



Dummy variable regression to compare and post GST condition of handloom weavers

J. S. BASAK, M. SAHA, M. ROY, P. MALLICK, T. BISWAS AND P. K. SAHU

Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, Pin – 741252

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ABSTRACT

GST known as Goods and Services Tax, is a type of indirect tax. In Indian economy it is a paradigm shift. Introducing in 2017 and including huge number of items and eliminate 7 indirect central and 10 indirect state tax on a single item, it increased the tax base. In it amount of tax also distributed with defined percentages within the central and state governments. As there was no tax on handloom industry, so, imposed tax on it becomes a burning topic nowadays. To examine GST effect on handloom weavers in West Bengal, an initial attempt has taken in this article as a case study using stepwise regression model with single dummy variable (D_i). From traditional weavers' village Nasratpur situated at 23°N and 88°E, primary information from 135 handloom weavers from different groups were collected during March-April, 2018. After GST selling prices of handloom sarees is decreasing whereas raw material cost per saree is increasing. To maintain profit margin, handloom owners are cutting down the labour wages. Moreover, the decreasing trend in sales of sarees compared to pre GST condition. Regression analysis of income from handloom on 8 independent variables reveals that the two regression lines are different in pre and post GST condition which is proved by significant of coefficient of intercept D_i and $D_i X_{i4}$ variable. The study recommended that efforts needed to diminish raw materials cost for handloom with improving channels of marketing for selling handloom goods.

Keywords: Dummy variable, GST, handloom, weaver

Taxation system is a backbone of any country. It is required to maintain expenditure of army for protection, for developmental work and the cost for operating the nation. Goods and Services Tax (GST) is paradigm shift to any national economy. It is came under indirect tax. Earlier it was introduced in European countries in 1970s-80s. In 1954, France implemented GST as a first country. And now a days there are 160 countries which implemented GST. In India, the President and the Prime Minister of India launched GST at 1st July, 2017 midnight. In the Indian Constitution GST was introduced as one hundred and first amendment act 2016. Introducing in 2017 and including huge number of items and eliminate 7 indirect central and 10 indirect state tax on a single item, it increased the tax base. In it amount of tax also distributed with defined percentages within the central and state governments. In GST, 0%, 5%, 12%, 18% and 28% taxes are imposed on goods and services. Some products namely petroleum and alcoholic products are excluded from GST, state government can imposed tax on this products individually.

In the previous centuries of history, no tax was imposed on handloom industry, so, imposed tax on handloom industry is a burning topic in now a days. Price impacts on handloom products in textile markets will be relatively higher and different due use of different types and quantities of fibre, fabric, yarn, etc. Khan and Soni

(2018), worked in Bhiwandi under the district of Thane in Mumbai on GST impact on textile hub. Mahender (2017), work out GST effect on manufacturing industry in India. Using dummy variable in regression equation, more than two regression line can be incorporated in one regression equation and it can also answered for which variable or intercept point the two regression equations are different. Oyeka and Nwankwo (2012) worked regression models using ordinary dummy variables. Oluwapelumi (2014) also compared wage bill revenue collected from six different geopolitical zones of Nigeria using dummy variables.

Introduced in the year 2017, many questions have been raised since about its advantages, disadvantages and overall impact on economy of the country and people. To examine GST effect on handloom weavers in West Bengal, an initial attempt has taken in this article as a case study using stepwise regression model with single dummy variable (D_i). Table 1 shows the GST rates for different textile products up to 25.04.2018.

MATERIALS AND METHODS

Nasratpur is also known as Samudragarh. It has a consistent contribution in the production of handloom garments. And also a well-known traditional handloom textile belt. Considering this logic, purposively this

village was considered for the investigation. This village came under Purbasthali-I block, Kalna subdivision in Purba Barddhaman district, West Bengal, India. This village has hardly 15 km distance from Kalna and 97 km away from Howrah. It is placed on the Western bank of the river Bhagirathi and the geographical location is 23°N and 88°E. This village has a small area but it has a significant contribute in the economical field of garments business not only in the local market but also in the national market. Main handloom product of this area is tant saree which produced in a bulk amount.

To know the mood of handloom weavers, a pilot survey is conducted in the 4 villages of the selected area at first. This villages are also chosen purposively. As the survey result, 405 numbers of weavers are found in the 4 villages and three groups namely, having 1 to 3, 4 to 5, 6 and above number handlooms in a house are spotted. By using sample drawing method of Israel (1992), 135 numbers of house were selected as a sample with 5 % level of significant and 7 % level of precision in table 2. Figure in the parenthesis represent the number of house selected from the distinct category from the selected 4 villages.

The term regression is used to describe the mathematical relationship of one dependent variable with other independent variable. Thus regression analysis is the dependency of one variable on at least one or more than one independent variables. Qualitative variables cannot be measured or quantified on well-defined scale, but can be graded or grouped or assigned to artificial values. As such from the qualitative variables artificial variables can be generated and these variables are known as dummy variables. Dummy variables are also known as categorical variables or indicator variables. Particular classes of dummy variables which can take only two values (like yes/no or 0/1) are known as binary variables or dichotomous variables. Here, one dummy variable D_i is used, which takes only two values.

$D_i = 0$ for before GST condition,

1 for after GST condition,

If Y is the dependent and X_1, X_2, \dots, X_p are p independent (explanatory) variables. Then the regression equation using single dummy variable is as follows,

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_p X_{pi} + \alpha_0 D_i + \alpha_1 D_i X_{1i} + \alpha_2 D_i X_{2i} + \dots + \alpha_p D_i X_{pi} + e_i,$$

where, Y_i represents dependent variable values; $X_{1i}, X_{2i}, \dots, X_{pi}$ represents independent variables values; $\beta_0, \beta_1, \dots, \beta_p, \alpha_0, \alpha_1, \dots, \alpha_p$ are the coefficients of regression equation and e_i is the error component and $e_i \sim \text{iid } N(0, \sigma^2)$. Modupe (2012) worked on regression using dummy variable to compare academic performance of students.

RESULTS AND DISCUSSION

Using questionnaires method data are collected during the period from 28.03.2018 to 25.04.2018. Here, data are taken on 16 variables. Among them raw material cost for each saree before GST (X_1), labour cost for each saree before GST (X_2), saree producing each month before GST (X_3), saree selling each month before GST (X_4), selling price for each saree before GST (X_5), profit from selling each saree before GST (X_6), monthly income of handloom owner before GST (Y_1), raw material cost for each saree after GST (X_7), labour cost for each saree after GST (X_8), saree producing each month after GST (X_9), saree selling each month after GST (X_{10}), selling price for each saree after GST (X_{11}), profit from selling each saree after GST (X_{12}), monthly income of handloom owner after GST (Y_2), family labour number (X_{13}), total labour number (X_{14}), all are economic variables. Table 3 reflects range, mean, standard deviation, skewness and kurtosis of 16 variables. Here, income per month of a family from handloom is calculated by summing the profit by selling saree produced by handloom and wage get by working as family labour.

Table 1: The GST rates for different textile products up to 25.04.2018

Sl. No	Particulars	Rate of GST
1	Cotton	5%
2	Cotton yarn	5%
3	All type of fabrics (with no ITC accumulation)	5%
4	Synthetics yarn	18%
5	Readymade Garments (more than Rs.1000)	12%
6	Readymade garments (up to Rs.1000)	5%
7	Silk and jute fiber	NIL
8	Embroidery, dyeing and printing job work	5%

Table 2: Sample size at 5% level of significant and 7% level of in precision

Village no.	1-3 handloom	4-5 handloom	6 and above handloom	Total
1	15(5)	25(8)	10 (3)	50 (16)
2	17(6)	20(7)	8(3)	45 (16)
3	40(13)	15(5)	5(2)	60 (20)
	50(17)	120(40)	80(26)	250 (83)
Total	122(41)	180(60)	103(34)	405(135)

Table 3: Descriptive statistics of 16 variables

Variables	Range	Mean	S.D.	Skewness	Kurtosis
Raw material cost for each saree before GST(X ₁)	670	353.56	148.46	1.15	0.8
Labour cost for each saree before GST(X ₂)	580	506.81	145.21	0.86	0.31
Saree producing each month before GST(X ₃)	140	55.27	29.53	1.14	1.26
Saree selling each month before GST(X ₄)	140	55.09	29.47	1.17	1.32
Selling price for each saree before GST(X ₅)	1410	1093.26	333.74	0.95	0.2
Profit from selling each saree before GST(X ₆)	370	232.89	81.79	0.75	0.11
Monthly income of handloom owner before GST(Y ₁)	47550	20926.07	8741.95	0.87	1.02
Raw material cost for each saree after GST(X ₇)	730	394.44	169.22	1.14	0.72
Labour cost for each saree after GST(X ₈)	530	479.63	129.52	1.05	0.82
Saree producing each month after GST(X ₉)	140	55.27	29.53	1.14	1.26
saree selling each month after GST(X ₁₀)	135	44.24	26.03	1.61	2.4
Selling price for each saree after GST(X ₁₁)	1310	1012.59	305.96	1.05	0.42
Profit from selling each saree after GST(X ₁₂)	300.00	138.52	51.90	1.21	1.89
Monthly income of handloom owner after GST(Y ₂)	33373.33	15566.83	6446.68	0.67	0.04
Family labour number(X ₁₃)	3.00	1.36	0.70	0.60	0.28
Total labour number(X ₁₄)	11.00	4.27	1.96	0.56	1.29

Table 4: Correlation coefficient between monthly income of handloom owner before GST (Y₁) and 8 independent variables in pre GST condition

Variables	Correlation coefficient (r) Y ₁
Raw material cost for each saree before GST (X1)	0.224**
Labour cost for each saree before GST (X2)	0.180*
Saree producing each month before GST (X3)	0.597**
Saree selling each month before GST (X4)	0.597**
Selling price for each saree before GST(X5)	0.290**
Profit from selling each saree before GST (X6)	0.456**
Family labour number (X13)	0.514**
Total labour number (X14)	0.688**

Note: ** and * represents significant at 1% and 5% level respectively

Table 5: Correlation coefficient between monthly income of handloom owner after GST (Y₂) and 8 independent variables in post GST condition

Variables	Correlation coefficient (r) Y ₂
Raw material cost for each saree after GST (X7)	0.077
Labour cost for each saree after GST (X8)	-0.025
Saree producing each month after GST (X9)	0.572**
Saree selling each month after GST(X10)	0.545**
Selling price for each saree after GST (X11)	0.114
Profit from selling each saree after GST (X12)	0.484**
Family labour number(X13)	0.628**
Total labour number(X14)	0.557**

Note: ** and * represents significant at 1% and 5% level respectively

Table 6: Results of stepwise multiple linear regression of monthly income of handloom owner (Y) on 8 independent variables using single dummy variable D_i

$$Y = -14676.593 + 3640.424 D_i^{**} + 7.106 X_2^{**} + 118.836 X_3^{**} + 89.519 X_4^{**} - 66.288 D_i X_4^{**} + 51.953 X_6^{**} + 6198.304 X_7^{**}$$

R² = 0.973 and adj R² = 0.945

Note: ** and * represents significant at 1% and 5% level respectively

Table 7: Mean function of monthly income of handloom owner before GST

$$Y = -14676.593 + 7.106 X_2 + 118.836 X_3 + 89.519 X_4 + 51.953 X_6 + 6198.304 X_7$$

Table 8: Mean function of monthly income of handloom owner after GST

$$Y = -11036.173 + 7.106 X_2 + 118.836 X_3 + 23.231 X_4 + 51.953 X_6 + 6198.304 X_7$$

Fig. 1 represents percentage share of average raw material cost for each saree before GST, average labour cost for each saree before GST and average profit from selling each saree before GST on the average selling price of each saree before GST. Considering average selling price for each saree before GST is 100% or Rs. 1093.26, average raw material cost for each saree before GST shares 32% or Rs. 353.56, average labour cost for each saree before GST shares 47% or Rs. 506.81 and average profit from selling each saree before GST shares 21% or Rs. 232.89.

Fig. 2 represents percentage share of average raw material cost for each saree after GST, average labour cost for each saree after GST and average profit from selling each saree after GST on the average selling price of each saree after GST. Considering average selling price for each saree after GST 100% or Rs. 1012.59 average raw material cost for each saree after GST shares 39% or Rs. 394.44, average labour cost for each saree after GST shares 47% or Rs. 479.63 and average profit from selling each saree after GST shares 14% or Rs. 138.52. Raw material cost for each saree is increased and labour cost for each saree is decreased after GST condition. After GST the selling price of each saree reduced for that reason average profit from selling each saree after GST is reduced.

Table 4 represents the correlation coefficient between monthly income of handloom owner before GST and 8 independent variables before GST. Here, all independent variables are significantly correlated with monthly income of handloom owner before GST. Raw material cost for each saree before GST is positively and significantly correlated with monthly income of handloom owner before GST because if raw material cost for each saree before GST is high, producing saree quality also superior and get good selling price, resulting in increasing income. If labour cost for each saree is increased, then income also increased by working as family labour. If number of saree producing each month and number of saree selling each month is increased, the family income also increased. It reflects by positive and significant correlation of saree producing each month before GST and saree selling each month before GST with monthly income of handloom owner before GST. If selling price is increased it also maximizing the profit for that reason selling price for each saree before GST

and profit from selling each saree before GST shows positive and significant correlation with monthly income of handloom owner before GST. If family labour number and total labour number is increased, the production of number of saree also increased. Beside this more family labour number means a lot of family income by earning labour wage. For that reason, family labour number and total labour number shows positive and significant correlation with monthly income of handloom owner before GST.

Table 5 represents the correlation coefficient between monthly income of handloom owner after GST and 8 independent variables after GST condition. Out of them, saree producing each month after GST, number of saree selling each month after GST, profit from selling each saree after GST, family labour number and total labour number shows positive and significant correlation with monthly income of handloom owner after GST. Raw material cost for each saree after GST is positively correlated with monthly income of handloom owner after GST because if raw material cost for each saree after GST, producing saree quality also superior and get good selling price, resulting in increasing income. But, after GST raw material cost is increased and handloom owner have to pay more money to produce same quality of saree, so increasing raw material cost for each saree after GST does not increased monthly income of handloom owner after GST that much extend compared to before GST condition. For that reason, it shows non-significant correlation in after GST condition. After GST raw material cost for each saree is increased and selling price for each saree decreased simultaneously. To maintained profit margin by selling saree the handloom owner reduced the labour wage, that's why labour cost for each saree after GST shows negative correlation with monthly income of handloom owner after GST. If number of saree producing each month and number of saree selling each month is increased, the handloom owner income also increased. It reflects by showing positive and significant correlation of saree producing each month after GST and saree selling each month after GST with monthly income of handloom owner after GST. If selling price for each saree is decreased it also reduces the profit margin as well as income from handloom. For that reason selling price for each saree after GST and profit from selling each saree after GST show positive correlation

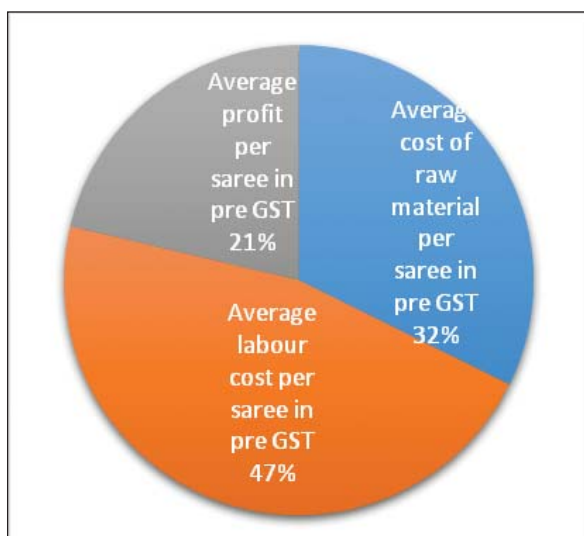


Fig. 1: Percentage share of three component on the average selling price for each saree before GST

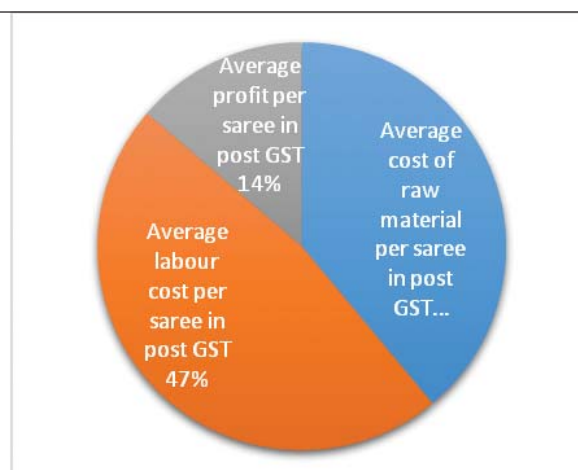


Fig. 2: Percentage share of three component on the average selling price for each saree after GST

with monthly income of handloom owner after GST. But, there have another factor, income by working as family labour that is not decreases to that extent. That's why selling price for each saree after GST shows non-significant correlation with monthly income of handloom owner after GST. If family labour number and total labour number is increased, the production of number of saree also increased. Beside this more family labour number means a lot of family income by earning as labour wage. For that reason, family labour number and total labour number shows positive and significant correlation with monthly income of handloom owner after GST.

Table 6 represents, stepwise multiple linear regression income per month of a family from handloom (Y) on independent variables –raw material cost for each saree (X_1), labour cost for each saree (X_2), saree producing each month (X_3), saree selling each month (X_4), selling price for each saree (X_5), profit from selling each saree (X_6), family labour number (X_7), total labour number (X_8) using dummy variable Di. Where, $D_i = 0$ for before GST condition and $D_i = 1$ for after GST condition. Dummy variable Di is used with raw material cost for each saree, labour cost for each saree, saree selling each month, selling price for each saree. In before and after GST condition number of saree produce each month, family labour number and total labour number variables values are same, for that reason dummy variable Di is used with those variables. Here, this eight independent variables explained 97.3% variation of Y.

Table 7 and table 8 represent, mean function of monthly income of handloom owner before GST

condition and mean function of monthly income of handloom owner after GST condition by taking D_i value as 0 and 1 respectively. Both the two lines are generated from the table 6 equation. Two equations are different which indicates by the significance of the variable D_i and $D_i X_4$.

Average raw material cost for each saree before GST and after GST condition was Rs. 353.56 and Rs. 394.44 respectively, thereby indicating higher cost during before GST condition due to impose tax on handloom sector. Average labour cost for each saree during before and after GST condition was Rs. 506.81 and Rs. 479.63 respectively, thereby indicating reducing labour wage during after GST condition. For maximizing the profit they reduced the labour wages during after GST condition, so that balance should be made for total cost of production for each saree. After GST condition the selling price for each saree and saree selling each month were also reduced, which decreased the profit after GST condition. In regression analysis single dummy variable D_i was used, where D_i value was taken as 0 for before GST condition and D_i value was taken as 1 for after GST condition. In this case coefficient of $D_i X_4$ were found negative and highly significant. Also the coefficient of intercept term D_i is also significant. Which reveals that before and after GST condition two regression lines are different. Before and after GST condition number of saree producing each month was same but saree selling each month was reduced. Handloom owners gather that unsold sarees and to maximize their profits they want to sell those stocked sarees before any festival when demand will be high and they can earned more profit. So, at the end it can be

concluded that after 1 year of introduction of GST, on handloom industry it produces a negative impact. The study also recommended that efforts needed to diminish raw materials cost for handloom with improving channels of marketing for selling handloom goods.

REFERENCES

- Anbuthambi, B. and Chandrasekaran, N. 2017. Goods and Services Tax (GST) and training for its implementation in India: a perspective. *ICTACT J. on management studies*, **3(2)** : 511-14
- Bhattacharya, G. 2017. Evaluation and implementation of GST in Indian growth : A study. *Intl J Commerce and Management Res.*, **3(11)** :65-68
- Dani, S. 2016. A research paper on an impact of Goods and Service Tax (GST) on Indian Economy. *Business and Economics J.*, **7(4)** : 264-65
- Khan, S. and Soni, R. 2018. Impact of GST on textile hub of Mumbai (Bhiwandi, Dist. Thane). *Account and Financial Management J.*, **3** : 1318-22
- Mahender, P. 2017. GST Effect on Manufacturing Industry – India. *Intl. J. Managerial Studies and Res.*, **5(1)** : 28-30
- Modupe, O., D. 2012. A dummy variable regression on students' academic performance. *Transnational J. Sci. Tech.*, **2(6)** : 47-54
- Oberoi, J. 2016. GST-a game changer for the textile sector in India. *Intl.J App. Res.*, **3(7)** : 189-94
- Oluwapelumi, A. 2014. Incorporating dummy variables in regression model to determine the average internally generated revenue and wage bills of the six geopolitical zones in Nigeria. *European J. Stat. Probability*, **2(1)** : 23-27
- Oyeka, I., C., A. and Nwankwo, C., H. 2012. Use of ordinal dummy variables in regression models. *IOSR J. Math.*, **2(5)** : 1-7
- Oyeka, I., C., A. and Nwankwo, C., H. 2014. Direct and indirect effects in dummy variable regression. *American J. Theoretical App. Stat.*, **3(2)** : 44-48
- Rani, S., A. 2017. Research paper on goods and service tax (GST) and its impact on Indian economy. *Intl.J. Adv. Res. Dev.*, **2(5)** : 209-12.
- Rana, C. 2019. A study on impact of GST on Indian economy, *Intl. J. Sci. Res.*, **8(4)** : 1909-13
- Sankar, R. (2017). GST: impact and implications on various industries in Indian economy. *J. Internet Banking and Commerce*, **22(2)** : 1-9
- Saravanan, S. and Chandra, M., K. 2017. Assessment and impact of existing indirect tax to goods and service tax in India. *Intl.J. Scientific Res. in Comp. Sci., Engg. Info. Tech.*, **2(3)** : 623-29.
- Israel, D., G. 1992. Determining sample size. Florida cooperative Extension Service. Institute of Food and Agricultural Sciences, University of Florida, pp. 1-5