



The Effects of Migration on Collective Action in Irrigation: Evidence from Rural China

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Motivation

- Extensive literature on collective action in the irrigation commons
- But little is known about effects of migration on collective action in irrigation



Irrigation Collective Action

- Araral, E. 2013. A Transaction Cost Approach to Climate Adaptation: Insights from Coase, Ostrom and Williamson and Evidence from the 400-year old Zangjeras. *Environmental Science & Policy*. 25:147-156
- Araral, E. 2013. Does geography matter to institutional choice? A comparative study of ancient commons. *Geoforum* 44: 224-231
- Araral, E, 2013. Ostrom, Hardin and the Commons. A Critical Appreciation and Revisionist View. *Environmental Science and Policy*. Volume 36, Pages 11-23
- Araral, E. (2011). The Impacts of Decentralization on Collective Action in Large Scale Commons. *Water Alternatives*. 4 (2): 110-123
- Araral, E. 2013. An institutional theory of robust socio-ecological systems: The case of the 2000 year-old Ifugao Society. *Human Ecology*. Volume 41, Issue 6, 2013, Pages 859-870
- Araral, E. (2011). The Impacts of Decentralization on Collective Action in Large Scale Commons. *Water Alternatives*. 4 (2): 110-123
- Araral, E. (2009). "What explains collective action in the commons? Theory with econometric results from the Philippines" *World Development*, Volume 37, Issue 3, March 2009, Pages 687-697

Findings

- migration has a statistically significant negative effect on collective irrigation
- controlling for type of irrigation and theoretically relevant variables
- can partly explain decline in surface irrigation and increase of groundwater irrigation since the 1980s (from 2.5m in 1980s to 5M in 2011)

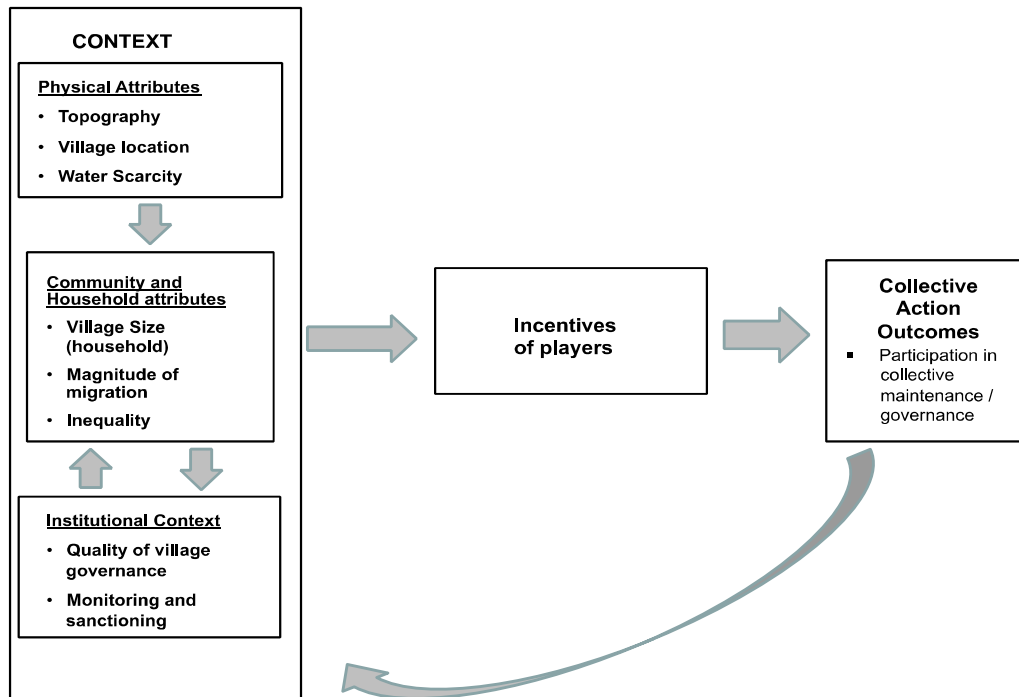
China as empirical case

- Urbanization 21% in 1982 to 56% in 2015
- → 278M rural to urban migrants by 2014
- Growth of ground water irrigation (40-70%)
- Double since 1980 (5M pumps in 2011)
- Drop in surface irrigation to 30% (WHY??)
- Irrigated land 50% of farmland
- 75% of grains / 90% of cash crops

Hypotheses

- Migration has a negative effect on collective action in surface irrigation
- Affects village leadership, social capital and sense of community, economic heterogeneity and dependency on irrigation

Framework



Data

- Survey in 2012 (household and village data)
- 1780 irrigation households
- 74 villages
- 18 provinces throughout China

Dependent variables		Definition	Expected sign
ODCA	Irrigation types: 0=rain-fed; 1= lift; 2= well; 3=open channel		\
CLTMTN	Frequency of participation in collective maintenance: 2=often; 1=normal; 0=seldom or never		\
CLTMET	Frequency of attending village meetings related to irrigation: 2=often; 1=normal; 0=seldom or never		
Independent variables			
Community attributes			
LMIGRATION	The share of households with out-migrants in total village households		-
LMIGRATION2	The share of out-migrants as proportion of village total population		-
LMIGRATION3	The share of out-migrants as proportion of total village labor size		-
GINI	Gini index: village level family income inequality measure		-
TOTALHOUSE	Village size: the number of total households		uncertain

Natural conditions		
TOPOGRAPHY	Plain=1 and 0 otherwise	+
LOCATION	Non-suburban village=1 and 0 otherwise	+
MIRRIGTSCAR	Moderate Water scarcity at village level=1 and 0 otherwise	+
SIRRIGTSCAR	Severe Water scarcity at village level=1 and 0 otherwise	-
Institutional arrangements		
VPAFAILURE	Village governance failure: 1 for petitions and conflicts, 0 otherwise	-
VSANCTION	Monitoring & sanctioning rules: 1 for imposing rules against free riders, 0 otherwise	+
Household characteristics		
HLABOR	Household labor: percentage of labors in household	+
IGTSHORTAGE	Irrigation shortage history: 1=never; 5=frequent	-
IMPTSHORTAGE	Impact of insufficient irrigation: 1=bad impact and 0 otherwise	+
MDISTANCE	Middle distance to public irrigation	+
LGDISTANCE	Long distance of village to public irrigation	+/-
AGE	Age of household head	Uncertain
EDU	Education of household head	uncertain

Variables	Description	Mean	Std. Dev.	Min.	Max.
Dependent variable	N=1780				
ODCA	Different irrigation types(3=open canal)	1.79	1.21	0	3
Independent variables					
LMIGRATION	Percentage of households with out-migrants	0.45	0.89	0	1
GINI	Gini index on village level	0.39	0.12	0.11	0.75
TOTALHOUSE	Ln(Number of total households)	5.83	1.05	2.30	7.56
TOPOGRAPHY	1= Plain; 0 otherwise	0.21	0.41	0	1
LOCATION	1=Non-suburban village; 0 otherwise	0.87	0.34	0	1
MIRRIGHTSCAR	1=Modest Water scarcity; 0 otherwise	0.43	0.49	0	1
SIRRIGHTSCAR	1=Severe Water Scarcity; 0 otherwise	0.23	0.42	0	1
VPAFAILURE	1=petitions and conflicts; 0 otherwise	0.49	0.50	0	1
VSANCTION	1=rules existence; 0 otherwise	0.24	0.43	0	1
HLABOR	Percentage of labors in household	0.62	0.25	0	1
IGTSHORTAGE	1=never; 5=frequent	2.24	1.18	1	5
IMPTSHORTAGE	1=bad impact; 0 otherwise	0.78	0.42	0	1
MDISTANCE	1=middle distance; 0 otherwise	0.32	0.47	0	1
LGDISTANCE	1=long distance; 0 otherwise	0.15	0.36	0.00	1
	Age of household head (years)				

	Rain-fed	Lift	Well	Canal
Migration:				
LMIGRATION=HIGH	40.92	22.99	7.37	28.74
LMIGRATION=LOW	16.39	17.02	20.45	46.14
Natural conditions:				
TOPOGRAPHY=1	6.23	13.03	39.38	41.36
TOPOGRAPHY=0	26.85	19.96	11.37	41.82
MIRRIGHTSCAR=1	14.81	21.74	13.72	49.73
SIRRIGHTSCAR=1	31.01	21.88	18.75	28.37

Institution arrangements:	Rainfed	Lift	Well	Canal
VPAFAILURE=1	27.19	17.96	17.72	37.13
VPAFAILURE=0	18.27	19.07	16.57	46.08
VSANCTION=1	14.46	21.32	19.85	44.36
VSANCTION=0	25.15	17.66	16.28	40.9
Household characteristics:				
IGTSHORTAGE=SELDOM	15.92	19.42	15.73	48.93
IGTSHORTAGE=OFTEN	32.65	17.2	19.24	30.9
IMPTSHORTAGE=1	23.37	17.98	17.45	41.2
IMPTSHORTAGE=0	19.95	20.47	16.01	43.57
MDISTANCE=0	27.73	18.26	17.23	36.78
MDISTANCE=1	11.89	19.1	16.94	52.07
LGDISTANCE=1	15.69	25.49	9.8	49.02

ODCA	Different irrigation types(1=open canal)	1.79	1.21	0	3
Independent variables					
LMIGRATION	Percentage of households with out-migrants	0.45	0.89	0	1
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LOCATION	1=Non-suburban village; 0 otherwise	0.87	0.34	0	1
MIRIGTSCAR	1=Modest Water scarcity; 0 otherwise	0.43	0.49	0	1
SIRIGTSCAR	1=Severe Water Scarcity; 0 otherwise	0.23	0.42	0	1
VPAFAILURE	1=petitions and conflicts; 0 otherwise	0.49	0.50	0	1
VSANCTION	1=rules existence; 0 otherwise	0.24	0.43	0	1
HLABOR	Percentage of laborers in household	0.62	0.25	0	1
IGTSHORTAGE	1=never; 3=frequent	2.24	1.18	1	5
IMPTSHORTAGE	1=bad impact; 0 otherwise	0.78	0.42	0	1
MDISTANCE	1=middle distance; 0 otherwise	0.32	0.47	0	1
LGDISTANCE	1=long distance; 0 otherwise	0.15	0.36	0.00	1
AGE	Age of household head (years)	47.41	19.09	14	88

Table 3. Irrigation type distribution of different group

	Rain-fed	Lift	Well	Canal
Migration:				
LMIGRATION=HIGH	40.92	22.99	7.37	28.74
LMIGRATION=LOW	16.39	17.02	20.45	46.14
Natural conditions:				
TOPOGRAPHY=1	6.23	13.03	39.38	41.36
TOPOGRAPHY=0	26.85	19.96	11.37	41.82
MIRRIGTSCAR=1	14.81	21.74	13.72	49.73
SIRRIGTSCAR=1	31.01	21.88	18.75	28.37
Institution arrangements:				
VPAPAILURE=1	27.19	17.96	17.72	37.13
VPAPAILURE=0	18.27	19.07	16.57	46.08
VSANCTION=1	14.46	21.32	19.85	44.36
VSANCTION=0	25.15	17.66	16.28	40.9
Household characteristics:				
IGTSHORTAGE=SELDOM	15.92	19.42	15.73	48.93
IGTSHORTAGE=OFTEN	32.65	17.2	19.24	30.9
EMPTSHORTAGE=1	23.37	17.98	17.45	41.2
EMPTSHORTAGE=0	19.95	20.47	16.01	43.57
MDISTANCE=0	27.73	18.26	17.23	36.78
MDISTANCE=1	11.89	19.1	16.94	52.07
LGDISTANCE=1	15.69	25.49	9.8	49.02

	Dep.=ordered collective irrigation (ODCA)			
Variables	(1)	(2)	(3)	(4)
LMIGRATION	-0.133***	-0.191***	-0.187***	-0.188***
	(0.041)	(0.049)	(0.049)	(0.050)
Other community attributes:				
GINI	-1.493***	-1.516***	-1.489***	-1.566***
TOTALHOUSE	0.163***	0.182***	0.180***	0.171***
Natural conditions:				
TOPOLOGY	0.420***	0.601***	0.599***	0.613***
	(0.071)	(0.101)	(0.101)	(0.102)
LOCATION	0.067	0.160	0.167*	0.196*
	(0.087)	(0.100)	(0.100)	(0.102)
MIRRIGTSCAR	0.352***	0.236***	0.221***	0.146*
	(0.058)	(0.070)	(0.071)	(0.087)
SIRRIGTSCAR				-0.137

Institution arrangements:				
VPAFAILURE	-0.256***	-0.157**	-0.152**	-0.140**
	(0.056)	(0.063)	(0.063)	(0.064)
VSANCTION	0.167**	0.171**	0.160**	0.170**
	(0.065)	(0.077)	(0.077)	(0.077)
Household characteristics:				
HLABOR	0.410***	0.196*	0.206*	0.207*
	(0.108)	(0.113)	(0.114)	(0.114)
IGTSHORTAGE	-0.190***	-0.140***	-0.143***	-0.138***
IMPTSHORTAGE	0.068	0.094	0.096	0.092
MDISTANCE	0.447***	0.386***	0.448***	0.451***
AGE	0.002	-0.005**	-0.005**	-0.006**
EDU	-0.010	-0.017*	-0.017*	-0.018*
	(0.009)	(0.009)	(0.009)	(0.009)
LGDISTANCE			0.244***	0.246***

	Dep.=ordered collective irrigation maintenance				
VARIABLES	(1)	(2)	(3)	(4)	margins
LMIGRATION3	-0.228**	-0.218**	-0.264**	-0.261*	0.055*
Other social economics controls:					
TOTALHOUSE	-0.123	-0.157	-0.187	-0.253*	0.053*
ECONOMYPOWER	-0.395**	-0.415**	-0.388**	-0.397*	0.083*
Natural geographic controls:					
TOPOGRAPHY	0.154	0.352	0.198	0.143	-0.030
LOCATION	-1.231***	-1.277***	-1.368***	-1.183***	0.249***
DISTOTOWN	0.275	0.332	0.390	0.189	-0.040
Governance and institution setup:					
VPAFAILURE	-0.506**	-0.520**	-0.578**	-0.483*	0.102*
VSANCTION	-0.353	-0.347	-0.335	-0.051	0.011
Provincial water endowment controls:					
WATERENDOW		0.165	0.352*	14.594	-3.068

Conclusion

- migration has a statistically significant negative effect on collective irrigation
- controlling for type of irrigation and theoretically relevant variables
- can partly explain decline in surface irrigation and increase of groundwater irrigation since the 1980s (from 2.5m in 1980s to 5M in 2011)

- but effects mediated through leadership, social capital, sense of community, economic heterogeneity, and dependence on resources
- Also mediated by proximity to urban centers or towns, increased inequality, lower levels of household labor, topography, water shortages.

Limitations

- Not panel data
- positive effects of migration on collective action have been omitted in the survey, e.g. remittances could be used to support local schools, culture, infrastructure, or in general human capital



Thank you

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