



## **UNVEILING THE CRAFT: EXPLORING DETERMINANTS OF TECHNICAL EFFICIENCY IN POTTERY PRODUCTION ACROSS NORTH-WEST INDIAN STATES**

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### ***Abstract***

The pottery industry in India is recognized as an eco-friendly, small scale cottage industry. In predominantly rural country like India, pottery significantly contributes to employment generation, export growth etc. Present study aims to examine the present socio-economic profile of pottery artisans in the North-West Indian states, providing essential background information of this industry. Additionally, this research also focuses on analyzing the production efficiency and identifying the determinants of inefficiency among the respondents in the study region. So, to ensure comprehensive representation of the targeted population, snowball sampling was employed. The population was divided into two strata, Delhi and Haryana. Simple descriptive statistics were used to analyze the demographic characteristics of the respondents. To achieve another objective, a stochastic production frontier model was utilized to measure technical efficiency in production and to identify the determinants of inefficiency. The research reveals that pottery exhibit varied characteristics influenced by socio-economic factors. Furthermore, the study highlights the differences in technical efficiency between Delhi and Haryana, with artisans in Haryana being more efficient than those of Delhi. Various cost, such as those for raw materials, clay making, design, kiln making, and storage have a positive and significant impact on income. The study quantifies the income gap resulting from not achieving potential efficiency levels, amounting to ₹1646 in Delhi and ₹12757 in Haryana. The study provides the invaluable insights for policymakers aiming to enhance the productivity and incomes of pottery artisans through targeted interventions addressing technological and financial challenges. This research underscores the importance of tailored support for artisans in different regions to bridge the efficiency gap and foster sustainable growth in the traditional pottery industry.

***Keywords: Technical Efficiency, Production, Pottery, Artisans, MSMEs, Socio-economic variables.***



**JEL Codes: D22, D24, D61, L20**

## **Background**

Art has been an inextricable part of economy since the existence of humans (Vidyarthi, 1986). India's rich cultural heritage, diverse traditions, and artistic expressions have thrived for millennia, deeply influencing the country's socio-economic factors (Srivastava, 2015). Artisans, integral to this cultural legacy, significantly contribute to India's development, historically recognized for their exceptional skills and craftsmanship (Verma and Gupta, 2017). The MSME sector contributes around 45 per cent to the India's manufacturing output and 20 per cent to GDP of the India (Singh & Mallaiyah, 2022). The intricate tapestry of human culture is woven from threads of art, tradition and craftsmanship passed down through generations. Among these crafts, pottery holds a significant position, particularly in the development of rural areas, by generating employment, increasing exports and reducing regional disparities (Regon, 2019). Pottery has been an important segment of culture and heritage for years, serving both utilitarian and artistic purposes. The history of pottery in India is illustrious, with excavations at Harappa, Mohenjodaro, and Mehrgarh revealing that the art of potting was highly advanced as early as 3000 B.C. The invention of the potter's wheel around 1700 B.C. in Persia and subsequent innovations in Egypt and Europe marked significant milestones in the evolution of pottery techniques (Wahab, 1956). This advancement provided artisans with better tools to manipulate clay, enhancing both the efficiency and quality of their creations.

Artisans are the backbone of India's non-farm rural economy, predominately belonging to the unorganized sector. Rural artisans, including creators of art and craft and handicraft, weavers, potters, metal wares makers and sculptors are regarded as custodians of India's heritage. However, they often lack access to modern facilities and financial assistance (Banik, 2017). Despite their significant contributions, rural artisans face numerous challenges that hinder their productivity. The major challenge being faced by pottery artisans was related to competition and supply of raw material (Jakhar, et al., 2024). The advent of modern machinery had begun to dominate small-scale industries including the pottery sector. Furthermore, competition from the plastic industry poses a major obstacle to the development of the pottery industry (Lakshman, 1996). Moreover, the daily earnings of workers in the traditional sector are lower compared to those in other sectors. The income disparity has led to a decline in the number of workers in the traditional sector (Jakhar, et al., 2023).

## **Review of Literature**

In India, each state and region boast its own unique art and craftsmanship. Potter making exemplifies the beautiful journey craftsmen undertake from "Mud and Money". The handicraft industry, particularly the pottery sector, provides substantial employment to a large population, both directly and indirectly. Consequently, this industry plays a pivotal role in job creation with minimal investment (Din, 2014). Potters are deeply invested in their art- mentally, physically and emotionally. Pottery making is a tradition rooted in ancient history, originating from various civilizations, and has been accepted, developed, modified and adapted over time (Panda



et.al., 2011). Historically, artisans enjoyed a high social status and were considered members of the commercial and trading segments of society. However, their social status began to decline in the 11<sup>th</sup> century (Qureshi, 1990).

Increased urbanization has necessitated new knowledge and skills for job creation, leading to the marginalization of the handmade sector, including handicraft and handlooms (Madhavan, 2012). Artisans face numerous challenges, such as lack of finance, dwindling demand and problems with supply of raw material (Vats, 202). On the supply side, issues like non-availability of raw materials and inadequate infrastructure prevail. On the demand side, intense competition from other industries, such as plastic, exacerbates their struggles (Yadagiri, 2010). Industrialization has posed a significant threat to the artisans and their art in India. With technological advancement, there has been a surge in demand for machine-produced products (Jahan, 2015).

These challenges have led to a decline in the income of potters, adversely affecting their livelihoods and forcing them to live in unhealthy conditions. therefore, intervention by central and state government is crucial for the growth and development of this industry (Pal and Pal, 2015).

Pottery making relies on a specific set of material resources, tools, and manufacturing techniques, skills and knowledge (Pfaffenberger, 1992). However, Pottery artisans face numerous challenges at each stage of value addition, significantly impacting their socio-economic conditions (Kasemi, 2014). This study examines the current socio-economic status of pottery artisans and analyzes the factors affecting their productivity efficiency and determinants of inefficiency within study region. Therefore, this study can illuminate the broader dynamics of the pottery industry in India and offer valuable insights for policy makers, entrepreneurs and stakeholders which can help in making policy recommendations to improve overall performance of pottery industry.

## **Data and Methodology**

Given the unique nature of the population, snowball stratified sampling method was used for data collection. To ensure comprehensive representation of our diverse target population, it was divided in two district strata based on northern west geographical area: Delhi and Haryana. This stratification was chosen to capture the varied experiences and perspective of participants. The sample included 396 pottery artisans, 203 from Delhi and 193 from Haryana.

The snowball sampling process was initiated by conducting pre-structured questionnaire. Data collection occurred over past six months (2023-24) and was primarily qualitative, involving interviews based on the study's objectives. A simple descriptive analysis was done to study the demographic characteristics of the pottery artisans. To fulfill another objective, to check the efficiency in production and the determinants of inefficiency. The



stochastic production model was used to measure the technical efficiency and to analyze the determinants and measure the extent to which they contribute to the presence of inefficiency. Thus, model estimates both efficiency and time-varying inefficiencies. The empirical form of model is given below:

$$Y_i = \beta_0 + \beta_1 \text{Ln\_Raw material\_cost}_i + \beta_2 \text{Ln\_clay making\_cost}_i + \beta_3 \text{Ln\_designing\_cost}_i + \beta_4 \text{Ln\_kiln making\_cost}_i + \beta_5 \text{Ln\_storage\_cost}_i + \beta_6 \text{Ln\_labour use}_i + (V_i - U_i)$$

Where,

$Y_{it}$  = Income of  $i^{\text{th}}$  household

$\text{Ln\_Raw material\_cost}_{it}$  = Log of Cost of raw material (Rs.) of  $i^{\text{th}}$  household

$\text{Ln\_Clay making\_cost}_{it}$  = Log of Clay making cost (Rs.)  $i^{\text{th}}$  household

$\text{Ln\_Designing\_cost}_{it}$  = Log of Designing cost (Rs.) of  $i^{\text{th}}$  household

$\text{Ln\_Kiln making\_cost}_{it}$  = Log of Kiln making cost of  $i^{\text{th}}$  household

$\text{Ln\_Storage\_cost}_{it}$  = Log of Storage cost of  $i^{\text{th}}$  household

$\text{Ln\_Labour use\_cost}_{it}$  = Log of Labour cost of  $i^{\text{th}}$  household

$\beta$  is an unknown parameter,  $V_{it}$  is random variable which are assumed to iid.  $N(0, \sigma^2)$  and independent of the  $U_i$  which are no negative random variable which are assumed to account for technical inefficiency in income and often assumed to be iid.  $|N(0, \sigma^2)|$ .

$$U_{it} = \alpha_0 + \alpha_1 \text{age}_i + \alpha_2 \text{age}_i^2 + \alpha_3 \text{education}_i + \alpha_4 \text{education}_i^2 + \alpha_5 \text{family size}_i + \alpha_6 \text{male dummy}_{it} + \alpha_7 \text{modern wheel dummy}_i + \alpha_8 \text{modern dryer dummy}_i + \alpha_9 \text{modern kiln dummy}_i + \alpha_{10} \text{modern pugmill dummy}_i + \alpha_{11} \text{SHG collaboration}_i + \alpha_{12} \text{no credit dummy}_i + \alpha_{13} \text{informal credit dummy}_i + \alpha_{14} \text{government schemes}_i$$

Where,

$U_{it}$  = Inefficiency score in income of  $i^{\text{th}}$  household

$\text{Age}_{it}$  = Age (years) of  $i^{\text{th}}$  household

$\text{Age}_{it}^2$  =  $\text{Age}^2$  (years) of  $i^{\text{th}}$  household



$Education_{it}$  = education of  $i^{th}$  household

$Education^2_{it}$  = Education<sup>2</sup> of  $i^{th}$  household

$Family\ size_{it}$  = Number of family members of  $i^{th}$  household

$Male\ dummy_{it}$  = if male=1 otherwise 0 of  $i^{th}$  household

$Modern\ wheel\ dummy_{it}$  = if using modern wheel=1 otherwise 0 of  $i^{th}$  household

$Modern\ dryer_{it}$  = if modern dryer=1 otherwise 0 of  $i^{th}$  household

$Modern\ kiln\ dummy_{it}$  = if modern kiln=1 otherwise 0) by  $i^{th}$  household

$SHG\ collaboration_{it}$  = SHG collaboration by  $i^{th}$  household

$No\ credit\ dummy_{it}$  = if formal credit is availed=1 otherwise 0) by  $i^{th}$  household

$Informal\ credit\ dummy_{it}$  = if informal credit is availed=1 otherwise 0) by  $i^{th}$  household

$Government\ schemes_{it}$  = government schemes are availed by  $i^{th}$  household

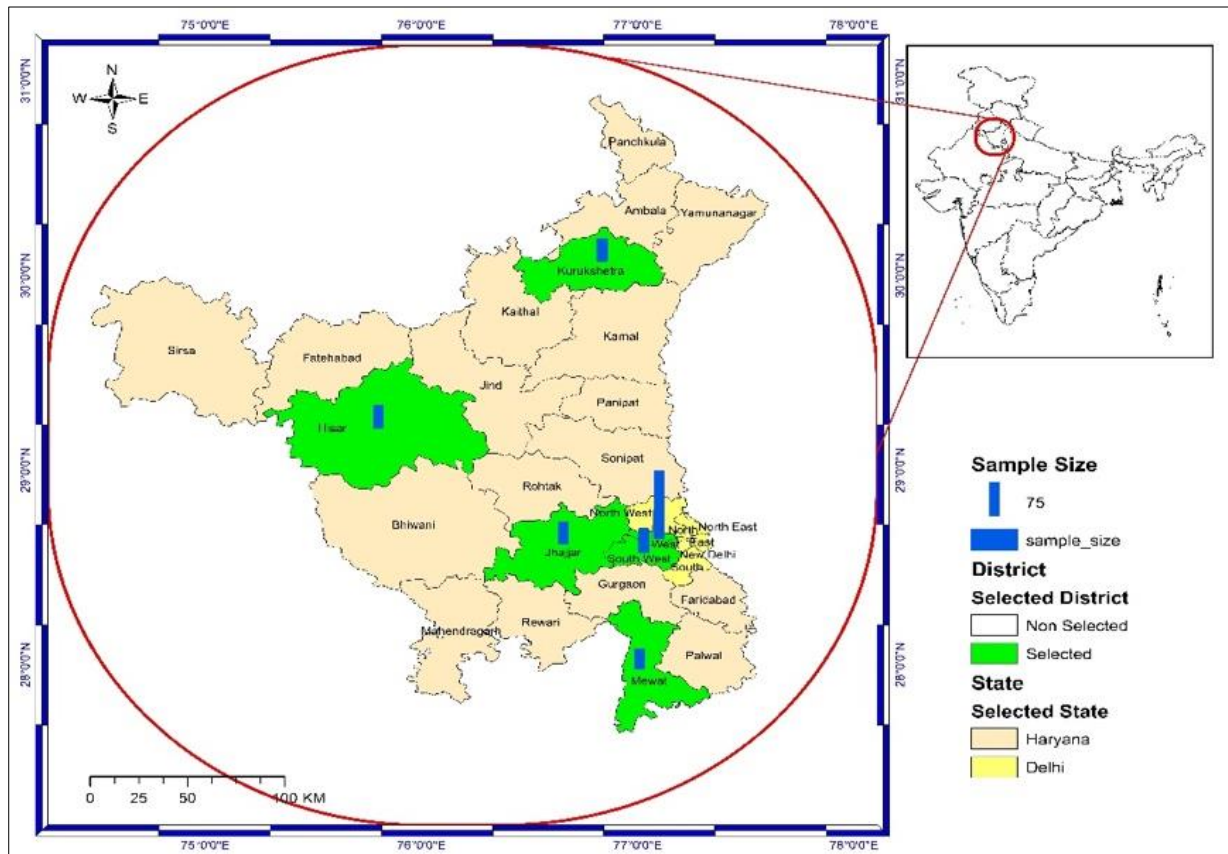
Further, the study has utilized the estimated values of technical efficiency to calculate the average potential gross value added by pottery manufacturing firms with the given level of inputs has been obtained for the study using the given formula:

$$\text{Return Gap}(\%) = \left[ 1 - \frac{\text{mean Technical efficiency}}{\text{maximum Technical efficiency}} \right] \times 100$$

After the estimation the Return gap from the potential return (in %), the estimation procedure of potential return as below:

$$\text{Potential Return} = \text{Actual Return} + \left( \frac{\text{Return gap \%}}{100} \right) * \text{Actual Return}$$

Ethical considerations were paramount throughout the research process. Informed consent was obtained from all participants.



Source: Authors created using ARC-GIS software

Figure I show the distribution of the sample population in the various districts of Haryana and Delhi. 48.7 per cent of the total population was collected from Haryana and remaining from Delhi. the study area is highlighted in the above map.

## Results and Discussion

Pottery has been an essential component of India’s cultural heritage and economic landscape. Nevertheless, the traditional pottery industry has recently faced numerous challenges arising from evolving socio-economic conditions and technological advancements. By analyzing the demographic profile of the pottery artisans in the study area, we can gain deeper knowledge of complexities being faced by them. Also focusing on their technical production efficiency, we can calculate the efficiency gap being faced by them and determinants of inefficiency in the production process.



**Table 1: Descriptive statistics of the pottery artisans in the study area**

Variable	Particulars	Delhi		Haryana		Overall	
		No	%	No	%	No	%
Gender	Male	177	87.19	191	98.96	368	92.92
	Female	26	12.81	2	1.04	28	7.08
Age	< 25	24	11.82	12	6.22	36	0.09
	25-35	31	15.27	49	25.39	80	20.20
	35-45	53	26.11	56	29.02	109	27.5
	45-55	48	23.65	43	22.28	91	22.97
	55-65	32	15.76	18	9.33	50	12.62
	>65	15	7.39	15	7.77	30	7.57
Education	Illiterate	38	18.72	78	40.41	116	29.29
	Up to Primary	26	12.81	49	25.39	75	18.93
	Up to 8th	49	24.14	38	19.96	87	21.96
	Up to Matric	43	21.18	26	13.47	69	17.42
	Up to 12th	30	14.78	1	0.52	31	7.82
	Graduation	17	8.37	0	0	17	4.29
	Diploma or vocational training	0	0.00	1	0.52	1	0.25
Family Size	<3	7	3.45	12	6.22	19	4.79
	3-6	118	58.13	120	62.18	238	60.10
	6-9	69	33.99	50	25.91	119	30.05
	9-12	8	3.94	10	5.18	18	4.54
	>12	1	0.49	1	0.52	2	0.50
Modern machinery	Wheel	203	100.00	117	60.60	320	80.80
	Dryer	2	0.99	28	14.51	30	7.58
	Kiln	2	0.99	28	2.59	7	1.77
	Pugmill	68	33.50	175	90.67	243	61.36
Collaboration	With SHG	4	1.97	46	23.83	50	12.63
Training	NGO training	0	0.00	40	20.72	40	10.10
Credit	No Credit	177	87.19	121	62.69	298	75.25
	Informal Credit	10	4.93	63	32.64	73	18.43
	Formal Credit	16	7.88	9	4.66	25	6.31
Awareness	Govt. Schemes	18	8.87	24	12.44	42	10.61

*Source: Author's Calculation*

Artisans significantly contribute to the country's economic development. They held a valued position in society and were consistently acknowledged for their craftsmanship (Verma & Gupta, 2017). Artisans have been a crucial foundation of our culture and heritage. Likewise, pottery, a longstanding craft in India, plays a crucial role in rural economies with low level income (Chyanraj et.al., 2005). Thus, this necessitates examining the demographic



characteristics of the pottery artisans. The respondent's gender is a crucial factor affecting the craft's production capacity (Lee, 2010). Table 1 reflects the distribution of demographic profile of the artisans. In Delhi, 87.19 per cent of respondents were male and 12.18 were females and in Haryana, out of the total respondents 98.96 per cent were males and rest were females. the number of females engaged in this profession was higher in Delhi as compared to Haryana. Therefore, the overall status as per the survey was that more men were engaged in pottery making profession compared to women. This shows that there was a significant disparity in the participation rates in men and women in this profession. Further, age is another key factor that influences mental-ability, decision making skills, physical development and confidence (Singh et.al., 2020). In the age group of below 25 years, 11.82 per cent of respondents were from Delhi, compared to 6.22 per cent from Haryana. Among the respondents aged 25-35 years, 15.27 per cent were from Delhi and 25.39 per cent from Haryana. Most respondents fell within the 35-45 years age group in both the states. For the 45-55-year category, 23.65 per cent of respondents were from Delhi, while 22.28 per cent were from Haryana. In the 55-65-year age group, 15.76 per cent of respondents were from Delhi and 9.33 per cent from Haryana. only 7.39 per cent of respondents in Delhi and 7.77 per cent in Haryana were aged above 65 years. This reflected that youth population is not much engaged in this profession.

The worker's skills are enhanced through the attainment of the education they gain. In Delhi, 18.72 per cent of respondents were illiterate, compared to 40.41 per cent in Haryana, indicating higher illiteracy in Haryana. Primary education was attained by 12.82 per cent of respondents in Delhi and 25.38 per cent in Haryana. Education up to 8<sup>th</sup> grade was reported by 24.14 per cent in Delhi and 19.69 per cent in Haryana. In Delhi, 21.18 per cent of respondents has metric level education, higher than Haryana's 13.47 per cent. Only 14.78 per cent in Delhi had completed 12<sup>th</sup> grade, compared to just 0.52 per cent in Haryana. No respondents in Haryana were graduate, while 8.37 per cent in Delhi were. Additionally, no respondents in Delhi had vocational training or diplomas, whereas in Haryana, 0.52 per cent did. These low education level highlights the insufficient development of education in these regions. Another important variable is family size. Family size significantly impacts the performance of small-scale enterprises (Khan, 2014). In Delhi, 3.45 per cent of respondents had less than 3 family members, compared to 6.22 per cent in Haryana. For families with 3-6 members, 58.13 per cent respondents were from Delhi and 62.18 per cent from Haryana. Families with 6-9 members accounted for 33.99 per cent of respondents in Delhi and 25.91 per cent in Haryana. Additionally, 3.94 per cent of respondents in Delhi and 5.18 per cent in Haryana had families comprising 9-12 members. Only 0.49 per cent of respondents in Delhi and 0.52 per cent in Haryana had more than 12 family members. Overall, the survey indicated that most respondents had medium-sized families, considering of 3-6 members.

The data highlights the utilization of modern machinery among the respondents in pottery making. All respondents in Delhi employed modern wheels, while in Haryana, 60.60 per cent did. Usage of modern dryer was minimal in Delhi (0.99 per cent) compared to Haryana (14.51 per cent). Electric kiln usage was below 3 per cent in both regions. Modern pugmill usage was reported by 33.50 per cent in Delhi and 90.76 per cent in Haryana. Collaboration





with Self-Help Groups (SHG's) was low in Delhi (1.97 per cent) but higher in Haryana (23.38 per cent). Training with NGO's was negligible in Delhi, contrasting with 20.72 per cent in Haryana. Further, to fulfill the needs like investment and consumption households tend to take credit from the different sources of borrowings (Bhuiya et.al., 2016). Regarding credit source, 87.19 per cent of respondents did not borrow while in Haryana 62.69 per cent abstained. Formal sources were utilized by 16 per cent in Delhi and 32.64 per cent in Haryana. while informal borrowing was 4.93 per cent in Delhi and 4.66 per cent in Haryana. Awareness of government schemes among respondents was low in both regions, with 8.87 per cent in Delhi and 12.44 per cent in Haryana being aware of such schemes exclusively for pottery artisans.

**Table 2: Average value of production and various cost in Delhi and Haryana**

Particulars	Average Value		
	Delhi	Haryana	Overall
Value of Production (Rs.)	307074	66228	189692
Raw Material Cost (Rs.)	51886	6755	29890
Clay Making Cost (Rs.)	19148	4350	11936
Designing cost (Rs.)	11786	2143	7086
Kiln making cost (Rs.)	14377	4462	9545
storage cost (Rs.)	6334	1683	4067
labour use (Days)	392	290	342

*Source: Author's Calculation*

The pottery industry incurs a range of cost associated with raw material, production etc. (Bandyopadhyay, 2001). The management of various cost significantly impacts the overall production efficiency and profitability of a manufacturing unit in pottery industry. This can be illustrated through detailed analysis of cost components across the regions. The table highlights the differences in the production output and the cost between Delhi and Haryana, showcasing various cost contribution to the average value of production in both the regions. The average production value is significantly higher in Delhi, suggesting more intensive or higher-valued production activities as compared to Haryana. The average value of production in Delhi was ₹3,07,074 and in Haryana the average value of production was ₹66,228.

There are various cost being incurred in the process of pottery making. Initially was the cost of procurement of raw material. Effective management of raw material is crucial. The average expenditure incurred in acquiring the raw materials necessary for pottery production in Delhi, was substantially higher as compared to Haryana. The higher average cost incurred in procurement of raw material in Delhi was attributed to the unavailability of raw material within the Delhi region. As a result, these material must be sourced from other regions, thereby increasing average transportation cost. Another cost is related to the preparation of clay, an essential component in pottery production. In Delhi, average cost incurred on clay making was ₹19,148 which was notably higher in Delhi as compared to Haryana, where average cost incurred on clay making was ₹4350. The cost refers to the expenses associated with the creative process of designing pottery products. Delhi (₹11,786) shows a higher average expenditure in designing compared to Haryana (₹2143). Further, kiln making pertains to the expenses



involved in constructing or maintaining kilns. The average cost incurred in kiln making was ₹14,377 and ₹4462 in Delhi and Haryana respectively. Delhi demonstrated a higher expenditure in kiln making as compared to Haryana. Additionally, the expense related to storing of finished pottery products was higher in Delhi compared to Haryana. Another cost associated was number of labour days utilized in pottery production. Interestingly, despite having a higher value of production and incurring higher cost in various categories, Haryana appeared to utilize labour more efficiently with lower number of labour days despite a lower value of production.

The differential cost management across Delhi and Haryana underscored the importance of strategic cost control in various facets of pottery production.

**Table 3: Results of Stochastic production frontier model**

Particulars	Delhi	Haryana	Overall
<b>Production function</b>			
beta 0	1.641*** (0.449)	2.198*** (0.311)	2.317*** (0.210)
raw material cost	0.655*** (0.044)	0.413 (0.035)	0.497*** (0.022)
Ln Clay making cost	0.284*** (0.040)	0.247*** (0.051)	0.388*** (0.028)
Ln Designing cost	0.026** (0.011)	0.014 (0.011)	0.023*** (0.007)
Ln Kiln making cost	0.061*** (0.017)	0.365*** (0.047)	0.094*** (0.015)
Ln storage cost	0.020*** (0.005)	0.024*** (0.005)	0.026*** (0.004)
Ln labour use	0.065 (0.096)	-0.002 (0.054)	0.022 (0.042)
<b>Inefficiency function</b>			
delta 0	0.135 (0.978)	-2.797*** (1.198)	-0.962 (0.960)
Age	-0.115* (0.055)	0.124* (0.047)	-0.035 (0.036)
Age2	0.001 (0.001)	-0.001* (0.001)	0.000 (0.000)
Education	-0.280 (0.222)	0.296*** (0.104)	0.207* (0.123)
Education2	0.062 (0.045)	-0.061*** (0.013)	-0.033 (0.027)
Family Size	0.214*** (0.071)	-0.027 (0.047)	0.159*** (0.037)
Male dummy	0.553 (0.534)	0.363 (0.758)	0.422 (0.285)
Modern wheel dummy	0.135 (0.978)	0.113 (0.163)	-0.200 (0.327)
Modern Dryer dummy	-1.975* (1.158)	0.045 (0.371)	-0.184 (0.146)
Modern Kiln dummy	-0.966 (1.040)	-0.118 (0.978)	-0.005 (0.193)
Modern Pugmill dummy	-0.149 (0.196)	-0.667*** (0.211)	-1.605*** (0.423)
SHG collaboration	-2.316** (1.170)	-0.303 (0.472)	-1.870 (1.155)
NGO training	0.000 (1.000)	-0.492 (0.322)	-0.570 (0.775)



No credit dummy	-1.441*** (0.427)	0.682 (0.691)	1.095*** (0.312)
Informal credit dummy	-1.584** (0.748)	0.531 (0.671)	-0.670 (0.723)
Govt Schemes dummy	0.189 (0.506)	-0.549 (0.433)	-0.375** (0.188)
sigma-squared	0.417*** (0.063)	0.134*** (0.025)	0.607*** (0.116)
Gamma $\gamma$	0.895*** (0.023)	0.777*** (0.054)	0.924*** (0.016)
<b>log likelihood function</b>	<b>-25.103</b>	<b>30.683</b>	<b>-33.276</b>
<b>LR test of the one-sided error</b>	<b>60.758</b>	<b>83.807</b>	<b>121.365</b>
<b>number of cross-sections</b>	<b>203</b>	<b>193</b>	<b>396</b>
<b>Average efficiency</b>	<b>0.854</b>	<b>0.886</b>	<b>0.857</b>

*Source: Author's Calculation*

The efficiency of pottery artisans in India showcase their deep rooted cultural heritage, continuous skill development, resourceful adaptation, collaborative networks and entrepreneurial spirit. By harmonizing tradition with innovation, they have elevated Indian pottery to a symbol of excellence and artistic mastery. Table 3 focusses on the analyzing the productive efficiency and the determinants of inefficiency in the production function in both the regions. The production function and the identification of variables contributing to inefficiency were analyzed by applying the stochastic production frontier model in both the states. This model, within a theoretical framework, is employed to assess economic, allocative and technical efficiency (Khanum et.al., 2009) and enhancing efficiency in pottery production is a crucial source of income with the given level of input. The level of productive efficiency is key indicator of competitiveness (Prasetyo & Dzaki 2020). The estimated value of  $\gamma$  was 0.895 in Delhi and 0.777 in Haryana and were significant at 1 per cent of level of significance. This implies that there exists inefficiency in the model. As per the model, the predicted average efficiency was 85.4 per cent and 88.6 in Delhi and Haryana respectively. In Delhi and Haryana the cost of raw material had a positive relation with the income of respondents and it was significant at 1 per cent level of significance, this reflects that as the respondent experiences a one-rupee increase in the purchase of raw material, their income is expected to rise by 65.5 per cent in Delhi and 41.3 per cent in Haryana. This elevation in income stems from the increase in the expenditure on procurement raw material, facilitating scaling up of production capabilities. Another variable was cost of clay making, the cost of clay making had a positive impact on the income of the respondent in both the states. As the respondent's expenditure on the clay increase by one rupee, there will be corresponding income boost of 28.4 per cent in Delhi and 24.7 per cent in Haryana.

Further as per the model, the cost incurred on designing of the pottery product was positively related with the income of respondents in Delhi and was significant at 5 per cent level of significance but is Haryana designing cost had a positive relation with the level of income of respondents but was insignificant. Another expenditure was cost of kiln making, cost of kiln making had a positive relation with the level of income of respondents and was significant at 1 per cent level of significance in both the states. As there was increase in



expenditure on kiln making by 1 rupee, respondents income was enhanced by 6.1 per cent and 36.5 per cent in Delhi and Haryana respectively. Likewise the storage cost also had a positive relation with level of income in both the states and was significant at 1 per cent level of significance. In Delhi, cost of labour hour per day also had positive relation with income but was not significant but in Haryana, cost of labour hour per day was negatively associated with level of income of respondents. The analysis of the model revealed that the expenses associated with the raw materials and kiln making exerted the most significant impact on the income levels of respondents in both the states.

Given the gamma value indicating inefficiency, the model proceeds to estimate the assorted determinants of inefficiency within the context of both the states. First variable is age, since age plays a pivotal role in shaping mental acuity, decision making power, confidence and physical well-being (Singh, 2020). In Delhi, the age of respondent exhibited a negative correlation with inefficiency. A one-year increase correspond to a 9.2 per cent improvement in income efficiency. This trend can be attributed to the accumulation of experience with age. However, it's noteworthy that as age exponentially rises, it can contribute to increased inefficiency due to its positive yet insignificant relationship with inefficiency. In contrast, in Haryana, the age of the respondent demonstrated a positive association with inefficiency. Here, an exponential increase in age led to a fall in inefficiency, supported by its significant relevance at 10 per cent level of significance. This pattern suggests that as the age of person increases exponentially person becomes more experienced and trained. Another variable in education, in Delhi, education demonstrates a negligible association with inefficiency. More education equates to better knowledge and practices in pottery making. However, with an exponential increase in education year, the relation with inefficiency becomes positive and insignificant. But in Haryana, education exhibits a minor positive correlation with inefficiency. knowledge refinement through formal or informal training enhances competence. Surprisingly, as education grow exponentially, the relation with inefficiency turns negative, potentially enhancing the efficiency. In Delhi, family size shows a significant positive correlation with inefficiency, indicating that as family size increases, respondents expenditure rises, impacting their income level. Conversely, in Haryana, family size demonstrates a significant negative relation with inefficiency, implying that as family size expands, more labour will be available to work. Respondent's gender being male was associated positively with inefficiency and was significant.

Furthermore, use of modern wheel in the process of pottery making had a positive impact on inefficiency and was insignificant in both the regions. Usage of pot dryer had a negative relation with inefficiency and was significant at 10 per cent level of significance. As more expenditure was incurred on purchase of pot dryer there would be increment in income of respondent by 97.5 per cent. On contrast, Haryana had positive relation between use of pot dryer and inefficiency and was insignificant. Use of pugmill was negatively associated with inefficiency in both the states. Likewise, collaborations with SHG's had a negative impact on inefficiency. Since, SHG's helps the respondents in training, finance etc. NGO training had a negative relation with inefficiency in Haryana. In Delhi, respondents who had not taken credit exhibited a significant negative relation with inefficiency, indicating better efficiency. In



contrast, in Haryana respondents who had not taken credit showed a significant positive relation with inefficiency. In Delhi, availability of informal credit sources had a negative relation with inefficiency and was significant at 1 per cent level of significance but in Haryana, the relation was positive as it creates the burden of repayment. Another variable was awareness about government schemes. Government schemes can help in the upliftment of the livelihood of the artisans in India (Deb & Molankal, 2001). Awareness about government schemes had a positive relation with inefficiency in Delhi and had a negative relation with inefficiency in Haryana respectively. Since the value of gamma is significant at 1 per cent level of significance and value of coefficient was close of 1 in both the states, it means this the model of best fit.

**Figure II: Cumulative distribution of potter's efficiency in Delhi**

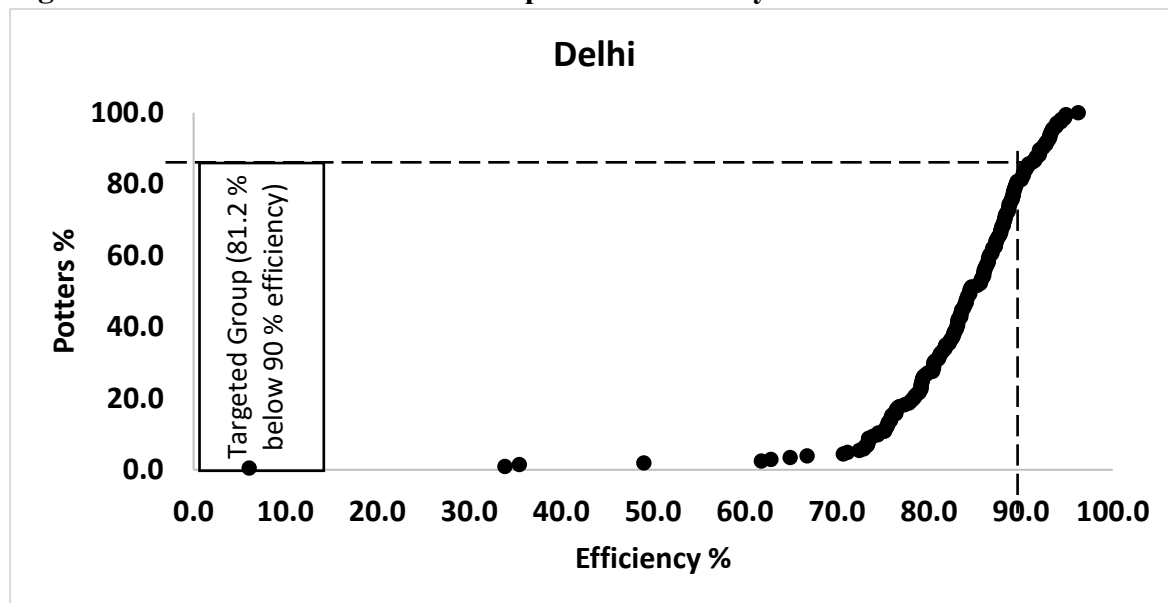


Figure II illustrates the cumulative distribution of potter's efficiency in Delhi. The data reveals that approximately 20 per cent of potters exhibit efficiency levels below 80 per cent. The majority, 60 per cent have efficiency levels ranging between 80 per cent to 90 percent. Additionally, about 20 per cent of potters demonstrates efficiency levels exceeding 90 per cent. The figure reflects that the 81.2 per cent of artisans are the targeted group having the efficiency level below 90 per cent of efficiency level. These findings suggest a significant opportunity for income enhancement through improvement in efficiency.



**Figure III: Cumulative distribution of potter's efficiency in Haryana**

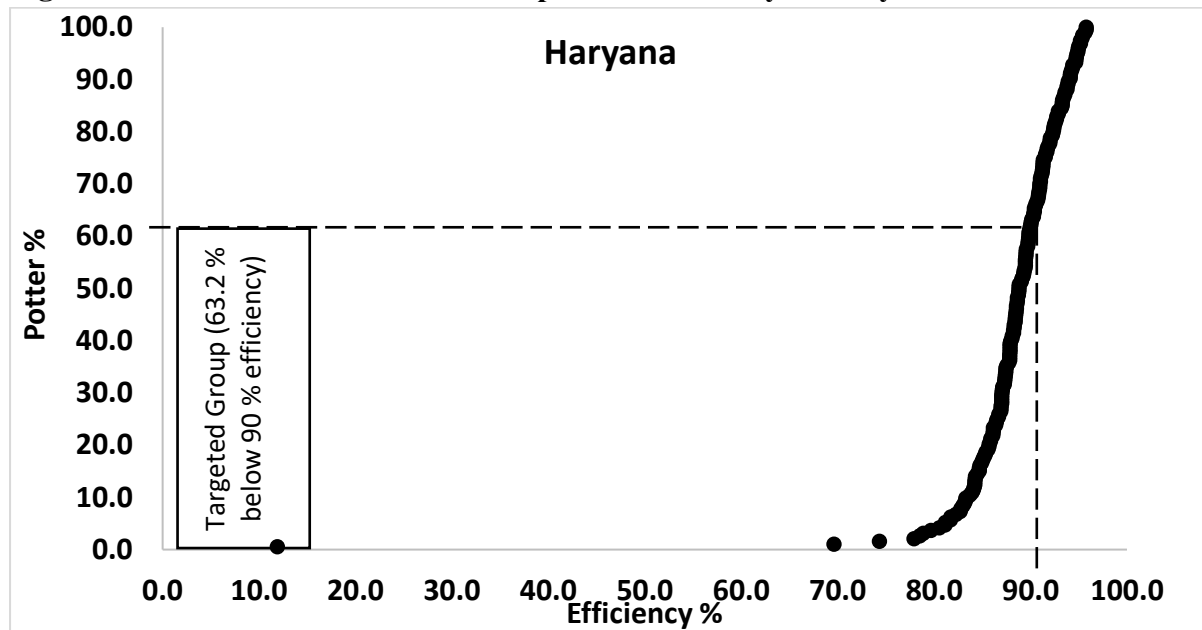


Figure III illustrates the cumulative distribution of potter's efficiency in Haryana, providing key insights into their efficiency levels. The data indicates that approximately 20 per cent of potters have an efficiency level below 85 per cent. Further, 60 per cent of potters have an efficiency level ranging from 85 per cent to 95 per cent. Only 20 per cent potters have an efficiency level above 95 per cent. The figure highlights that 63.2 per cent of artisans fall into the target group with the efficiency level below 90 per cent. This suggests a significant opportunity for respondents to enhance their efficiency, which could lead to more prosperous future in the pottery industry.

**Figure IV: Overall cumulative distribution of potter's efficiency**

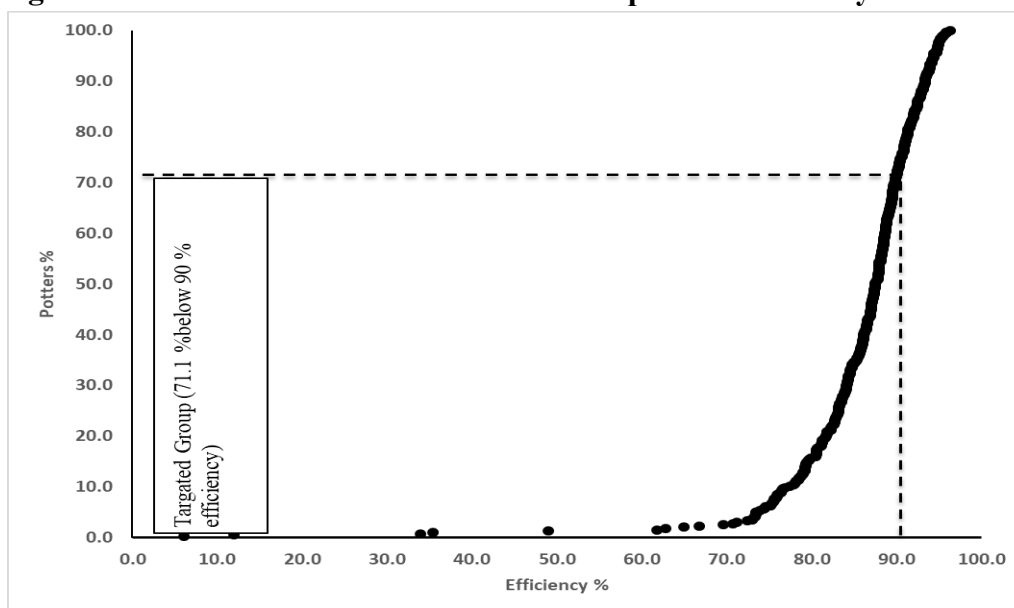




Figure IV presents the cumulative distribution of potters efficiency across both states, revealing that 20 per cent of potters have an efficiency level below 80 per cent. Moreover, 60 per cent of potters have an efficiency below 80 per cent to 90 per cent. Only 20 per cent of potters have an efficiency level above 90 per cent. This distribution indicates that 71.1 per cent of artisans have efficiency level below 90 per cent. This suggest a significant potential for enhancing the production efficiency. By targeting improvements in this majority group, there is considerable scope to increase productivity and, consequently, boost earnings within the pottery industry.

### Estimation of Income gap

In developing country like India, small-scale industries hold significant potential for generating revenue, creating employment opportunities, and attracting foreign investment (Pizam, 1990). Moreover, it is widely recognized that micro, small and medium enterprises (MSMEs) play a crucial role in driving the economic performance of nations (Youndt, et al., 1996). While financial constraint faced by these industries is one of the major reasons that is impeding the growth of MSMEs. Further analysis indicates potential income with the existing potential level of technical efficiency.

**Table 4: Estimates of potential income in with existing technical efficiency level.**

Particulars	Delhi	Haryana	Overall
Actual Technical Efficiency	0.886	0.854	0.857
Potential Technical Efficiency	0.958	0.962	0.962
Efficiency Gap (%)	7.48	11.24	10.92
Actual Income (Rs./HH per year)	22006	113458	68887
Potential Income (Rs./HH per year)	23652	126216	76410
Income Gap (Rs./HH per year)	1646	12757	7523

*Source: Author's Calculation*

By improving their technical efficiency, artisans can increase their earnings and ultimately contribute to reducing the income gap. Table 4 highlights the estimates of potential income with the existing technical efficiency level. Findings of the table 4 shows that potential income gains that are achievable through enhancement in technical efficiency within the regions. Analysis reveals that actual technical efficiency stood at 0.886 per cent in Delhi, 0.854 per cent in Haryana and 0.857 overall, the potential efficiency level was higher, reaching 0.958 per cent for Delhi and 0.962 per cent for both Haryana and overall dataset. This disparity underscores an efficiency gap of 7.48 per cent, 11.24 per cent and 10.92 per cent for Delhi, Haryana and overall, respectively. Correspondingly, potential income per household demonstrates considerable improvements in the current earnings. The income gaps amounting to Rs 1,646 for Delhi, ₹12,757 and ₹7,523 overall, underscores the imperative for enhancing production to reach the potential levels of technical efficiency. This strategic imperative not



only addresses the existing income gaps within these regions but also facilitates a path towards their reduction.

## **Conclusion**

Pottery has long been an integral part of cultural heritage, serving both utilitarian and artistic purposes. The pottery industry not only preserves rich traditions but also significantly contributes to the economy, particularly rural development. An analysis of this study reveals that pottery artisans exhibit varied characteristics influenced by socio-economic factors. Demographically, the surveyed households are predominantly male headed, with most artisans aged between 35 to 45 years. The majority of respondents belong to families with 3 to 6 members. Education level vary, with most artisans in Delhi having completed up to 8<sup>th</sup> grade, while a majority in Haryana are illiterate.

Despite its cultural and economic contributions, pottery industry faces numerous socio-economic challenges that hinder artisans well-being. Many artisans still rely on primitive production technologies. The study highlights difference in technical efficiency between Delhi and Haryana, with Haryana being more efficiency than Delhi. Various cost, such as raw material, clay making, design, kiln making, and storage have positive and significant impact on artisans' income. However, labor has a different impact, it positively affects in Delhi but negatively in Haryana. inefficiencies in production are primarily due to the lack of modern technology and financial constraints. There was the income gap of ₹1646 in Delhi and ₹12757 in Haryana for not producing at the potential level of efficiency.

To address these challenges and enhance productivity, it is essential to provide financial support for modern technology and encourage the adoption of contemporary technologies. Government and non-government organizations should expand skill development and training programs, focusing on organizations of workshops. Increased awareness about government schemes is crucial to ensure artisans can benefit from available support. Collaborations with stakeholder, including academicians, policy makers and consumer are vital for upliftment of artisans. Additionally, raising consumer awareness about the value of handmade and eco-friendly products can boost their demand, thereby increasing artisan's revenue.

Fostering an environment that values and supports the pottery community is essential for overcoming socio-economic challenges, preserving this craft and enhancing the well-being of artisans.

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