Mobility and Desertification: New Evidence from Rural Household Survey in the Minqin Oasis, Northwest China

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Introduction

In the increasing global discussion on impacts of climate change, migration has been one of central issues.[1,2,3] Despite the potential for climate and other forms of environmental change to profoundly affect human mobility, we still have limited empirically grounded knowledge of the relationships between climate change and population mobility.[4,5]

This study addresses the issue of how, and to what extent, climate and political factors interact with other drivers to shape people's migration choices in the Minqin oasis in northwest China. This study area provides a special case because of drastic desertification and increased water shortage in the region, high levels of governmental intervention to reverse the steady spread of desertification and environmental degradation, and willingness of government to enforce climate induced migration and displacement of large numbers of rural residents.

The analysis of the paper is built upon an existing conceptual framework for unravelling the relationship between climate change and migration.[6]

Study Area

The study area encompasses 5 townships of Minqin county, four of which are located at the terminus of the Shiyang River in northwest China (Fig. 1).

Minqin oasis is surrounded by two large deserts: Badain Jaran Desert in northwest and Tengger Desert in northeast, which converge at the Qingtu Lake. This region is extremely dry, with annual rainfall being less than 150mm across majority of the county and even less than 50mm in the lake area; but evaporation is as much as 2,000-2,600mm per annum.

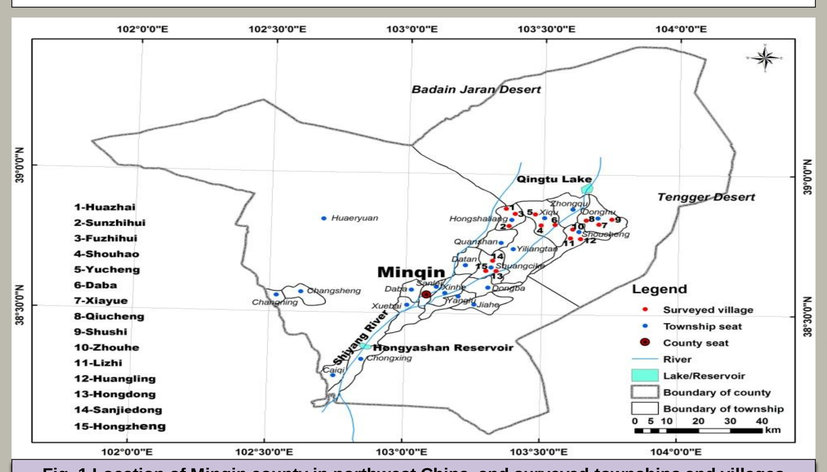

Fig. 1 Location of Minqin county in northwest China, and surveyed townships and villages

Method

Two classes of Probit models are estimated.
- the *past migration models* for migration that occurred in 2008-12
- the *future migration models* for intended migration in 2013-14

The dependent variable for the past model (or future model) is defined as:
- 1 if anyone of the household has migrated since 2008 (or plans to migrate in 2013-14)
- 0 if otherwise.

The explanatory variables of interest include two domains of factors:
- climate change effects : the reductions in cropping (including livestock) production, arable land, and water
- political factors: the villagers' *willingness* to participate in, and *satisfaction* with, governmental migration policies and programs.

The control variables consist of:
- individual and household characteristics, housing, social networks and health.

Lagged explanatory and control variables are used in the estimations.

Primary Data Collection

- a three-stage Probability Proportionate to Size (PPS)
- N=440 households
- proportionate distribution of the total sample size to each township in terms of population size in 2010
- random selection of 3 villages in each selected township
- a structured questionnaire survey in August 2012

Results

Past Migration

Table 1. Climate change and probability of past migration

Variables	MFX	MFX	MFX
Cropping	-0.0428**		
Arable land		0.0365*	
Water quantity			0.0455**
Household head	-0.0486**	-0.0507***	-0.0502***
Age	-0.0010*		
Rural hukou	-0.0821*	-0.0795*	-0.0877*
Schooling	0.0128***	0.0129***	0.0128***
Housing area	-0.0001*		-0.0001*
Type of house (ref. clay): wood	0.1666*	0.1474*	0.1616*
Other cities	0.0393*	0.0336*	0.0334*
Having physical problems	-0.0757***	-0.0764***	-0.0787***
Township fixed effects	controlled	controlled	controlled
Observations	1810	1805	1807
Pseudo R^2	0.19	0.19	0.19

* p<.10; ** p<.05; *** p<.01.

Table 2. Estimated impacts of willingness to participate in various migration projects on past migration decisions

Variables	MFX	MFX	MFX
Willingness to participate in ecological/anti-poverty migration	-0.0005		
Willingness to participate in 'export of migrant workers' program		0.0025***	
Willingness to participate in displacement & resettlement			0.0006
Household head	-0.0527***	-0.0523***	-0.0529***
Rural hukou	-0.0837*	-0.0900*	-0.0842*
Schooling	0.0129***	0.0133***	0.0129***
Housing area	-0.0001*		-0.0001*
Type of house (ref. clay): wood	0.1653*	0.1653*	0.1638*
Other cities	0.0351*	0.0346*	0.0349*
Other provinces		0.0320*	
Having sensory problems		-0.0447*	
Having physical problems	-0.0773***	-0.0729***	-0.0769***
Township fixed effects	controlled	controlled	controlled
Observations	1804	1807	1804
Pseudo R^2	0.19	0.2	0.19

* p<.10; ** p<.05; *** p<.01.

Table 3. Estimated impacts of satisfaction with various migration policies on past migration decisions

Variables	MFX	MFX	MFX
Government support	-0.0018		
Overall willingness		0.0033	
Overall satisfaction			0.0012
Household head	-0.0510***	-0.0508**	-0.051***
Rural hukou	-0.0834*	-0.0848*	-0.0839*
Schooling	0.0130***	0.0130***	0.0130***
Housing area		-0.0001*	-0.0001*
Type of house (ref. clay): wood	0.1667*	0.1673*	0.1629*
Other cities	0.0353*	0.0365*	0.0358*
Having physical problems	-0.0783***	-0.0775***	-0.0786***
Township fixed effects	controlled	controlled	controlled
Observations	1810	1810	1810
Pseudo R^2	0.19	0.19	0.19

* p<.10; ** p<.05; *** p<.01.

Future migration

Table 4. Climate change and probability of future migration

Variables	MFX	MFX	MFX
Cropping (2011)	-0.0223		
Arable land (2011)		0.0087	
Water quantity (2011)			0.0097
Married	-0.0279*	-0.0261*	-0.0263*
Schooling	0.0096***	0.0096***	0.0096***
Household size	-0.0101*	-0.0091*	-0.0088*
Log income per capita	-0.0208*	-0.0196*	-0.0198*
Officials	0.0248*	0.0246*	0.0241*
Other counties		0.0239*	0.0243*
Having sensory problems	-0.0570***	-0.0568***	-0.0575***
Township fixed effects	controlled	controlled	controlled
Observations	1796	1791	1796
Pseudo R^2	0.23	0.23	0.23

* p<.10; ** p<.05; *** p<.01.

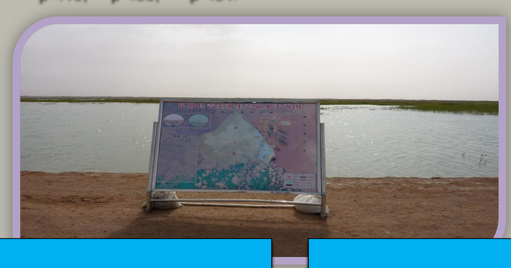

Table 5. Estimated impacts of willingness to participate in various migration projects on future migration intentions

Variables	MFX	MFX	MFX
Willingness to participate in ecological/anti-poverty migration	0.0039*		
Willingness to participate in 'export of migrant workers' program		-0.0001	
Willingness to participate in displacement & resettlement			0.0065***
Married	-0.0256*	-0.0264*	-0.0254*
Schooling	0.0096***	0.0096***	0.0095***
Household size	-0.0092*	-0.0090*	-0.0100*
Log income per capita	-0.0204*	-0.0206*	-0.0190*
Income inequality	-0.0091***	-0.0097***	-0.0101***
Housing condition	0.0043*		
Type of house (ref. clay): brick			-0.0266*
Officials		0.0258*	
Other counties	0.0246*	0.0246*	0.0272*
Having sensory problems	-0.0543**	-0.0568**	-0.0560*
Township fixed effects	controlled	controlled	controlled
Observations	1790	1793	1790
Pseudo R^2	0.24	0.23	0.24

* p<.10; ** p<.05; *** p<.01.

Table 6. Estimated impacts of satisfactions with various migration policies on future migration intentions

Variables	MFX	MFX	MFX
Government support (2011)	-0.0019		
Overall willingness (2011)		0.0031	
Overall satisfaction (2011)			0.0052*
Married	-0.0265*	-0.0271*	-0.0262*
Schooling	0.0096***	0.0096***	0.0094***
Household size	-0.0087*	-0.0090*	-0.0094*
Log income per capita	-0.0202*	-0.0206*	-0.0199*
Officials	0.0251*	0.0248*	0.0234*
Other counties	0.0241*	0.0256*	0.0242*
Having sensory problems	-0.0571**	-0.0560**	-0.0554**
Township fixed effects	controlled	controlled	controlled
Observations	1796	1796	1796
Pseudo R^2	0.23	0.23	0.24

* p<.10; ** p<.05; *** p<.01.

Conclusion

❖ **Climatic impacts:**
- significantly stimulated migration decisions in last five years (2008-12); *but*
- insignificantly associate with intended migration in next two years (2013-14).

❖ **Political factors** are playing an increasingly significant part in intended future migration in the study area:
- The 'willingness to participate in job-orientated programs' has significant impact on past migration.
- People's 'overall satisfaction level with policies on migration' could raise the probability of migration.

❖The findings of the study offers strong support for Black et al. (2011) views that environmental factors are a part of a wider constellation of forces influencing migration.

❖ Vulnerable housing conditions and health disadvantages have statistically significant and quantitatively great impact on individual mobility.

❖ Social networks, marital status, household size, per capita household income, and relative income inequality perceived by villagers, are critical factors for migration intentions in the future.

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