

Driving Forces of the Changes in Livestock in Inner Mongolia: Population, Price and Policy

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Introduction

The grassland degradation is becoming very serious, leading sand storm and many other environmental problems in northern China including Inner Mongolia. The degradation is widely believed as result of over-grazing and over-cultivation, and recently the significant increases in air temperature due to global warming, with the increases varying significantly and being nonparallel among ecosystems

The mechanism of the grazing and its causes and consequence can be illustrated by two steps: First grazing as economic behaviors is to maximize the utilities in subsistence economy and profit in market economy which is in response to change of the markets and policies as well as the climate. Then, grazing would direct affect the grassland quality and productivity from both of intensity and animals' composition. Therefore, understanding the grassland changes in quality as well quantity, the key issue is to examine the grazing behaviors. Unlike other studies mainly addressing the relationship between grazing and its impact on grassland degradation, this study would mainly aim to understand the grazing behaviors.

Animal husbandry is the economic foundation of Inner Mongolia. Figure 1 presents the total number of large animals since 1947. Sheep and goats have experienced a great increment from 1947 to 2009; The number of cattle has remained the same since 1947 both due to restrictions as cattle, and less economic profit compared with sheep or goats. The draft animals (horse, donkey, mules and camels) had been increasing until late 1970s. Since then, the number of draft animals have been decreasing resulted from the transition of lifestyle, fast economic growth, social development, and more importantly the changes in transportation both in domestic and military affairs.

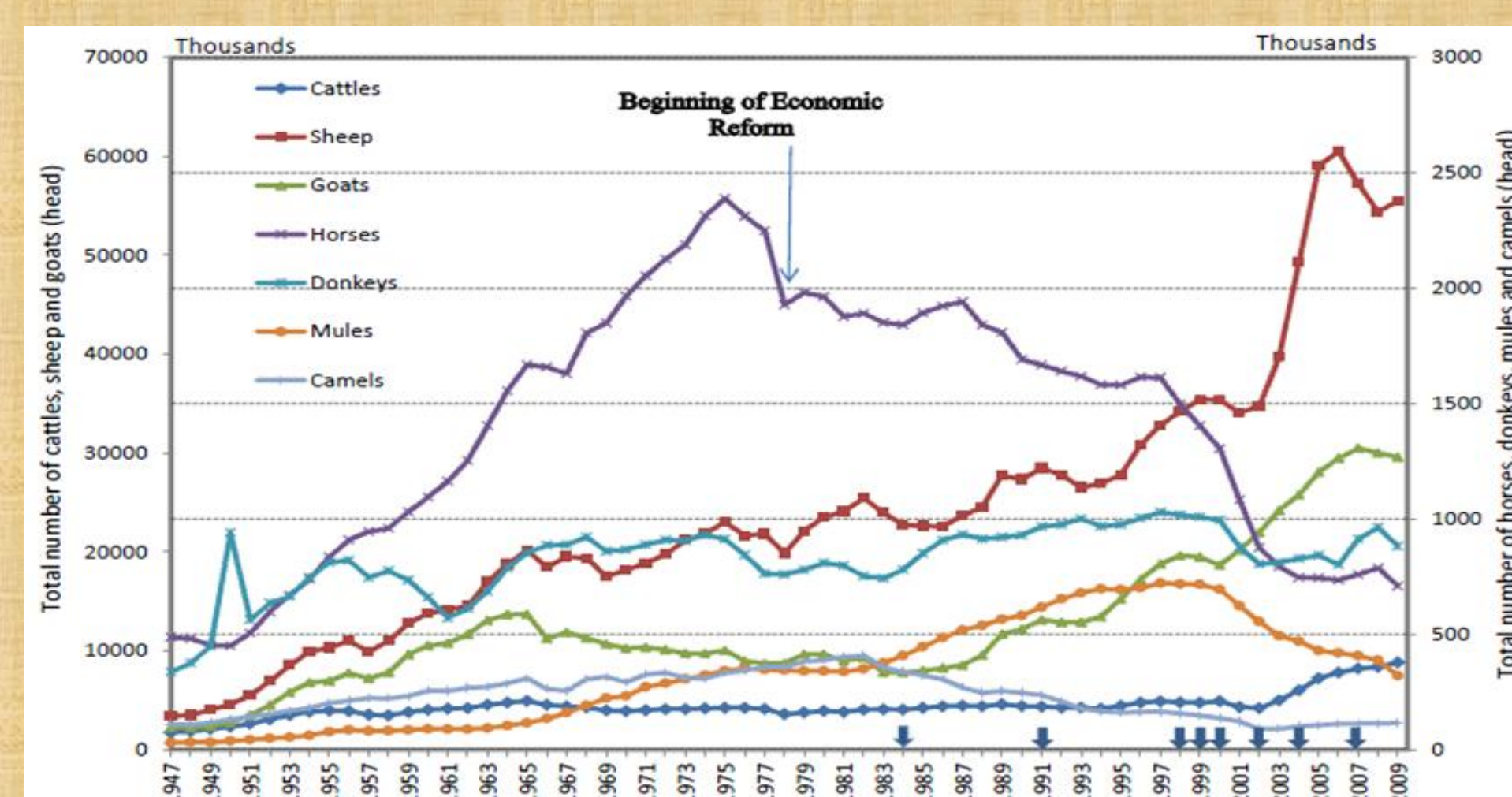


Fig. 1: Total number of livestock in the middle of the year in Inner Mongolia from 1947 to 2009

Economic Models of Livestock and Grazing

The substantial increase for goats, sheep, and cattle in the late 1980s was largely a result of livestock and grassland tenure reform, while the drop in livestock around 2000 was caused by the grassland restoration policy enacted in 1998-1999. The substantial livestock increase since 2004 was likely caused by growing demand driven by fast economic growth and market reform (Figure 1). Conceptually the grazing model of livestock is as follows:

$$\text{Livestock} = f(\text{population, price indexes, policies})$$

Population

In central planned economy, animal husbandry industry was guided by central planning for the various products. The objectives of the planning economy are to maximize the productions to the social needs not only from local people but also for the whole nation. The local population is often key underlying force of grazing production capacity. There is a significant impact from population growth on grassland over-grazing (see Figure 2).

Prices

In market economy the grazing is increasingly induced by market signal—relative prices. Figure 3 illustrate the changes of prices for the major products: mutton, beef, wool, cashmere and milk. Seen from the Figure 3, the relative prices appear fluctuating significantly along the time. The biggest change was cashmere which appeared 100 times of variation from the early 1980s to 2010. Another significant increase is mutton and beef. The wool and milk seems decreasing overall over time. Due to the transportation and the large scope of the territory of Inner Mongolia, the prices variation seems significant. The changing prices induce the changes of grazing behaviors and the allocation of time as well as grassland for various animals

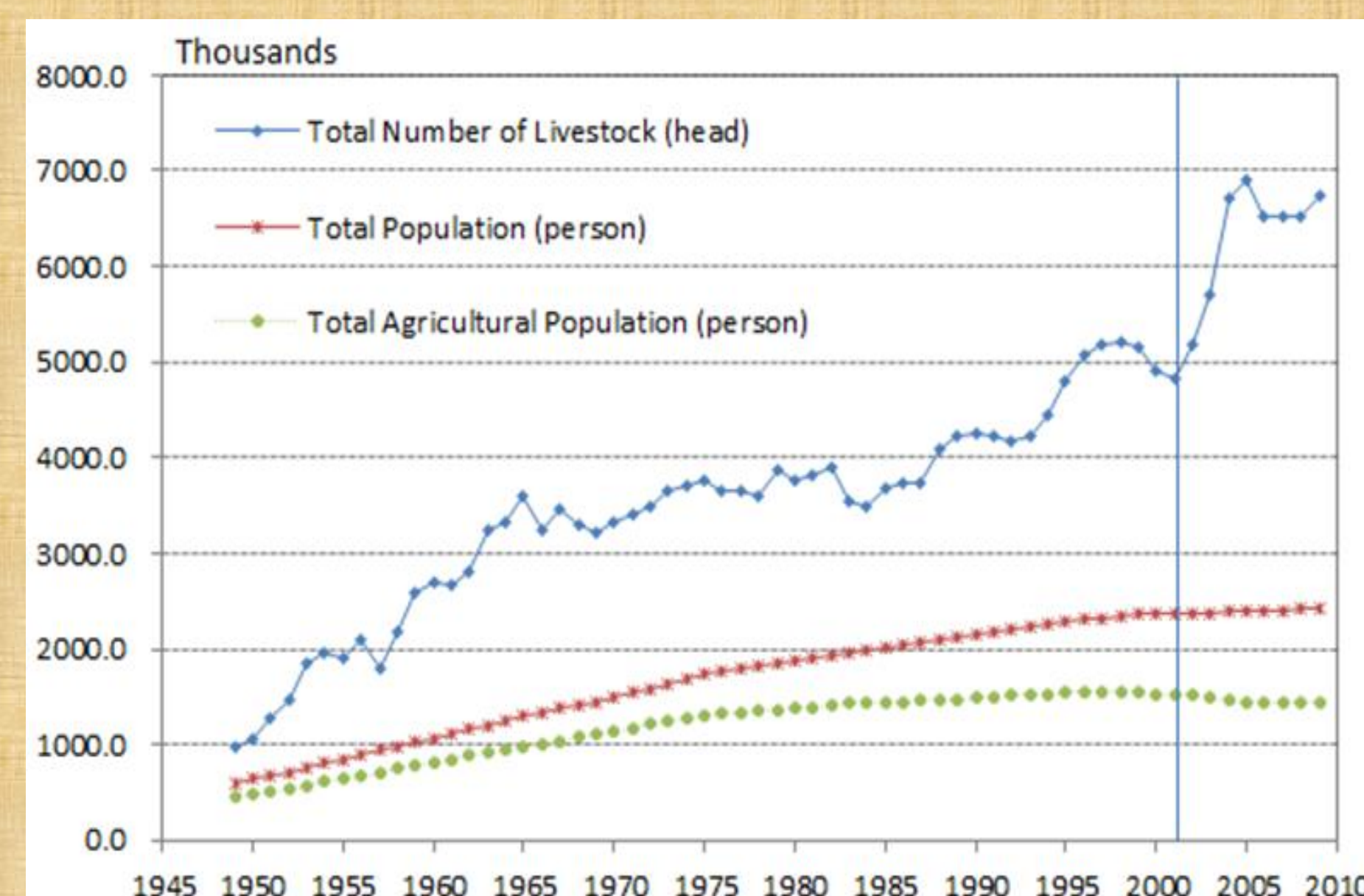


Fig. 2: Population & livestock in Inner Mongolia, Data source: Inner Mongolia Statistic Yearbook, 2010 (data are taken at Year-end).

Policy

The first notable change was the property rights of the livestock, first, then the grassland, from centralization ownership and management to decentralized management and privatization since the late 1970s. This change indicates the economy was transition from the central plan economy into market economy. It was argued that argue that the governmental policies particularly the property right changes promote overgrazing. The second notable change was grassland protection (regulation) and restoration policies since the late 1990s. The most important ones include no-grazing subsidies, pastoralists' production subsidies, and education and training of pastoralists for livelihood transformation.

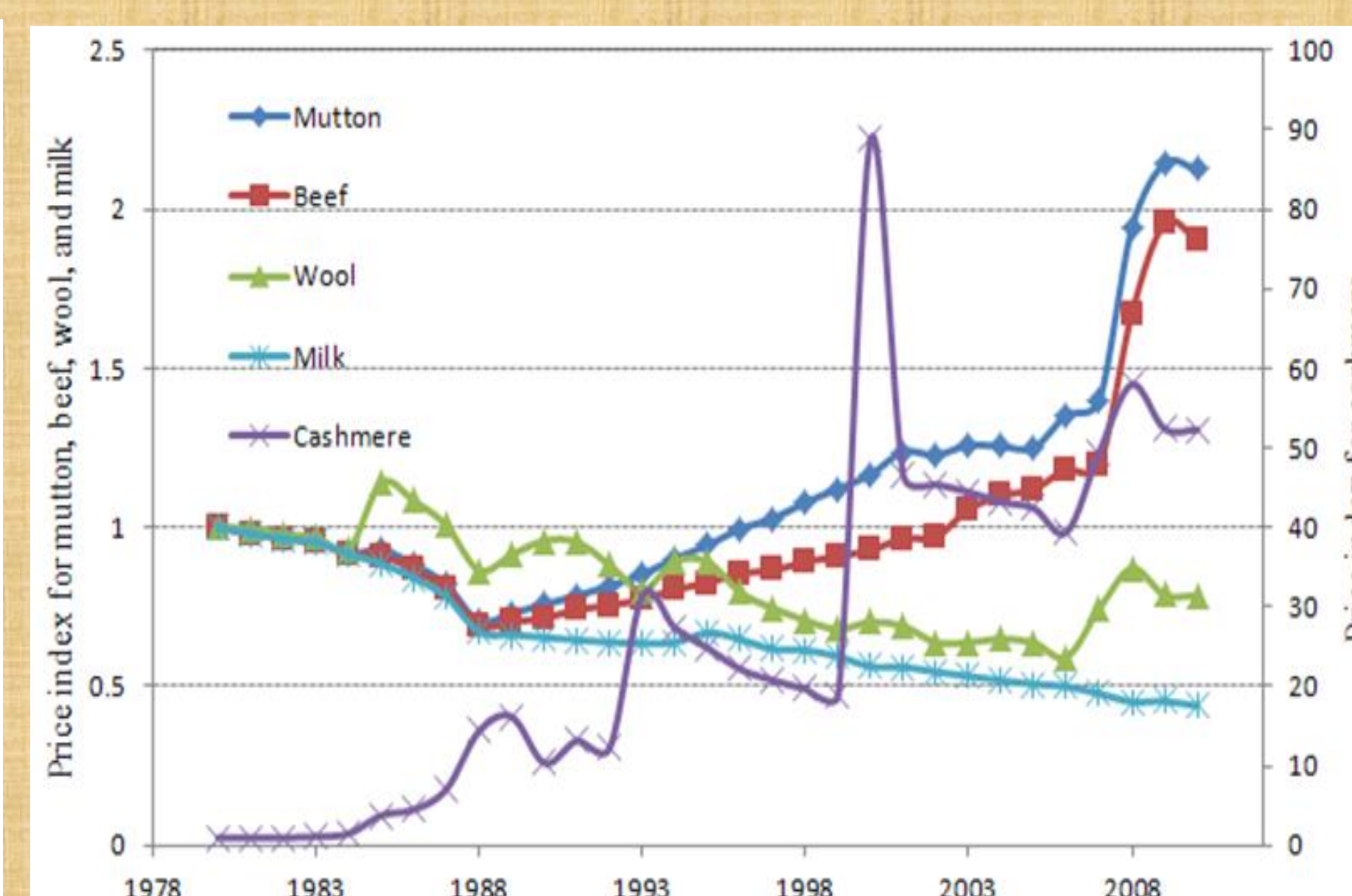


Fig.3 Relative prices of livestock products Note. The price has been deflated and using the 1980 price as 1.

Data

The data were collected from Inner Mongolia statistical yearbook, Chifeng statistical yearbook, GDP accounting manual of Inner Mongolia and other official data sources provided by central and local statistical bureau.

Results

The regression results are presented in Table 1. The results indicate the population, market and policies play their important roles. Cattle is positively related with price of beef and milk, but negatively related with price of mutton and wool. Products of cattle and sheep/goat are usually complementary, which means the increasing of cattle number with mutton/ wool price's increment. It is also positively related with income and population for both urban and rural. The regional dummy variables which measure the size as well as other climate, grassland quality as well as other regional variance are apparently important to the grazing animals and their number. The results suggest we should jointly apply both economic as well as institutional changes to cope with grassland management.

Table 1: The regression results of livestock numbers in Inner Mongolia

Variable	Cattle	Horses	Goat	Sheep
Intercept	-3.41** (1.43)	-2.01 (1.60)	9.28*** (1.38)	9.77*** (1.13)
Price_mutton	-2.08*** (0.57)	1.56*** (0.64)	1.79*** (0.55)	-1.26*** (0.45)
Price_beef	1.96*** (0.61)	-0.47 (0.69)	-1.44** (0.59)	1.41*** (0.48)
Price_wool	-0.48** (0.24)	0.44 (0.27)	-0.15 (0.23)	-0.37** (0.19)
Price_cashmere	-0.09 (0.06)	0.14** (0.06)	0.17*** (0.06)	0.19*** (0.05)
Price_milk	1.26*** (0.33)	0.55 (0.37)	-0.09 (0.32)	0.93*** (0.26)
Income_urban	0.37** (0.17)	-1.33*** (0.19)	0.25 (0.16)	0.52*** (0.13)
Income_rural	0.88*** (0.12)	-0.01 (0.13)	-0.17 (0.11)	-0.04 (0.09)
Pop_urban	0.41*** (0.13)	0.18 (0.14)	-0.39*** (0.12)	-0.39*** (0.10)
Pop_Rural	0.66*** (0.13)	0.99*** (0.15)	-0.30*** (0.13)	-0.21** (0.10)
AlXa	-0.15 (0.58)	1.11* (0.65)	-0.52 (0.56)	-2.09*** (0.46)
BaYanNur	-0.52*** (0.13)	0.30** (0.15)	0.69*** (0.13)	0.23** (0.10)
BaoTou	-0.94*** (0.14)	0.27* (0.16)	1.54*** (0.14)	0.81*** (0.11)
ChiFeng	0.80*** (0.19)	1.14*** (0.21)	2.27*** (0.18)	1.38*** (0.15)
HingGan	1.28*** (0.13)	1.44*** (0.15)	0.44*** (0.1267)	0.34*** (0.1035)
HuLun Buir	0.93*** (0.13)	1.63*** (0.14)	0.66*** (0.12)	1.11*** (0.10)
OrDos	-0.12 (0.18)	0.76*** (0.20)	1.83*** (0.17)	0.68*** (0.14)
TongLiao	1.36*** (0.14)	1.61*** (0.15)	1.36*** (0.13)	0.68*** (0.11)
Ulanqab	0.60*** (0.13)	0.13 (0.14)	0.15 (0.12)	1.12*** (0.10)
WuHai	-2.70*** (0.57)	-1.57** (0.63)	-3.63*** (0.55)	-5.10*** (0.45)
XiLin Gol	2.38*** (0.21)	2.83*** (0.23)	1.19*** (0.20)	1.40*** (0.16)

Note: *** Significant at 10% level; **Significant at 5% level; *Significant at 1% level; Standard error is in the parentheses

Acknowledgments

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