Contracts, Late Payments and Growth:

Evidence from Bulgarian Agriculture

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Outline

- Research question
- Motivation
- Data
- Descriptive statistics
- Model specification & Results
- Conclusion

Research Question

What is the impact of institutions and exchange in economic growth?

More specifically, how is economic growth in the Bulgarian dairy sector influenced by

1. contract break-downs (late payments) and

2. contractual innovations (farm assistance programs)?

Motivation

- Natural experiment: TRANSITION experience
    - Privatization (break up of supply chains)
    - Poor legal institutions & inadequate contract legislation
    - Price and trade liberalization
    - Macroeconomic instability

⟹ Contract enforcement problems (e.g. <u>late payments</u>)   (1)

⇩

Credit constrained farmers

⇩

Quantity and Quality of the production ⇩

⇩

Emergence of innovative contract mechanisms

(e.g. <u>farm assistance programs</u>)   (2)

Why the Bulgarian dairy sector?

- Importance of agriculture in Bulgaria
  - 17% of population employed in agriculture

- Importance of dairy in rural areas
  - 30% of all farms are dairy farms

- Interaction with the accession process
  - Changes in legislation and production practices to fulfill EU requirements

- Need for restructuring
  - Large decline in production, number of cows and productivity after transition
  - Mainly very small scale households producing dairy

Data

- Two data sources

  - In depth interviews with 11 dairy processing companies

  - Survey of 305 of their potential suppliers, mainly farm households

Dairy processor survey

- Region:
  - Central region
  - Sofia
  - North Eastern region

	Danone	Serdika90	Mlekimex	Fama	Iotovi	Markelli	Meggle	Merone	PRL	Mandra Obnova	Milky World
Processed milk (mio ltr./year)	36	24	20	19	11	10	6	4	3	2	1
Newly Established	No	No	No	Yes	Yes	No	Yes	Yes	No	No	Yes
FDI	Yes	No	No	No	No	No	Yes	No	No	No	No
If yes, since when	1993	-	-	-	-	-	2000	-	-	-	-
If yes, home country	France	-	-	-	-	-	Germany	-	-	-	-

Data

Household Survey


Data

Household Survey

- Sample:
  - 2 regions: NCR and SCR with 44% of dairy suppliers 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

- Data:
  - Information on the demographics, non-farm activities, contract behaviour, milk quality and investments over the period 1994-2003
  - Yearly information on the evolution of the payment conditions, the type of contract, the farmers' negotiation power and dairy processing company to whom they deliver

Data

Household Survey

| Number of cows per farm	Survey 1994			Survey 2003			Bulgaria, total, 2001		
	# farms	Share farms	Share cows	# farms	Share farms	Share cows	# farms	Share farms	Share cows
1	89	37,7	15,2	87	29,2	8,1	149323	70.7	45.0
2	75	31,8	25,7	89	30,0	16,5	42498	20.1	25.6
3-5	56	23,7	35,5	77	25,9	25,7	15552	7,4	16,5
6-9	9	3,8	10,3	25	8,4	15,7	2725	1.3	6.2
≥10	7	3.0	13,4	19	6,4	34.1	1071	0.5	6.7
Total	236	100	100	297	100	100	211169	100	100

Late payments

1. Have you experienced a payment delay or non payment in this year?
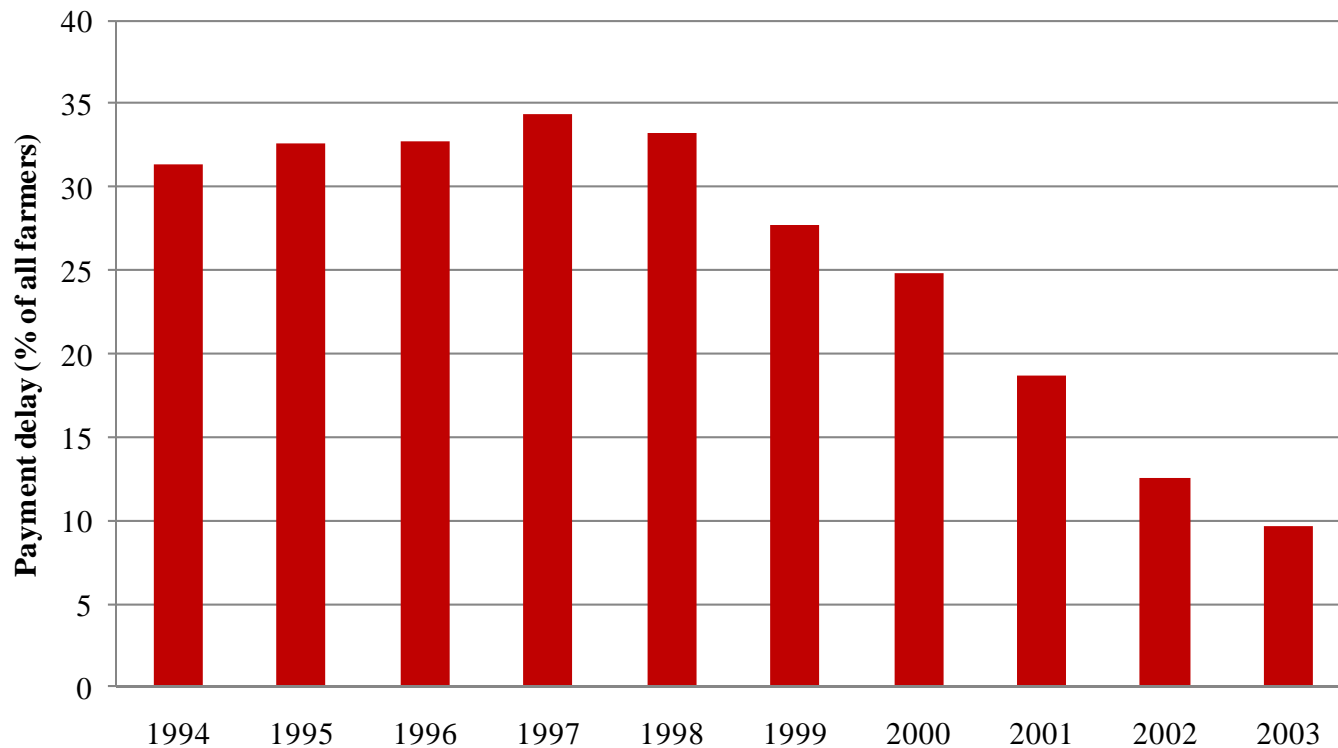
Late payments

2. On average, how long did it take until you received your payment?
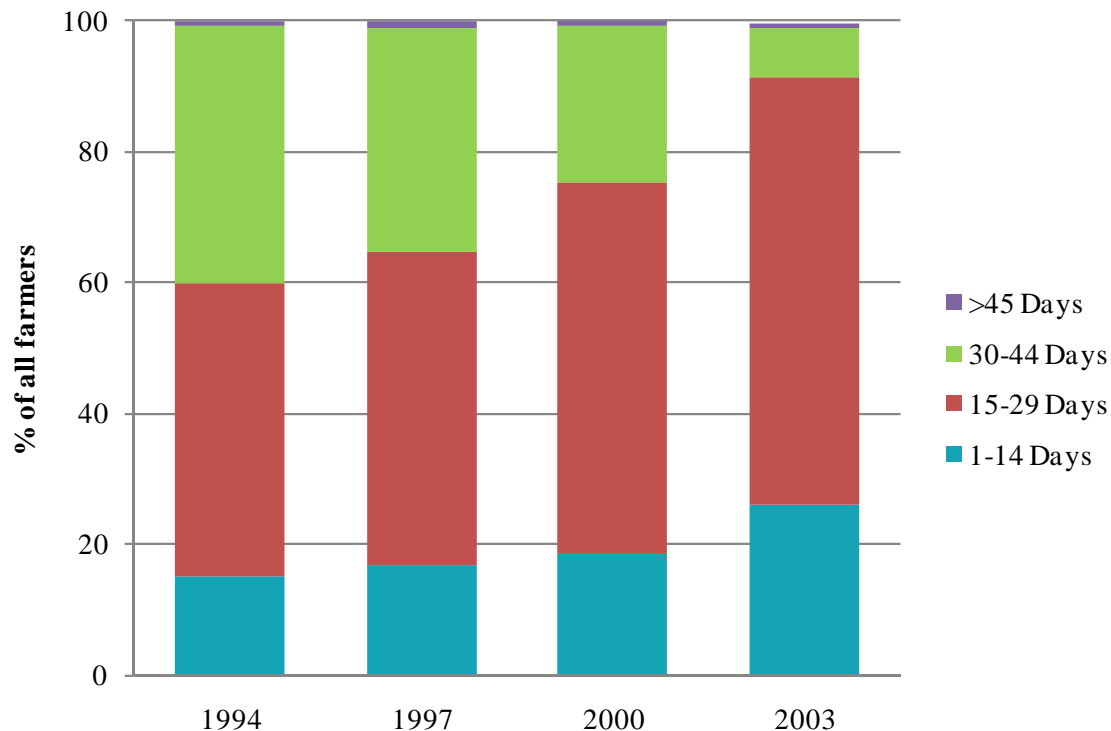
Farm assistance programs

	Danone	Serdika90	Mlekimex	Fama	Iotovi	Markelli	Meggle	Merone	PRL	Mandra Obnova	Milky World
Processed milk (mio ltr./year)	36	24	20	19	11	10	6	4	3	2	1
Newly Established	No	No	No	Yes	Yes	No	Yes	Yes	No	No	Yes
FDI	Yes	No	No	No	No	No	Yes	No	No	No	No
Does the company offers the following program and since when?											
Credit program	Yes (1997)	Yes (1997)	Yes (1997)	Yes (1994)	Yes (2001)	Yes (1999)	Yes (2001)	Yes (2000)	No	Yes (1998)	Yes (1999)
Input supply program	Yes (1998)	Yes (1997)	Yes (1997)	Yes (1994)	Yes (1995)	Yes (1998)	Yes (2001)	Yes (1992)	No	No	Yes (1999)
Extension service	Yes (2000)	Yes (1997)	Yes (1999)	No	No	No	Yes (2001)	Yes (1992)	Yes (2002)	Yes (2000)	Yes (1999)
Veterinary service	Yes (1995)	No	Yes (1997)	No	No	No	No	No	No	No	No
Bank loan guarantee	Yes (1999)	No	Yes (1998)	Yes (1994)	Yes (1995)	No	No	No	No	No	Yes (1999)
Milk payments in advance	Yes (1994)	No	No	Yes (1994)	Yes (1995)	No	Yes (2001)	Yes (1992)	No	Yes (1998)	Yes (1999)

Decriptive statistics

Farm assistance programs

- Number of farms receiving farm assistance programs:

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

Farm growth

- Survival of farms:
  - 75 % of all farm households started their dairy activities before 1994 and are still active in 2003

  - 22% of all farm households started their dairy activities after 1994 and are still active in 2003

  - 3% of all farm households stopped their dairy activities in the period 1994-2003

    (mainly because non-economic reasons)

Farm growth

- Size distribution:
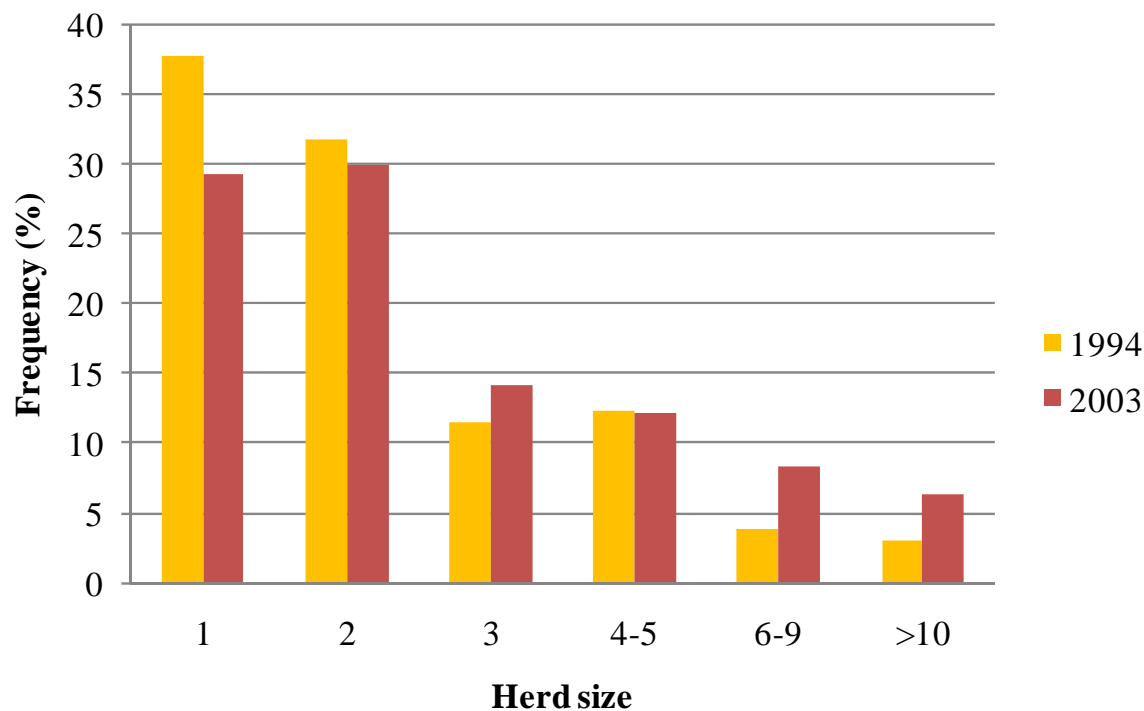
Model specification

- Firm growth relationship (Nelson and Winter 1982; Evans 1987; Weiss 1999; Dries and Swinnen 2004):

$$S_{i,t} = \left[F(X_{i,t-1}, S_{i,t-1}) \right] S_{i,t-1} \ e_{i,t}$$

- $S_{i,t}$ = Size of farm *i* in number of cows in year *t*

- $S_{i,t-1}$ = Size of farm *i* in number of cows in year *t-1*

- $X_{i,t-1}$ = vector of contract characteristics in year *t-1* (including late payments and assistance programs)

- $e_{i,t-1}$ = Error term

Model specification

- ## After taking logarithms:

$$\ln(S_{i,t}) - \ln(S_{i,t-1}) = a_0 + a_1 DELAY_{i,t-1} + a_2 PROGRAM_{i,t-1} + a_3 \ln(S_{i,t-1}) +$$

$$\sum_{j=1}^{k} b_j X_{i,b,t-1} + \varepsilon_{i,t}$$

- $S_{i,t}$ and $S_{i,t-1}$ = defined as on the previous slide
- $DELAY_{i,t-1}$ = impact of late payments in *t-1*
- $PROGRAM_{i,t-1}$ = impact of farm assistance programs received in *t-1*
- $X_{i,b,t-1}$ = vector of contract characteristics in year *t-1* (excluding late payments and assistance programs)
- $\varepsilon_{i,t-1}$ = Error term

Variables

Variable name	Description	Mean	Std. dev
Outcome variables			
GROWTH	Difference of natural logarithm of herd size in period t and in period t-1	0.03	0.24
FARMSIZE	Natural logarithm of the herd size in period t	0.80	0.68
Contract variables			
DELAY	Dummy for experiencing a late payment in t-1	0.27	0.44
PAYTIME	Natural logarithm of the time until payment of the farm in t-1(in days+1)	2.85	0.53
PROGRAM	Number of assistance programs received by the farm in t-1	0.08	0.55
CONTRACT	Dummy for having a oral or written contract in t-1	0.64	0.48
WRCONTRACT	Dummy for having a written contract in t-1	0.05	0.21
FDI	Dummy for foreign ownership of the dairy company to which the farm delivers in t-1	0.14	0.35
Household variables (time invariant)			
AGE	Natural logarithm of the age (in number of years) of the household head	4.03	0.23
EDU	Natural logarithm of the education (in number of years) of the household head	9.58	2.64
HHSIZE	Number of household members	3.46	1.72
COOPMEMB	Dummy for membership by a household member of a cooperative	0.45	0.49
NEWFARM	Dummy for farms that started in the period 1994-2003	0.22	0.42
SOUTH	Dummy for the region of the farm	0.46	0.50
Lagged Size variable			
SIZE	Natural logarithm of the herd size in period t-1	0.79	0.66

Model specification & Results

Pooled OLS

$$\ln(S_{i,t}) - \ln(S_{i,t-1}) = a_0 + a_1 DELAY_{i,t-1} + a_2 PROGRAM_{i,t-1} + a_3 \ln(S_{i,t-1}) +$$

$$\sum_{j=1}^{k} b_j \, X_{i,b,t-1} + \sum_{j=1}^{l} c_j \, Y_{i,c} + \delta_t + \varepsilon_{i,t}$$

- $S_{i,t}, S_{i,t-1}, DELAY_{i,t-1}, PROGRAM_{i,t-1}, X_{i,b,t-1}$ = like already defined
- $Y_{i,c}$ = vector with household variables
- δ_t = time dummies
- $\varepsilon_{i,t-1}$ = Error term

Problems with Pooled OLS

- Unobserved heterogeneity: Presence of non observed farm household specific effects that are correlated with the variables of interest or the control variables ⇨ Biased estimates

  For example: it is possible that dairy companies offer more productive farm households better payment conditions or more assistance programs and at the same time the more productive farm households are more likely to grow

Fixed effects

- Include household fixed effects μ_i to control for unobserved heterogeneity and rewrite the model:

$$\ln(S_{i,t}) = \mu_i + a_1 DELAY_{i,t-1} + a_2 PROGRAM_{i,t-1} + (a_3 + 1)\ln(S_{i,t-1})$$

$$+ \sum_{j=1}^{k} b_j \, X_{i,b,t-1} + \delta_t + \varepsilon_{i,t}$$

Problems with Fixed effects

- In the within estimation the regressor $\left(\ln(S_{i,t-1}) - \overline{\ln(S_{i,.})}\right)$ is correlated with the error $\left(\varepsilon_{i,t} - \overline{\varepsilon_{i,.}}\right)$, because $\ln(S_{i,t-1})$ is correlated with $\varepsilon_{i,t-1}$ and hence with $\varepsilon_{i,.}$

$\Longrightarrow$ Bias in the fixed effects dynamic specification

System GMM

- Method used by Blundell and Bond (1998):

  Estimates a system of equations:

  - First differenced equation where they use lagged levels of the explanatory and the dependent variable as instruments (cfr. Arrellano-Bond GMM)

  - Equation in levels where they use lagged first-differences of the explanatory and the dependent variables as instruments

Overview

Dependent variable: FARMSIZE	OLS model		Fixed effects		SYS GMM	
	Coefficient	t-value	Coefficient	t-value	Coefficient	z-value
Contract variables						
DELAY	-0.042	(-3.23)***	-0.076	(-2.30)**	-0.174	(-2.99)***
PROGRAM	0.038	(2.19)**	0.094	(3.05)***	0.138	(2.79)***
CONTRACT	0.004	(0.35)	0.099	(1.65)	-0.009	(-0.12)
WRCONTRACT	0.087	(1.67)*	-0.046	(-0.95)	0.009	(0.10)
FDI	-0.033	(-1.68)*	-0.045	(-1.60)	-0.026	(-0.62)
Size variables						
SIZE	0.935	(95.18)***	0.731	(36.65)***	0.905	(18.78)***
Household variables	Yes		No		Yes	
Time dummies	Yes		Yes		Yes	
Constant	0.154	(0.85)	0.176	(4.06)***	-2.510	(-1.81)*
R^2						
Observations	2335		2381		2335	
Sargan test	-		-		70.83 (0.18)	
m_1	-		-		-8.63 (0.00)	
m_2	-		-		1.40 (0.16)	

Robustness tests

- Estimation with a <u>different measure</u> for late payments, namely PAYTIME (=average time until payment)

  ⟹ Robust estimations

- <u>Recall bias</u> due to inaccurate reporting

  ⟹ Restricted sample (last 5 years)

  ⟹ Robust estimations

Robustness tests (variable PAYTIME)

Dependent variable: FARMSIZE	OLS model		Fixed effects		SYS GMM	
	Coefficient	t-value	Coefficient	t-value	Coefficient	z-value
Contract variables						
PAYTIME	-0.028	(-2.46)**	-0.027	(-1.81)*	-0.044	(-2.09)**
PROGRAM	0.041	(2.38)**	0.124	(4.36)***	0.193	(2.83)***
CONTRACT	0.003	(0.20)	0.069	(1.26)	0.001	(0.01)
WRCONTRACT	0.083	(1.58)	-0.033	(-0.66)	-0.025	(-0.26)
FDI	-0.023	(-1.15)	-0.035	(-1.25)	0.027	(0.58)
Size variables						
SIZE	0.933	(91.29)***	0.733	(37.88)***	0.890	(19.95)***
Household variables	Yes		No		Yes	
Time dummies	Yes		Yes		Yes	
Constant	0.190	(1.08)	0.733	(37.88)***	-2.30	(-1.48)*
R²		0.88		0.86		
Observations		2324		2369		2324
Sargan test		-		-		80.02 (0.38)
m_1		-		-		-8.88 (0.00)
m_2		-		-		1.02 (0.31)

Model specification & Results

Robustness tests (restricted sample)

Dependent variable: FARMSIZE	OLS model		Fixed effects		SYS GMM	
	Coefficient	t-value	Coefficient	t-value	Coefficient	z-value
Contract variables						
DELAY	-0.043	(-2.68)***	-0.055	(-1.69)**	-0.114	(-3.30)***
PROGRAM	0.046	(2.43)**	0.109	(2.64)***	0.231	(3.71)***
CONTRACT	0.005	(0.31)	0.059	(0.94)	-0.045	(-0.62)
WRCONTRACT	0.051	(1.36)	-0.054	(-1.05)	-0.031	(-0.44)
FDI	0.005	(-0.97)	-0.054	(-1.02)	-0.015	(-0.45)
Size variables						
SIZE	0.945	(71.36)***	0.501	(20.12)***	0.821	(20.29)
Household variables	Yes		No		Yes	
Time dummies	Yes		Yes		Yes	
Constant	-0.037	(-0.16)	0.433	(9.00)***		
R²		0.87		0.84		
Observations		1380		1413		1380
Sargan test		-				79.56 (0.02)
m_1		-				-7.72 (0.00)
m_2		-				-0.06 (095)

Model specification & Results

Conclusion

- Late payments:
  - Negative effect on farm growth
- Farm assistance programmes:
  - Positive effect on farm growth
- Findings relevant beyond the dairy industry in Bulgaria:
  - Most developing countries and less economic advanced transition countries: still disruptions in the supply chain and contracting problems + ineffective contract enforcement

Thank you for your attention

Questions?

Robustness tests
(OLS model)

Dependent variable: GROWTH	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Contract variables						
DELAY	-0.038	(-2.86)***	-0.038	(-2.92)***	-0.042	(-3.27)***
PROGRAM	0.048	(2.74)***	0.038	(2.06)**	0.038	(2.21)**
CONTRACT	-	-	0.005	(0.38)	0.003	(0.23)
WRCONTRACT	-	-	0.074	(1.42)	0.087	(1.67)*
FDI	-	-	-	-	-0.035	(-1.72)*
Lagged size variable						
SIZE	-0.060	(-5.41)***	-0.064	(-6.40)***	-0.064	(-6.59)***
Household variables		Yes		Yes		Yes
Time dummies		Yes		Yes		Yes
Constant	0.123	(0.67)	0.148	(0.82)	0.147	(0.81)
R²		0.07		0.07		0.07
Observations		2335		2335		2335

Robustness tests
(fixed effects model)

Dependent variable: FARMSIZE	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Contract variables								
DELAY	-0.069	(-2.07)**	-0.069	(-2.09)**	-0.076	(-2.30)**	-0.047	(-3.09)***
PROGRAM	0.096	(2.75)***	0.100	(3.15)***	0.094	(3.05)***	0.051	(2.49)**
CONTRACT	-	-	0.102	(1.64)*	0.099	(1.66)*	0.009	(0.64)
WRCONTRACT	-	-	-0.071	(-1.49)	-0.046	(-0.95)	0.065	(1.37)
FDI	-	-	-	-	-0.045	(-1.60)	-0.041	(-1.49)
Lagged size variable								
SIZE	0.729	(36.21)***	0.731	(36.55)***	0.731	(36.65)***	0.900	(82.94)***
Household variables	No		No		No		Yes	
Time dummies	Yes		Yes		Yes		Yes	
Constant	0.233	(9.99)***	0.170	(4.00)***			0.296	(1.44)
R²	0.87		0.86		0.86		0.87	
Observations	2381		2381		2381		2335	
Hausman test							235.38 (0.00)	

Robustness tests
(SYS GMM model)

Dependent variable: FARMSIZE	Coefficient	z-value	Coefficient	z-value	Coefficient	z-value
Contract variables						
DELAY	-0.157	(-2.65)***	-0.140	(-2.45)**	-0.174	(-2.99)***
PROGRAM	0.149	(3.43)***	0.120	(2.27)**	0.138	(2.79)***
CONTRACT	-	-	0.019	(0.17)	-0.009	(-0.12)
WRCONTRACT	-	-	0.031	(0.27)	0.009	(0.10)
FDI	-	-	-	-	-0.026	(-0.62)
Lagged size variables						
SIZE	0.919	(17.24)***	0.895	(17.87)***	0.905	(18.78)***
Household variables	Yes		Yes		Yes	
Time dummies	Yes		Yes		Yes	
Constant	-1.965	(-1.08)	-2.031	(-1.32)	-2.510	(-1.81)*
R²						
Observations	2335		2335		2335	
Sargan test	22.88 (0.41)		56.59 (0.14)		70.83 (0.18)	
m_1	-8.54 (0.00)		-8.65 (0.00)		-8.63 (0.00)	
m_2	1.38 (0.17)		1.36 (0.17)		1.40 (0.16)	

Model specification & Results

Late payments

2. If you experienced a payment delay, what was the longest payment delay in that year?

Dairy supply chain

Individual farmer

Milk collection point

Dairy processing company
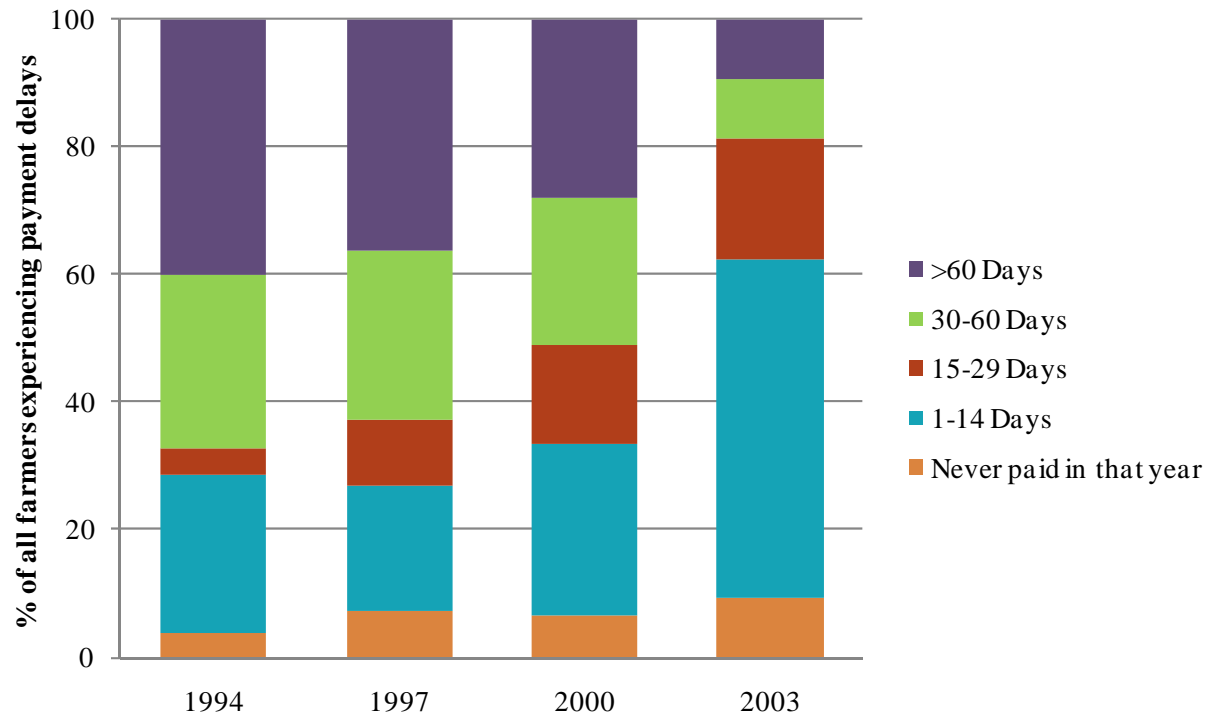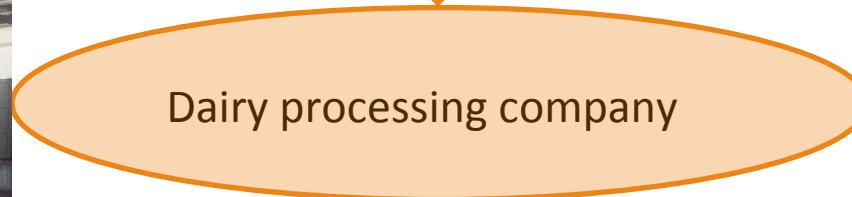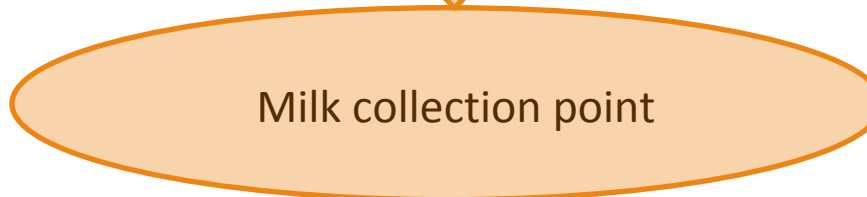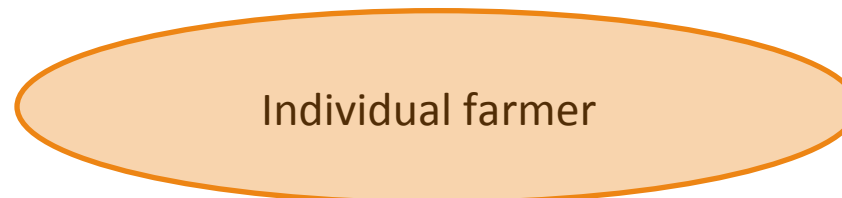
Late payments

"Virtually every commercial transaction has within itself an element of trust, certainly any transaction conducted over a period of time. It can plausibly be argued that much of the economic backwardness in the world can be explained by a lack of mutual confidence"

Arrow (1974)

Motivation

Late payments

- Contract enforcement

  - Legal contract enforcement (court action)

  - Private contract enforcement (reputation loss)

- Transition period:

  - Poor working legal institutions & inadequate contract legislation

  - Recent privatization ⇨ No reputation building yet & Creation of geographical monopolies and monopsonies

  ⇨ Ineffective contract enforcement

  ⇨ Emergence of "Hold-ups"

    (e.g. late payments by processing firms)

Motivation

Late payments

- Impact of late payments on firm growth (Cungu et al. 2008):

    - <u>Directly:</u> it puts the firms' working capital under pressure, worsen the firms' credit constraints, cash flow and profitability (especially in comb. with high inflation)

        ⇨ Short run: less input use

        ⇨ Long run: less investment capacity

        - <u>Indirectly:</u> firms that experienced a late payment will expect a late payment or non payment in the next year and adapt their behavior

    ⇨ Slows down firm growth

Motivation

Late payments

- Large literature on the occurrence of late payments in developing and transition countries:
  - In the manufacturing sector: Bigsten et al. 2000; Fafchamps 2004; Van Biesenbroeck 2005; Johnson et al. 1999
  - In the agricultural sector: Fafchamps and Minten 2001; Gorton et al. 2000; Cungu et al. 2008

  - Mostly ad hoc evidence and only little empirical evidence:
  - Cungu et al. 2008: They find that late payments have a significant negative effect on investments when farms consider late payments to be "important"

Farm assistance programs

- Introduced by foreign investors to improve quantity and quality of the production

- Examples are credit provision, input supply, milk collection on farm and investment support

- Enforcement typically by deductions from the payment to the farmer at the time of delivery ("interlinked contracts")

Motivation

Farm assistance programs

- Horizontal & vertical spillover effects:

(Dries and Swinnen 2004)

- Horizontal spillover effects because domestic companies rapidly after the introduction of these programs started to copy the programs

- Vertical spillover effects because improved access to finance & information for all farmers

⇨ Positive impact on productivity & quality

(Gow and Swinnen 2000; White and Gorton 2004;
Leat and Van Berkum 2003; Dries and Swinnen 2004, 2009)