APPENDIX II-A-1

EMPLOYEMENT MULTIPLIER OF PALOLEM

Analysis of data:
The total Net Domestic product at constant prices of taluk for the year 2001-02 was estimated to be Rs. 10,268 lakhs. The working population of the taluk according to 2001 census is estimated to be 17,654.
The yearly income/contribution of the working population in primary sector = Rs. 2730 lakhs.
The yearly income/contribution of the working population in secondary sector = Rs. 3304 lakhs.
The yearly income/contribution of the working population in tertiary sector = Rs. 4234 lakhs.
The total working population of the taluk happens to be 17,654, out of the total population of 43,912 as per 2001 census. The percent of working population engaged in primary sector is 42.65%, in secondary sector 10.43%, while in tertiary sector which includes tourism as well, it turns out to be 46.92% respectively. Therefore, working population (17654) when calculated in percent, turns out to be 40.21 of the total population and the remaining 59.79% are the non-working population of the taluk. Therefore, the total income of the taluk for the year 2001-02 = Rs.10,268 lakhs.
Hence, the income – employment ratio is

\[
\frac{10268 \times 10^7}{17654} = Rs.58,162
\]

This implies that the average annual earnings of each working person is Rs. 58,162, which includes all the sectors taken together.

From the sample survey (simple stratified random sampling) conducted at Palolem, we get the total income of direct employment of 220 persons from tourism to be Rs.1, 11,77,500 that equals the tourists’ expenditure for different services. So, the mean income of direct employment to be (Rs. 1,11,77,500 / 220) = Rs. 50,807.

It can be concluded from this calculation that population and sample means are by and large same as shown above, however, the difference in mean income can be attributed to external factors which are difficult to measure and beyond the scope of this research.
The total tourist expenditure for the year is approximately, Rs.3,39,12,000. This expenditure equals the total income of the number of people, (both direct and indirect) it can support. If we consider the average earnings of every person employed directly or indirectly in tourism industry to be Rs.58,612, then this tourist expenditure can support approximately \[
\frac{33912000}{58612} = 579 \text{ people (apprx).}
\]

The amount of direct employment being 220 as per survey, which covered hotels, restaurants, trading, transport and other establishments providing direct employment in tourism at Palolem area, it follows that indirect employment (jobs) from tourism = 579 – 220 = 359. We further assume static conditions that no other external factors prevail. It is also quite evident from this that Palolem is steadily emerging as an upcoming tourist destination. This is so because indirect employment generated by tourism is though small, yet significant and would eventually increase with the development of tourism in future.

The spillover effect of employment in the tourism industry on the economy of Palolem can only be estimated and cannot be effectively quantified. There is thus a multiplier effect of employment in the tourism industry.

The employment multiplier is the ratio of total employment (both direct and indirect) in an industry. In this case, the total direct and indirect jobs or total employment in tourism industry at Palolem is estimated as 579 and direct employment is estimated to be 220 jobs (sample).

Thus the employment multiplier for tourism industry in Palolem is estimated at
\[
\frac{579}{220} = 2.63
\]
EMPLOYEMENT MULTIPLIER OF BAGA AND ANJUNA

Analysis of data:
The total Net Domestic product at constant prices of taluk for the year 2001-02 was estimated to be Rs. 50635 lakhs.

The total population of the taluk is 227010 and the working population is 90804 persons, according to 2001 census, which is approximately 40% of the population.

The number of persons engaged in primary sector is estimated to be approximately 7240 (apprx. 8%), contributing Rs. 2683 lakhs annually. The number of persons engaged in secondary sector is approximately 10947 (12%); contributing Rs. 18,825 lakhs per year and the remaining 72,617 (80%) persons in tertiary sector including tourism are contributing Rs. 29,127 lakhs annually.

So, the income – employment ratio is calculated as follows: -

\[
\frac{50635 \times 10^5}{90804} = Rs.55,763
\]

This implies that the average annual earnings of each working person is Rs.55,763 which includes all the sectors taken together.

From the sample survey conducted at Calangute and Anjuna, we get total direct income of 470 persons to be Rs. 2,67,59,000 which equals the tourists’ expenditure for the services. Hence, the mean income of 470 persons is \((26759000 / 470) = Rs.56,934\) which is almost equal to the earning of average working person at Calangute, Baga and Anjuna.

The total tourist expenditure for the year is approximately, Rs.28956000. This expenditure equals the total income of the number of people, (both direct and indirect) it can support. If we consider the average earnings of every person employed directly or indirectly in tourism industry to be Rs.55,763, then this tourist expenditure can support (direct and indirect employment) approximately =
The amount of direct employment being 470 as per survey, which covered hotels, restaurants, trading, transport and other establishments providing direct employment in tourism at Calangute and Anjuna, it follows that indirect employment (jobs) from tourism = 519 - 470 = 49.

Therefore, the employment multiplier at Calangute, Baga and Anjuna is =

\[
\frac{519}{470} = 1.10
\]
APPENDIX II-A-3

EMPLOYMENT MULTIPLIER OF PONDA

Analysis of the data:
The total Net Domestic product at constant prices of taluk for the year 2001-02 was estimated to be Rs. 38643 lakhs (Economic Survey 2003-04). The total population of the taluk, according to 2001 census is 1,49,630. The working population, which is 40% of the total population, works out to be 59,852. The number of persons engaged in primary sector is 21851 (appx. 37%) and contributing Rs. 8098 lakhs. In the secondary sector, 11,606 (appx. 20%) persons are contributing Rs. 19,958 lakhs to the NSDP and the remaining 26395 (appx. 43%) persons engaged in tertiary sector that includes tourism are contributing Rs. 10,587 lakhs respectively.

Therefore, the income-employment ratio will be as follows:

\[
\frac{38643 \times 10^5}{59852} = \text{Rs. 64,564.}
\]

This income – employment ratio indicates that the average income of the working population per year is Rs. 64,564.

The tourist expenditure for the year 2001-02 is approximately, Rs. 2516.36 lakhs. This is the income of the people engaged in tourism sector, both direct and indirect, and if we assume that the average earning of every person engaged in tourism industry is Rs. 64564, then this expenditure can support, both directly and indirectly 3897 persons in terms of employment.

According to the sample, the number of people directly employed in tourism industry in Ponda is 450, which means indirect employment generated by tourism is 3447, (i.e. 3897 - 450 = 3447)

Hence, the employment multiplier = \( \frac{3897}{450} = 8.66 \).
**APPENDIX II-A-4**

**EMPLOYMENT MULTIPLIER OF COLVA AND BENAULIM**

**Analysis of the data:**

The Net Domestic Product (NDP) of the taluk at constant prices for the year 2001-02 was estimated to be Rs. 1,49,121 lakhs.

The total population of the taluk (2001) is 2,59,787. The working population is approximately 40 percent of the total population, which works out to be 1,03,915. The number of persons engaged in primary sector is approximately 16866, contributing Rs. 6250 lakhs, those engaged in secondary sector is approximately 81874, contributing Rs. 1,40,795 lakhs and those engaged in tertiary sector, including tourism is 5175 approximately, contributing Rs. 2076 lakhs respectively. In terms of percentage, nearly 16% is engaged in primary activities, 79% engaged in industrial sector and the remaining 5% is engaged in tertiary sector. In addition to that a large number of people are working in the Gulf countries.

Hence, the income – employment ratio works out to be:

\[
\text{Rs.} \frac{149121 \times 10^5}{103915} = 1,43,503 \text{ per year, which indicates the average yearly income of the working population in the Salcete taluk.}
\]

The tourist expenditure for the year 2001-02 is approximately, Rs. 22,38,87,900 approximately. This is the income of the people engaged in tourism sector, both direct and indirect, and if we assume that the average earning of every person engaged in tourism industry to be Rs. 1,43,503, then this expenditure can support, both directly and indirectly about 1560 persons, i.e. \( \frac{223887900}{143503} \)

According to the sample, the number of people directly employed in tourism industry is 425, which means indirect employment generated by tourism is \( (1560 - 425) = 1135 \).

Hence the employment multiplier will be \( \frac{1560}{425} = 3.67 \).


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<th>Expenditure</th>
<th>% age</th>
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APPENDIX II-B-2

A correlation between tourist spending and multiplied income can be demonstrated through a formula:

\[ K = \frac{1}{1 - \frac{\Delta C}{\Delta Y}} = \frac{1}{1 - MPC} \implies 1 - MPC = MPS, \]

\[ \therefore \frac{1}{MPS} = K \text{ (or Income Multiplier)} \]

The formula in effect, says that the multiplier \( K \) is dependent on the relationship between a change in consumption (\( \Delta C \)) and a change in income (\( \Delta Y \)). Thus for example, for Rs. 1000/- of tourist expenditure, the change in income may amount to Rs. 3275.50 and the change in consumption Rs. 2272.50, then the multiplier (\( K \)) would equal 3.27, i.e.

\[ K = \frac{1}{1 - \frac{2272.50}{3272.50}} = 3.27 \]
Let $\bar{X}_1$ be the mean income of Hotels and Lodges = 2.21

$\bar{X}_2$ be the mean income of Restaurants = 1.15

$\bar{X}_3$ be the mean income of Others = 0.80

The Combined Mean Income is

\[
\bar{X} = \frac{N_1 \bar{X}_1 + N_2 \bar{X}_2 + N_3 \bar{X}_3}{N_1 + N_2 + N_3} \quad (1)
\]

\[
= \frac{12 \times 2.21 + 14 \times 1.15 + 14 \times 0.80}{12 + 14 + 14} = \frac{26.49 + 16.09 + 11.23}{40} = \frac{53.81}{40} = \text{Rs.1.35 lakhs.}
\]

Let $\sigma_1$ = Standard Deviation of Hotels etc.

$\sigma_2$ = Standard Deviation of Restaurants etc.

$\sigma_3$ = Standard Deviation of Others.
\[
\begin{align*}
\therefore\sigma_1 &= \sqrt{\frac{\sum(X_i - \bar{X}_1)^2}{n}} = \text{Rs. 0.29} \\
\sigma_2 &= \sqrt{\frac{\sum(X_i - \bar{X}_2)^2}{n}} = \text{Rs. 0.36} \\
\sigma_3 &= \sqrt{\frac{\sum(X_i - \bar{X}_3)^2}{n}} = \text{Rs. 0.27} \\
\therefore \text{Combined Standard Deviation is}
\end{align*}
\]

\[
\sigma = \sqrt{\frac{n_1(\sigma_1^2 + d_1^2) + n_2(\sigma_2^2 + d_2^2) + n_3(\sigma_3^2 + d_3^2)}{n_1 + n_2 + n_3}} \quad \text{(II)}
\]

where,
\[
\begin{align*}
d_1 &= \bar{X}_1 - \bar{X} = 2.21 - 1.35 = 0.86 \\
d_2 &= \bar{X} - \bar{X}_2 = 1.35 - 1.15 = 0.2 \\
d_3 &= \bar{X} - \bar{X}_3 = 1.35 - 0.80 = 0.55
\end{align*}
\]

and \( n_1 = 12 \)
\( n_2 = 14 \)
\( n_3 = 14 \)

\[
\therefore \text{Substituting in (II)}
\]

\[
\sigma = \sqrt{\frac{12(0.29^2 + 0.86^2) + 14(0.36^2 + 0.2^2) + 14(0.27^2 + 0.55^2)}{12 + 14 + 14}}
\]

\[
= \sqrt{\frac{9.88 + 2.37 + 5.26}{40}}
\]
\[
= \sqrt{\frac{17.51}{40}} = \text{Rs. 0.66}
\]

\therefore \text{Standard Error (S.E.)} = \frac{\sigma}{\sqrt{n}}

\[
= \frac{0.66}{\sqrt{40}} = \frac{0.66}{6.34} = \text{Rs. 0.10 lakhs.}
\]
Coefficient of Variation for Hotels / Lodges = \[
\frac{\text{Standard Deviation}}{\text{Mean}} \times 100
\]
\[
= \frac{\sigma_1}{X_1} \times 100 = \frac{0.29}{2.21} \times 100
\]
\[
= 13.12
\]

Coefficient of Variation for Restaurants / Eateries = \[
\frac{\text{Standard Deviation}}{\text{Mean}} \times 100
\]
\[
= \frac{\sigma_2}{X_2} \times 100 = \frac{0.36}{1.15} \times 100
\]
\[
= 31.30
\]

Coefficient of Variation for Others = \[
\frac{\text{Standard Deviation}}{\text{Mean}} \times 100
\]
\[
= \frac{\sigma_3}{X_3} \times 100 = \frac{0.27}{0.80} \times 100
\]
\[
= 33.75
\]
APPENDIX II-C-III

Given that $N_1 = 12$, $N_2 = 14$, and $N_3 = 14$

Let $\bar{X}_1$ be the mean savings of Hotels / Lodges. Hence, $\bar{X}_1 = 0.20$

Let $\bar{X}_2$ be the mean savings of the Restaurants. $\bar{X}_2 = 0.12$

Let $\bar{X}_3$ be the mean savings of Others. $\bar{X}_3 = 0.09$

The Combined Mean Savings $= \frac{N_1 \bar{X}_1 + N_2 \bar{X}_2 + N_3 \bar{X}_3}{N_1 + N_2 + N_3}$

$= \frac{12 \times 0.20 + 14 \times 0.12 + 14 \times 0.09}{12 + 14 + 14}$

$= Rs. 0.14 \text{ lakhs}$

Income remaining after the first round Leakage (Saving) $= Rs. 1.35 - Rs. 0.14 = \textbf{Rs.1.21 lakhs}$.

APPENDIX II- C-IV

Let $\bar{X}_1$ be mean taxes of Hotels / Lodges etc. $\bar{X}_2$ be the mean taxes of Restaurants and $\bar{X}_3$ be the mean taxes of Others respectively.

$\bar{X}_1 = 0.12 \quad \bar{X}_2 = 0.04 \quad \bar{X}_3 = 0.05$

Combined mean taxes $= \frac{N_1 \bar{X}_1 + N_2 \bar{X}_2 + N_3 \bar{X}_3}{N_1 + N_2 + N_3}$

$= \frac{12 \times 0.12 + 14 \times 0.04 + 14 \times 0.05}{12 + 14 + 14}$
\[
\frac{2.67}{40} = \text{Rs. 0.07 lakhs}
\]

Income remaining after second round Leakage (Taxes) = Rs.1.21 - Rs.0.07

\[= \text{Rs.1.14 lakhs.}\]

**APPENDIX II-C-V**

Let \( \bar{X}_1 \) be the mean import of Hotels / Lodges etc.

Let \( \bar{X}_2 \) be the mean import of Restaurants / Eateries etc. and

Let \( \bar{X}_3 \) be the mean import of Others.

\[\therefore \bar{X}_1 = 0.29 \quad \bar{X}_2 = 0.1 \quad \bar{X}_3 = 0.05\]

Combined mean import

\[
\frac{N_1\bar{X}_1 + N_2\bar{X}_2 + N_3\bar{X}_3}{N_1 + N_2 + N_3}
\]

\[= \frac{12 \times 0.29 + 14 \times 0.1 + 14 \times 0.05}{12 + 14 + 14}
\]

\[= \frac{5.54}{40} = \text{Rs. 0.14 lakhs}\]

Income remaining after third round Leakage (Imports) = Rs. 1.14 - Rs. 0.14

\[= \text{Rs.1 lakh.}\]
APPENDIX II- C-VI

Let $X_1$ be the mean profits of Hotels / Lodges etc.

Let $X_2$ be the mean profits of Restaurants / Eateries etc. and

Let $X_3$ be the mean profits of Others.

$\therefore \bar{X}_1 = 0.27 \quad \bar{X}_2 = 0.26 \quad \bar{X}_3 = 0.15$

Combined mean profits $= \frac{N_1\bar{X}_1 + N_2\bar{X}_2 + N_3\bar{X}_3}{N_1 + N_2 + N_3}$

$= \frac{12 \times 0.27 + 14 \times 0.26 + 14 \times 0.15}{12 + 14 + 14}$

$= \frac{9.04}{40} = \text{Rs. 0.23 lakhs}$

Income remaining in the area after fourth round of leakage would be as follows:

Rs.1 – Rs. 0.23 = Rs. 0.77 lakhs.
Let $\bar{X}_1$ is the mean income of Restaurants / Eateries and $\bar{X}_2$ is the mean income of Others.

$$\therefore \bar{X}_1 = \frac{39.94}{17} = 2.35 \quad \bar{X}_2 = \frac{14.59}{23} = 0.63$$

Combined mean income $\bar{x} = \frac{N_1 x_1 + N_2 x_2}{N_1 + N_2}$ \hspace{1em} (1)

$$= \frac{17 \times 2.35 + 23 \times 0.63}{40} = \frac{408.5}{40} = \text{Rs.1.36 lakhs}$$

Let $\sigma_1$ = Standard Deviation of restaurants

$\sigma_2$ = Standard Deviation of others

$$\therefore \sigma_1 = \sqrt{\frac{\sum (X_i - \bar{X}_1)^2}{n}} = 0.88$$

$$\sigma_2 = \sqrt{\frac{\sum (X_i - \bar{X}_2)^2}{n}} = 0.21$$

$\therefore$ Combined Standard Deviation is
\[ \sigma = \sqrt{\frac{n_1 (\sigma_1^2 + d_1^2) + n_2 (\sigma_2^2 + d_2^2)}{n_1 + n_2}} \quad \text{(II)} \]

where,
\[ d_1 = \bar{X}_1 - \bar{X} = 2.35 - 1.36 = 0.99 \]
\[ d_2 = \bar{X} - \bar{X}_2 = 1.36 - 0.63 = 0.73 \]

and \[ n_1 = 17 \]
\[ n_2 = 23 \]

\[ \therefore \text{substituting in (II)} \]

\[ = \sqrt{\frac{17(0.88^2 + 0.99^2) + 23(0.21^2 + 0.73^2)}{17 + 23}} \]

\[ = \sqrt{\frac{29.83 + 13.27}{40}} \]

\[ = \sqrt{\frac{43.1}{40}} = \text{Rs.} 1.04 \]

\[ \therefore \text{Standard Error (S.E.)} = \sigma / \sqrt{n} \]

\[ = \frac{1.04}{\sqrt{40}} = \frac{1.04}{6.34} = \text{Rs.} 0.16 \text{ lakhs} \]
APPENDIX II-D-II

Coefficient of Variation for restaurants = \( \frac{\text{StandardDeviation}}{\text{Mean}} \times 100 \)

\[ = \frac{\sigma_1}{\bar{X}_1} \times 100 = \frac{0.88}{2.35} \times 100 \]

\[ = 37.45 \]

Coefficient of Variation for others = \( \frac{\sigma_2}{\bar{X}_2} \times 100 = \frac{0.21}{0.63} \times 100 \)

\[ = 33.33 \]

APPENDIX II-D-III

\[ N_1 = 17 \quad N_2 = 23 \]

Let \( \bar{X}_1 \) is the mean savings of Restaurants and Eateries and \( \bar{X}_2 \) is the mean savings of Others.

\[ \therefore \bar{X}_1 = \frac{16.605}{17} = 0.98 \quad \bar{X}_2 = \frac{4.165}{23} = 0.18 \]

Combined mean savings = \( \frac{N_1x\bar{X}_1 + N_2x\bar{X}_2}{N_1 + N_2} = \frac{17 \times 0.98 + 23 \times 0.18}{40} \)

\[ = \frac{20.77}{40} = \text{Rs. 0.52 lakhs} \]

Thus money remaining in the area after the first round of leakage will be as follows:

\[ \text{Rs.1.36} - \text{Rs. 0.52} = \text{Rs. 0.84 lakhs} \]
APPENDIX II- D-IV

\[ N_1 = 17 \quad N_2 = 23 \]

Let \( \bar{X}_1 \) is the mean taxes of Restaurants and Eateries and \( \bar{X}_2 \) is the mean taxes of Others.

\[ \bar{X}_1 = \frac{0.75}{17} = 0.044 \quad \bar{X}_2 = \frac{0.232}{23} = 0.01 \]

\[ \therefore \text{Combined mean taxes} = \frac{N_1 \bar{X}_1 + N_2 \bar{X}_2}{N_1 + N_2} = \frac{17 \times 0.044 + 23 \times 0.01}{40} = \frac{0.978}{40} = \text{Rs. 0.024} \]

Thus money remaining in the area after second round of leakage will be as follows:

\[ \text{Rs. 0.84 - Rs. 0.024 = Rs. 0.82 lakhs.} \]

APPENDIX II- D-V

\[ N_1 = 17 \quad N_2 = 23 \]

Let \( \bar{X}_1 \) is the mean imports of Restaurants and Eateries and \( \bar{X}_2 \) is the mean imports of Others.

\[ \bar{X}_1 = \frac{12.52}{17} = 0.74 \quad \bar{X}_2 = \frac{2.075}{23} = 0.09 \]

\[ \therefore \text{Combined mean imports} = \frac{N_1 \bar{X}_1 + N_2 \bar{X}_2}{N_1 + N_2} = \frac{17 \times 0.74 + 23 \times 0.09}{40} = \frac{14.6}{40} = \text{Rs. 0.37 lakhs} \]

Thus money remaining in the area after third round of leakage will be as follows:

\[ \text{Rs. 0.82 - Rs. 0.37 = Rs. 0.46 lakhs.} \]
APPENDIX II- D-VI

\[ N_1 = 17 \quad N_2 = 23 \]

Let \( \bar{X}_1 \) is the mean profits of Restaurants and Eateries and \( \bar{X}_2 \) is the mean profits of Others.

\[ \bar{X}_1 = \frac{4.96}{17} = 0.29 \quad \bar{X}_2 = \frac{4.212}{23} = 0.18 \]

\[ \therefore \text{Combined mean profits} = \frac{N_1 \times \bar{X}_1 + N_2 \times \bar{X}_2}{N_1 + N_2} = \frac{17 \times 0.29 + 23 \times 0.18}{40} \]

\[ = \frac{9.17}{40} = \text{Rs. 0.23 lakhs} \]

Thus income remaining in the area after fourth round of leakage will be as follows: -

\[ \text{Rs. 0.46} - \text{Rs. 0.23} = \textbf{Rs. 0.23 lakhs}. \]
APPENDIX H - E-I

\[ N_1 = 23 \quad N_2 = 18 \quad N_3 = 19 \]

\[ N = n_1 + n_2 + n_3 = 23 + 18 + 19 = 60 \]

Let us assume that \( \bar{X}_1 \) is the mean income of Hotels / Lodges / Resorts etc.; \( \bar{X}_2 \) is the mean income of Restaurants / Eateries / Shacks etc. and \( \bar{X}_3 \) is the mean income of Others.

\[ \therefore \bar{X}_1 = \frac{302.68}{23} = 13.16 \]

\[ \bar{X}_2 = \frac{80}{18} = 4.44 \]

\[ \bar{X}_3 = \frac{67.865}{19} = 3.57 \]

\[ \therefore \text{Combined mean income of } \bar{X}_1, \bar{X}_2 \text{ and } \bar{X}_3 \text{ will be as follows} \]

\[ \bar{X} = \frac{N_1 x \bar{X}_1 + N_2 x \bar{X}_2 + N_3 x \bar{X}_3}{N_1 + N_2 + N_3} \]

\[ \bar{X} = \frac{23 \times 13.16 + 18 \times 4.44 + 19 \times 3.57}{60} \]

\[ = \frac{450.55}{60} = \text{Rs. 7.51 lakhs.} \]

Let \( \sigma_1 \) = Standard Deviation of Hotels etc.

\( \sigma_2 \) = Standard Deviation of Restaurants etc.

\( \sigma_3 \) = Standard Deviation of Others.

\[ \therefore \sigma_1 = \sqrt{\frac{\sum (X_i - \bar{X}_1)^2}{n}} = 24.72 \]
\[ \sigma_2 = \sqrt{\frac{\sum (X_i - \bar{X}_2)^2}{n}} = 2.29 \]

\[ \sigma_3 = \sqrt{\frac{\sum (X_i - \bar{X}_3)^2}{n}} = 2.52 \]

.: Combined Standard Deviation is

\[ \sigma = \sqrt{\frac{n_1(\sigma_1^2 + d_1^2) + n_2(\sigma_2^2 + d_2^2) + n_3(\sigma_3^2 + d_3^2)}{n_1 + n_2 + n_3}} \]  

(II)

And

\[ d_1 = \bar{X}_1 - \bar{X} = 13.16 - 7.51 = 5.65 \]

\[ d_2 = \bar{X} - \bar{X}_2 = 7.51 - 4.44 = 3.07 \]

\[ d_3 = \bar{X} - \bar{X}_3 = 7.51 - 3.57 = 3.94 \]

.: substituting in (II)

.: Combined Standard Deviation =

\[ \sigma = \sqrt{\frac{n_1(\sigma_1^2 + d_1^2) + n_2(\sigma_2^2 + d_2^2) + n_3(\sigma_3^2 + d_3^2)}{n_1 + n_2 + n_3}} \]  

(II)
\[
\sqrt{\frac{23(24.72^2 + 5.65^2) + 18(2.29^2 + 3.07^2) + 19(2.52^2 + 3.94^2)}{23 + 18 + 19}} = \sqrt{\frac{15468.41}{60}} = \sqrt{257.81} = \text{Rs. 16.06 lakhs}
\]

It appears from the calculation that Standard Deviation (\(\sigma\)) is nearly double of that of Mean income (\(\bar{X}\)) in this area and hence, it can be stated that there is extreme variation in income as is shown by the data collected. Hotels etc. are earning much more than that of Restaurants and Others.

In this manner, we can account for Standard Error.

\[\text{Standard Error (S.E.) = } \frac{\sigma}{\sqrt{n}} = \frac{16.06}{\sqrt{60}} = 2.08\]

**APPENDIX II- E-II**

Let us find out the coefficient of variation in order to ascertain as to which category is preferred.

Coefficient of Variation will be as follows:

\[\frac{\text{S.D.}}{\text{Mean}} \times 100\]

Coefficient of variation for Hotels / Lodges etc. will be

\[\frac{\sigma_1}{\bar{X}_1} \times 100 = \frac{24.72}{13.16} \times 100 = 188\]

Coefficient of variation for Restaurants / Eateries etc. will be

\[\frac{\sigma_2}{\bar{X}_2} \times 100 = \frac{2.29}{4.44} \times 100 = 51.58\]

Coefficient of variation for Others will be

\[\frac{\sigma_3}{\bar{X}_3} \times 100 = \frac{2.52}{3.57} \times 100 = 70.59\]
APPENDIX II-E III

N = n₁ + n₂ + n₃ = 23 + 18 + 19 = 60. Let us assume that \( \bar{X}_1 \) is the mean profits of Hotels / Lodges / Resorts etc.; \( \bar{X}_2 \) is the mean profits of Restaurants / Eateries etc. and \( \bar{X}_3 \) is the mean profits of Others.

\[
\therefore \bar{X}_1 = \frac{72.065}{23} = 3.14
\]

\[
\bar{X}_2 = \frac{18.5}{18} = 1.03
\]

\[
\bar{X}_3 = \frac{13}{19} = 0.68
\]

\[
\therefore \text{Combined mean profits of all the establishments will be as follows: -}
\]

\[
\frac{N_1 \cdot \bar{X}_1 + N_2 \cdot \bar{X}_2 + N_3 \cdot \bar{X}_3}{N_1 + N_2 + N_3}
\]

i.e. \[ \frac{23 \times 3.14 + 18 \times 1.03 + 19 \times 0.68}{23 + 18 + 19} = \frac{103.57}{60} = \text{Rs.} 1.73 \text{ lakhs} \]

Thus money remaining in the area after the first round leakage (Profits) is (Rs.7.51 - 1.73) = \text{Rs.} 5.78 \text{ lakhs}
N = n₁ + n₂ + n₃ = 23 + 18 + 19 = 60. Let us assume that $X_1$ is the mean taxes of Hotels / Lodges / Resorts etc.; $X_2$ is the mean taxes of Restaurants / Eateries etc. and $X_3$ is the mean taxes of Others.

\[ \therefore X_1 = \frac{30.268}{23} = 1.316 \]

\[ X_2 = \frac{8}{18} = 0.44 \]

and \[ X_3 = \frac{5.43}{19} = 0.29 \]

Hence, combined mean taxes

\[ \bar{X} = \frac{n_1xX_1 + n_2xX_2 + n_3xX_3}{n_1 + n_2 + n_3} = \frac{23 \times 1.316 + 18 \times 0.44 + 19 \times 0.29}{23 + 18 + 19} \]

\[ = \frac{43.70}{60} = \text{Rs. 0.73 lakhs} \]
APPENDIX II -E-V

N = n1 + n2 + n3 = 23 + 18 + 19 = 60. Let us assume that $\bar{X}_1$ is the mean imports of Hotels / Lodges / Resorts etc.; $\bar{X}_2$ is the mean imports of Restaurants / Eateries etc. and $\bar{X}_3$ is the mean imports of Others.

\[ \therefore \bar{X}_1 = \frac{90.804}{23} = 3.95 \]
\[ \bar{X}_2 = \frac{16}{18} = 0.89 \]
\[ \bar{X}_3 = \frac{27.146}{19} = 1.43 \]

Combined mean imports will be as follows:

\[ \frac{N_1x\bar{X}_1 + N_2x\bar{X}_2 + N_3x\bar{X}_3}{N_1 + N_2 + N_3} \]

\[ = \frac{23x3.95 + 18x0.89 + 19x1.43}{23 + 18 + 19} \]

\[ = \frac{133.95}{60} = Rs.2.23 \text{ lakhs} \]
APPENDIX II-E-VI

\[ N = n_1 + n_2 + n_3 = 23 + 18 + 19 = 60. \]

Let us assume that \( \bar{X}_1 \) is the mean savings of Hotels / Lodges / Resorts etc.; \( \bar{X}_2 \) is the mean savings of Restaurants / Eateries etc. and \( \bar{X}_3 \) is the mean savings of Others.

\[
\therefore \bar{X}_1 = \frac{45.402}{23} = 1.974
\]

\[
\bar{X}_2 = \frac{20}{18} = 1.11
\]

and \( \bar{X}_3 = \frac{13.573}{19} = 0.72 \)

Combined mean savings will be as follows:

\[
\frac{N_1x\bar{X}_1 + N_2x\bar{X}_2 + N_3x\bar{X}_3}{N_1 + N_2 + N_3}
\]

i.e \[
\frac{23 \times 1.974 + 18 \times 1.11 + 19 \times 0.72}{23 + 18 + 19}
\]

\[
= \frac{45.402 + 20 + 13.573}{60}
\]

\[
= \frac{78.98}{60} = Rs. 1.32 \text{ lakhs}
\]

Thus money remaining in the area after the fourth round leakage (Savings) is (Rs.2.28 - Rs.1.32) = Rs. 0.96 lakhs
APPENDIX II-F-I

\[ N = n_1 + n_2 + n_3 = 20 + 25 + 25 = 70 \]

Let us assume that \( \bar{X}_1 \) is the mean income of Hotels / Lodges / Resorts etc.; \( \bar{X}_2 \) is the mean income of Restaurants / Eateries etc. and \( \bar{X}_3 \) is the mean income of Others.

\[ \bar{X}_1 = \frac{2779}{20} = \text{Rs.138.95 lakhs} \]
\[ \bar{X}_2 = \frac{790.69}{25} = \text{Rs.31.63 lakhs} \]
\[ \bar{X}_3 = \frac{156.12}{25} = \text{Rs. 6.24 lakhs} \]

Hence combined mean income \( \bar{X} = \frac{n_1 x_1 \bar{X}_1 + n_2 x_2 \bar{X}_2 + n_3 x_3 \bar{X}_3}{n_1 + n_2 + n_3} \) \hspace{1cm} (I)

\[ = \frac{20 \times 138.95 + 25 \times 31.63 + 25 \times 6.24}{20 + 25 + 25} \]

\[ = \frac{3725.81}{70} = \text{Rs. 53.23 lakhs.} \]

Let \( \sigma_1, \sigma_2 \) and \( \sigma_3 \) be the standard deviation of all the establishments respectively.
\[
\begin{align*}
\sigma_1 &= \sqrt{\frac{\sum (X_i - \bar{X}_1)^2}{n_1}} = \text{Rs.}114.03 \\
\sigma_2 &= \sqrt{\frac{\sum (X_i - \bar{X}_2)^2}{n_2}} = \text{Rs.}16.57 \\
\sigma_3 &= \sqrt{\frac{\sum (X_i - \bar{X}_3)^2}{n_3}} = \text{Rs.}9.73
\end{align*}
\]

And
\[
\begin{align*}
d_1 &= \bar{X}_1 - \bar{X} = 138.95 - 53.23 = 32.72 \\
d_2 &= \bar{X} - \bar{X}_2 = 53.23 - 31.63 = 21.6 \\
d_3 &= \bar{X} - \bar{X}_3 = 53.23 - 6.24 = 46.99
\end{align*}
\]

\[
\therefore \text{Combined Standard Deviation} = \\
\sigma = \sqrt{\frac{n_1(\sigma_1^2 + d_1^2) + n_2(\sigma_2^2 + d_2^2) + n_3(\sigma_3^2 + d_3^2)}{n_1 + n_2 + n_3}} \quad \text{---------- (II)}
\]

Substituting the values in (II)

\[
\sqrt{\frac{20(114.03^2 + 32.72^2) + 25(16.57^2 + 21.6^2) + 25(9.73^2 + 46.99^2)}{20 + 25 + 25}}
\]

\[
\frac{\sqrt{376093.36}}{70} = \sqrt{5372.76} = \text{Rs.}73.30 \text{ lakhs.}
\]

In this manner, we can account for Standard Error.

\[
\therefore \text{Standard Error (S.E.)} = \frac{\sigma}{\sqrt{n}} = \frac{73.30}{\sqrt{70}} = \text{Rs} \ 8.76 \text{ lakhs.}
\]
APPENDIX II-F-HI

\[ N = n_1 + n_2 + n_3 = 20 + 25 + 25 = 70 \]

Let us assume that \( X_1 \) is the mean profits of Hotels / Lodges / Resorts etc.; \( X_2 \) is the mean profits of Restaurants / Eateries etc. and \( X_3 \) is the mean profits of Others.

\[
X_1 = \frac{555.8}{20} = \text{Rs. 27.79} \\
X_2 = \frac{276.7415}{25} = 11.07 \\
X_3 = \frac{46.752}{25} = 1.87
\]

Hence combined mean profits \( \bar{X} \) is:

\[
\bar{X} = \frac{n_1X_1 + n_2X_2 + n_3X_3}{n_1 + n_2 + n_3}
\]

\[
= \frac{20 \times 27.79 + 25 \times 11.07 + 25 \times 1.87}{20 + 25 + 25}
\]

\[
= \frac{555.8 + 276.7415 + 46.752}{70}
\]

\[
= \frac{879.23}{70} = \text{Rs. 12.56 lakhs.}
\]

Thus, money remaining in the area after the first round leakage (Profits) is (Rs. 53.23 lakhs – Rs. 12.56) = **Rs. 40.67 lakhs.**
APPENDIX II-F-IV

\[ N = n_1 + n_2 + n_3 = 20 + 25 + 25 = 70 \]

Let us assume that \( \bar{X}_1 \) is the mean taxes of Hotels / Lodges / Resorts etc.; \( \bar{X}_2 \) is the mean taxes of Restaurants / Eateries etc. and \( \bar{X}_3 \) is the mean taxes of Others.

\[ \therefore \quad \bar{X}_1 = \frac{277.9}{20} = \text{Rs.13.90} \]
\[ \bar{X}_2 = \frac{79.069}{25} = 3.16276 \]
\[ \bar{X}_3 = \frac{13.2592}{25} = 0.530368 \]

Hence combined mean taxes \( \bar{X} \):

\[ \bar{X} = \frac{n_1x\bar{X}_1 + n_2x\bar{X}_2 + n_3x\bar{X}_3}{n_1 + n_2 + n_3} \]

\[ = \frac{20 \times 13.90 + 25 \times 3.16276 + 25 \times 0.530368}{20 + 25 + 25} \]

\[ = \frac{370.23}{70} = \text{Rs.5.29 lakhs}. \]

Thus money remaining in the area after the second round leakage (Taxes) is (Rs. 40.67 lakhs - Rs.5.29) = \text{Rs. 35.38 lakhs}.\]
APPENDIX II-F-V

\[ N = n_1 + n_2 + n_3 = 20 + 25 + 25 = 70 \]

Let us assume that \( X_1 \) is the mean imports of Hotels / Lodges / Resorts etc.; \( X_2 \) is the mean imports of Restaurants / Eateries etc. and \( X_3 \) is the mean imports of Others.

\[
\therefore \quad \bar{X}_1 = \frac{829.2}{20} = \text{Rs. 41.46} \\
\bar{X}_2 = \frac{158.138}{25} = \text{Rs. 6.33} \\
\bar{X}_3 = \frac{62.336}{25} = \text{Rs. 2.49} 
\]

Hence combined mean imports \( \bar{X} = \frac{n_1\bar{X}_1 + n_2\bar{X}_2 + n_3\bar{X}_3}{n_1 + n_2 + n_3} \)

\[
= \frac{20 \times 41.46 + 25 \times 6.33 + 25 \times 2.49}{20 + 25 + 25} \\
= \frac{1049.67}{70} = \text{Rs. 14.99 lakhs} 
\]

Thus money remaining in the area after the third round leakage (Imports) is (Rs. 35.38 lakhs)
APPENDIX II-F-VI

\[ N = n_1 + n_2 + n_3 = 20 + 25 + 25 = 70 \]

Let us assume that \( \bar{X}_1 \) is the mean savings of Hotels / Lodges / Resorts etc.; \( \bar{X}_2 \) is the mean savings of Restaurants / Eateries etc. and \( \bar{X}_3 \) is the mean savings of Others.

\[ \bar{X}_1 = \frac{416.35}{20} = \text{Rs.} \ 20.82 \]
\[ \bar{X}_2 = \frac{197.6725}{25} = \text{Rs.} \ 7.90 \]
\[ \bar{X}_3 = \frac{29.181}{25} = \text{Rs.} \ 1.17 \]

Hence combined mean savings \( \bar{X} \)

\[ \bar{X} = \frac{n_1 \bar{X}_1 + n_2 \bar{X}_2 + n_3 \bar{X}_3}{n_1 + n_2 + n_3} \]

\[ = \frac{20 \times 20.82 + 25 \times 7.90 + 25 \times 1.17}{20 + 25 + 25} \]

\[ = \frac{643.20}{70} = \text{Rs.} \ 9.19 \text{ lakhs.} \]

Thus money remaining in the area after the fourth round leakage (Savings) is (Rs. 20.39 lakhs - Rs.9.19) =Rs.11.20 lakhs.