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RESEARCH NOTES

Inequality in the Distribution of Farm Assets in Himachal Pradesh: A Decomposition Analysis

The analysis of income distribution has remained an area of intense research since the publication of the seminal works of Kuznets (1966) and Chenery *et al.* (1974). However, the generation and distribution of income not only depend upon total assets but also on their composition. Thus from the policy perspective, it is more important and demanding to analyse this aspect more vigorously. This is particularly true in the agricultural sector where the asset ownership shows a very high degree of variability.

A study of asset distribution provides valuable insights regarding capital formation within the agricultural sector. Moreover, in a society where assets are unevenly distributed, measures to modify income distribution are the short-term measures for development.

In Himachal Pradesh, although the per capita net area sown is 1.23 hectare, yet there are a few cultivators having large holdings that are better placed in terms of climatic, topographic and infrastructural suitability. This has led to very high degree of variability in the incomes among all the farmers. Not only land, the other farm assets like farm implements/equipments have also been observed to be highly skewed towards the large farmers. An attempt is made in the paper (a) to examine the degree of inequality in the distribution of farm assets of different types and (b) to study the relative contribution of different assets towards inequality in the distribution of total assets.

METHODOLOGY

The study is confined to Himachal Pradesh. Multi-stage stratified random sampling was adopted for the selection of households. The state has been divided into four agro-climatic zones. In each of the four zones, one district was randomly selected. The districts of Una, Mandi, Sirmaur and Lahaul-Spiti represented zone I, zone II, zone III and zone IV respectively. In each of the selected districts, community development blocks varying from one to three were randomly chosen. Two per cent of the villages in each of the selected blocks and a sample of 400 farmers from the selected villages were again randomly selected. Since the total number of cultivators in zone IV was low, a sample of 50 farmers was allocated to this zone. The remaining 350 farmers were randomly selected on the basis of proportional allocation of cultivated area among the three zones. The selected cultivators were post-stratified into small (upto 2 hectares) and large farms (more than 2 hectares of land). The distribution of sampled households among different zones was marginally adjusted. In all, 408 cultivators were selected. Blockwise distribution of sample households is presented in Table I.

TABLE I. DISTRIBUTION OF SAMPLE HOUSEHOLDS ACROSS DIFFERENT AGRO-CLIMATIC ZONES OF HIMACHAL PRADESH

Zone	District	Development blocks	Households		
			Small	Large	Total
(1)	(2)	(3)	(4)	(5)	(6)
I	Una	Una, Amb, Gagret	86	45	131
II	Mandi	Sundernagar, Mandi Sadar, Gopalpur	107	36	143
III	Sirmaur	Shillai	60	24	84
IV	Lahaul-Spiti	Lahaul and Spiti	38	12	50
Total			291	117	408

THEORETICAL FRAMEWORK AND ANALYTICAL TOOLS

Several methods to measure inequality are available in the literature. Their properties and characteristics have been analysed and discussed by different authors (Kakwani, 1980; Champernowne, 1974; Dasgupta *et al.*, 1973; Chopra, 1986). It is argued that an income inequality measure should have six basic properties. These are (i) Pigou-Dalton transfer sensitivity, (ii) symmetry, (iii) mean independence, (iv) population homogeneity, (v) decomposability and (vi) the index lying between 0 and 1. Pigou-Dalton transfer sensitivity holds true "if a distribution is modified by altering *two* incomes only so as to leave their *total unaltered* then the index concerned must be increased, unchanged or decreased, according as the absolute difference between the two incomes is increased, unchanged or decreased" (Champernowne, 1974, p. 790). Symmetry holds if the measure remains unchanged when an individual switches off places in the income hierarchy. Mean independence holds if an increase (or decrease) in the population size across all income levels has no effect on the measured level of inequality. The property of decomposability permits the inequality to be partitioned either over sources or sub-populations (Champernowne, 1974; Adams and Alderman, 1992). There are several measures which satisfy these properties. In broad terms, all the measures may be classified into two categories, *viz.*, positive and normative measures. The normative measures have been derived directly from a social welfare function. The positive measures have, however, also implications for social welfare function built into them. The implicit social welfare function may not be as restrictive as is assumed in the specification of social welfare function from which normative measures are derived. While Gini index, coefficient of variation and standard deviation of logarithms are well-known and most commonly used positive measures, Dalton and Atkinson have developed normative measures incorporating value judgements represented by the chosen welfare function. In more recent times, economists have questioned the distinction between positive and normative measures on the basis of social welfare function (Sen, 1973). The Gini index, as a measure of inequality, has been criticised by a number of scholars (Atkinson, 1970; Newbery, 1970; Sen, 1973). It has been argued that the social welfare function implicit in the Gini index is always more sensitive to mean income than to income inequality. Coefficient of variation as a method of measuring inequalities is based on all values rather than ranks. It can be interpreted as in pairwise comparison a person with a lower income suffers from some depression which is proportional to the square of differences in incomes. The average of all such depression leads to coefficient of variation. Sen criticised that measure for this property and preferred a measure that attaches greater importance to income transfer at the lower end of the distribution. The measure satisfying this property is the standard deviation of logarithms.

In so far as the suitability of different measures of inequality is concerned, "there is no single best coefficient of inequality since there are a number of distinct aspects of inequality in which one may be interested and some coefficients are most suited to reflect one and some another" (Champernowne, 1974, p. 787). Keeping this in view, the following inequality measures were considered: (1) Gini index (GI), (2) Coefficient of variation (CV) and (3) Standard deviation of logarithms (SDL). These measures were further decomposed to ascertain the percentage contribution of different types of assets towards inequality. The mathematical form of these measures is presented as follows:

1. Gini Index $= \frac{\Delta}{2u}$

$$= \frac{1}{n(n-1)} \sum_{i=1}^{n} \sum_{j=1}^{n} | x_{ik} - x_{jk} |$$

2. Coefficient of variation $= \left[\frac{1}{n-1} \sum_{i=1}^{n} (x_i - \bar{x})^2 \right]^{\frac{1}{2}} / \bar{X}$

3. Standard deviation of logarithms:

$$S \log x = S^2 \log x$$

$$S^2 = \frac{1}{N} \left[\Sigma \log x_{ik}^2 - \frac{(\log x_{ik})^2}{N} \right]$$

The decomposition of the above-mentioned inequality measures was analysed as follows. In respect of Gini coefficient, decomposition factor for a particular asset was given by

$$DGK = B_k R (A, x_k) G (x_k)$$

The overall Gini coefficient is

$$G (A) = \sum_{k=1}^{n} D_{GK}$$

where A is the total value of assets owned by the household i.

$$A = \sum_{k=1}^{n} x_k$$

x_k = the value of assets of type k owned by household i,

k = proportion of assets of type k in total assets.

$$R(A, x_k) = \frac{Cov.x_k.r(A)}{Cov.x_k.r(x_k)}$$

r (A) = rank of household in total asset ranking,

$r (x_k)$ = rank of household i in k-th asset ranking.

The contribution of a particular type of asset to total inequality in asset distribution depends on:

(i) X_k = contribution of asset k to the total value of assets,

(ii) $G(x_k)$ = coefficient of inequality of asset k in its distribution and

(iii) $R(A,x_k)$ = ratio measuring the difference in the distribution of asset k and total assets A.

The decomposition rules for coefficient of variation and standard deviation of logarithms are:

$$D, (CV_k) = \frac{Cov.(x_k.A)}{\sigma^2(A)}$$

$$D, (SDL_k) = \frac{Cov.(\log x_k.\log A)}{S^2(A)}$$

D, (CV_k) = contribution of asset k towards total inequality in assets based on coefficient of variation,

D, (SDL_k) = contribution of asset k towards total inequality based on standard deviation of logarithm,

σ^2 (A) = variance of total asset A,

S^2 (A) = variance of logarithm of total assets and

A = value of total assets owned by the household i.

RESULTS AND DISCUSSION

The percentage shares of different assets in the pool of total assets of the small and large farmers in the four selected zones in Himachal Pradesh are presented in Table II. As expected, the percentage share was estimated to be the highest for land. The value of total assets per hectare in absolute terms was higher on the small farms in all the zones under reference. The value of the assets was found to be the highest in zone I, followed by zone II. The contribution of land was also estimated to be the highest in zone I. This is mainly because a higher value is attached to land due to availability of infrastructural facilities. Next in importance was farm buildings particularly for small farms. In all the zones there were no separate storehouses. The residences were temporarily converted into farm stores and the farmers were observed to be keenly interested in the investment on farm buildings. The investment on farm machinery and equipment was found to be very low except on the large farms in zone II. The contribution of dairy animals was found to be significant.

TABLE II. COMPOSITION OF FARM ASSETS

(per cent)

Assets	Zone I		Zone II		Zone III		Zone IV	
	Small	Large	Small	Large	Small	Large	Small	Large
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Land	70.50	72.46	50.45	57.72	61.63	74.23	54.49	69.44
	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)
Modern assets	0.63	4.99	1.90	15.42	0.57	2.11	0.09	0.11
	(2.13)*	(18.12)	(3.83)	(36.47)	(1.50)	(8.17)	(0.20)	(0.34)
Traditional assets	0.31	0.23	0.62	0.24	0.75	0.42	0.19	0.19
	(1.03)	(0.85)	(1.26)	(0.55)	(1.96)	(1.64)	(0.42)	(0.64)
Dairy animals	4.74	3.27	6.87	4.48	3.71	3.22	2.64	2.67
	(16.08)	(11.89)	(13.87)	(10.60)	(9.75)	(12.49)	(5.81)	(8.75)
Draught animals	1.53	1.17	3.16	1.42	1.46	0.99	1.83	1.83
	(5.18)	(4.23)	(6.37)	(3.36)	(3.83)	(3.87)	(4.04)	(5.99)
Farm buildings	22.29	17.88	37.00	20.72	31.58	19.03	40.76	25.74
	(75.58)	(64.91)	(74.67)	(49.02)	(82.96)	(73.83)	(89.53)	(84.28)
Value of total assets (Rs.) per hectare	1,39,652	1,02,983	1,10,044	92,059	1,09,701	90,295	89,991	69,412
	(41,198)†	(28,360)	(54,525)	(38,923)	(41,760)	(23,269)	(40,953)	(21,213)

Note: * Figures in parentheses are percentages to the total assets excluding land.
† Figures in parentheses are absolute values of total assets excluding land.

It is generally argued that land is an ancestral property which an individual receives·as gift. There are a few exceptions of land purchase particularly in the hill areas. Thus the accumulation of assets including land shows a biased picture and is highly skewed towards land. In the present study, asset distribution without land was also studied. The analysis showed that farm buildings were the most important factor, followed by dairy animals. It is significant to see the importance of modern assets on the large farms in zone II. The results indicated that the value of total assets excluding land was higher on the small farms in all the zones under reference on per hectare basis.

Inequality in Assets Distribution

The results of inequality in different assets are presented in Table III. It can be seen from the table that the inequality in land was much less on the large farms as compared to the small farms. This indicates that the land holdings above 2 hectares are more evenly distributed around their mean values. There were a few large holdings above 4 hectares of land. The results were true for all the zones. In the case of modern assets and animals both the categories of farms did not vary significantly. The table further shows that the traditional assets distribution was unequal to a greater extent on the small farms. This can be attributed to the fact that some of the small farmers kept these assets which were outdated and they did not purchase the new ones mainly because of weak financial position. Moreover, they worked on others' farms for their livelihood where they were provided with farm implements such as spade, etc., for work.

TABLE III. INEQUALITY IN ASSETS DISTRIBUTION

Assets	Measures of inequality	Zone I		Zone II		Zone III		Zone IV	
		Small	Large	Small	Large	Small	Large	Small	Large
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Land	GR	0.36	0.50	0.35	0.33	0.33	0.41	0.27	0.06
	CV	0.99	0.91	0.62	0.70	0.60	0.78	0.47	0.11
	SDL	0.43	0.38	0.35	0.27	0.28	0.42	0.23	0.04
Modern assets	GR	0.67	0.84	0.84	0.83	0.88	0.82	0.69	0.50
	CV	0.69	0.73	0.63	0.70	0.60	0.79	0.70	0.93
	SDL	0.68	0.10	0.11	0.10	0.96	0.14	0.62	0.41
Traditional assets	GR	0.42	0.28	0.22	0.28	0.45	0.29	0.40	0.39
	CV	0.79	0.51	0.41	0.52	0.87	0.54	0.72	0.67
	SDL	0.62	0.43	0.51	0.63	0.70	0.21	0.72	0.73
Dairy animals	GR	0.33	0.36	0.30	0.33	0.48	0.29	0.23	0.13
	CV	0.61	0.71	0.56	0.59	0.90	0.52	0.41	0.22
	SDL	0.42	0.50	0.53	0.86	0.62	0.25	0.20	0.09
Draught animals	GR	0.42	0.35	0.25	0.35	0.28	0.33	0.22	0.17
	CV	0.76	0.64	0.45	0.63	0.51	0.61	0.41	0.29
	SDL	0.12	0.11	0.81	0.11	0.69	0.51	0.18	0.12
Farm buildings	GR	0.24	0.38	0.34	0.32	0.46	0.44	0.17	0.15
	CV	0.69	0.69	0.66	0.62	0.99	0.85	0.30	0.25
	SDL	0.30	0.30	0.28	0.26	0.38	0.33	0.14	0.12
All assets	GR	0.28	0.44	0.20	0.30	0.23	0.37	0.18	0.08
	CV	0.76	0.89	0.36	0.60	0.42	0.64	0.31	0.13
	SDL	0.30	0.34	0.16	0.22	0.18	0.36	0.15	0.05

G.R. = Gini ratio. CV = Coefficient of variation. SDL = Standard deviation of logarithms.

A significant difference in variability on the small and large farm categories for dairy animals can be observed in zones III and IV. This was mainly because on the small farms some of the farmers reared cross-bred cows and thus their value was significantly higher. Most of the large farmers kept improved cows and thus the variation was estimated to be low. It can be further seen from the table that the farm buildings showed significant difference in variations among the two groups observed for zone I only which may be because the large farmers constructed their buildings which were on the roadside and thus had higher market values. A few farmers lived in their farm houses. On the other hand, the small farmers kept themselves confined to villages and thus the variations were low. The inequality in the distribution of all assets showed that it was higher on the large farms.

Decomposition of Inequalities

The sourcewise/assetwise contribution of inequality in total assets is presented in Table IV. It may be noted from the table that on the small farms, land was found to be the largest contributor to total inequality, followed by farm buildings in all the four zones under study. The contribution of modern assets was estimated to be negligible particularly in zone IV. In the case of traditional assets the contribution was about nil in zones II and IV. This, therefore, would suggest that there was not much variation in modern and traditional asset distribution on the small farms. However, while using standard deviation of logarithmic (SDL) values technique the contribution of modern assets to total asset inequality was worth noting. The contribution of land was significantly reduced, whereas on farm buildings the changes were not very high. On the large farms, similar results were obtained. The contribution of modern assets to total asset inequality in zone II was estimated to be 73 per cent. This may be because there were wide variations in the purchase of tractors, threshers and

TABLE IV. DECOMPOSITION OF INEQUALITY IN TOTAL ASSETS

(per cent)

Sr. No.	Assets	Zone I			Zone II			Zone III			Zone IV		
		GI	CV	SDL	GI	CV	SDL	GI	CV	SDL	GI	CV	SDL
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	I. Small farms												
1.	Land	85.79	89.97	40.14	64.83	62.58	37.38	68.44	60.57	33.66	74.66	74.46	45.13
2.	Modern assets	0.50	0.46	21.62	0.50	0.28	15.18	0.48	0.15	0.00	0.00	0.01	0.00
3.	Traditional assets	0.10	0.09	4.64	0.01	0.00	0.00	0.36	0.38	2.95	0.00	0.00	0.00
4.	Dairy animals	1.59	1.04	16.28	3.69	3.50	22.16	1.63	1.32	31.16	1.46	1.52	19.27
5.	Draught animals	0.05	0.00	0.00	0.05	0.00	0.00	0.27	0.19	10.57	0.83	0.84	13.56
6.	Farm buildings	11.97	8.44	17.32	30.92	33.64	25.28	28.82	37.39	21.66	23.05	23.17	22.04
	II. Large farms												
1.	Land	79.72	86.77	25.25	55.92	59.95	23.89	79.38	79.50	35.92	50.39	53.04	11.56
2.	Modern assets	6.55	4.11	40.69	38.29	38.23	73.31	2.62	2.90	33.35	0.26	0.19	32.58
3.	Traditional assets	0.00	0.02	5.58	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00
4.	Dairy animals	1.31	1.19	12.11	0.03	0.00	0.00	1.16	1.17	9.02	0.51	0.45	5.57
5.	Draught animals	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	2.31	2.30	20.25
6.	Farm buildings	12.42	7.91	16.37	5.76	1.82	2.80	16.82	16.39	21.71	46.53	44.02	30.04

other modern equipments by the large farmers in this zone. The draught animals did not contribute towards total asset inequality except in zone IV. This was because this zone is snow bound and draught animal was the only source of draft power. The contribution of farm buildings was mainly due to the situation of farm buildings, whether on road, near urban areas, etc.

The decomposition of inequality of total assets excluding land indicates that farm buildings are the major contributor to total inequality in both the categories of farms (Table V). The contribution of draught animals was again found to be important in zone IV while in zones I and II their contribution was nil. The contribution of dairy animals was significant in zone I. This was mainly because the cultivators used to purchase the high-yielding animals from the adjoining areas of Punjab and they had the local breed also and thus the inequality was high. The contribution of modern assets on the large farms in zone II was estimated to be the highest whereas in the case of zone IV the traditional assets did not contribute anything towards total inequality in the assets distribution. The table further reveals that with the use of SDL method the contribution of modern assets significantly increased.

TABLE V. DECOMPOSITION OF INEQUALITY IN TOTAL ASSETS EXCLUDING LAND

(per cent)

Sr. No.	Assets	Zone I			Zone II			Zone III			Zone IV		
		GI	CV	SDL	GI	CV	SDL	GI	CV	SDL	GI	CV	SDL
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	I. Small farms												
1.	Modern assets	2.46	2.41	33.67	9.19	7.95	62.16	0.00	0.00	0.00	0.00	0.00	0.00
2.	Traditional assets	0.10	0.00	0.00	0.00	0.00	0.00	0.76	0.78	25.68	0.00	0.00	0.00
3.	Dairy animals	10.94	8.34	22.92	0.00	0.00	0.00	0.68	0.08	8.17	3.56	3.57	35.96
4.	Draught animals	0.90	0.37	16.24	1.70	1.22	11.20	1.13	0.69	16.73	0.98	1.07	10.04
5.	Farm buildings	85.60	88.88	27.17	89.11	90.83	26.64	97.43	98.45	49.42	95.46	95.36	54.00
	II. Large farms												
1.	Modern assets	35.12	45.45	58.37	75.97	88.61	70.20	9.74	5.60	51.43	0.30	0.38	20.52
2.	Traditional assets	0.03	0.00	0.14	0.00	0.00	3.64	0.00	0.00	0.00	0.00	0.00	0.00
3.	Dairy animals	6.01	6.67	16.13	1.48	0.00	11.26	4.56	4.09	10.79	1.19	1.70	11.57
4.	Draught animals	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.35	1.27	5.27	4.99	26.87
5.	Farm buildings	58.84	47.88	25.36	22.55	11.39	14.90	85.48	89.96	36.51	93.24	92.93	41.04

CONCLUSIONS

The study has shown that land and farm buildings were the largest contributors to total asset distribution in all the four zones as well as in both the categories of farms. On per hectare basis the value of farm assets was found to be higher on the small farms and it was also the highest in zone I. A similar trend was observed when the decomposition of inequality in total assets was examined. In the case of large farms, the major contributors were farm buildings and modern assets. The study thus comes to the conclusion that land is the most important contributing factor to total assets as well as to inequalities in the total assets of farmers. This is followed by farm assets. The ownership of modern assets was very low which caused sub-optimum use of other resources too. To enhance their use, the machinery and equipment which are economical for small holdings may be developed and provided to the cultivators. Further, to increase the contribution of dairy animals to total assets, the cultivators may be persuaded to keep only the improved/cross-bred dairy animals. This would not only help to increase the supplementary income from dairying but also reduce the inequalities on the farms.

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