Productivity and Efficiency Effect of Policy Reforms in Kazakhstan

Research Objective:

To analyze the effects of different policies on agricultural efficiency in the case of Central Asian countries.

Research Gap:

Limited numbers of studies have been done on assessing the effects of policies on agricultural efficiencies in the case of the Central Asian countries.

Why Central Asia?

- The total population of Central Asia is around 68 million people, of which nearly 60% live in rural areas (Population of Central Asia 2016).

- Five Central Asian countries collectively cover an area of 400 million hectares. However, only 20% of this area is suitable for farming, and the rest is characterized as deserts and mountains. Nevertheless, agricultural production in that limited area forms the backbone of Central Asian economies (Bucknall et. al., 2003).

Why Central Asia?

- The five Central Asian countries are highly agrarian, with agriculture accounting for over 45% of total number of employed and nearly 25% of GDP on average (S. Djalalov, S.C. Babu, 2006).

- Therefore, agriculture plays significant role in maintaining food security and economic stability in this region.

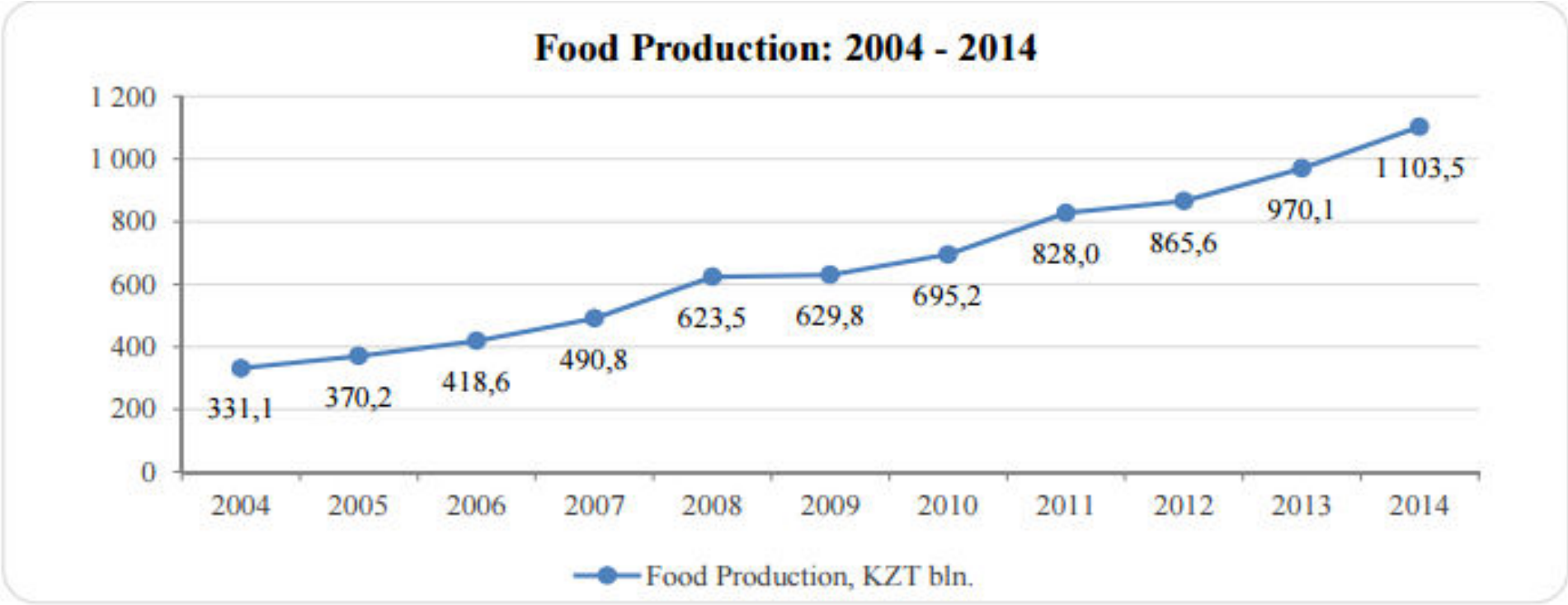
In the case of Kazakhstan:

Agriculture plays an important role not only because of rural employment, but also in order to diversify its oil dependent economy.

The main agricultural commodity is wheat.

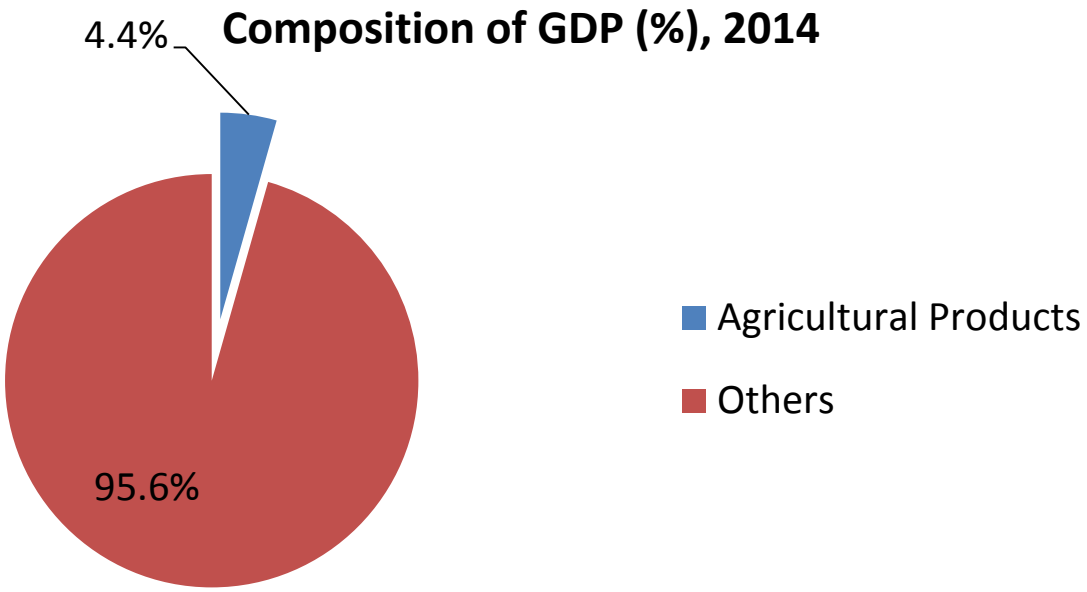
- 8th largest producer of wheat in the world. (Workman, 2016)
- Average annual production is about 13 mln. tons. (United States Department of Agriculture, 2010)

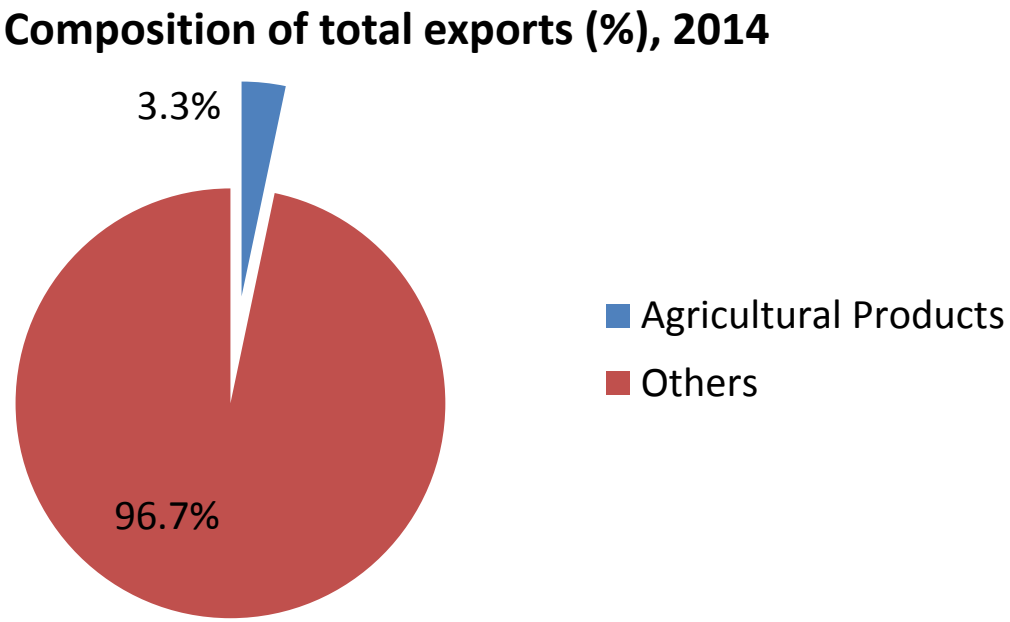
Agriculture in Kazakhstan



Source: Committee on Statistics of the Republic of Kazakhstan, RA RFCA

Agriculture in Kazakhstan





Agricultural Reforms and Policies since Independence:

- De-collectivization of farms. (Kelley Cormier, 2001)
- Free college level education to all technical specialties, including agriculture. (KAZINFORM, 2016)
- Free access to seminars and lectures in agriculture to all farm managers. (National Chamber of Entrepreneurs of Kazakhstan "Atameken“, 2016)
- Concessional credits provided under the umbrella of Kazagro. (Martin Petrick, 2016)
- Subsidies to financial services, fodder purchases and restocking of herds and etc. under Agribusiness 2020. (Martin Petrick, 2016)
- Ensuring direct supply to agro-processing enterprises, like Kazagro. (KAZAGRO, 2014)

Literature Review

Studies have inconsistent results:

- *Farmer education and efficieny:*

- Positive connections observed: Mathijs and Vranken (2001), Alene and Hassan et al.(2003), Asadullah and Rahman (2009) and Karimov (2014
- No relationship observed: Llewelyn and Williams (1996) and Chirwa (2007)

Literature Review

Studies have inconsistent results:

- *Farm size and efficiency:*

- Inverse relationship observed: Thapa (2007), Masterson (2007), Vu T.H. et al. (2012) and Ladvenicova and Miklovicova (2015)
- Positive relationship observed: Karimov (2014)

Data

- A cross-sectional data for the year 2015 was collected from the Akmola Region of Kazakhstan.
- Akmola is one of the largest wheat producing regions in Kazakhstan.
- Akmola, North Kazakhstan and Kostanai regions collectively account for 75% of all wheat produced in country. (United States Department of Agriculture, 2010)
- A sample of 161 wheat producing farms from 36 districts in Akmola region have responded to the questionnaire.

Methodology

- Half-Normal distributed, output-oriented stochastic production frontier model for cross-sectional data:

$$ln\, y_i = ln\, y_i^* - u_i, \qquad u_i \geq 0 \tag{1}$$

$$ln\, y_i^* = f(x_i; \beta) + v_i \tag{2}$$

$$\exp(-u_i) = \frac{y_i}{y_i^*} = TE \tag{3}$$

$$u_i = \delta_0 + \sum_m \delta_m Z_{i,m} + \varphi_i \tag{4}$$

- Conducted on the basis of Cobb-Douglas Production Function, using the STATA “sfmodel” package by Kumbhakar et al. (2015)

Results and Findings

Table 1 Descriptive Statistics	Units	Akmola (n=138 observations)			
		Mean	Std. Dev.	Min	Max
Output variable					
Output	KZT ('000)	66200	158000	720	1370000
Production Variables					
Labor	KZT ('000)	10400	21600	600	165000
Land	hectars	2865.16	7650.07	20	62000
Variable_inputs	KZT ('000)	31700	71900	23	561000
Capital	KZT ('000)	508.22	615.17	8	5400
Farm characteristics					
Size	hectars	3553.92	9258.4	20	62000
Age	years	9.40	6.31	1	23
Age_squared	years	127.89	141.01	1	529
Machines	numbers	6.63	5.98	0	54
Distance	km	26.14	80.23	2	870
Belongs to parental organization (par_org)	Dummy	0.04	0.19	0	1
Cooperates with other farms (cooperating)	Dummy	0.16	0.37	0	1
Uses insurance (insurance)	Dummy	0.38	0.49	0	1
Educational characteristics					
Has special agricultural education (edub)	Dummy	0.37	0.48	0	1
Graduated from university (eduu)	Dummy	0.71	0.46	0	1
Graduated from college (educ)	Dummy	0.20	0.40	0	1
Supply characteristics					
Supplies directly to Agro-processing enterprise (supply_ch1)	Dummy	0.1884	0.3925	0	1
Supplies directly to Procurement enterprise (supply_ch2)	Dummy	0.4275	0.4965	0	1
Supplies under contract (supply_contract)	Dummy	0.7754	0.4189	0	1

Table 2 Maximum Likelihood Estimates of the stochastic frontier production function

loutput	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
frontier						
llabor	0.1918154**	0.0751423	2.55	0.011	0.0445391	0.3390916
lland	0.2403806***	0.0603432	3.98	0	0.1221101	0.358651
lvariable_input	0.3294515***	0.0633836	5.2	0	0.2052219	0.453681
lcapital	0.1110271*	0.0573767	1.94	0.053	-0.0014292	0.2234833
cooperating	0.7376789***	0.1530133	4.82	0	0.4377784	1.037579
_cons	5.784084	1.112266	5.2	0	3.604082	7.964086

Note: Significance level at 10% *, 5% **, 1% ***

Table 3 Descriptive Statistics of Technical Efficiency

Variable	Obs	Mean	Std. Dev.	Min	Max
TE	138	0.9405967	0.1605222	0.0803639	1

Figure 1Technical Efficiency Distribution

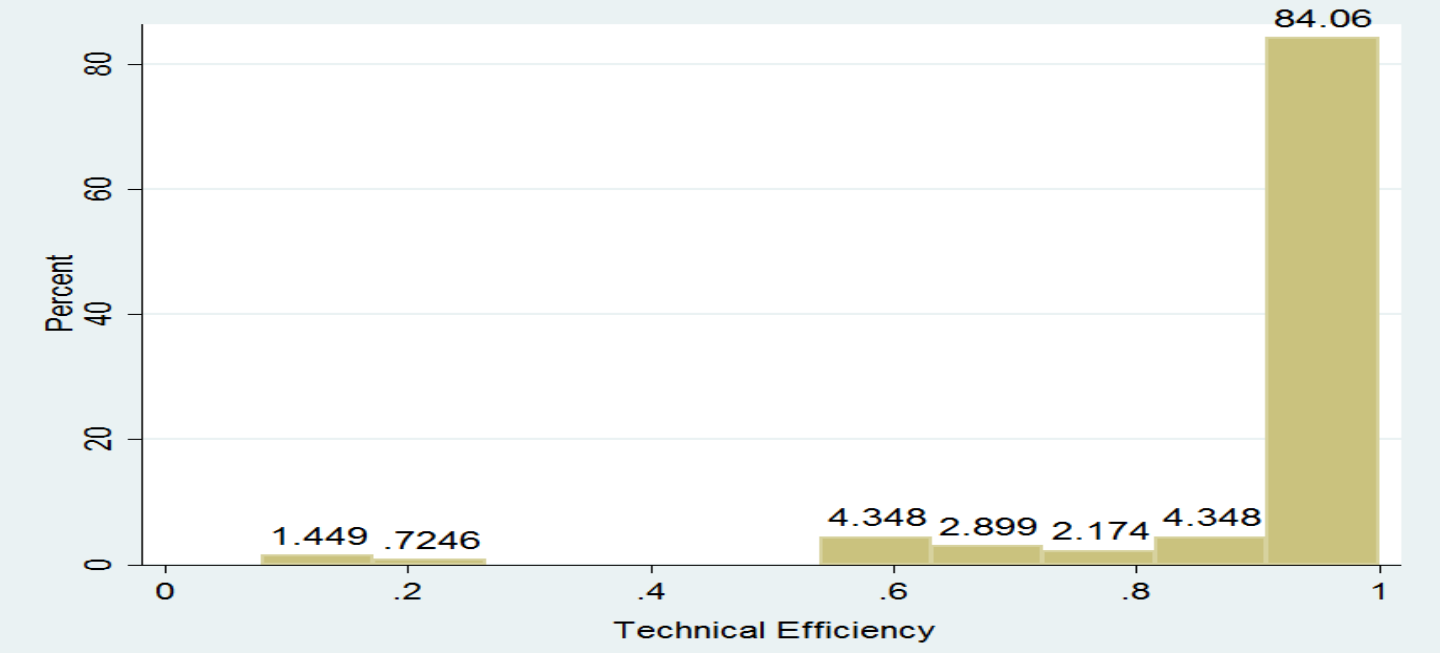


Figure 2 Distribution of Technical Efficiency by Districts

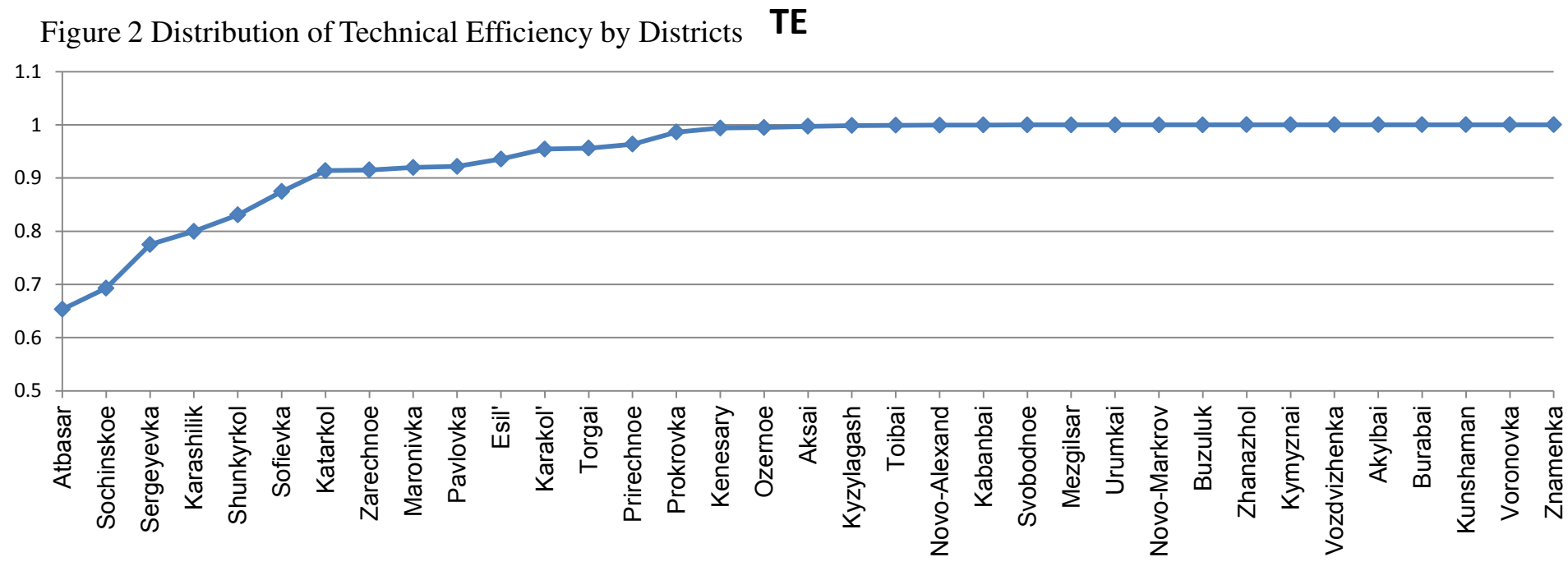


Table 4 Estimation of inefficiency effects

	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
usigmas						
size	2.627115**	1.125208	2.33	0.02	0.4217487	4.832481
age	-0.3997244	0.7472989	-0.53	0.593	-1.864403	1.064954
age_squared	-0.0448506	0.0366773	-1.22	0.221	-0.1167367	0.0270355
machines	-2.452893*	1.287528	-1.91	0.057	-4.976402	0.0706167
distance	-7.994066**	3.836303	-2.08	0.037	-15.51308	-0.4750503
par_org	21.23954**	10.06823	2.11	0.035	1.506179	40.9729
insurance	-5.60255	4.292351	-1.31	0.192	-14.0154	2.810304
edub	-7.487288**	3.394685	-2.21	0.027	-14.14075	-0.8338285
eduu	-3.160626	2.931727	-1.08	0.281	-8.906705	2.585453
supply_ch1	-15.63975**	7.364221	-2.12	0.034	-30.07336	-1.20614
supply_ch2	-9.671924**	4.575575	-2.11	0.035	-18.63989	-0.7039625
supply_contract	-3.071509	1.930482	-1.59	0.112	-6.855184	0.7121666
_cons	21.3822	11.31021	1.89	0.059	-0.7854041	43.54981

Note: Significance level at 10% *, 5% **, 1% ***

Thank you!!!