UNIVERSITY OF CENTRAL ASIA
GRADUATE SCHOOL OF DEVELOPMENT
Institute of Public Policy and Administration

Determinants of milk market participation among small dairy farmers in Kyrgyzstan

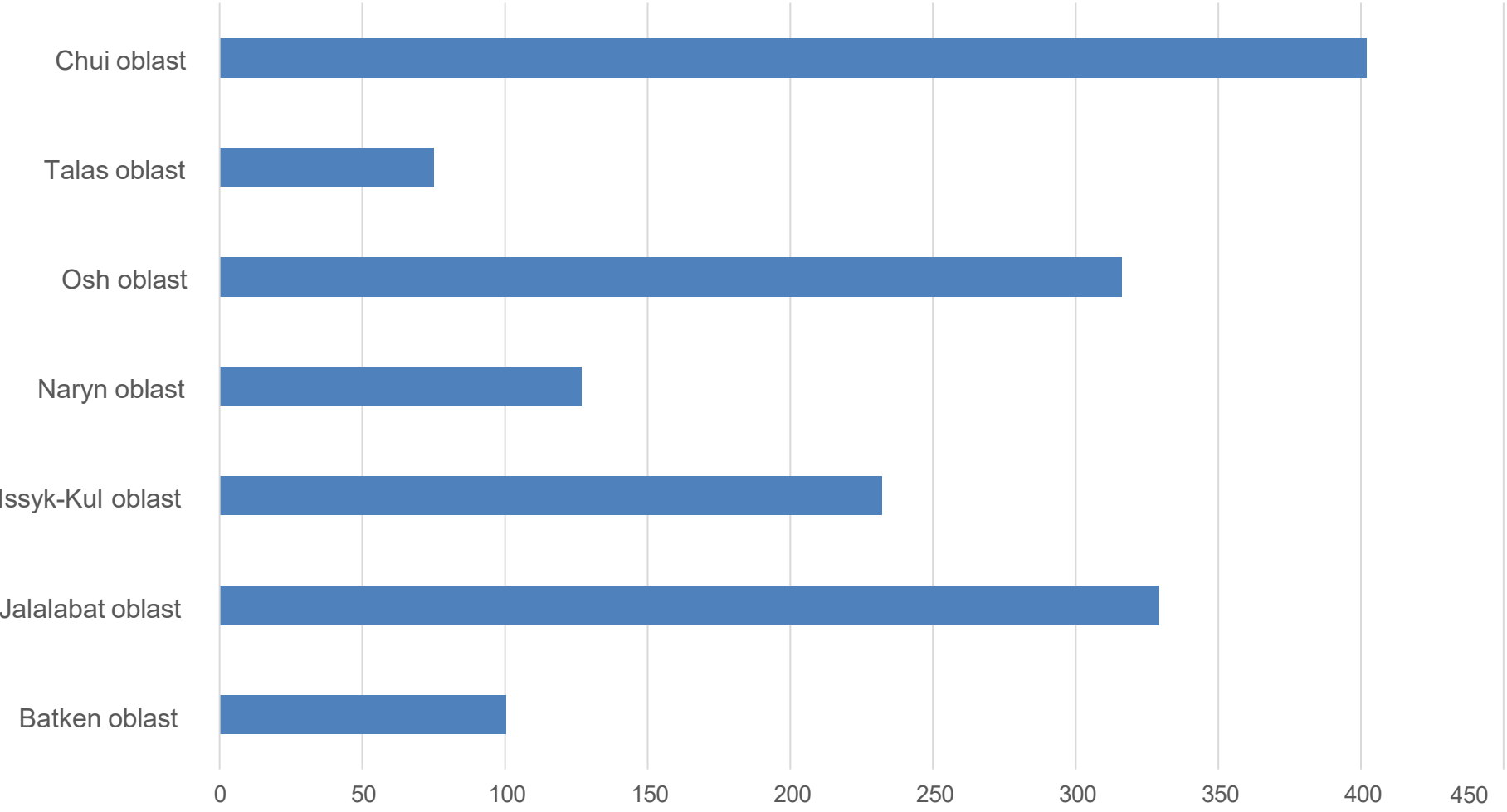
Overview

- Motivation of the study
- Literature review
- Data and methodology
- Hypotheses
- Regression results
- Summary
- Policy implications
- Discussion

Actuality of the study

1. Social factor, antipoverty effect
2. Market integration (from subsistence to commercialization)
3. Capitalization of the natural resources
4. Export potential

Production of milk by region in 2018 (thnd. tons)



Source: NSC KR

Research questions

1. What are the determinants that explain a farmer's choice to participate in the dairy market in the Chui region of Kyrgyzstan?
2. If a farmer decides to participate in the dairy market, what factors influence the volume of milk sold?

Literature Review

- Globalization, privatization, and vertical coordination in food value chains in developing and transition countries (Swinnen, J. & Maertens, M., 2007)
- Farmers, Vertical Coordination, and the Restructuring of Dairy Supply Chains in Central and Eastern Europe (Dries, L., Germenji, E. & Noev, N., 2009. Farmers)
- Formal versus informal: Efficiency, inclusiveness and financing of dairy value chains in Indian Punjab (Birthal, P. S., Chand, R. & Josh, P. K., 2017)
- "Key factors for increasing farmer participation in markets: evidence from the Malian dairy sector" (Vroegindewey, R., Richardson, R. & Thériault, V., 2021)

Methodology

Cragg Double-Hurdle Model- econometric model used to analyze consumer behavior and estimate the demand for a particular product or service

The Cragg Model consists of two parts: the first hurdle and the second hurdle

First Hurdle: This part of the model estimates the probability that farmer decides to sell the product (milk) at all.

Second Hurdle: It models the quantity decision.

Cragg Double-Hurdle Model

Stage 1: market participation

$$\boldsymbol{P(M_i = 1) = P(Q_i > 0) = X_i\alpha + \varepsilon_i}$$

Stage 2: sales volume conditional on participation

$$\boldsymbol{Q_i = Z_i\beta + \mu_i,}$$

where $\boldsymbol{P}$ is the probability of participation in the market (M);

$\boldsymbol{Z_i}$, $\boldsymbol{X_i}$ - two vectors of explanatory variables from the main model;

$\boldsymbol{\alpha}$ ***and*** $\boldsymbol{\beta}$ - the marginal effects of these vectors of explanatory variables for the first and second stages, respectively.

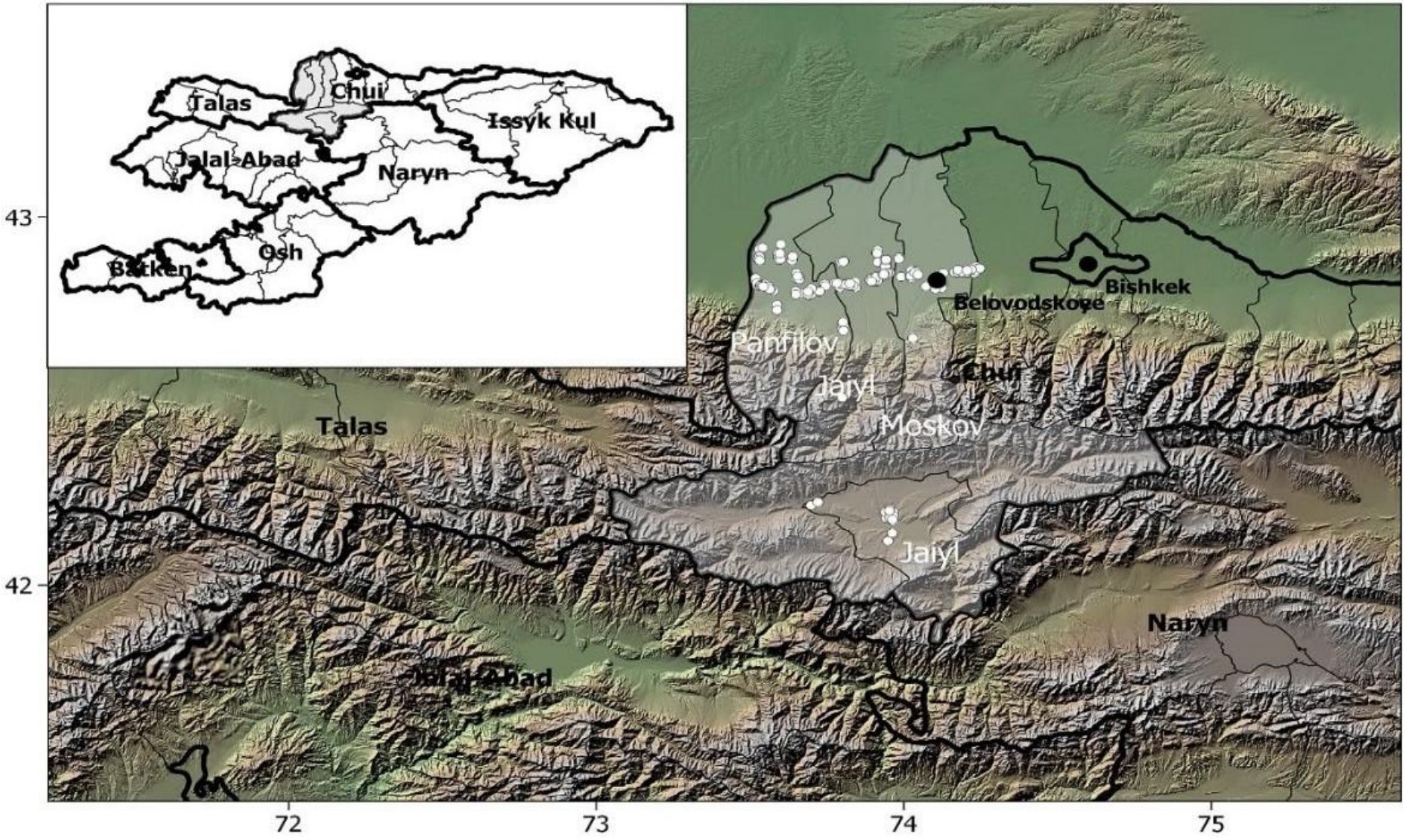
Data

Source: AniCAnet project in 2018 (summer)

Sample: 250 households keeping 5 or more cattle

Variables:1470 from ANICANET+19 from WorldClim V1 climatic dataset

Map of sampling



Source: Sarah Robinson

Survey questionnaire

- Household/farm structure, labor and production specifics;
- Land ownership and land transactions;
- Farming: production and marketing;
- Grazing and fodder;
- Costs of farm inputs, investment and loans, labor and access to information;
- Animal breeding and health.

Hypotheses

- Access to **village pasture** can push the farmer to keep cows as they will save on fodder preparation and purchase (+) (Stage 1)
- Using of **hayfields** increases the fodder base for feeding cattle, consequently the milk volume (+) (Stage 1)
- More **hay** provided to the animals will increase milk output (+) (Stage 1)
- The more the village **population** the more milk can be collected by intermediaries (+) (Stage 1)
- The high **prices** can incentivize to sell the milk (+) (Stage 1/Stage 2)
- **More cows** produce more milk (+)(Stage 1/Stage 2)
- The high **milk yield** can be the incentive for the participation decision and the sold quantity (+) (Stage 1/Stage 2)
- High **rainfall** increases the hay and crop growth intensity which affects on milk productivity (+) (Stage 1/Stage 2)
- The **loan** can be used for fodder purchase increasing the milk volume (+) (Stage 1/Stage 2)
- **Milking machinery** is a precondition for larger milk quantities produced per farm (+) (Stage 2)
- Large milk quantities can be stored only with professional **cooler** (+) (Stage 2)
- Cultivating the **cropland** increases the fodder base for feeding cattle consequently the milk volume (+) (Stage 2)
- More **grain** provided to the animals will increase milk output (+) (Stage 2)

Regression output

	Probit (1st stage)			Truncated regression (2nd stage)		
	Coef.		P-val	Coef.		P-val
Number of cows	0.712	***	<0.001	1.973	***	<0.001
Roughage fodder	0.002		0.58	0.053	***	<0.001
Concentrate fodder	0.006		0.684	-0.059		0.508
Local pasture	1.004	***	<0.001			
Cropland area	0.002		0.805	0.239	**	0.014
Hayfield area	-0.074		0.112	-0.234		0.263
Credit constrained	0.314		0.426	-2.095		0.253
Median price	0.394	***	0.005	2.203	*	0.051
Population	-0.082		0.117			
_cons	-6.557	***	0.001	-44.337	**	0.011
Milking machinery				5.519	**	0.06
Cooler				0.361		0.917
Legal status				4.619	**	0.059
Coop member				4.356		0.111
sigma						
_cons	7.816		<0.001			

Summary

Significant determinants of the 1 stage:

- Access to the local pasture
- Median milk price
- Number of cows

Significant determinants of the 2nd stage:

- Number of cows
- Roughage fodder
- Cropland area cultivated
- Milking machinery
- Farm registration
- Median milk price

Policy implications

- Promoting Financial Inclusion for Dairy Farmers (financial intermediation, Financial Literacy and Training Programs)
- Improving access to credit facilities for farmers interested in investing in modern milking machinery (subsidies, leasing)
- Incentives for Farm Registration (reduced taxes, access to subsidized resources, or eligibility for government support programs)
- Price stabilization mechanisms can also be explored to mitigate market fluctuations (revealing of collusion on purchasing price among big actors)
- Promoting Sustainable Pasture Management for Dairy Farms (regulations to prevent overgrazing, educating farmers on rotational grazing, payments for environmental services)

Discussion

- Actuality of the used data for paper
- Number of determinants in regression models
- Inclusion of seasonal price to regression
- How to take into account reverse causality. What if farmers stock up their herd or invest into milking equipment only as a consequence of better market access? This problem needs to be discussed in the framework of what econometricians call the “identification strategy” for your model.

Thank you for your attention!

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