.75 \times 10^{-6}$ )	$-2.05 \times 10^{-6}$ ( $2.80 \times 10^{-6}$ )
$b_2$	0.168 (0.104)	0.106*** (0.089)	0.169 (0.110)	0.280*** (0.093)
$c_0$	3.329*** (0.290)	2.995*** (0.313)	3.330*** (0.311)	3.100*** (0.333)
$c_1$	$-2.83 \times 10^{-6***}$ ( $3.30 \times 10^{-7}$ )	$-2.56 \times 10^{-6***}$ ( $3.42 \times 10^{-7}$ )	$-2.83 \times 10^{-6***}$ ( $3.75 \times 10^{-7}$ )	$-2.19 \times 10^{-6***}$ ( $4.52 \times 10^{-7}$ )
$c_2$	1.379*** (0.096)	1.506*** (0.101)	1.380*** (0.104)	1.470*** (0.114)
$c_3$	$9.53 \times 10^{-9***}$ ( $1.07 \times 10^{-9}$ )	$8.35 \times 10^{-9***}$ ( $1.14 \times 10^{-9}$ )	$9.53 \times 10^{-9***}$ ( $1.35 \times 10^{-9}$ )	$6.83 \times 10^{-9***}$ ( $1.34 \times 10^{-9}$ )
$\lambda$	-1.463 (1.117)	-1.731* (1.002)	-1.460 (1.210)	2.560 (1.950)
$\delta$		0.638*** (0.231)		0.926*** (0.347)
$\gamma$			$8.97 \times 10^{-4}$ (0.799)	-0.374 (0.260)
Test Over	0.1811 11.954	0.1577 10.414	0.1811 11.954	0.1596 10.537



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## Tests Bases on Estimates of the MPT Model

$H_0: \delta = 0$  (BPT)  
vs.  $H_a: \delta > 0$  (MPT)  
 $t = 2.776$   
p-valor = 0.003

$H_0: \delta = 0$  (BPT)  
vs.  $H_a: \delta \neq 0$   
 $\chi^2 = 7.655$   
p-valor = 0.005

## Tests Bases on Estimates of the RPT Model

$H_0: \gamma = 0$  (BPT)  
vs.  $H_a: \gamma > 0$  (RPT)  
 $t = 0.001$   
p-valor = 0.499

$H_0: \gamma = 0$  (BPT)  
vs.  $H_a: \gamma \neq 0$   
 $\chi^2 = 1.26 \times 10^{-6}$   
p-valor = 0.991

## Tests Bases on Estimates of the NST Model

$H_0: \gamma = 0$  (MPT)  
vs.  $H_a: \gamma \neq 0$  (NST)  
 $\chi^2 = 2.072$   
p-valor = 0.150

$H_0: \delta = 0$  (RPT)  
vs.  $H_a: \delta \neq 0$  (NST)  
 $\chi^2 = 7.095$   
p-valor = 0.007

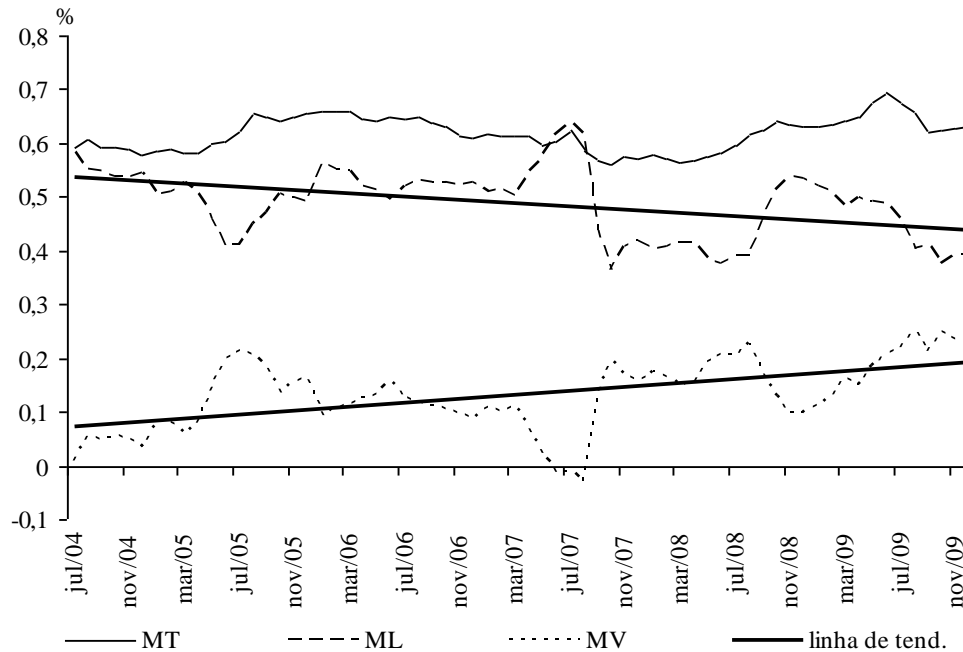
## Nonnested Hypothesis Tests

$H_0$ : MPT  
vs.  $H_a$ : RPT  
 $T = -2.871$   
p-valor = 0.002

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- Empirical Evidences



Source: Study results

**Figure 5. Total marketing relative margins of UHT milk retailers and wholesale dairy companies**

## 6. Final Comments



- There is market power of retailers on dairy (oligopsony power);
- The estimate of the conduct parameter was  $\delta = 0.638$ ;
- Antitrust concern should occur in the wholesale segment instead of the raw milk;
- Because it is a supply chain, the market power identified even only the wholesale segment, affects directly consumers and rural producers.

# 7. Future Challenges



- What is the deadweight loss?
- Is the increasing concentration implied efficiency gain?
- What are the impacts on the surplus distribution in the dairy sector?
- How important is the size of firms in the wholesale market?
- Proposition of public policies.



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# Thank you

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