



COST PASS THROUGH IN DIFFERENTIATED PRODUCT MARKETS: A DISAGGREGATED STUDY FOR MILK AND BUTTER

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BACKGROUND

- ✦ Reform of EU-Dairy Market Policy in 2003.
 - ✦ Price volatility on the EU-dairy market increased since 2007.
 - ✦ Public debates on the level and the volatility of farm prices.
 - ✦ Public debates on the role of retailers in setting prices for consumers and negotiating prices with dairies.
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- Hypothesis I: Retailers execute market power.
 - Hypothesis II: Market power results in asymmetric cost pass through.
 - Hypothesis III: National brands and retailers with a larger assortment of goods have more market power.

BACKGROUND



MEYER AND CRAMON-TAUBADEL (2004) point out the major difficulties to prove the relationship between market power and asymmetric cost pass through. The studies either present only one pair of time series (prices and costs) with likely no change in market power over time or use a cross section panel that fails to account for differences between products and/or countries (see PELTZMAN, 2000).

CITATIONS ON PRICE ASYMMETRY



What Goes Up Need Not Come Down?

"Those who are doing the gouging will hear from the president." —Treasury Secretary Nicholas Brady. *The Wall Street Journal*, (Shribman and McQueen) August 9, 1990.

"Retail (gasoline) prices go up much faster than they come down." —a spokesman for the Automobile Association of America. *The Wall Street Journal*, (Solomon) August 9, 1990.

"Pump prices are fast to respond to rising prices but slower to fall when crude prices fall." —Antonio Szabo, oil consultant with Bonner & Moore. *The Wall Street Journal*, (Business Bulletin) August 3, 1989.

"Whenever oil prices fall, there is always this stickiness in gasoline prices on the way down. You never see this stickiness on the way up." —Ed Rothschild, energy expert at Citizen Action. *New York Times*, (Wald) July 2, 1990.

"When crude prices go up, product prices tend to rise with crude prices. But when crude prices go down, product prices tend to lag—they go down slowly." —John Hilton, oil industry analyst for Argus Research Corp. *St. Louis Post-Dispatch*, (Crudele) June 19, 1990.

LITERATURE I



Author(s)	Kinnucan, Forker	Serra, Goodwin	Chavas, Mehta	Jensen, Møller	Baumgartner et al.	European Commission	Stewart, Blayney
Year	1987	2003	2004	2007	2009	2009	2011
Journal ^a	AJAE	AE	AJAE	WP	WP	RP	ARE
Relationship ^b	Pf ↔ Pr	Pf ↔ Pr	Pw ↔ Pr	Pf ↔ Pw ↔ Pr	Pf ↔ Pr	Pf ↔ Pr	Pf ↔ Pr
Product	Milk, Butter, Cheese, Ice Cream	Milk, Cheese, Cream Caramel	Butter	Milk	Milk, Butter, Cheese	Milk, Butter, Cheese and Other	Milk, Cheese
Country	USA	Spain	USA	Denmark	Austria	EU-27	USA
Frequency	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly
Result (Asymmetry)	Yes	Yes ^d	Yes	Yes	Yes	Yes	Yes
Form of Asymmetry	Positive	Positive	Positive	Positive ^e	Positive ^f	Positive	Positive ^g
Model ^c	DLM	TECM	ECM	ECM	TVECM	DLM	ECM/TECM/STECM
# Regimes	2	3	2	2	3	2	1/2/3

Holm T., J.-P. Loy and C. Steinhagen (2012)

LITERATURE II



- ✦ GOPINATH, G.; GOURINCHAS, P.-O.; HSIEH, C.-T.; AND LI, N. (2011): INTERNATIONAL PRICES, COSTS, AND MARKUP DIFFERENCES. IN: AMERICAN ECONOMIC REVIEW 101(6): 2450–2486.
- ✦ EICHENBAUM, M.; JAIMOVICH, N.; AND REBELO S. (2011): REFERENCE PRICES, COSTS, AND NOMINAL RIGIDITIES“. AMERICAN ECONOMIC REVIEW 101(1): 234–262.
- ✦ NAKAMURA, E. AND D. ZEROM. 2010. "ACCOUNTING FOR INCOMPLETE PASS-THROUGH." REVIEW OF ECONOMIC STUDIES 77: 1192-1230

THEORY



- ✦ Market power (tacit collusion: Green and Porter, 1984, E.;Tirole, 1988; Borenstein et al., 1997, QJE)
- ✦ Search costs (Tappata, 2009, RJE)
- ✦ Menu costs (Ball and Mankiw, 1994, TEJ)
- ✦ Storage (Reagan and Weitzman, 1982, JET; Blinder, 1982, AER)
- ✦ Spatial demand (Azzam, 1999, AJAE)

CONTRIBUTION TO THE LITERATURE



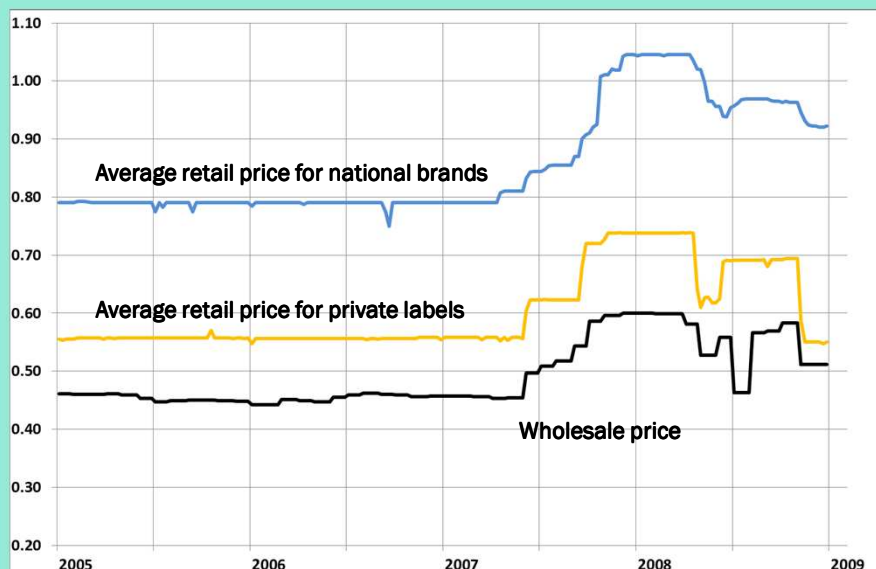
- ✦ Weekly scanner data
- ✦ Many time series for different brands and retailers (2650)
- ✦ Period with strong cost shocks
- ✦ Wholesale prices instead of farm prices as cost indicator
- ✦ Consideration of sales prices
- ✦ Three regime threshold error correction model
- ✦ Testing the number of regimes and threshold co-integration
- ✦ Model with estimated dependent variables to analyze the determinants of cost pass through

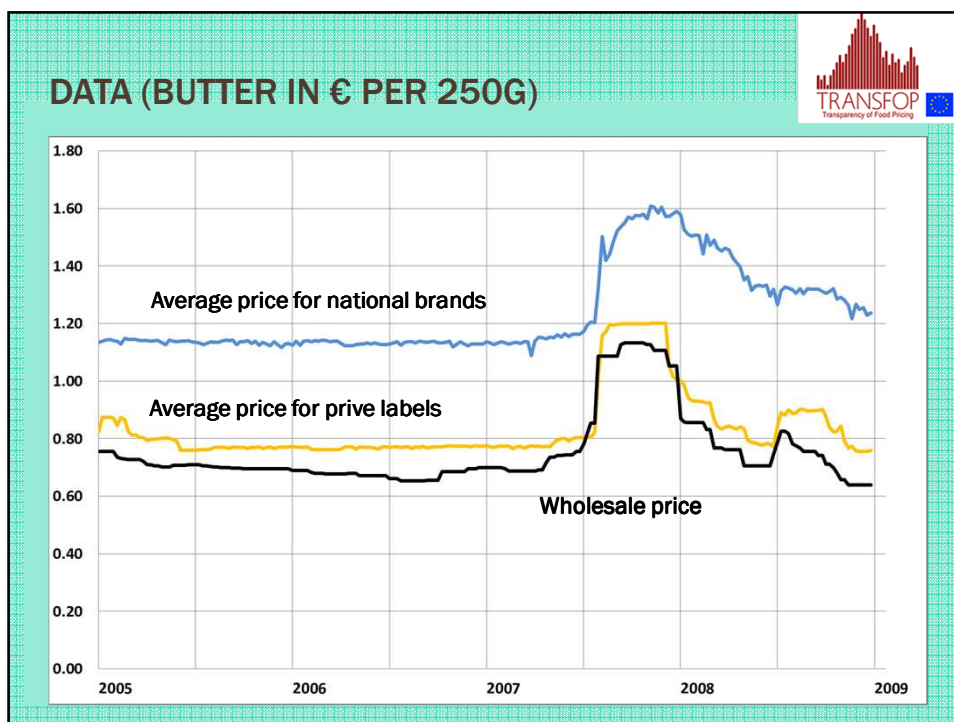
DATA



- ✦ Milk with 3.5 % fat content in Tetra-Pak
- ✦ Butter 250g packed in Paper
- ✦ Weekly Scanner Data
- ✦ 327 to 447 different stores
- ✦ 71 to 90 different brands
- ✦ Wholesale prices for milk and butter for the same qualities
- ✦ Further variables: type of retailer, retail chain, national brand and private label, cooperate and private dairies, price promotions, volumes, fresh milk UHT-milk, butter with and without extra label

DATA (MILK IN € PER LITER)





DATA (MILK IN €-CENT PER LITER)

A	Milk (in Eurocents/Litre)					
	Brands (Price Series)	Market Share	Mean	St.Dev.	Min.	Max
Wholesale Price			49	5	44	60
Retail Price Series	(919)		77	14	53	106
Brands	71 (919)					
National Brands	50 (633)	41.6%	84	8	53	106
Cooperative Dairies	35 (297)	22.3%	78	8	53	93
Non-Cooperative Dairies	15 (335)	19.3%	89	7	58	106
Private Labels	21 (286)	58.4%	60	3	56	100
Type of Milk						
Fresh Milk	35 (320)	23.4%	79	11	53	102
UHT Milk	36 (599)	76.6%	75	14	58	106
	Stores (Price Series)					
Stores	327 (919)					
Supermarket	72 (168)	6.8%	76	15	59	106
Small Consumer Market	60 (175)	9.3%	77	14	59	96
Large Consumer Market	71 (233)	25.7%	78	13	56	97
Hypermarket	83 (276)	50.6%	78	12	53	93
Discounter	39 (67)	7.6%	65	11	56	90

DATA (BUTTER IN €-CENT PER 250G)



B	Butter (in Eurocents/250 g)					
	Brands (Price Series)	Market Share	Mean	St.Dev.	Min.	Max
Wholesale Price			78	13	64	113
Retail Price Series	(1724)		125	20	80	239
Brands	90 (1724)					
National Brands	81 (1581)	68.8%	129	17	80	239
Cooperative Dairies	55 (1130)	24.7%	132	16	80	172
Non-Cooperative Dairies	26 (451)	44.1%	123	17	94	239
Private Labels	9 (143)	31.2%	83	5	80	106
Type of Butter						
Standard Butter	52 (512)	31.3%	121	19	81	239
Additionally Labelled Butter	29 (1069)	68.7%	127	21	80	173
	Stores (Price Series)					
Stores	447 (1724)					
Supermarket	76 (205)	3.6%	132	17	82	173
Small Consumer Market	66 (253)	5.0%	134	20	82	239
Large Consumer Market	77 (458)	19.1%	130	18	81	205
Hypermarket	83 (570)	53.6%	123	20	80	173
Discounter	145 (238)	18.7%	109	21	81	148

MODELING



- ✦ Time series properties (unit roots, lags etc.)
- ✦ Granger causality
- ✦ Co-Integration, Threshold Co-Integration (Enders and Siklos, 2001)
- ✦ Testing non linearity and # of regimes (Strikholm und Teräsvirta, 2006)
- ✦ Estimation TECM
- ✦ Model with estimated dependent variables
 - + Estimators of TECM
 - + Average margin (Lerner Index)
 - + Asymmetry
 - + Menu costs

MODELING I



★ Three Regime Threshold-Error Correction Model (TECM)

$$\Delta p_{i,t}^R = \begin{cases} \alpha_{0,j} + \delta_i^- ECT_{t-1,j} + \sum_{j=1} \lambda_{j,j} \Delta p_{t-j,j}^R + \sum_{k=0} \varphi_{k,j} \Delta p_{t-j,j}^W + \varepsilon_{i,t} & \text{if } ECT_{t-1} < \theta^- \\ \alpha_{0,j} + \delta_i^0 ECT_{t-1,j} + \sum_{j=1} \lambda_{j,j} \Delta p_{t-j,j}^R + \sum_{k=0} \varphi_{k,j} \Delta p_{t-j,j}^W + \varepsilon_{i,t} & \text{if } \theta^- < ECT_{t-1} < \theta^+ \\ \alpha_{0,j} + \delta_i^+ ECT_{t-1,j} + \sum_{j=1} \lambda_{j,j} \Delta p_{t-j,j}^R + \sum_{k=0} \varphi_{k,j} \Delta p_{t-j,j}^W + \varepsilon_{i,t} & \text{if } ECT_{t-1} > \theta^+ \end{cases}$$

MODELING I



MODELING II



- Model with estimated dependent variable:

$$\hat{\delta}_i = \beta_0 + \beta_1 NCB_i + \beta_1 PL_i + \beta_1 Qu_i + \sum_{j=2} \beta_j DC_{j,i} + \omega_i$$

Non-Cooperative Brands Private Labels
 Additionally Labeled / Retailer
 Fresh Milk

MODELING III



- Model with estimated dependent variable:

$$\text{Menu Costs} = \beta_0 + \beta_1 NCB_i + \beta_1 PL_i + \beta_1 Qu_i + \sum_{j=2} \beta_j DC_{j,i} + \mu_1 E_i^D + \mu_2 \frac{Q_{NB,i}^D}{Q_i^D} + \omega_i$$

Asymmetry
 Margin (MP)
 Market Share
 Demand Elasticity

RESULTS MODEL I



- ✦ Prices are I(1) (ADF 5 % and KPSS 95 %)
- ✦ Linear Co-Integration (67 bzw. 15 %)
- ✦ Threshold-Cointegration (96 bzw. 82 %)
- ✦ Granger-Causality (90 % $P_w \rightarrow P_r$ 50 % $P_r \mid \rightarrow P_w$)
- ✦ # of Regimes (90 % $>=1$, 50-75 % $>=2$)

- + Milk: 10 41 49
- + Butter: 6 20 74

✦ Asymmetry:

- + Milch: $H_0: \delta^- \neq \delta^+$
- + Butter: $H_0: \delta^- \neq \delta^+$

	SM	SC	LC	HM	D
Cooperative Dairies	79%	71%	82%	65%	80%
Non-Cooperative Dairies	56%	50%	68%	41%	n.a.
Private Labels	54%	80%	57%	100%	89%

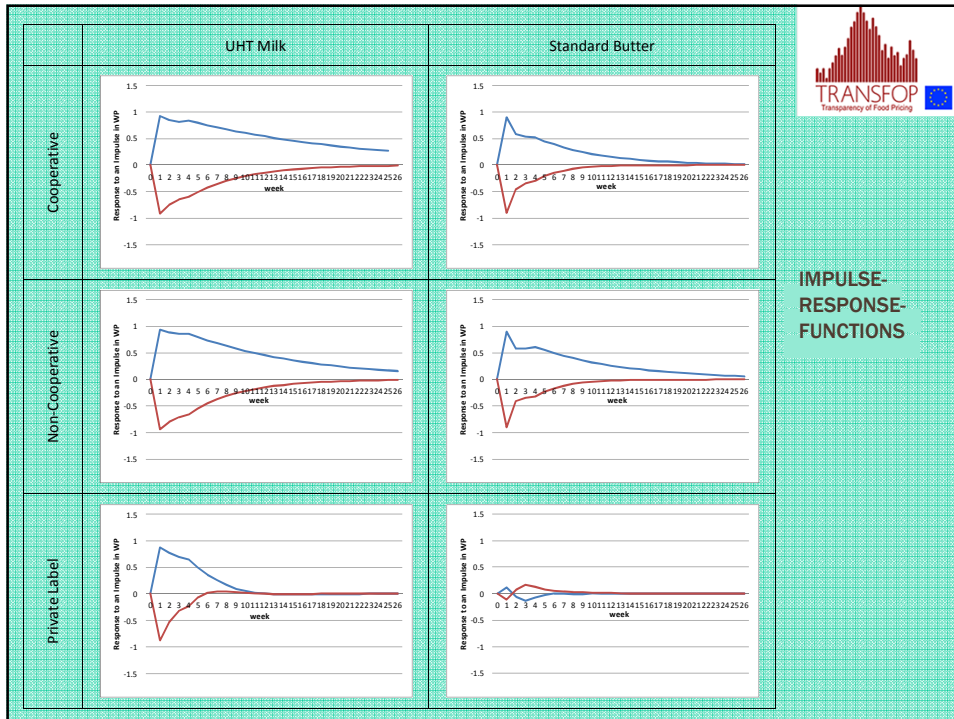
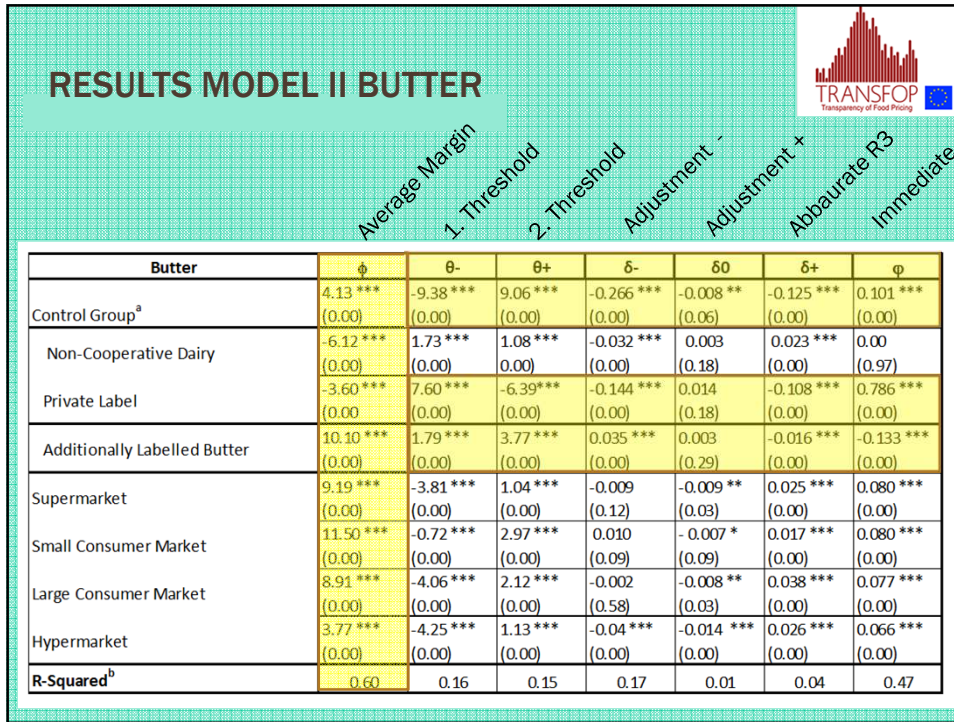
	SM	SC	LC	HM	D
Cooperative Dairies	61%	63%	55%	61%	53%
Non-Cooperative Dairies	79%	52%	76%	70%	100%
Private Labels	n.a.	0%	21%	23%	43%

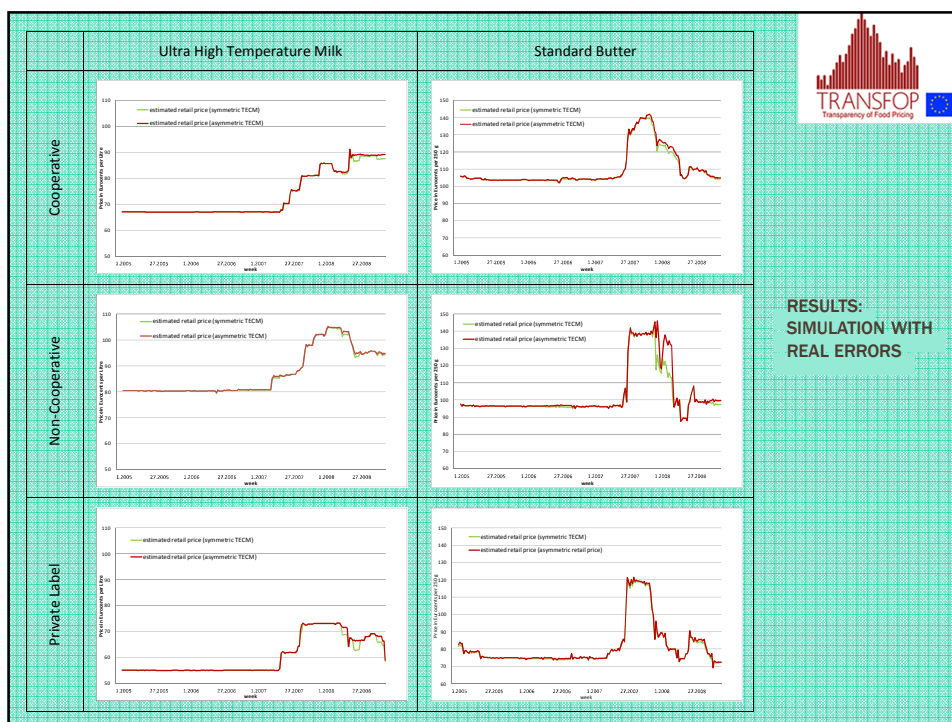
RESULTS MODEL II MILK



Average Margin
1. Threshold
2. Threshold
Adjustment -
Adjustment +
Abbaurate R3
Immediate

Milk	ϕ	θ^-	θ^+	δ^-	δ_0	δ^+	φ
Control Group ^a	28.40 *** (0.00)	-2.76 *** (0.00)	6.63 *** (0.00)	-0.144 *** (0.00)	-0.016 * (0.08)	-0.047 *** (0.00)	0.081 *** (0.00)
Non-Cooperative Dairy	10.40 *** (0.00)	-1.64 *** (0.00)	-0.39 (0.19)	-0.018 *** (0.00)	-0.017 *** (0.00)	-0.026 *** (0.00)	-0.024 *** (0.00)
Private Label	-19.10 *** (0.00)	0.17 ** (0.03)	-1.89 *** (0.00)	-0.328 *** (0.00)	-0.041 *** (0.00)	-0.158 *** (0.00)	0.049 *** (0.00)
Fresh Milk	-0.56 (0.50)	0.37 *** (0.00)	0.11 (0.51)	0.002 (0.52)	0.001 (0.75)	-0.003 (0.29)	-0.029 *** (0.00)
Supermarket	4.05 *** (0.01)	0.00 (0.99)	-0.77 ** (0.01)	0.001 (0.92)	0.023 ** (0.02)	0.016 *** (0.01)	-0.011 (0.31)
Small Consumer Market	3.63 ** (0.03)	0.00 (0.99)	0.22 (0.47)	-0.005 (0.52)	0.019 ** (0.05)	-0.019 *** (0.00)	-0.002 (0.87)
Large Consumer Market	1.93 (0.23)	0.00 (0.77)	0.00 (0.91)	-0.029 *** (0.00)	0.009 (0.28)	0.018 *** (0.00)	0.022 ** (0.38)
Hypermarket	0.51 *** (0.75)	-0.11 (0.27)	-0.22 (0.48)	0.020 (0.80)	-0.005 (0.61)	0.017 *** (0.00)	0.021 ** (0.04)
R-Squared ^b	0.81	0.12	0.07	0.55	0.02	0.49	0.08





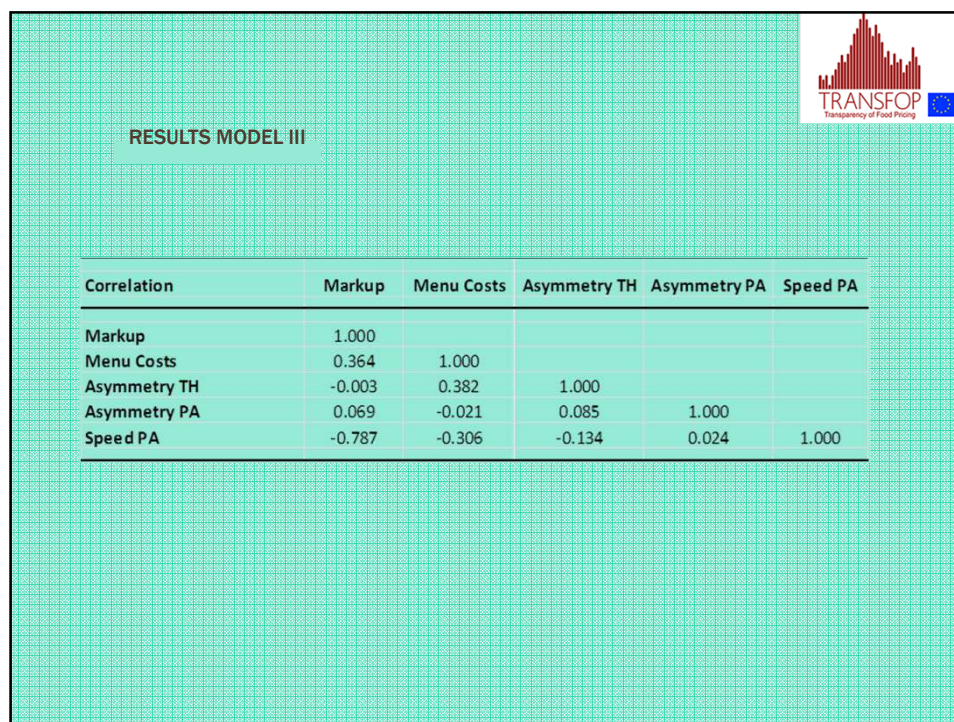
**RESULTS:
SIMULATION WITH
REAL ERRORS**

	Markup	Menu Costs	Asymmetry TH	Asymmetry PA	Speed PA
Reference: Discounter, Cooperative Dairy, NB					
Mid-Germany, UHT-Milk					
Fresh Milk	0.0085*	-0.0015	-0.0005	-0.0999	0.0004
Supermarket	0.0417***	-0.0026	-0.0037	0.1311	-0.0413**
Small Convenience Store	0.0375***	0.0038	-0.0046	0.0208	-0.0535**
Large Convenience Store	0.0221**	0.0051	-0.0026	0.3113	-0.0318*
Hypermarket	0.0135*	-0.0029	0.0013	0.1048	-0.0492**
North	0.0089*	0.009	0.0159***	-0.0884	-0.0505***
South	0.0218***	0.0027	0.0135***	0.1882	-0.0306***
Non-Cooperative Dairy	0.0783***	0.0013	-0.0189***	-0.4372*	-0.0099
Product is a PL	-0.1832***	-0.0375***	-0.0190***	-0.4827*	0.2389***
Elasticity of Demand	0.0027*	-0.0012	-0.0021*	0.0712	-0.0031
Market Share of NB	0.0174*	0.0150*	0.0172**	-0.5156*	-0.002
Constant	0.3358***	0.0888***	0.0126	3.0351***	0.1951***
N	593	593	593	593	593
R-squared	0.85	0.15	0.10	0.04	0.65
AdjR-squared	0.84	0.13	0.08	0.02	0.65

Legend: * p<0.05, **p<0.01, *** p<0.001 based of robust standard errors
 Markup = Lerner Index
 Menu Costs = Range of Thresholds (range of inner regime)
 AsymmetryTH = Sum of thresholds (location of the inner regime)
 AsymmetryPA = Cumulative difference of response to positive and negative schocks over 8 weeks
 Speed PA: Average speed of returning to the equilibrium



**RESULTS
MODEL III**



SUMMARY



- ★ **Estimated dependent variable regression**
 - ★ Private labels indicate the least markups and menu costs but adjust fastest to cost changes.
 - ★ Large markups are adjusted faster in retail formats other than discounter.
 - ★ The level of asymmetric price adjustment is not correlated with average markups (market power)
 - ★ Menu costs are as expected not related to the level of asymmetry but slightly positively related to market power.
 - ★ The speed of adjustment is negatively correlated with market power.