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***Do Agroholding Members Perform  
Better than Independent Farms?***

*Evidence from the Oblasts Belgorod, Oryol and Tatarstan*

Gataulina, E., Hockmann, H., and Stokov, A.

Agro-holdings and other types of mega-farming operations in developed and emerging economies, pre-conference workshop, Aug. 8, 2014, Milano, Italy

# Structure

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Motivation and objective

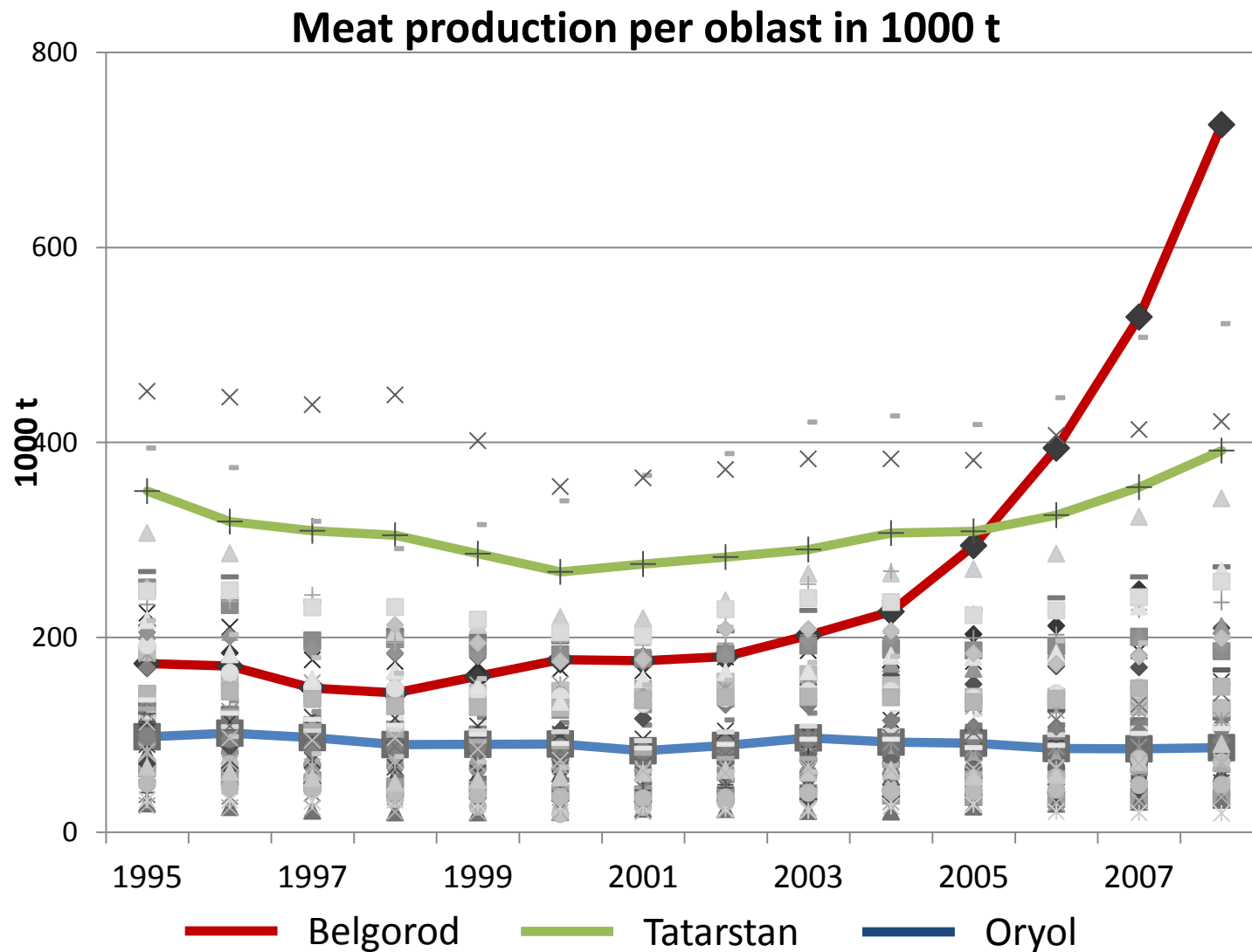
Data

Model and results for Belgorod

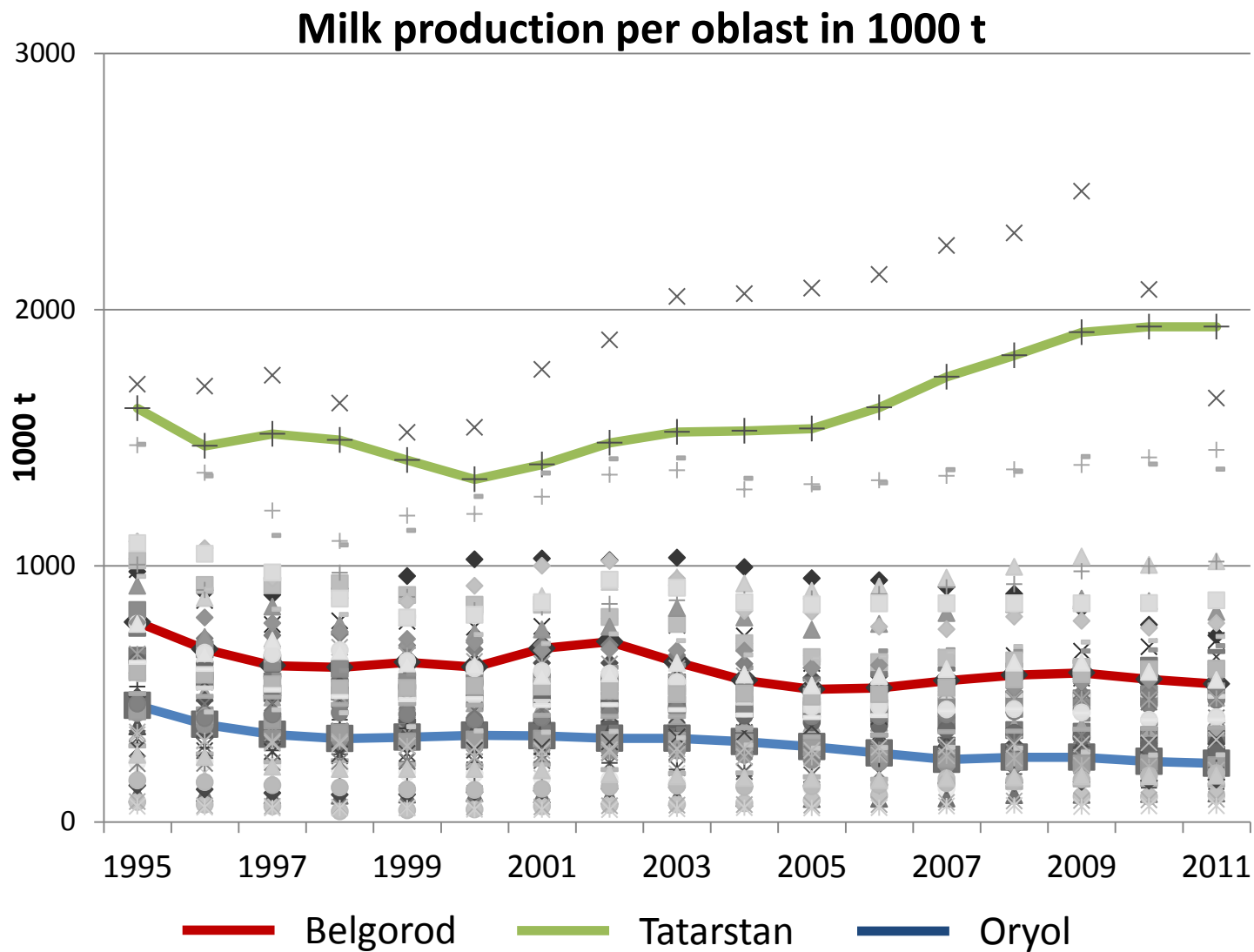
Model and results for Tatarstan and Oryol

Conclusion

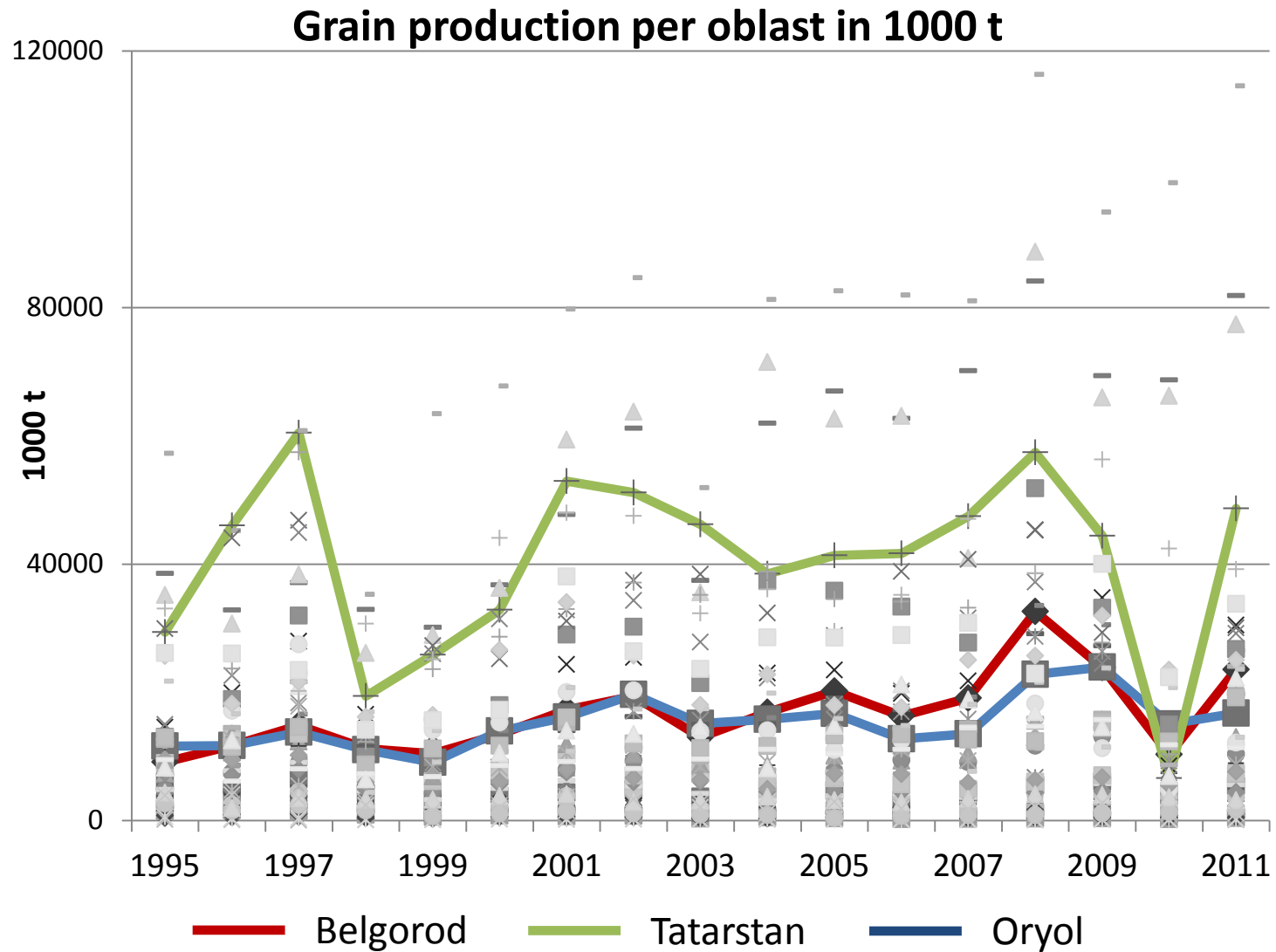
# Motivation



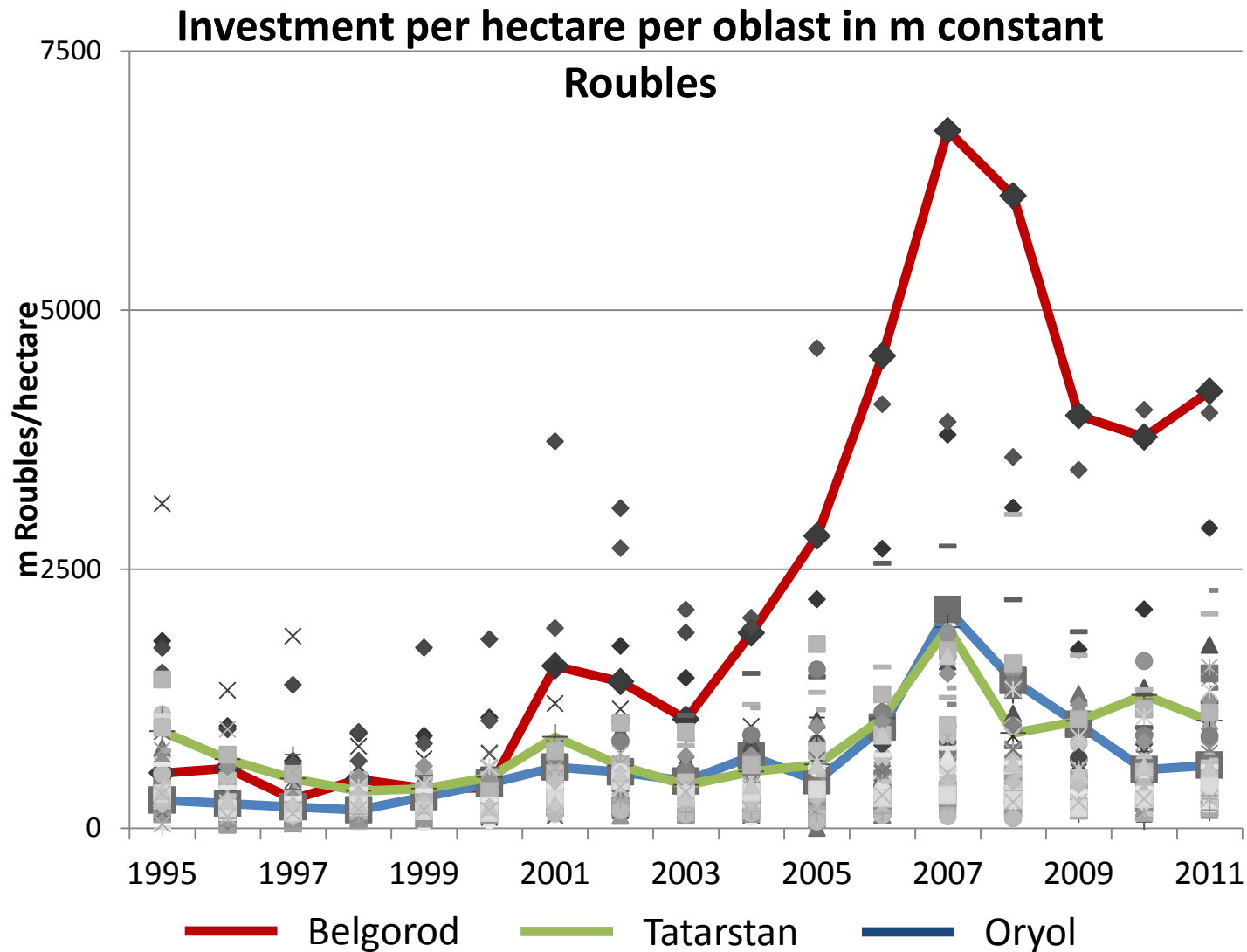
# Motivation



# Motivation

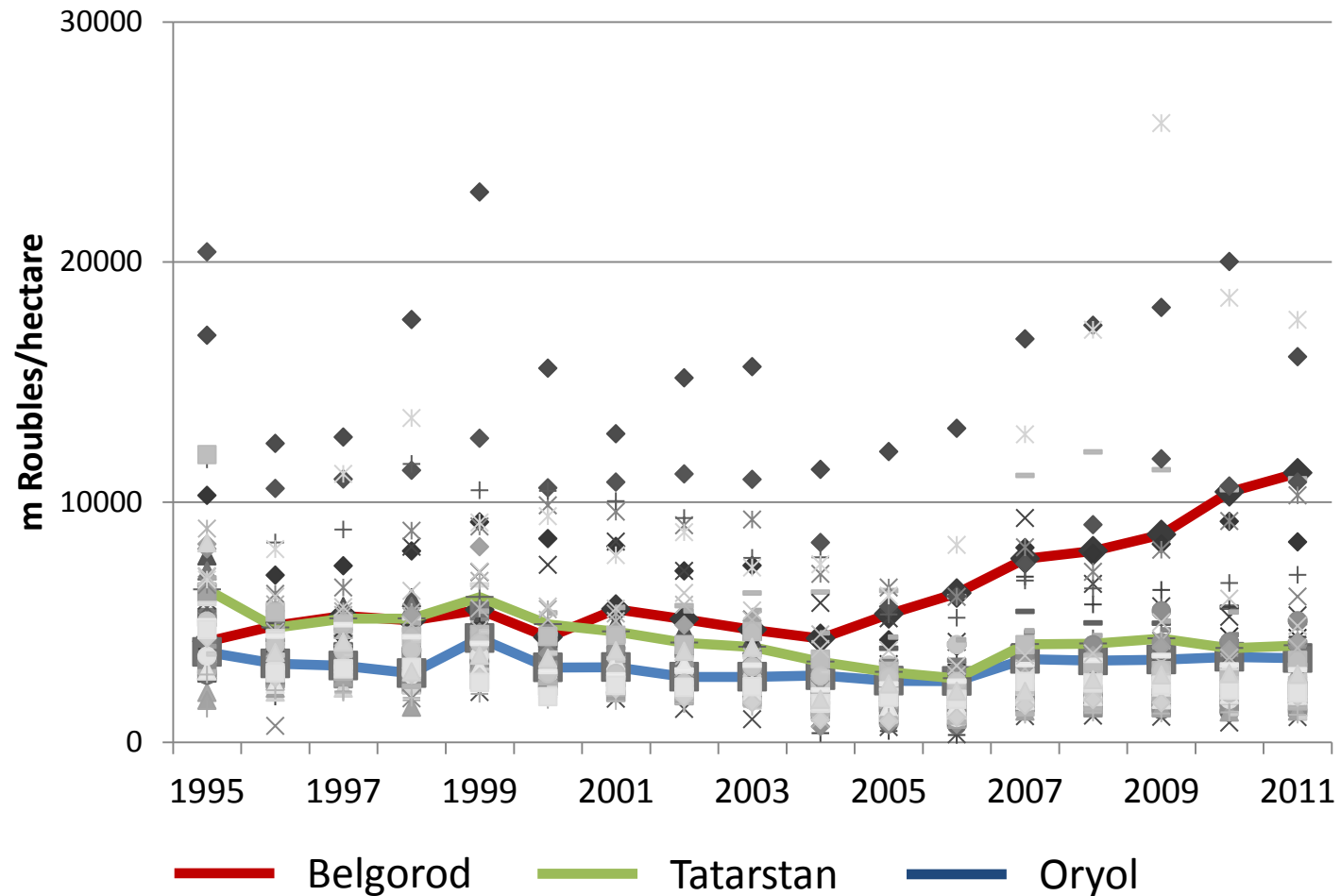


# Motivation

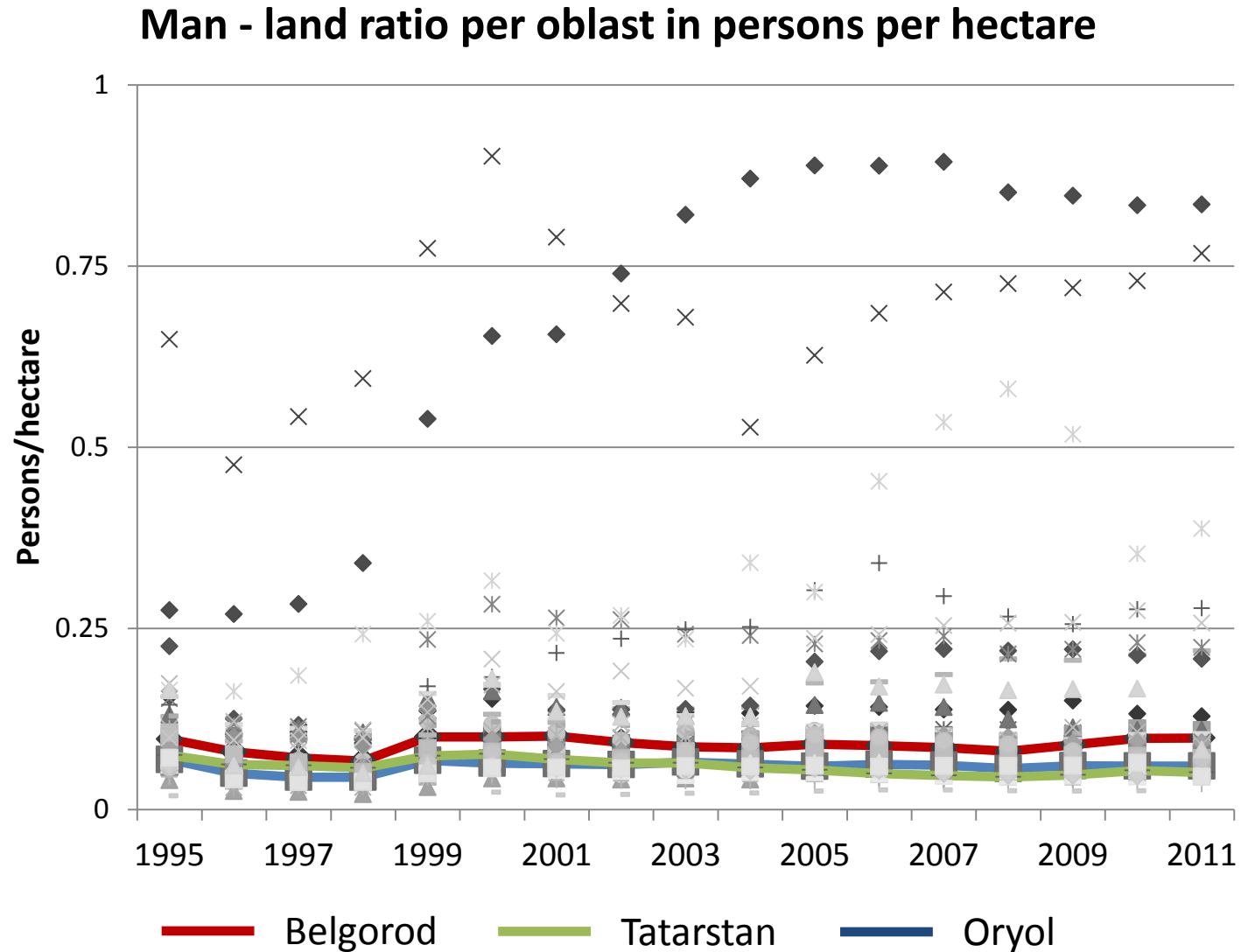


# Motivation

Intermediate input use per hectare per oblast in m constant Roubles



# Motivation





# Objective

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To assess whether productivity differences among farms are determined by ownership (governance) structures

- Are agroholdings more productive than independent farm?
- How does regional specialisation contribute to the productivity differences

# Data

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Bookkeeping data for three oblasts, ROSSTAT Agricultural Registry rolling panel

Belgorod: 2001, 2004, 2007

191 independent farms

126 agroholding members

455 observations

Tatarstan/Oryol: 2006-2008

	Tatarstan	Oryol
independent farms	238	148
agroholding members	40	24
total obs.	634	352

# Data

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Output: 7 crop outputs

9 animal outputs

- sum of gross productions,
- deflated by unit prices (from the data) ,  
construction of a multilateral consistent TTI

Input	land	agricultural hectare	(hectares)
	labour	agricultural workers	(persons)
	capital	depreciation	(th. Roubles)
	material input		
	seed+fertilizers+feed+energy+others		(th. Roubles)

- capital and material inputs deflated by regional prices indices

# Model: Belgorod

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translog function

$$f(\ln \mathbf{x}_{it}, q_i, h, t) = a_0 + a' \ln \mathbf{x}_{it}^* + \frac{1}{2} \ln \mathbf{x}_{it}^* ' A \ln \mathbf{x}_{it}^*,$$

effective inputs:  $\ln \mathbf{x}_{it}^* = \ln \mathbf{x}_{it} + \tau t + \eta h_i + \theta q_{it}$

$\mathbf{x}$  actual inputs

$t$  time

$h$  holding membership

$q$  factor quality (land)

$z$  precipitation

efficiency model

$$\ln y = f(\ln \mathbf{x}_{it}, q_i, h, t) + v - u; \quad v \sim N(0, \sigma_v), \quad \sigma_v = \exp(\delta_0 + \mathbf{x}_{it}' \boldsymbol{\delta} + \delta_h h)$$
$$u \sim N(0, \sigma_u), \quad \sigma_u = \exp(\nu_0 + \mathbf{z}_{it}' \boldsymbol{\nu} + \nu_h h)$$

double heteroskedastic model

# Estimation results: Belgorod

	Variable	Estimate	
Production function parameters	Con	0.003	
	Lab	0.255	***
	Lan	0.148	***
	Cap	0.124	***
	Mat	0.481	***
	Lab <sup>2</sup>	0.046	
	Lan <sup>2</sup>	-0.399	***
	Cap <sup>2</sup>	-0.004	***
	Mat <sup>2</sup>	0.037	
	LabLan	-0.009	
	LabCap	0.017	
	LabMat	-0.057	***
	LanCap	0.097	***
	LanMat	0.236	***
	CapMat	-0.085	***

effective input parameters	time	Lab	-0.201	***
		Lan	0.128	***
		Cap	0.782	***
		Mat	-0.055	
	group	Lab	-0.002	
		Lan	0.319	***
		Cap	0.712	*
		Mat	-0.363	***
	Land quality		1.667	

het in v	Con	-2.830	***
	Lab	1.149	
	Lan	-0.597	***
	Cap	0.164	
	Mat	-1.372	***
	Hol	0.059	
het in u	Con	-1.548	***
	Pet	0.002	
	Hol	0.093	

# Calculation results: Belgorod

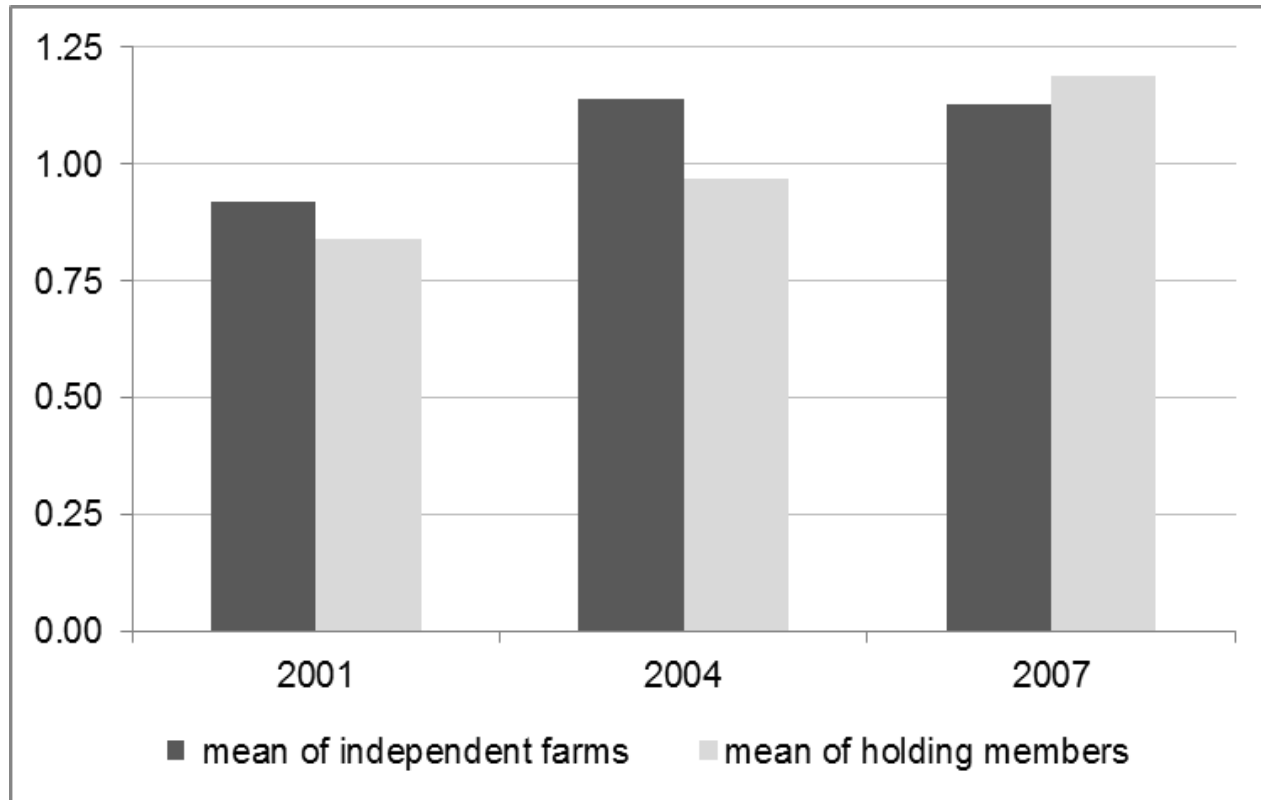
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## Additional parameters

Effect off/ on	Time	Holding	Quality
Constant	0.038	-0.594	0.246
Time	0.005	0.022	0.010
Holding	—	—	-0.239
Quality	—	—	-0.055
Labour	0.005	0.029	-0.016
Land	0.014	-0.143	-0.666
Capital	0.010	0.059	0.163
Materials	-0.027	0.001	0.394

# Results: Belgorod

TFP development by organizational form, 2001, 2004, and 2007



# Model: Tatarstan/Oryol

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translog function

$$f(\ln \mathbf{x}_{it}, q_i, h, t) = a_0 + a_t t + \frac{1}{2} a_{tt} t^2 + a_t' \ln \mathbf{x}_{it} t + a_h h_i + a_h' \ln \mathbf{x}_{it} h_i + a' \ln \mathbf{x}_{it} + \frac{1}{2} \ln \mathbf{x}_{it}' A \ln \mathbf{x}_{it},$$

$\mathbf{x}$  actual inputs

$t$  time

$h$  holding membership

efficiency model

$$\ln y = f(\ln \mathbf{x}_{it}, q_i, h, t) + g(\ln \mathbf{x}, h) v - q(\ln \mathbf{x}, h) u; \quad v \sim N(0, 1)$$
$$u \sim N(0, \sigma_u)$$

Just and Pope model (Kumbhakar)



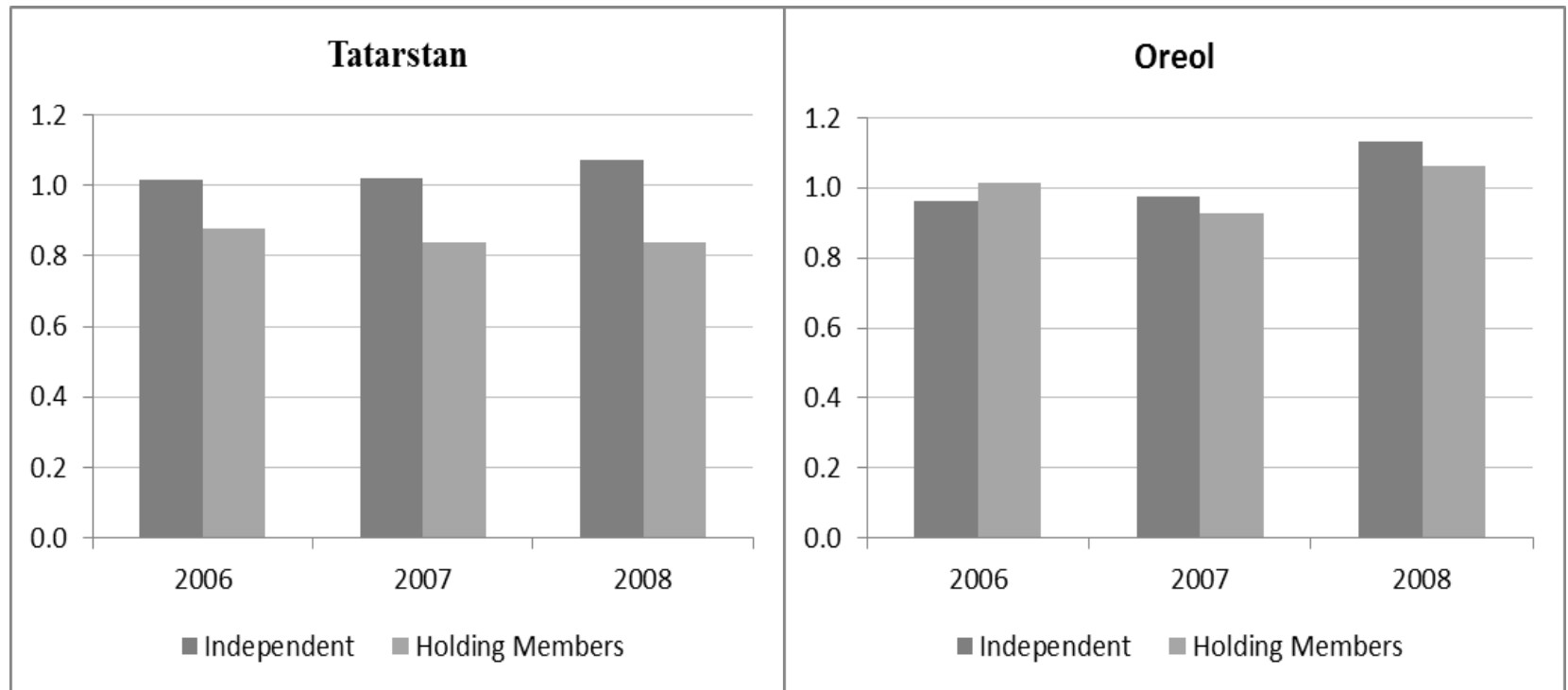
# Estimation results: Tatarstan/Oryol:

	Variable	Tatarstan		Oryol	
		Estimate		Estimate	
mean production function	Constant	0.077	***	-0.031	
	Tim#	0.011		0.069	***
	Tim*Tim	0.062	*	0.204	***
	Lab	0.066	***	0.121	***
	Lan	0.320	***	0.093	***
	Cap	0.207	***	0.195	***
	Mat	0.419	***	0.569	***
	Lab*Tim	0.043	**	0.100	**
	Lan*Tim	0.037	*	0.134	***
	Cap*Tim	-0.024	***	-0.040	*
	Mat*Tim	-0.038	*	-0.089	***
	Lab*Lab	0.004		-0.023	
	Lan*Lan	0.004		-0.216	***
	Cap*Cap	0.053	***	0.028	*
	Mat*Mat	0.123	***	0.120	***
	Lan*Lab	0.065	**	-0.008	
	Lan*Cap	-0.017		0.029	
	Lan*Mat	-0.021		0.001	
	Lab*Cap	-0.000		0.062	***
	Lab*Mat	-0.057	*	0.052	***
	Cap*Mat	-0.037	*	-0.082	***
	Mem	-0.204	***	-0.077	
	Tim*Mem	-0.053		-0.106	***
	Lab*Mem	0.048		0.009	
	Lan*Mem	-0.005		0.115	
	Cap*Mem	-0.129	***	0.040	
	Mat*Mem	0.044		0.009	

	Variable	Tatarstan		Oryol	
		Estimate		Estimate	
risk function	Constant	-1.595	***	-1.307	***
	Dum06	-0.096		-0.005	
	Dum08	0.078		0.176	**
	Lab	0.473	***	0.343	***
	Lan	-0.189	**	0.038	
	Cap	0.025		0.296	***
	Mat	0.476	***	0.197	***
	Mem	0.305	***	0.207	**
	Lab	0.035		1.135	
	Lan	1.400	***	1.063	
inefficiency function	Cap	0.388	***	0.012	
	Mat	-0.484	**	2.096	*
	Mem	-5.577	***	-0.092	
	Std. Dev.	0.310	**	0.020	

# Results: Tatarstan/Oryol

TFP level and development by organisational form (mean = 1), 2006-2008



# Conclusion

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Belgorod: concentration on pork production  
massive investment in agriculture

agroholdings started with low productivity  
steady increase, overtake independent farms

Agrarholdings  
perform better

Tatarstan/Oryol

dairy production/diversified production  
moderate investment in agriculture

agroholdings: decrease in TFP (Oryol)  
lower increase in TFP (Tatarstan)

Agrarholdings  
perform poorer