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Leibniz Institute of Agricultural Development
in Transition Economies

Measuring the degree of Oligopsony Power in Kazakh grain processing industry: Evidence from PTA approach

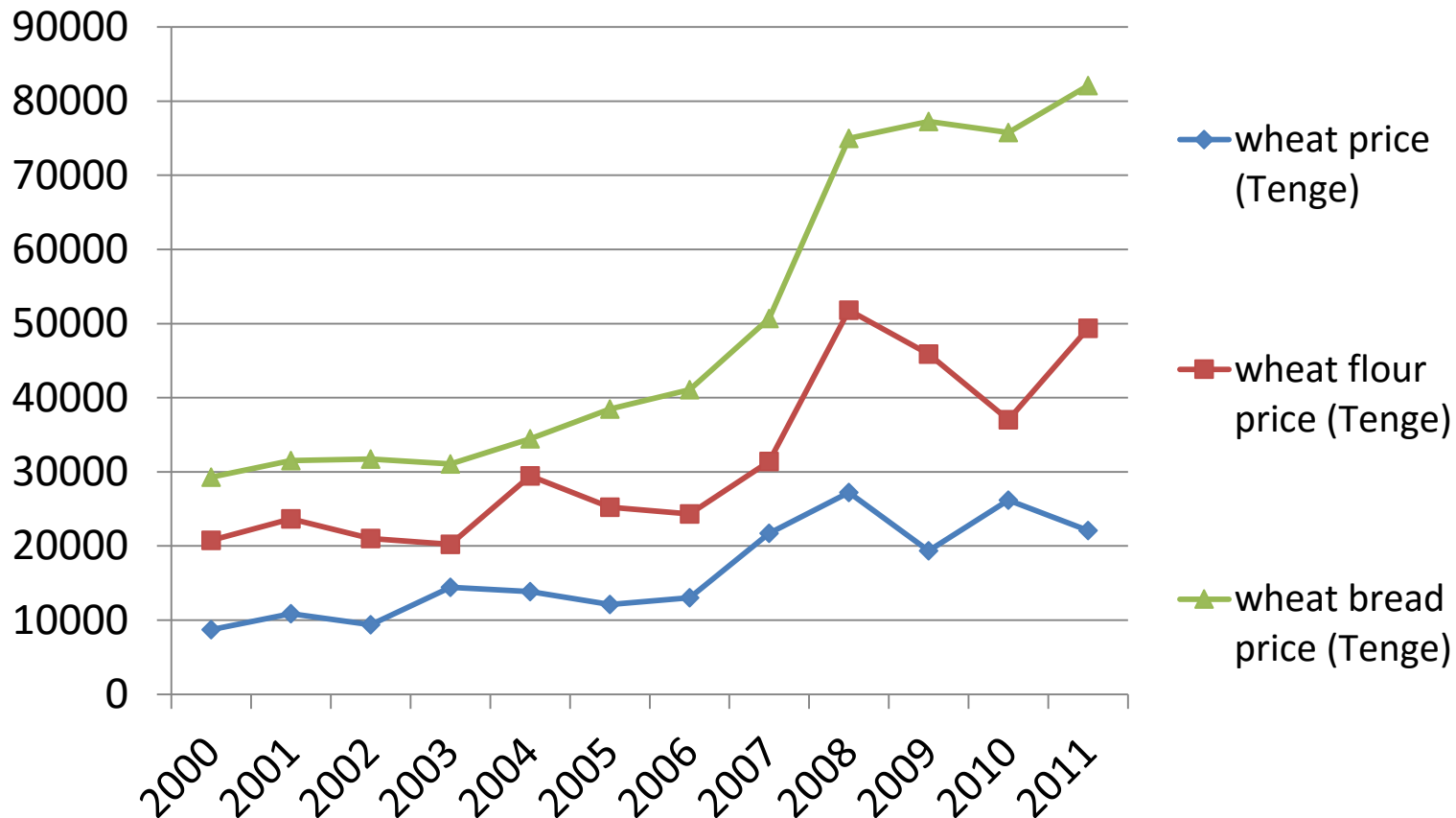
Giorgi Chezha

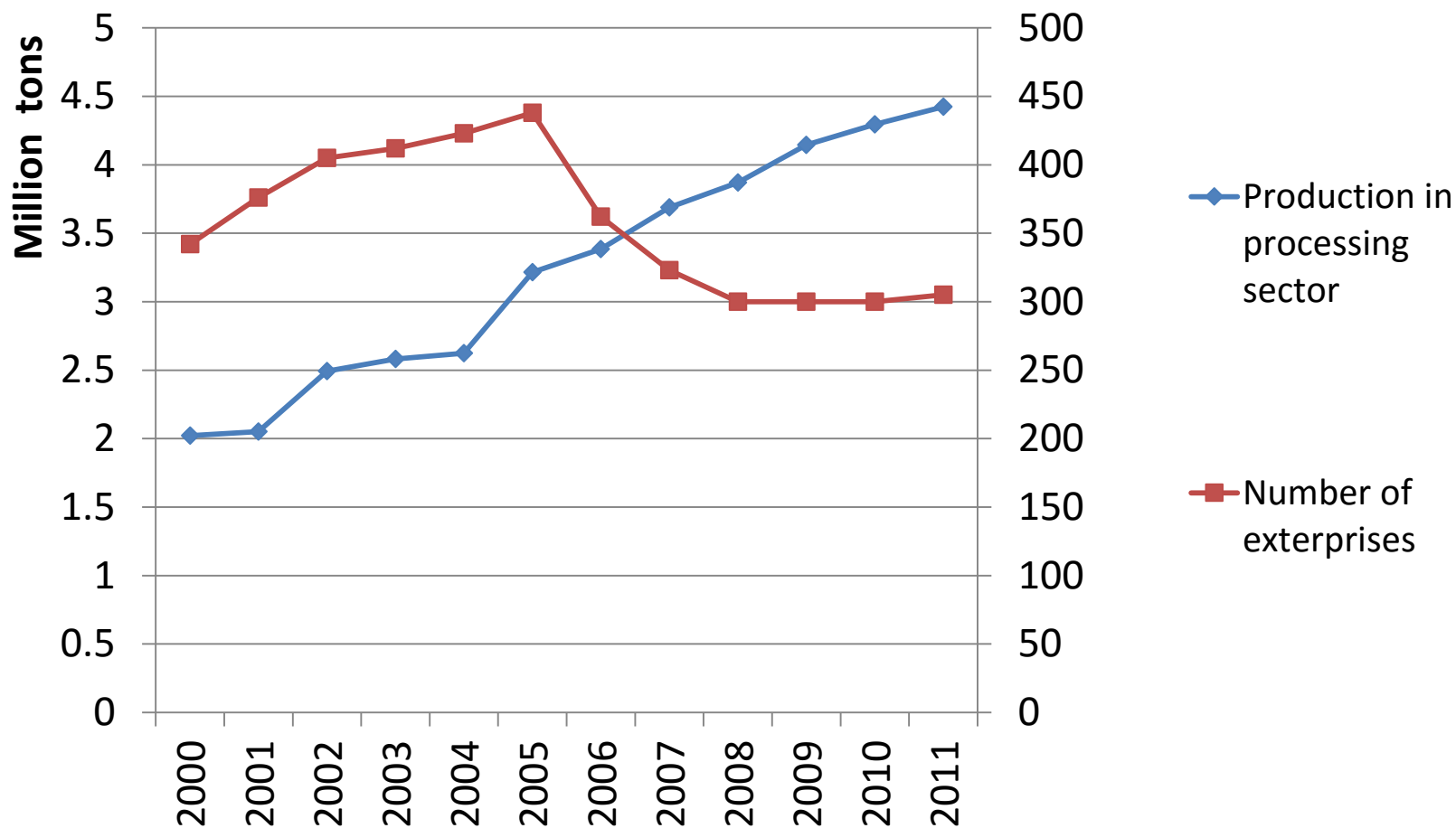
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1. Background
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- Government market intervention: fixing domestic prices, wheat export ban, trade restrictions, consumer subsidies, social protection, and increase supply strategies (Pomfret, 2007; Oskembayev and Turabayev, 2014);
- Dominance of large agroholdings vertically integrated in both production and processing sector (Business Media Group, 2011; OECD 2013)
- Increasing concentration in Kazakh milling industry (Business Media Group, 2011);
- Asymmetric development of prices along the grain supply chain (Oskembayev and Turabayev, 2014);
- Undeveloped technology and infrastructure that facilitates to grain market imperfections (OECD, 2013).

Price development





To analyze the degree of competition among grain processors on Kazakhstan grain markets. Focus of the study:

- Are processors price takers on agricultural input market or they are able to exert monopsony power on grain suppliers?
- To estimate the degree of monopsony power on grain supply market if it exists.

Overview of selected empirical studies used

Author(s) (year)	Country	DA ^a	DF ^b	TP ^c	Industry/Market	Functional form ^d			Method ^d	Market Power Parameter
						P/C/R/PF	D	S		
Appelbaum (1982)	USA	N	A	1947-71	Textile	GLC	DL	-	FIML	0.0368
					Tobacco					0.4019
Azzam (1997)	USA	N	A	1970-1992	Beef packing	GLC	-	DL	N3SLS	-0.799
Bhuyan and Lopez (1997)	USA	N	A	1972-1987	Food	TLC	DL	-	N3SLS	0.180
					Tobacco					0.211
					Food and Tobacco					0.183
Hockman and Vöneki (2009)	Hungary	N	M	1998-2006	Raw Milk	TLR	-	TL	N3SLS	0.05
Morrison Paul (2001)	USA	P	M	1958-1991	Beef packing	GLC	-	-	N3SLS	-0.0083
Schroeter (1988)	USA	N	A	1951-1983	Beef and cattle	GLC	DL	DL	FIML	0.0176
Perekhozhuk (2015)	Ukraine	R	M	1996-2003	Dairy Industry	TLPF	-	TL	N3SLS	0.1475
Lopez (1984)	Canada	N	A	1965-1979	Food Processing	GLC	SL	-	FIML	0.192

Advantages/strength of structural models:

- Provides possibility to estimate market power on input/output level simultaneously (Azzam, Pagoulatos 1990);
- Provides estimates regarding factor substitution, own price and production elasticities giving possibility to estimate the market power more precisely (Perekhozhuk, 2016).
- Possibility to not only detect market power but also to estimate the degree of competition.

Limitations of structural models :

- Provides identical input/output estimates of market power if fix proportions technology applied (Schroeter, 1988) or requires assumption regarding fixed exogenous value of price elasticities if variable proportions technology applied (Azzam, Pagoulatos 1990);
- Sensitive to deviations in specifications (Hyde, Perloff 1995);
- Full production technology data requirement.

Production function for grain processor:

$$Y = f(G, \mathbf{N})$$

where

Y – the quantity produced by processor;

G – the quantity of grain for processing;

\mathbf{N} – vector of agricultural inputs (Labor and Capital).

Inverse supply function:

$$W_G = g(G, \mathbf{S})$$

where

W_G – the grain price;

\mathbf{S} – vector of agricultural producer' inputs (Labor, Capital, Pesticides, Machinery and Fuel).

Profit maximization for grain processor:

$$\Pi = P \cdot f(G, N) - W_G \cdot G - \mathbf{W}_N \cdot \mathbf{N}$$

where

P – the output price;

\mathbf{W}_N – price vector of nonagricultural inputs.

First-order-condition:

$$W_G \left(1 + \frac{\theta}{\varepsilon} \right) = P \cdot f_G$$

where θ and ε are conjectural and own price elasticities respectively, f_G is the marginal product of grain.

FOC for processors with non-constant price elasticity ε :

$$W_G = \frac{(\beta_G + \beta_{GG} \ln G + \beta_{GL} \ln L + \beta_{GC} \ln C + \gamma_{GT} T) \frac{Y}{G} P}{(1 + \theta) / (\beta_G + \delta_{GT} T)}$$

- θ varies between zero and one, $0 \leq \theta \leq 1$ indicate the oligopsony power (imperfect competition),
- $\theta = 0$ indicate the absence of market power (pure competition),
- $\theta = 1$ indicate a perfectly collusive cartel or monopsony.

Regional level data for the period 2000-2011:

- ✓ Production quantities and prices of the output products of the grain processors: flour mill products, cereal food and baking mixes;
- ✓ Production quantities (gross yield) and prices of agricultural inputs (wheat, maize, rice, barley, rye, oat, buckwheat and millet) used in grain processing industry;
- ✓ Prices and quantities of nonagricultural inputs of grain processors– Capital and Labor;
- ✓ Prices and quantities of nonagricultural inputs of grain producers– Capital, Labor, Pesticides, Machinery and Fuel;
- ✓ Prices of cattle and export price of the wheat;
- ✓ Grain sown area;
- ✓ Consumer price index.

The data have been collected from official yearbooks of Agency of Statistics of the Republic Kazakhstan and received from Information and Computing Center of the Agency of the Republic of Kazakhstan on Statistics.

Samples applied for analysis:

Sample I – comprises data for the total time period 2000-2011;

Sample I.A – comprises data for the period 2000-2008;

Sample I.B – comprises data for the period 2008-2011;

Descriptive Statistics for Sample I

Time period 2000-2011

Variable	Obs	Mean	Std. Dev.	Min	Max
year	168	2006	3	2000	2011
region	168	8	4	1	14
Q	168	230910.50	210029.20	493.00	1025995.00
pQ	168	13.81	6.00	1.64	36.06
M	168	301280.10	263786.40	701.00	1202969.00
L	168	831.27	581.66	16.17	2299.00
pL	168	9400.08	4001.05	2250.17	23645.74
C	168	218409.40	258430.70	1781.00	1495909.00
pC	168	88.12	10.24	64.21	105.71
IPI salary	168	18537.02	11597.76	3619	50847
IPI pesticide	168	133.43	37.21	98.60	251.41
IPI tractor	168	133.04	33.62	100	253.86
IPI fuel	168	233.15	96.62	100	600.07
IP Cattle	168	202.09	85.84	99.2	501.28
EUUV Tenge	168	21394.3	7998.12	12634.86	62476.47
SA grain	168	1058.81	1344.09	0.1	4537.1

Descriptive Statistics for Sample I

Time period 2000-2008

Variable	Obs	Mean	Std. Dev.	Min	Max
year	126	2004	3	2000	2008
region	126	7.5	4.05	1	14
Q	126	205796.50	173723.30	493	861675.00
pQ	126	17.97	9.84	3.68065	58.03
M	126	281853.10	235179.50	701.003	1094269.00
L	126	843.58	579.64	16.17061	2299.00
pL	126	12621.69	7486.59	2758.62	39758.77
C	126	163183.40	205392.30	1781	1236471.00
pC	126	123.18	17.07	100	171.57
IPI salary	126	13240.33	7320.42	3619	35846.00
IPI pesticide	126	117.41	21.66	98.6033	187.98
IPI tractor	126	119.21	21.05	100	231.64
IPI fuel	126	194.89	64.00	100	397.96
IP Cattle	126	167.88	55.39	99.2	341.43
EUV Tenge	126	19401.38	7728.59	12634.86	62476.47
SA grain	126	1019.93	1253.11	0.1	4146.00

Time period 2008-2011

Variable	Obs	Mean	Std. Dev.	Min	Max
year	56	2010	1	2008	2011
region	56	8	4	1	14
Q	56	298786.80	271907.50	552.00	1025995.00
pQ	56	16.67	7.19	1.64	36.06
M	56	357419.80	324070.00	701.00	1202969.00
L	56	791.50	584.61	16.68	1724.00
pL	56	11105.57	3994.74	4378.74	23645.74
C	56	346655.40	308692.00	2301.61	1495909.00
pC	56	77.16	5.89	64.21	87.92
IPI salary	56	32568.73	6723.97	17468	50847
IPI pesticide	56	174.62	32.50	106.19	251.41
IPI tractor	56	169.51	30.26	124.74	253.86
IPI fuel	56	338.11	81.68	199.66	600.07
IP Cattle	56	292.01	75.93	166.19	501.28
EUV Tenge	56	29219.36	5897.45	17677.64	46363.33
SA grain	56	1169.36	1573.26	0.14	4537.1

Findings and Results

	Sample I – 2000-2011	Sample I.A – 2000-2008	Sample I.B – 2008-2011
θ	-0.008	-0.005	0.010
β^G	1.334***	1.866***	0.809
β^{GG}	0.121***	0.084*	0.143
β^{GL}	-0.062	-0.010	-0.104
β^{GC}	-0.117***	-0.159***	-0.089
β^{GT}	-0.024**	-0.012	-0.032
Observations	168	126	56
R-squared	0.8892	0.8811	0.8906
Adjusted R-squared	0.8851	0.8751	0.8775

- Parameter θ is and close to zero for all samples indicating no evidence of noncompetitive behavior on grain market;
- Positive but insignificant estimates with small magnitude (in case of time period 2008-2011) reflect price distortions on the market (Schroeter 1988);
- Looking at the estimations in dynamics over time periods (2000-2008 and 2008-2011) tendency of decreased level of competition can be observed;

- Findings for the periods 2000-2011, 2000-2008 and 2008-2011 reveal no evidence of market power on grain purchase market.
- Findings for the period 2008-2011 might capture the price distortions on the grain market caused by government interventions (e.g. export ban in 2008).

Thank you for your attention !



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