

Asymmetric Transmission in Wheat Flour Markets in Indonesia

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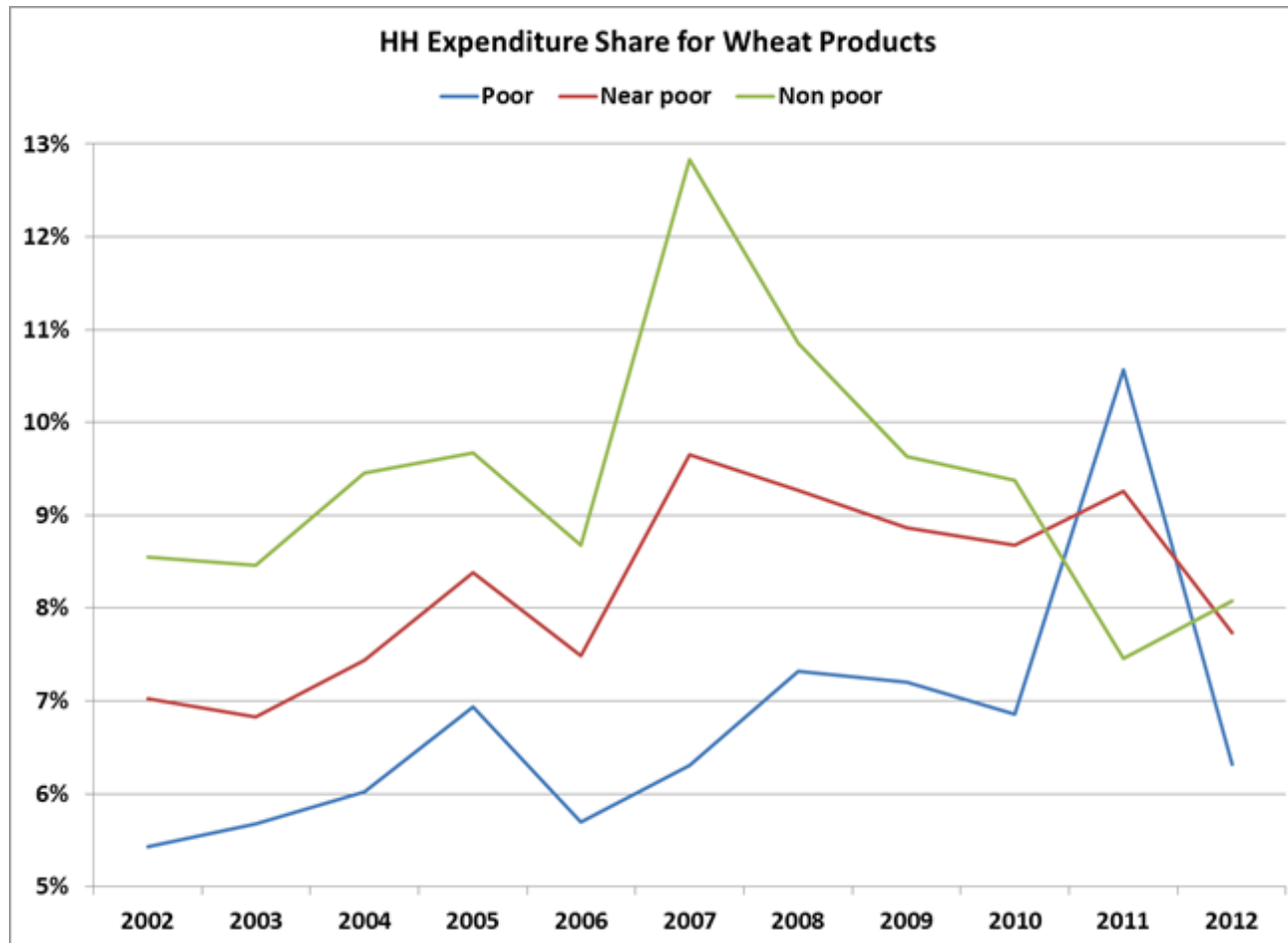
Outline of Presentation

- Motivation of this study
- Market Structure of Wheat Flour Market in Indonesia
- Asymmetric Price Transmission
 - Empirical Models
 - Empirical Results
- Summary of Findings and Policy Suggestions



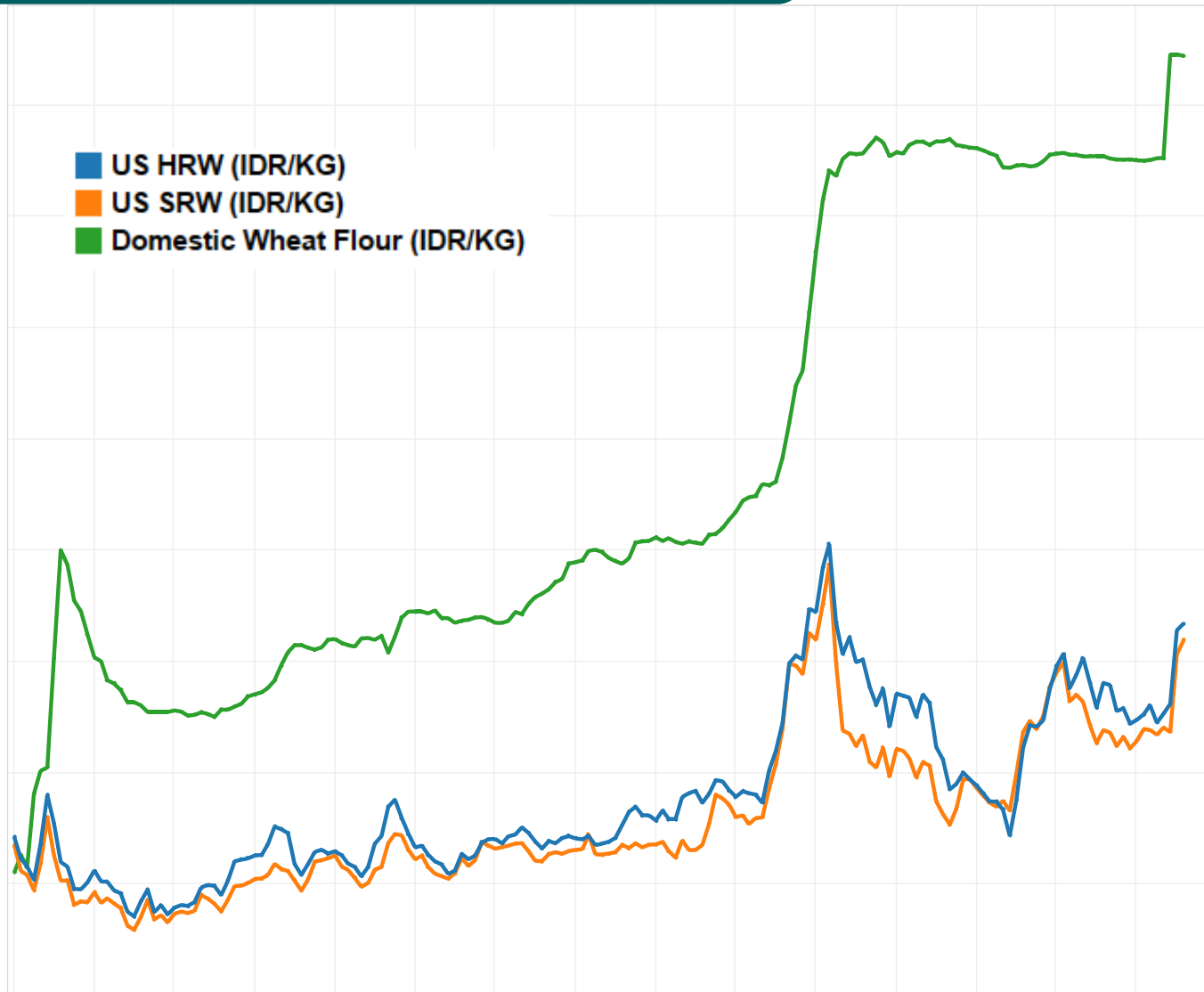
Motivation of Study

Wheat flour is getting more important for Indonesian diet...



Source: SUSENAS household expenditure survey (various years) and author's calculation
Note: Definition of the poor is by BPS. The near poor is a household beyond the poverty line but below the twice poverty line.

Motivation of Study



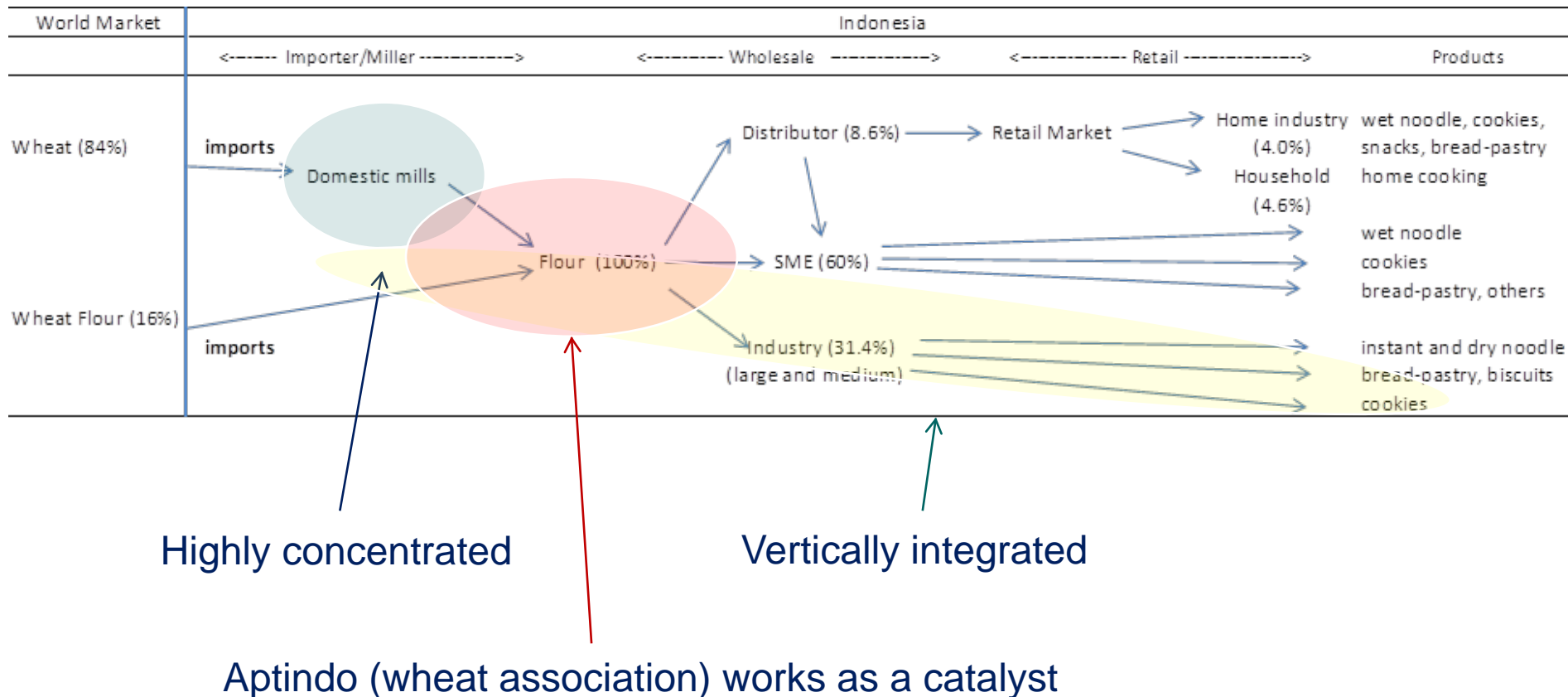
Motivation of Study



- This study is motivated by the hypothesis of **Asymmetric Price Transmission**
 - ⇒ downstream price changes co-move in a different manner to upstream price changes with international prices
 - ⇒ APT can be “vertical” as in our case and “spatial (horizontal)”
 - ⇒ Visual inspection of the Indonesia wheat flour and international wheat prices indicate the existence of APT
- Pertinent questions are
 - Does APT actually happen in Indonesia wheat flour market, even if we control for different factors
 - If so, what are the drivers of APT?



Market Structure of Wheat Flour in Indonesia



Source: APTINDO and author's calculation based on 2009 data

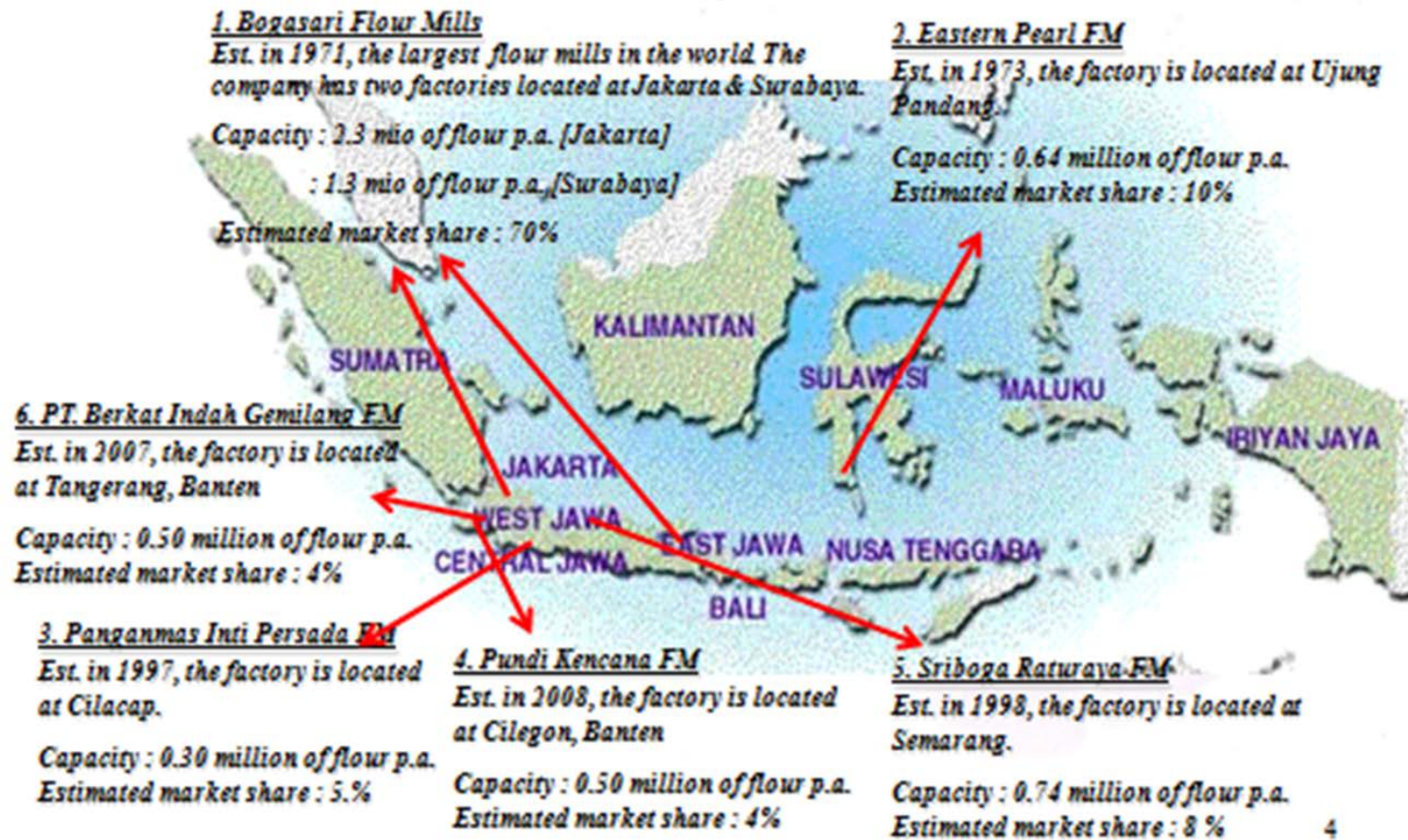
Market Structure of Wheat Flour in Indonesia

Company	Location	Production Capacity (MT/Year)	Share (%)
PT Indofood Sukses Makmur Tbk, Bogasari	Jakarta & Surabaya	4,905,000	62.1%
PT Eastern Pearl Flour Mills	Makassar	750,000	9.5%
PT Sriboga Ratu Raya	Semarang	450,000	5.7%
PT Fugui Flour & Grain Indones	Gresik	324,000	4.1%
PT Pangan Mas Inti Persada	Cilacap	300,000	3.8%
Others		1,165,000	14.7%
Total		7,894,000	100%

Source: APTINDO (March 2010)

Market Structure of Wheat Flour in Indonesia

Lokasi Pabrik Terigu di Indonesia



Market Structure of Wheat Flour in Indonesia

PT Bogasari's (allegedly world largest) wheat flour milling site and its port



Photo credit: PT Bogasari

Market Structure of Wheat Flour in Indonesia

If APT exists, we suspect it is caused by flour milling market concentration.

Question:

- Where did the market power of a few flour milling firms come from?

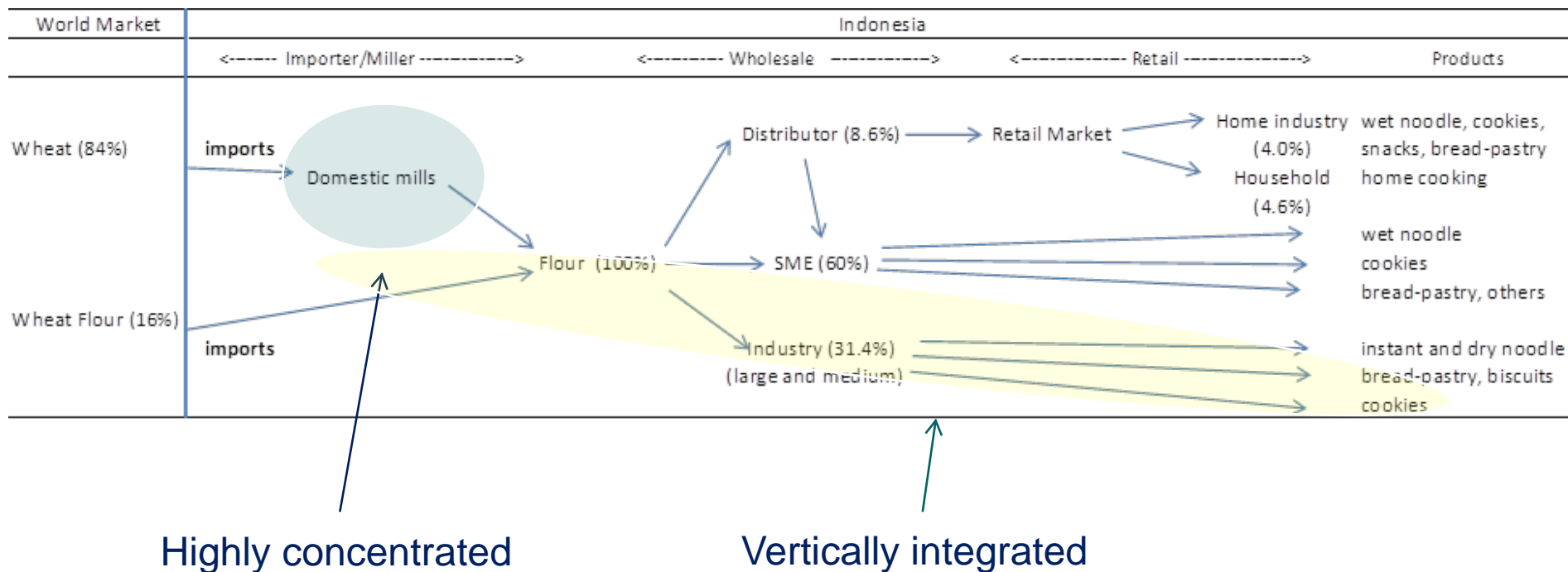
(Possible) Answer:

- Start-up costs were paid by the government.

Market Structure of Wheat Flour in Indonesia

- 1968 Bulog (government food logistics agency) was established
- 1971 PT Prima (Singaporean firm) was established for flour milling
- 1972 PT Bogasari was established
 - ⇒ Bank credit of Rp 2,800 million (Bogasari's initial capital is Rp 100 million)
 - ⇒ Bulog revoked PT Prima's original license for flour milling
- 1980 PT Prima sold 100% share to PT Berdikari (associated with military)
 - ⇒ PT Bogasari maintained 87% share of the market
- 1984 Wheat price for flour milling was fixed at Rp 141/kg by the government
- 1998 Heavy government intervention to wheat flour market was over due to Asian financial crisis
 - ⇒ Any import and investment in wheat flour market is free until today

Market Structure of Wheat Flour in Indonesia



Source: APTINDO and author's calculation based on 2009 data

Market Structure of Wheat Flour in Indonesia

Question:

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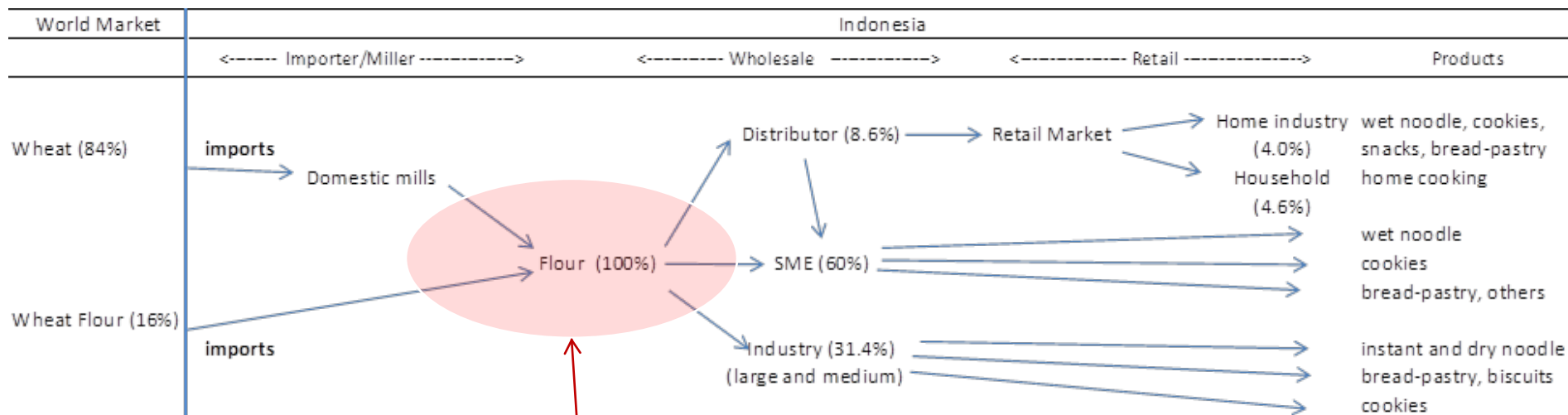
Additional Question (not discussed in the paper):

- The “start-up argument” implicitly assumes that start-up costs in the wheat milling industry are higher than in other industries. Is it the case?

(Possible) Answer:

- Start-up costs are not necessarily higher than other industries. Instead, Aptindo (wheat association) works as a lobby group to represent incumbents. (This point is still under debates.)

Market Structure of Wheat Flour in Indonesia



Aptindo (wheat association) works as a catalyst

Source: APTINDO and author's calculation based on 2009 data

Asymmetric Price Transmission

Base Model: $wf_t = \beta_0 + \beta_1 w_t + \beta_2 e_t + u_t$

ECM:
$$\Delta wf_t = \alpha_0 + \alpha_1 \Delta wf_{t-1} + \alpha_2 \Delta w_t + \alpha_3 \Delta w_{t-1} + \alpha_4 \Delta e_t + \alpha_5 \Delta e_{t-1} + \delta \hat{u}_{t-1} + \vartheta_t$$

ECM w/ + - terms
$$\Delta wf_t = \alpha_0 + \alpha_1 \Delta wf_{t-1} + \alpha_2 \Delta w_t + \alpha_3 \Delta w_{t-1} + \alpha_4 \Delta e_t + \alpha_5 \Delta e_{t-1} + \delta^+ \hat{u}_{t-1,+} + \delta^- \hat{u}_{t-1,-} + \vartheta_t$$

where

wf_t = the average retail price of wheat flour in Indonesia expressed in rupiah per kilo at time t

w_t = the international price of wheat expressed in dollars per kilo at time t

e_t = the nominal exchange rate expressed as rupiah per US dollar

u_t = the error term (serially uncorrelated and uncorrelated with the regressors)

\hat{u}_{t-1} = the lagged estimated deviation from the long run equilibrium relationship

ϑ_t = white noise

Δ operator = proportional changes

Alphas, betas are lower case deltas are parameters

All variables are in the log form

Asymmetric Price Transmission

Model Variations

- Different data frequencies to allow for arbitrage over wider windows
 - Monthly
 - Half yearly
- Additional input prices to control for different factors
 - Energy prices (index of unit electricity cost by manufacturers)
 - Unit labor cost (ratio of average wage in wheat flour and productivity)
 - Food component of CPI
- Geographical heterogeneity to rule out APT being an artifact of geographical aggregation
 - Average wheat flour prices across province capitals

Asymmetric Price Transmission

Table 3: Long Run Relation for Baseline Model

Dep. Var.: Wheat Flour Price (Log)	(1) Canadian Wheat	(2) US SRW	(3) US HRW
International Wheat Price(Log)	0.898*** (0.0646)	0.911*** (0.0658)	0.908*** (0.0556)
Nominal Exchange Rate (Log)	0.804*** (0.161)	1.311*** (0.212)	0.891*** (0.210)
Constant	-3.802*** (1.310)	-8.179*** (1.874)	-4.436** (1.804)
Seasonal Dummies	Yes	Yes	Yes
Observations	129	129	129
R-squared	0.803	0.745	0.709

Robust standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

The estimated pass-through coefficient from wheat to wheat flour prices is neither statistically different from unity nor the pass-through from nominal exchange rates to wheat flour prices

=> Vertical integration b/w international wheat and wheat flour prices

Asymmetric Price Transmission

Table 4: Error Correction for Baseline Model

	Canadian Wheat dl Wheat Flour	Canadian Wheat dl Wheat Flour	US SRW dl Wheat Flour	US SRW dl Wheat Flour	US HRW dl Wheat Flour	US HRW dl Wheat Flour
Lagged D. Log Flour Price	0.347*** (0.114)	0.225** (0.0942)	0.381*** (0.126)	0.266** (0.109)	0.423*** (0.126)	0.296*** (0.105)
D. Log Wheat Price	0.0706** (0.0329)	0.0737** (0.0333)	0.0411* (0.0224)	0.0463* (0.0239)	0.0365 (0.0257)	0.0347 (0.0231)
D. Log NER	-0.0333 (0.0300)	-0.0315 (0.0267)	-0.0199 (0.0314)	-0.0318 (0.0300)	-0.0337 (0.0300)	-0.0289 (0.0286)
Adjustment Average	-0.0424*** (0.0114)		-0.0385*** (0.00959)		-0.0301*** (0.00915)	
Adjustment Downwards		-0.00969 (0.00773)		-0.0142* (0.00752)		0.00282 (0.00588)
Adjustment Upwards		-0.100*** (0.0207)		-0.0933*** (0.0236)		-0.104*** (0.0196)
Constant	0.00500* (0.00292)	0.000577 (0.00310)	0.00510* (0.00293)	0.00197 (0.00289)	0.00382 (0.00301)	-0.00315 (0.00295)
Observations	127	127	127	127	127	127
R-squared	0.505	0.566	0.492	0.536	0.463	0.563
Seasonal Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Akaike Information Criterion	-690.1314	-704.7159	-686.8403	-696.2504	-679.7812	-704.0041
Durbin Alt S.Corr	0.6292	0.0761	0.5598	0.1425	0.7391	0.3301
T-stat Adjustment	-3.72		-4.01		-3.29	
T-stat Adjustment Down		-1.25		-1.89		0.48
T-stat Adjustment Up		-4.84		-3.96		-5.32
Asym Test		0.000149		0.00245		2.82e-06

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Asymmetric Price Transmission

Table 6: Error Correction Model with Six-Month Periodicity Data

VARIABLES	Canadian Wheat dl Wheat Flour	Canadian Wheat dl Wheat Flour	US SRW dl Wheat Flour	US SRW dl Wheat Flour	US HRW dl Wheat Flour	US HRW dl Wheat Flour
Lagged D. Log Flour Price	0.225 (0.145)	0.0519 (0.125)	0.218 (0.169)	-0.00447 (0.216)	0.260 (0.227)	0.111 (0.150)
<u>D. Log Wheat Price</u>	0.302*** (0.0814)	0.304*** (0.0702)	0.207*** (0.0633)	0.283*** (0.0914)	0.213** (0.0976)	0.217** (0.0731)
D. Log NER	-0.0158 (0.132)	0.0371 (0.128)	0.115 (0.146)	0.144 (0.137)	-0.0352 (0.158)	0.0704 (0.131)
Adjustment Average	-0.285*** (0.0779)		-0.301** (0.107)		-0.236** (0.0816)	
Adjustment Upwards		-0.535*** (0.117)		-0.609** (0.256)		-0.616*** (0.174)
Adjustment Downwards		-0.171* (0.0869)		-0.211** (0.0856)		-0.0402 (0.0845)
Constant	0.0259** (0.0112)	0.0152 (0.0133)	0.0275** (0.0115)	0.0182 (0.0170)	0.0273* (0.0131)	-0.00654 (0.0194)
Observations	20	20	20	20	20	20
R-squared	0.765	0.818	0.640	0.624	0.575	0.763
Seasonal Dummies	Yes	Yes	Yes	Yes	Yes	Yes
T-stat Adj. Upwards		4.57		2.38		3.54
T-stat Adj. Downwards		1.97		2.46		0.59
<u>DurbinAlt S. Corr.</u>	0.178	0.1928	0.1019	0.9279	0.1815	0.2245
<u>Asym Test</u>		0.0299		0.135		0.0204

53.5% disequilibrium adjustment upwards by 6 mo.

17.1% disequilibrium adjustment downwards by 6 mo.

Asymmetric Price Transmission

Table 8: Error Correction Models with Other Input Prices as Controls

	(1)	(2)	(3)	(4)
	dl Wheat Flour	dl Wheat Flour	dl Wheat Flour	dl Wheat Flour
Lagged D. Log Flour Price	0.514**** (0.125)	0.269** (0.106)	0.295**** (0.105)	0.456**** (0.137)
D. Log NER	-0.0214 (0.0340)	-0.0264 (0.0312)	-0.0287 (0.0301)	-0.0399 (0.0332)
Lagged D. Log NER	0.0715* (0.0376)	0.0420 (0.0360)	0.0419 (0.0364)	0.0600* (0.0335)
D. Log Wheat Price	0.0335 (0.0310)	0.0688* (0.0369)	0.0707* (0.0371)	0.0342 (0.0364)
Lagged D. Log Wheat Price	0.0207 (0.0335)	-0.000736 (0.0278)	0.00693 (0.0290)	0.0166 (0.0370)
D. Log Food CPI	0.218**** (0.0726)			0.281**** (0.0824)
Lagged D. Log Food CPI	-0.195** (0.0965)			-0.227* (0.131)
D. Log Electricity Costs		-0.00111 (0.00574)		-0.00276 (0.00606)
Lagged D. Log Electricity Costs		-0.0103**** (0.00362)		-0.00768** (0.00375)
D. Log Unit Labor Costs			-0.00143 (0.00323)	0.00536**** (0.00196)
Lagged D. Log Unit Labor Costs			0.00355 (0.00237)	-0.000943 (0.00262)
Adjustment Upwards	-0.0802* (0.0404)	-0.104**** (0.0266)	-0.106**** (0.0266)	-0.144**** (0.0511)
Adjustment Downwards	-0.0351 (0.0522)	-0.00472 (0.00773)	-0.00669 (0.0152)	-0.0521 (0.0541)
Constant	0.00314 (0.00454)	-0.000325 (0.00315)	0.00228 (0.00341)	0.00355 (0.00455)
Observations	127	127	118	118
R-squared	0.526	0.577	0.557	0.566
Seasonal Dummies	Yes	Yes	Yes	Yes
T-stat Adj. Upwards	-1.98	-3.89	-3.97	-2.82
T-stat Adj. Downwards	-0.67	-0.61	-0.44	-0.96
Durbin Alt S. Corr.	0.1009	0.2546	0.2553	0.1812
Asym Test	0.585	0.000562	0.00256	0.276

Robust standard errors in parentheses

**** p<0.01, ** p<0.05, * p<0.1

Even though we control various costs, upward adjustment persists

Summary of Findings and Policy Suggestion

Finding 1: The wheat flour is one of the essential food items for the Indonesian diet and is likely to become more important as the economy grows.

Finding 2: Indonesia's flour milling market is concentrated, while trade and investment is relatively open. The domestic wheat flour market is vertically integrated to the foreign wheat market.

Finding 3: Market concentration might be originated from the fact that the start-up cost was shouldered by the government. The wheat milling association might have been successfully keeping competitors away.

Finding 4: The vertical APT is observed, i.e., the price adjustment upward is much faster than the one downward. This is consistent through various models. Spatial APT is also observed (not shown in this presentation).

Policy Suggestion: Law enforcement for introducing fair competition and adjusting market concentration of wheat flour milling

Wheat Flour in Indonesia

Thank you