Contracts, Payments Delays and Farm Growth:
Evidence from Bulgarian Agriculture

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Outline

- Motivation:
  - Delayed payments
  - Contract innovations
- The survey
- Descriptive statistics:
  - Farm growth
  - Delayed payments
  - Contract innovations
- Model specification
- Results
- Conclusion

Motivation

- End of the 1990s in CEEC:
  - Break up of the previously vertically coordinated supply chains ⇨ Contract enforcement problems
  - Macroeconomic instability & Price and trade liberalization

⇩

Credit constrained farmers

⇩

Quantity and Quality of the production ⇩

⇩

Emergence of innovative contract mechanisms

Motivation

- Delayed Payments
  - Example of hold up problem (Klein et al. 1978; Williamson 1985)
  - Direct impact: Effect on household budget, cash flow and profitability ⇨ Production & Quality ⇩ + Investments⇩
  - Indirect impact: Farmers expect delayed payment next year ⇨ Reluctant to invest in asset specific investments
  - Frequently observed in developing and transition countries (Bigsten et al. 2000; Fafchamps 2004; Fafchamps and Minten 2001; Gorton et al. 2000; Cungu et al. 2008)

Motivation

- Contract innovations
  - Introduced by foreign investors to improve quantity and quality of the production
  - Examples are farm assistance programmes (credit provision, input supply, milk collection on farm, …)
  - Positive impact on output & productivity, quality and investments (Gow and Swinnen 2000; Leat and Van Berkum 2003; White and Gorton 2004).

Household Survey

Household Survey

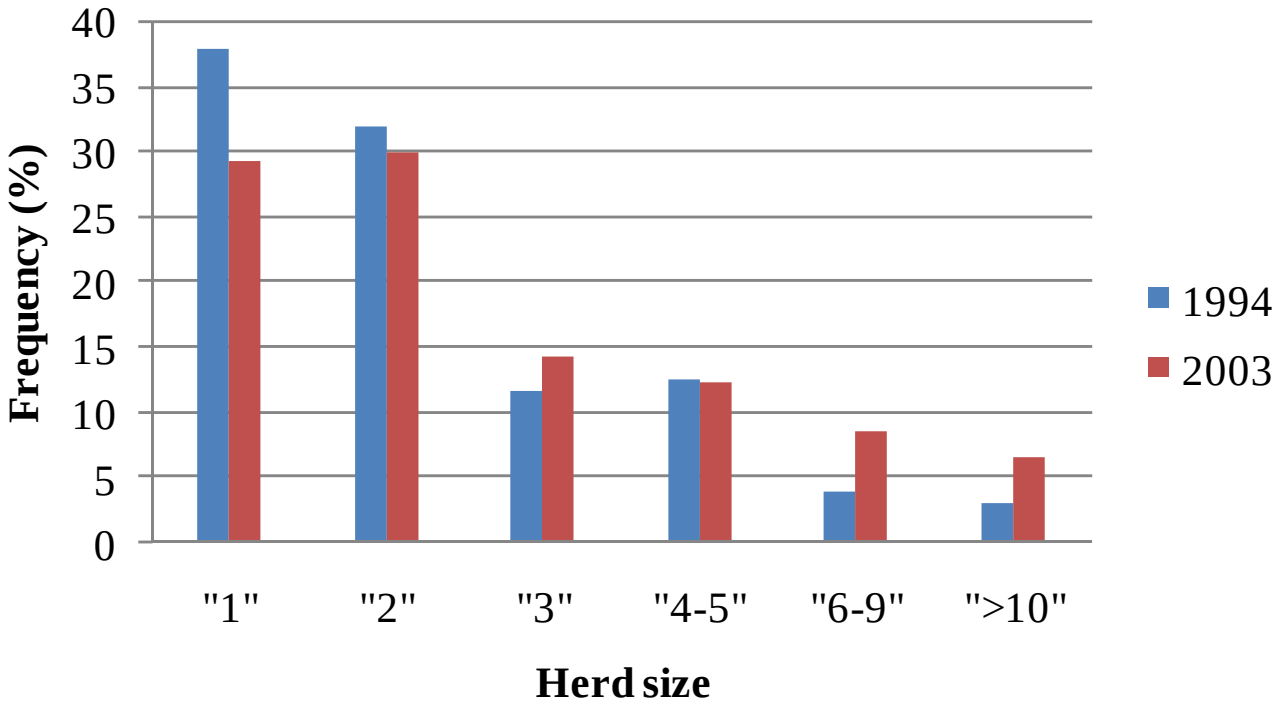
- Sample:
  - 2 regions: NCR and SCR with 44% of dairy producing households and 49% of dairy cows in Bulgaria
  - 6 counties: Pleven, Veliko Tarnovo, Gabrovo, Plovdiv, Haskovo, Stara Zagora
  - 22 villages (random selected)
  - 305 households that had at least some commercial dairy activities in the period 1994-2003 (random selected)

Descriptive statistics

- Farm growth
  - 20% of the farmers started in 1994-2003
  - 2,3% of the farmers stopped in 1994-2003

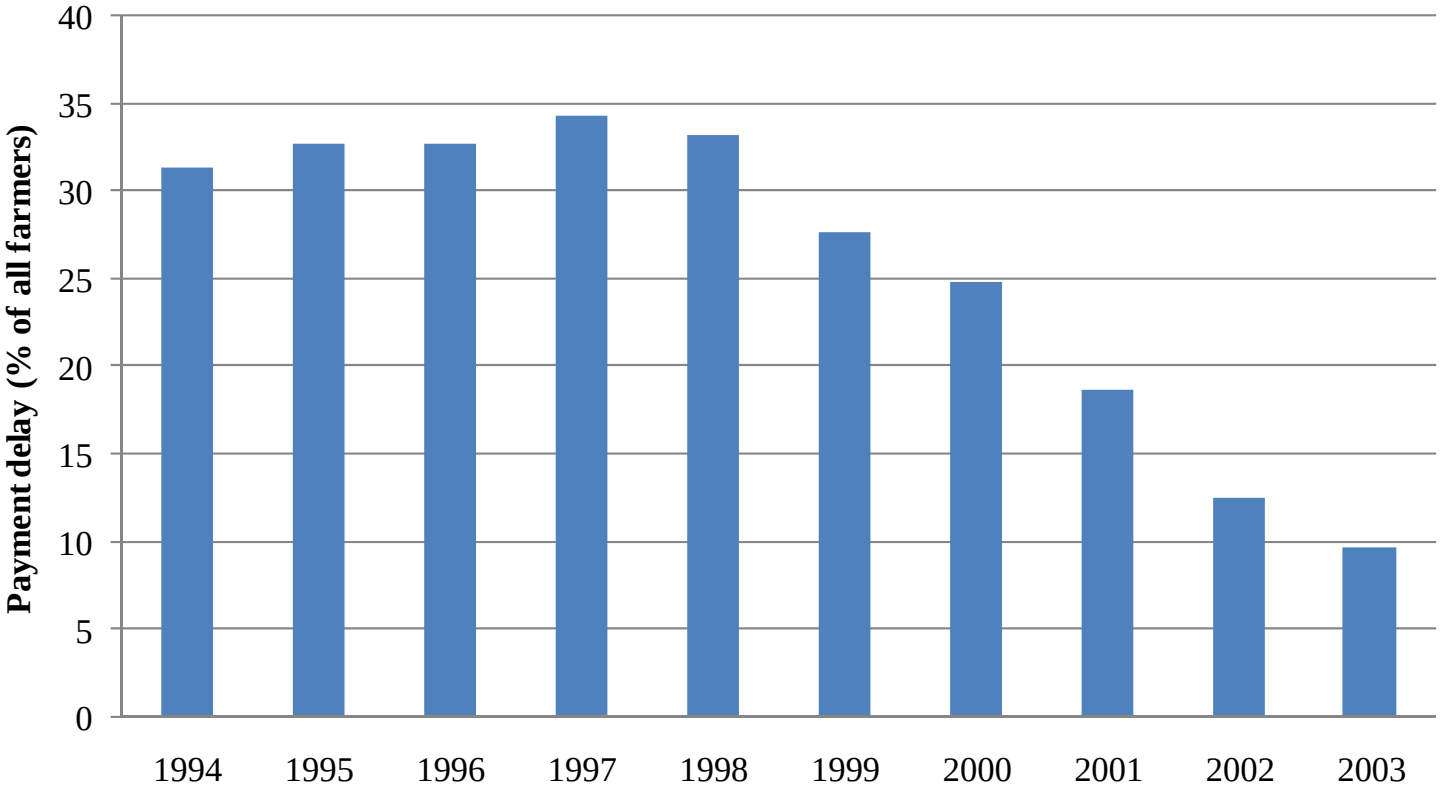
Descriptive statistics

- Farm growth



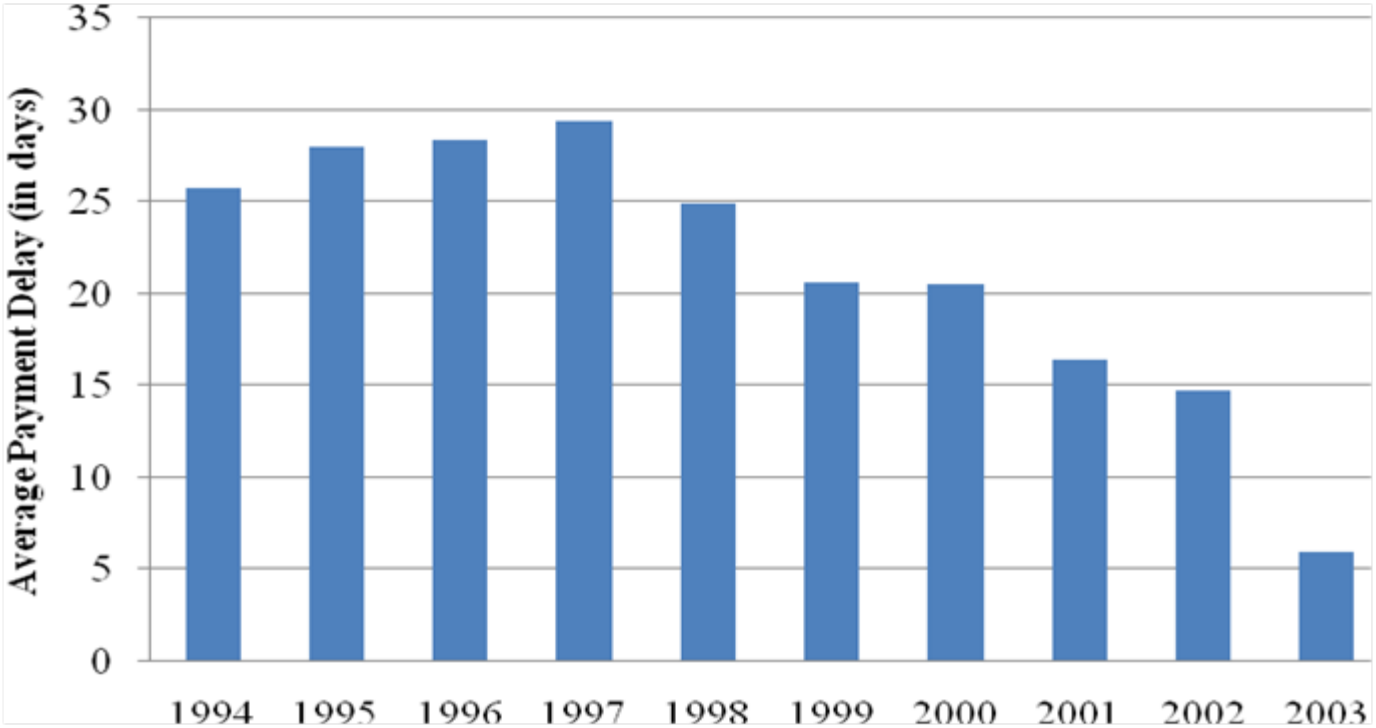
Descriptive statistics

- Payment delays



Descriptive statistics

- Payment delays



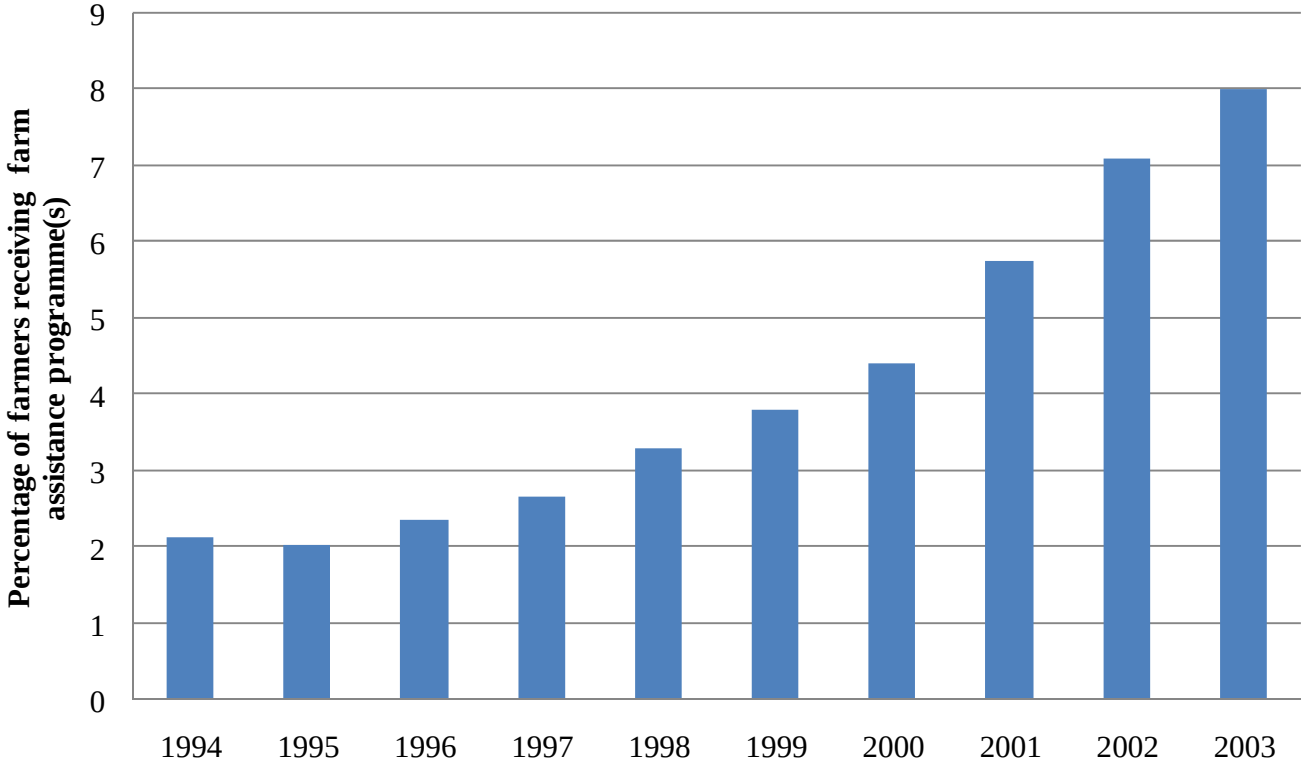
Descriptive statistics

- Contract innovations

Year	1994	1997	2000	2003
Agricultural extension service	3	5	5	6
Veterinary assistance	0	0	0	1
Forward credit for dairy specific investments	1	1	1	2
Forward credit for general agr. investments	1	1	1	1
Forward credit for buying cows	1	2	2	4
Forward credit for buying inputs	1	1	2	4
Milk collection at the farm	5	7	13	22
Bank loan guarantees	1	1	1	1
Forward credit to buy forage, animal medicine, etc.	2	2	3	5

Descriptive statistics

- Contract innovations



Model specification

- Farm growth function
  - $G_{i,t}$ = Growth of farm *i* in year *t*
  - $X_{i,t-1}$ = Contract characteristics in year *t-1*
  - Y_i = Household characteristics
  - $S_{i,t-1}$ = Farm size in number of cows in year *t-1*
  - $\varepsilon_{i,t}$ = Disturbance term

$$G_{i,t} = \ln(S_{i,t}) - \ln(S_{i,t-1}) = \ln\left[F(X_{i,t-1}, Y_i, S_{i,t-1})\right] + \varepsilon_{i,t}$$

Model specification

- Three estimation approaches
  1. Pooled OLS,
     but unobserved heterogeneity

$$\ln(S_{i,t}) - \ln(S_{i,t-1}) = a_0 + a_1 PAYTIME_{i,t-1} + a_2 PROGRAM_{i,t-1} + a_3 \ln(S_{i,t-1}) + a_4 \ln(S_{i,t-1})^2 + \sum_{j=1}^{k} b_j X_{i,b,t-1} + \sum_{j=1}^{l} c_j Y_{i,c} + \delta_t + \varepsilon_{i,t}$$

Model specification

- Three estimation approaches
  2. Fixed effects,

     but since in the whitin estimation $E\left[(\ln(S_{i,t-1})-\ln(\bar{S}_{i,.-1})),(\varepsilon_{i,t}-\bar{\varepsilon}_{i.})\right]$ does not equal 0, the estimates are biased and inconsistent

$$\ln(S_{i,t}) = \mu_i + a_1 PAYTIME_{i,t-1} + a_2 PROGRAM_{i,t-1} + (a_3 + 1)\ln(S_{i,t-1}) + a_4 \ln(S_{i,t-1})^2 + \sum_{j=1}^{k} b_j X_{i,b,t-1} + \delta_t + \varepsilon_{i,t}$$

Model specification

- Three estimation approaches

  3. System GMM (Blundell and Bond):

     uses lagged levels and lagged differences of the explenatory and the dependent variable as an instrument for the differenced equation

$$\ln(S_{i,t}) = \mu_i + a_1 PAYTIME_{i,t-1} + a_2 PROGRAM_{i,t-1} + (a_3 + 1)\ln(S_{i,t-1}) + a_4 \ln(S_{i,t-1})^2 + \sum_{j=1}^{k} b_j X_{i,b,t-1} + \delta_t + \varepsilon_{i,t}$$

Results SYS GMM

	Model A		Model B		Model C	
Dependent variable: farm size	**Coefficient**	**z-value**	**Coefficient**	**z-value**	**Coefficient**	**z-value**
Contract						
PAYTIME	-0.026	(-1.70)*	-0.025	(-1.69)*	-0.026	(-1.65)*
PRO	0.235	(4.41)***	0.235	(4.62)***	0.238	(3.65)***
FDI			0.024	(0.88)	0.042	(1.56)
CONTRACT					0.073	(1.34)
WRCON					-0.061	(-1.42)
Farm						
SIZE	1.038	(21.52)***	0.993	(22.66)***	1.004	(20.22)***
SIZESQ	-0.034	(-1.55)	-0.020	(-0.92)	-0.022	(-1.04)
Time dummies	Yes		Yes		Yes	
Constant	0.104	(1.41)	0.120	(1.53)	0.067	(1.36)
R^2						
Observations	2366		2366		2366	
Sargan test	70.41 (0.15)		93.29 (0.06)		88.21 (0.75)	
m_1	-9.92 (0.00)		-9.83 (0.00)		-9.79 (0.00)	
m_2	0.67 (0.50)		0.68 (0.49)		0.73 (0.47)	

*

Results

	OLS		FE		SYS-GMM	
Dependent variable: farm size	**Coefficient**	**t-value**	**Coefficient**	**t-value**	**Coefficient**	**z-value**
Contract						
PAYTIME	-0.020	(-2.00)**	-0.028	(-1.92)*	-0.026	(-1.65)*
PRO	0.042	(4.44)***	0.120	(4.25)***	0.238	(3.65)***
FDI	0.002	(0.15)	-0.029	(-1.42)	0.042	(1.56)
CONTRACT	-0.003	(-0.31)	0.075	(1.40)	0.073	(1.34)
WRCON	0.040	(1.42)	-0.044	(-1.00)	-0.061	(-1.42)
Farm						
SIZE	0.843	(47.33)***	0.676	(25.85)***	1.004	(20.22)***
SIZESQ	0.050	(6.23)***	0.031	(2.65)***	-0.022	(-1.04)
Time dummies	Yes		Yes		Yes	
Constant	0.152	(4.55)***	0.249	(4.42)***	0.067	(1.36)**
R^2	0.87		0.86		0.86	
Observations	2366		2366		2366	
Sargan test					88.21 (0.75)	
m_1					-9.36 (0.00)	
m_2					0.72 (0.47)	

Conclusion

- Delayed Payments:
  - Negative effect on farm growth
- Contract innovations (farm assistance programmes):
  - Positive effect on farm growth
- Findings relevant beyond the dairy industry in Bulgaria:
  - Farmers in the EU and USA: also credit constrained
  - Most developing countries and less economic advanced transition countries: still contracting problems

Thank you for your attention

Questions?