



DOES NUMBER MATTER? CONNECTION BETWEEN THE NUMBER OF LIVESTOCK AND THE SOCIOECONOMIC STATUS OF MONGOLIAN NOMADS

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Abstract: *This study examines the relationship between the number of livestock domesticated in Mongolia and socio-economic status of Mongolian nomads. A major assumption of this study is higher the number of livestock, higher the livestock product and vice-versa. Human Development Index of Mongolia is taken as a measurement scale for socio-economic status of Mongolian nomads and Gross Livestock Product is taken as measurement scale for the number of livestock in Mongolia. Impact of livestock output on the socio-economic status of Mongolian nomads is analysed through log-log and semi-log regression module. The statistical output shows a strong and positive relationship between the socio-economic status of Mongolian people and gross livestock output. Mongolian government should be prepared for urgent distribution of livestock fodder packages, immediate veterinary services in the dzud and drought-affected areas, development of pre dzud risk mapping system, and special plan to upgrade economic status of small and middle level herders in order to maximize the livestock output which result in positive changes in socio-economic status of Mongolian people. Implementation of the social protection programme can be beneficial for the Mongolian government to control rural to urban migration due to livestock loss. Education regarding sanitation and development of technologically advanced slaughterhouse can be supportive for the Mongolian government to increase the export level of their livestock product.*

Keywords: *livestock, dzud, herders, nomads, aimags*

JEL CODE: A13, A14, B55, C0, D13, D31, H84.



INTRODUCTION:

Mongolia is a landlocked country sharing borders with China on its southern, eastern, and western sides and northern sides with Russian Federation. 3.08 million people of this country are living within the boundary of 1,566,500 square kilometres. Due to the inward migration of people from rural to urban for job opportunities, better health, and social services, an urban population of Mongolia is increasing steadily since 1990. Currently, nearly around one million people living in rural areas are mostly livestock herders and spend their lives mostly in pastures. 34 per cent of the total labour force is involving in the agriculture sector that accounts for 17 per cent of total GDP and stands as the second largest key economic sector after mining (NSO, 2017). The individual contribution of the livestock sector to GDP is 14.45 per cent and provides employment to 85 per cent labour force participating in the agricultural sector and 28.9 per cent of the total labour force of Mongolia. Mongolia is categorized as a lower middle-income country having GDP per capita of about USD 3,641 as of statistics provided by National Statistical Office of Mongolia (NSO), 2017 and it has low Gini coefficient of 0.32 for the entire nation (NSO, 2016). 30 per cent of the total population is still living under the poverty line and poverty is densely populated in rural Mongolia. Poverty index of rural Mongolia is 34.9 per cent as compared to 27.1 per cent in urban areas (NSO, 2016). The Khangai, eastern, and western region of Mongolia are vulnerable on the ground of poverty and poverty headcounts in these regions are 34, 44, and 36 per cent respectively (NSO, 2016). Even though mineral product such as iron ore, copper, coal, crude petroleum, gold, precious metal, and jewellery are the major exportable items of Mongolia, livestock farming and its export plays a vital influential role in the national economy. Dzung and drought are two major threats and contributing factors to livestock mortality in Mongolia. For illustration, as per special report jointly prepared by Food and Agriculture Organization (FAO) and World Food Program (WFP) about 12,000 households out of 75,000 entirely lost their livestock and migrated to urban areas (especially in Ulaanbaatar) in order to search alternative options of livelihood in year 2010 and nearly around 180,000 people migrated to Ulaanbaatar in between 1998 and 2003. 30,000 herder households migrated to Ulaanbaatar after 2010 dzung and 710,740 animals have died in the year 2018 till date (Lifang, 2018). All these people who had migrated to Ulaanbaatar were small livestock farmer who had only a few numbers of animals, that is, less than 200. As per the per head production capacity of livestock in Mongolian condition, a herder household having less



than 200 head of livestock is considered as poor as this number only assures self-sufficiency. Here it can be clearly seen that the number of livestock with herder's family determines their earning as well as their socio-economic status. Out of 311.4 thousand herders' household, nearly around 80 per cent have less than 500 heads of livestock and 43 per cent have below 200 (The World Bank, 2016). It means that 43 per cent of herders' households are still in a trap of extreme poverty since they have less than 200 heads of livestock. This variation in the number of livestock heads per herder household does not only indicate variation in number but also indicate variation in wealth distribution and socio-economic characteristics of Mongolian nomads. Dzud has a completely undesirable impact on livestock herders as it reduces their production, makes them unable to repay their loan within the production year, creates a burden of accumulated interest on the loan and the like. Dzud not only causes hypothermia but also decreases the quantity and quality of fodder required to feed their animals and sometime herders have to travel more than 1,000 km to mitigate this problem. On the one hand hypothermia causes death to livestock and on the other hand, travelling 1,000 of km to collect fodder increases their cost of goods sold and other operating expenses which reduces net profit at an individual level and tax revenues at the national level. Only more affluent herders can mitigate the problems of fodder shortage means that small herders have been facing the negative impact of drought continuously since many years before. Dzud also cuts the price of livestock and creates difficult situation regarding decision whether to sell at a lower than normal price or hold until slaughter season to get higher prices. In this situation large herder households having more than 500 livestock prefer to sell their animals which are less likely to survive in cold winter season but small herders having less than 200 animals prefer to keep their animals with them and this decision of small herders put them at greater risk of losing a huge portion of their animals during dzud. This study will focus on livestock sector of Mongolia which began in between 8th and 3rd century B.C. and became little bit noticeable and professional from the latter half of the 2nd century B.C. (Shagdar, 2002). As Mongolia has extensive grazing area, that is, nearly around 80% of the total land mass, development of the livestock sector can be a major economic driver to this nation. Despite the negative impact of dzud and drought, and the declining contribution of the livestock sector to GDP, the livestock sector continues to be a key traditional sector of the Mongolian economy. The number of livestock has been increasing continuously in Mongolia, as herders boost their knowledge and skill related to



livestock farming and also due to the increase in the number of organizations to support the agricultural sector. Mongolian nomads have been increasing the number of livestock unceasingly in order to increase output that results in positive changes in their socio-economic status. Estimated number of livestock in Mongolia was 66,218,959 heads in the year 2017 (NSO, 2017). The continuous increase in the number of livestock heads results in livestock output growth by 3 times over the last ten years. This growth has exceeded the domestic demand and it will have a progressive contribution on the national and local economy of Mongolia as extra production can be exported to neighbouring trading partners such as China and the Russian Federation. However, lack of sanitation, modern abattoirs, and storage facilities, have limited their ability to export and their current level of export is still well below potential capacity. For instance, as per Mongolian custom data export of livestock product such as meat, skin, and wool was only of USD 330 million, that is, 7 per cent of total export in the year 2016 and it was far below its possible capacity. Now Mongolian government is implementing herd maximization strategies to mitigate the risk of livelihood loss due to the death of livestock. In the year 2005 Mongolian government asked for assistance from World Bank to support herders' livelihood problem caused by the mortality of livestock and from 2012 Bank has implemented the so-called Index-based Livestock Insurance Program (IBLIP) in all 21 aimags of Mongolia (World Bank, 2009). As per this program herder get paid if the loss of livestock surpasses 6 per cent of the total count at soum level (FAO & WFP, 2017). Even though not enough, Mongolian government is arranging emergency feed supply as a contingency plan and also importing hay and fodder from the Russian Federation. The government also introduced barter system in Mongolia where herders agree to destock part of their herds in exchange for hay or concentrated feed to support the remaining animals. From all the above discussion we can guess that the number of livestock per family is the major determinant of their socio-economic status. Hence, this study will try to identify that whether there is an association between the number of livestock and socio-economic status of Mongolian nomads or not?

LITERATURE REVIEW:

Before the outer Mongolian revolution of 1921 and the creation of Mongolian People's Republic in 1924, Mongolian livestock management was supervised and regulated by Tibetan Buddhist Lamas through their religious institutions. The livestock sector is the only source of income for more than 34 per cent of households in Mongolia and it covers 80 per



cent of gross agricultural product (Shagdar, 2002). There was rapid growth in livestock enterprises during the 1990s due to favourable weather condition and many nomads entered the livestock economy during this period (Lise, Hess, & Purev, 2006). Animal husbandry has been developing as a key economic sector having an impact on all individuals in the country (Batjargal, 2000). The Mongolian government has transferred all its state-owned livestock to the herders at the very beginning of the 1990s which was the economic shifting period of Mongolia from a planned economy to market economy. Many scholars (Nixson & Walter, 2006; Yoshihara, Chimeddorj, Buuveibaatar, Lhagvasuren, & Takatsuki, 2008; Zinsstag et al., 2005) have focused their study on animal husbandry during this period as it was not only due to the transferred of national wealth but also due to its probable influences on livestock and grassland management. Many studies during that time were focused on environmental degradation rather than on socio-economic characteristics of Mongolian nomads. Formation of ecotone is common in Mongolia (Peters, 2002; Pogue & Schnell, 2001) and due to this climatic difficulty, it is very hard to farm livestock. Owing to the increase in livestock numbers over 75 per cent of total rangeland has degraded and many of them require more than three years of time to recover (NAMEN, 2015). On the one hand increasing number of livestock has an optimistic impact on herders' socio-economic status but on the other hand the degradation of pasture land has limited the expansion of livestock farming. Because of a high level of grassland degradation and extremely negative impact of dzud on livestock farming, nomadism seems to be a risky enterprise (Fernandez-Gimenez & Allen-Diaz, 1999; Goldstein, Beall, & Cincotta, 1990). Some facts related to the death of animals has indicated towards the importance of number livestock that a herder family holding and impact of the reduction in the number of livestock on socio-economic characteristics such as educational component, life expectancy component, and a decent standard of living. Study of Chimgee, Shinoda, Tachiiri, & Kurosaki (2010) revealed that there is direct and severe economic loss to the inhabitants due to mass livestock death. There is a direct and significant association between death of livestock, that is, decrease in livestock number and Health-Related Quality of Life (HRQoL) of Mongolian nomads (Mu, Otani, Shinoda, Yokoyama, Onishi, Hosoda, Okamoto, & Kurozawa, 2013). Johnson, Sheehy, Miller, & Damiran (2006) stated that as activities such as crop production and manufacturing are very limited in Mongolian plateaus, more than 50 per cent Mongolian are dependent on



livestock production (cashmere wool and meat) where herders represent not less than 30 per cent of the manpower. Even though there is rapid growth in service and mining sector, many Mongolian want to involve in agribusiness (livestock) for a better future (Enkhbold, 2016). Enkhbold (2016) also stated that Mongolian has a great opportunity to expand the livestock sector as it surrounded by two populated economic giants, that is, the People's Republic of China and the Russian Federation and he also mentioned that current annual meat export of Mongolia is only one-tenth of its potential capacity which is less than their export during the socialist period by 40,000 tons.

Finally, we can conclude through the literature that on the one side it is necessary to control the impact of overgrazing on rangeland through following modern pasture herding method and through fodder crop farming, and on the other side it is necessary to increase the number of livestock per herders 'household for better socio-economic status and this can be done by reducing animal mortality rate or through extra breeding. Sanitation, modern slaughterhouse, and extra storage facilities are other additional requirements to increase export. Even though study about the impact of farming on the socio-economic status of Mongolian nomads is common, this is a new attempt to find out the impact of each animal on the socio-economic status of Mongolian nomads. This research will analyze the fluctuation in HDI due to variation in gross livestock product.

METHODOLOGY:

Association between socioeconomic status of Mongolian nomads and number of livestock was analyzed using time series data provided by National Statistical Office of Mongolia (NSO) and United Nations Development Program (UNDP). Data related to livestock were taken from NSO and data related to the socio-economic status of Mongolian people were taken from the updated report of UNDP. Human Development Index (HDI) was taken to measure the socio-economic status of Mongolian people. We have taken HDI as it captures three major socio-economic components (such as education, life expectancy at birth, and standard of living) of Mongolian people. This research assumes that higher the number of livestock higher the Gross Livestock Product (GLP) and vice-versa. Therefore, Gross Livestock Product represents the number of livestock in this research. Even though HDI indexed was first introduced in 1990 by a Pakistani economist Mahbub ul Haq, we have taken time series data of both dependent and independent variables from 2000 to 2017. Therefore, all



available data of 18 years was used in this study. In this study, HDI was response variable and Gross Livestock Product was taken as controlled variables. The hypothesis for this study was set as under:

H_0 (null hypothesis): Gross Livestock Product has no impact on the socio-economic status of Mongolian people.

H_a (alternate hypothesis): There is a linkage between Gross Livestock Product and socio-economic status of Mongolian people.

On the ground of the nature of data and after having Shapiro-Wilk test, log-log, as well as a semi-log model, was used in this study. The statistical model used in this study can be explained mathematically as under:

$$\text{LN (HDI)} = \beta_0 + \beta_1 \text{LN (GLP)} + \beta_2 (T) + \epsilon, \text{ where}$$

“LN” indicate natural log of dependent and independent variables, that is, HDI and GLP. Time in this research is taken as a semi-log independent variable. Likewise, β_0 , β_1 and β_2 represent intercept and multiplier of Gross Livestock Product and Time respectively. Similarly, ϵ represents error terms. The Mongolian government has not enough historical data, hence, we have used only time series data of 18 years.

DATA ANALYSIS AND RESULT:

Impact of change in the number of livestock on the socio-economic status of Mongolian people can be explained through trend analysis as well as through hypotheses testing as under.

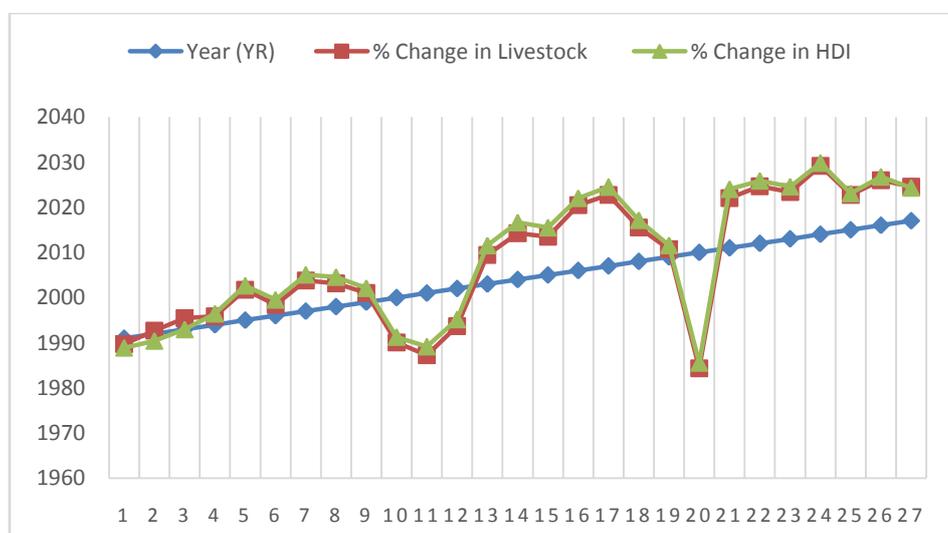


Figure 1: Trend of Animals Domesticated in Mongolia and HDI of Mongolia (% based on last year data). (Source: NSO/UNDP)



Figure 1 clearly demonstrates that the fluctuations in the trend of percentage changes in HDI and number of livestock are more or less parallel. This parallel trend of percentage changes in the number of livestock domesticated in Mongolia and Human Development Index of Mongolia force us to think about the existence of the association between the number of livestock and change in HDI of Mongolia. Likewise, the trend of HDI and fluctuation in the number of livestock can be analyzed through base year basis as under.

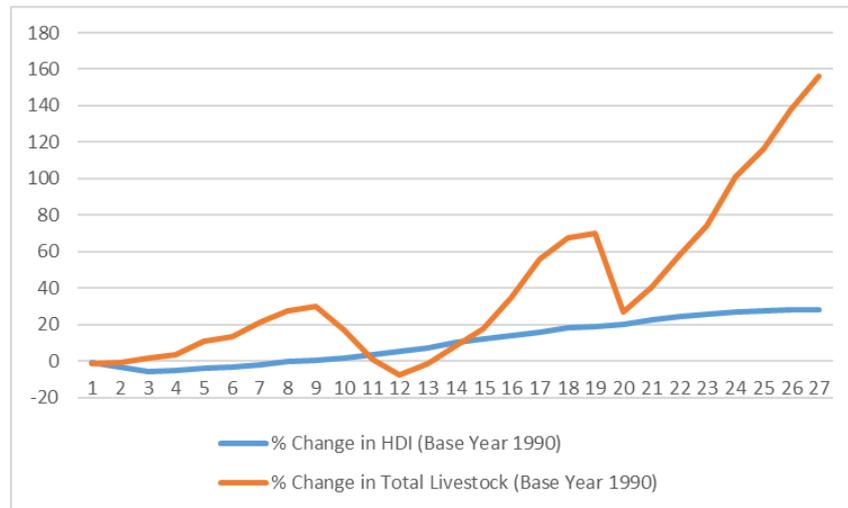


Figure 2: Trend of Fluctuation in the number of livestock and HDI as Per Base Year 1990.

Figure 2 reveals the trend of fluctuation in the number of livestock and Human Development Index as per the base year 1990. As the value of HDI always lies in between 0 and 1, and the number of livestock can be of any quantitative size it is not logical to compare percentage change in HDI with the percentage change in the number of livestock. But we can clearly analyze the trend of change through the graph plotted above. The graph clearly shows less fluctuation and the continuous increase in HDI as compared to high fluctuation and continuous increase in the number of livestock from 1990 to 2017. Except for the sharp decrease in the number of livestock in some years, the number of livestock in the year 2017 was 156.1 per cent more as compared to the number of livestock in the year 1990. Similarly, HDI in the year 2017 was 27.98 per cent more as compared to HDI in the year 1990. Despite some fluctuations, both HDI and number of livestock has been increasing continuously in average. It cannot be clearly observed from the above chart that whether there is the existence of the relationship between the number of livestock and the Human Development Index of Mongolia or not. Hence it is necessary to analyze it through



regression module. The output of the regression module employed to analyze the linkage between the number of livestock and HDI of Mongolia is as under.

Table 1: Summary Statistics

CORRELATION MATRIX						
	GLP	T	HDI			
GLP	1	0.976	0.980			
T	0.976	1	0.984			
HDI	0.980	0.984	1			
SUMMARY OF THE VARIABLE SELECTION (HDI) AND GOODNESS OF FIT STATISTICS						
Number of Variables	2					
Variables	GLP / T					
Observations	18					
Sum of Weights	18					
DF	15					
MSE	0.000					
R ²	0.977					
Adjusted R ²	0.973					
Mallows' Cp	3.000					
Akaike's AIC	154.704					
Schwarz's SBC	-152.033					
Amemiya's PC)	0.029					
RMSE	0.013					
ANOVA (HDI)						
Source	DF	Sum of Squares	Mean Squares	F	Pr> F	
Model	2	0.099	0.050	312.580	< 0.0001	
Error	15	0.002	0.000			
Corrected Total	17	0.102				
<i>Computed against model Y=Mean(Y)</i>						
MODEL PARAMETERS (HDI)						
Source	Value	Standard Error	t	Pr> t	Lower Bound (90%)	Upper Bound (90%)
Intercept	-18.040	5.098	3.539	0.003	-26.976	-9.104
GLP	0.034	0.015	2.219	0.042	0.007	0.061
T	0.009	0.003	3.235	0.006	0.004	0.013
Model Equation (HDI)						
LN (HDI) = -18.0399910750508+3.42379011011528E-02*LN (GLP)+8.5496161016593E-03*(T)						

Using the best model variables selection method, 2 variables have been retained in the model. Given the R², 97.7 per cent of the variability of the dependent variable HDI is explained by the 2 explanatory variables. Given the p-value of the F statistic computed in the ANOVA table, and given the significance level of 10 per cent, the information brought by the explanatory variables is significantly better than what a basic mean would bring. The correlation coefficient between Gross Livestock Product (GLP) and HDI and between time and HDI are 0.980 and 0.976 respectively. This correlation coefficient exhibits strong and positive relationship among HDI, GLP and T. This also indicates that the direction of change



in HDI is directly proportional to change in GLP, and T. Our variables in the regression model are log-log and semi-log transformed. As per the model, 1 per cent increase in Gross Live Stock product causes 0.015 per cent increase in HDI of Mongolia if other variables are constant. Likewise, every additional year causes 0.0085 units to increase in HDI of Mongolia. Finally, computed F-value in ANOVA table direct us towards the rejection of the null hypothesis. Hence, we can conclude that there is a relationship between HDI and its explanatory variables GLP and Time.

SUMMARY, CONCLUSION, AND RECOMMENDATION:

Besides mining, one and only sector that has high possibility to contribute its economy is livestock sector. Even though it is tough to win natural calamities like dzud and drought, the only option for those 40 per cent poorest of the poor livestock herders to win their poverty is to increase livestock output along with the increase in the number of livestock. As the analysis shows the positive impact of livestock output (determined by the number of livestock) on socio-economic status (measured by HDI) of Mongolian nomads, Mongolian government must bring special plan and projects allied to the livestock sector. Preparation for urgent distribution of livestock fodder packages, immediate veterinary services in the dzud and drought-affected areas, development of pre dzud risk mapping system, and special plan to upgrade the economic status of small and middle-level herders can be an immediate action plan for Mongolian government recommended through this research. Implementation of a social protection programme can be beneficial for the Mongolian government to control rural to urban migration due to livestock loss. Education regarding sanitation and development of technologically advanced slaughterhouse can be supportive for the Mongolian government to increase the export level of their livestock product.

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Annexe: Data Used in Overall Analysis

Year	HDI	Total Livestocks (Head Count)	Total Gross Livestock Production (Million Tugrik)
1990	0.579	25,858,900.00	N/A (Not Available)
1991	0.574	25,527,900.0	N/A (Not Available)
1992	0.561	25,694,100.00	N/A (Not Available)
1993	0.547	26,316,400.00	N/A (Not Available)
1994	0.55	26,808,100.00	N/A (Not Available)
1995	0.555	28,608,300.0	N/A (Not Available)



1996	0.561	29,300,000.00	N/A (Not Available)
1997	0.568	31,292,300.00	N/A (Not Available)
1998	0.576	32,897,500.00	N/A (Not Available)
1999	0.582	33,568,700.0	N/A (Not Available)
2000	0.589	30,227,400.00	353,916.70
2001	0.6	26,075,200.00	318,507.70
2002	0.609	23,897,300.00	284,921.50
2003	0.622	25,427,700.0	302,024.80
2004	0.637	28,027,900.00	564,510.60
2005	0.65	30,398,800.00	738,477.40
2006	0.66	34,803,000.00	834,477.40
2007	0.672	40,263,800.0	1,147,009.70
2008	0.683	43,288,400.00	1,377,085.40
2009	0.689	44,023,800.00	1,307,739.40
2010	0.697	32,729,500.00	1,353,906.30
2011	0.711	36,335,800.0	1,585,329.60
2012	0.72	40,920,915.00	2,114,805.30
2013	0.729	45,144,324.00	2,937,634.50
2014	0.734	51,982,583.00	3,468,417.30
2015	0.737	55,979,781.0	3,728,705.60
2016	0.743	61,549,236.00	3,496,077.00
2017	0.741	66,218,959.00	3,704,054.00