Correlation and Regression Analysis for Sample Enterprises

This section discusses the various analytical results relating to employment potential of sample enterprises. The main purpose is:

a) to study the nature and degree of relationship among the different variables with the help of correlation analysis;
b) to examine the results of regression analysis for the determinants of employment potential;

The whole analysis has been carried out with respect to three sets of measures of employment potential:

i) Absolute measures of employment comprising total employment, skilled employment, semi-skilled, unskilled employment and non-production employment.

ii) Production-based measures of employment comprising total employment per unit of production, skilled employment per unit of production, semi-skilled, unskilled employment per unit of production and non-production employment per unit of production.

iii) Cost-based measures of employment comprising total employment per unit of cost, skilled employment per unit of cost, semi-skilled, unskilled employment per unit of cost and non-production employment per unit of cost.

At first, correlation and regression analysis have been carried out for large scale, small scale and aggregated sample enterprises. Afterwards, sector-wise/industry-wise regression analysis have been attempted to identify characteristic determinants of employment for specific industry or industry groupings.

6.1 Correlation Analysis at Aggregate Level

Correlation analysis was carried out using each of the three sets of employment variables in conjunction with the explanatory variables (fourteen variables in total). The correlation matrix, thus obtained is fully represented (table 6.1) only for absolute measures of employment since for the production-based and cost-based measures of employment, interrelationship among explanatory variables remains the same.

In interpreting correlation co-efficients, the possibility of non-linearity in relationship has to be kept in view. Significance of the co-efficients has been considered at 1 to 5 per cent and at less than 1 per cent level.

6.1.a Correlation Matrix Using Absolute Measures of Employment

- Highly significant positive correlation (significant at 0.01% level) has been obtained for:
  - Total employment and production (0.75)
  - Total employment and absolute stock of machinery (0.64)
  - Skilled employment and production (0.6)
  - Skilled employment and absolute stock of machinery (0.52)

The remaining variants of employment (i.e., semi-skilled, unskilled and non-production employment) followed the same trend in general.

- Moderately significant positive correlation (significant at 1% level) had been noted for:
  - Semi-skilled, unskilled employment and stock of machinery per employee (0.16)
  - Non-production employment and stock of machinery per employee (0.17)

Explanation: The crucial role played by machines in production process is confirmed by the results above. The influence of capital intensity (i.e., machinery per employee) becomes pronounced for semi-skilled, unskilled employment and non-production employment and the
Table 6.1: Correlation Matrix using Absolute Measures of Employment Potential - Both Scale

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No. of cases: 208  1-tailed signif: *.01  **.001
direction of relationship remains positive. May be because of the comparative predominance of these two categories in the overall employment structure, these two appear as sensitive ones, responding to the additional increment in stock of machines.

- Highly significant negative correlation (significant at 0.01% level) holds between:
  - All the variants of employment and local sales (r' ranging from -0.23 and -0.26)
  - All the variants of employment and tailor-made items (r' ranging from -0.24 to -0.32)
  - Non-production employment and brand item (-0.32)

- Moderately significant negative correlation (significant at 1% level) has been noted for:
  - Total employment and brand item (-0.21)
  - Semi-skilled, unskilled employment and brand item (-0.19)

Explanation: Limited extent of market (or predominance of local sales) can be held responsible for casting a depressing effect on production level which in turn works against further employment generation.

Out of the two main components of the product-mix, the tailor-made items faired relatively badly (compared to brand items) as all the variants of employment reveal inverse relationship with it.

Regarding the relation with brand items, only skilled employment remained unaffected but for the other three employment measures, production or dependence on brand items emerged a significant variable, having negative impact.

This implication suggests that the level of absolute employment and its largest element (i.e., semi-skilled and unskilled employment) gets considerably affected not only by market restriction but by the nature of the product-mix (i.e., tailor / brand items) as well. The functional characteristic of skilled employment being highly specialised and mainly technical in nature, it need not suffer a similar fate (at least for production of brand items). The limiting influence of tailor-made items stems from the commonplace (or unsophisticated) nature of the products concerned which permits little scope for utilising the available work force systematically (especially, the bulk of semi-skilled and unskilled workers).

The prevailing inverse direction of relationship between employment (at various levels) and the product-mix in general, points towards the other intimidating possibility. That is, the number of employees in general, remains considerably out of proportion to the volume of production. So, a sumptuous amount of finance (meant for direct capital expenditure) has to be diverted to sustain the workers which inflicts diminutive effect on production.

6.1.b Correlation Using Production-based Measures of Employment

The following results are obtained from the correlation matrix corresponding to above measures;

- Highly significant positive correlation (significant at 0.01% level) has been observed for:
  - Non-production employment per unit of production and local raw material in use (0.27)

- Moderately significant positive correlation (significant at 1% level) has been noted for:
  - Skilled employment per unit of production and stock of machinery per unit of production (0.19)

Apart from these two, the matrix has yielded no direct relationship between the production-based employment measures and explanatory variables.

Explanation: A significant positive correlation between machinery per unit of production and skilled employment per unit of production remains self evident. The positive correlation between non-production employment per unit of production and proportion of local raw material in use may have been an outcome of greater involvement of non-
production work-force in handling local raw materials.

- Highly significant negative correlation (significant at 0.01 per cent level) holds for:
  - All of the variants of production-based measures of employment and gross profit per unit of production ('r' ranging from -0.19 to -0.35)
  - Total employment per unit of production and working capital per unit of production (0.35)
  - Skilled employment per unit of production and working capital per unit of production (-0.35)
  - Semi-skilled, unskilled employment per unit of production and working capital per unit of production (-0.29)
  - Semi-skilled, unskilled employment per unit of production and share of tailor-made items in total production (-0.22)

- Moderately significant negative correlation (significant at 1 per cent level) has been obtained for:
  - Total employment, skilled employment, non-production employment per unit of production and gross profit per unit of capital invested ('r' ranging from -0.14 to -0.21)
  - Total employment per unit of production and share of tailor-made items (-0.21)
  - Skilled employment per unit of production and per cent working hours utilisation (-0.18)
  - Non-production employment per unit of production and per cent working hours utilisation (-0.19)
  - Non-production employment per unit of production and working capital per unit of production (-0.19)
  - Non-production employment per unit of production and stock of machinery per employee (-0.18)

**Explanation:** The economic viability of an industrial enterprise can be gauged from the market competitiveness (or sales performance) of the product which is represented by gross profit per unit of production and by capital productivity indicated by gross profit per unit of capital invested. Quite unassumingly, here, all the production-related employment variants reveal inverse relationship with the above-mentioned variables. It seems that such lacklustre sales performance has arisen out of production constriction of various character (working capital constraint, for example).

Such an indication is corroborated by inverse relationships obtained for all the production-related measures of employment and working capital per unit of production. The same intimidating influence of tailor-made items has been noted for the major production-based measures of employment (total employment per unit of production and semi-skilled, unskilled employment per unit of production).

Another finding revealed that in spite of a significant direct relationship abiding for capital intensity (i.e., stock of machinery per employee) and skilled employment per unit of production, the relationship between production time utilisation and skilled workforce remains inverse. This, apparently indicates an excess of labour in relation to machine or an overweighing ruling of machines in production.

Non-production employment per unit of production reveals an inverse relationship with production time utilisation and capital intensity (MACE) may be because being non-technical (or mainly administrative) in nature, non-production employees can avail themselves of little opportunity to get directly involved in the production process.


This part of the analysis relating cost-based measures of employment with the explanatory variables revealed the following pattern of relationship.

- Highly significant positive correlation (significant at 0.01 per cent level) has been noted between:
  - Total employment per unit of cost and proportion of local sales (0.22)
  - Skilled employment per unit of cost and per cent local raw material in use (0.23)
  - Non-production employment per unit of cost and per cent local raw material in use (0.23)
Non-production employment per unit of cost and proportion of local sales (0.22)

Moderately significant positive correlation (significant at 1% level) has been obtained for:
- Total employment per unit of cost and proportion of local raw material in use (0.18)
- Skilled employment per unit of cost and proportion of local sales (0.19)
- Skilled employment per unit of cost and machinery per unit of production (0.17)

**Explanation:** It is obvious that increased utilisation of local raw materials will have a telling effect on the freight cost and price reduction in this important element of direct manufacturing expense, can bring down the total cost of production considerably. Hence, a concomitant gain in employment can be realised.

Likewise, the result projects that increasing dependence on local sales can help to expand absolute employment, skilled employment and non-production employment per unit of cost incurred. However, the remaining cost-based employment measure, that is, semi-skilled, unskilled employment per unit of cost, does not respond similarly to the variables of local sales or consumption of local raw material.

For skilled employment per unit of cost, machinery per unit of production have been found to have exercised significant positive influence. **Large scale mechanisation of production process provides for conspicuous savings in production cost and at the same time, it creates scope for skilled employment generation. But may be for this same reason, the scope of employment generation for semi-skilled and unskilled labour gets somewhat marginalised.**

Moderately significant negative correlation has been identified for:
- Total employment per unit of cost and machinery per employee (-0.16)
- Semi-skilled, unskilled employment per unit of cost and brand item (-0.21)

**Explanation:** The overall restrictive impact of increasing capital intensity on employment gets endorsed by the first finding. The second finding denoted that dominance of brand items in the total product-mix can be proved to be a costly venture, particularly in relation to employment opportunity available for semi-skilled and unskilled workers.

On the whole, it appears that when the size of employment is considered in relation to the production cost, economical use of factor inputs and triumph of mechanisation hold the key role. And for ample scope of employment generation per unit of production cost, the overall economic efficiency of an unit (derived from a market-friendly product mix, impressive sales profile and greater intake of local raw material) matters a lot.

**Inter-relationship among independent variables:**
The correlation matrix yielded the following relationships among explanatory variables.

Highly significant positive relationship (significant at 0.01% level) has been noted for:
- Absolute stock of machinery and production (0.91)
- Machinery per employee and production (0.35)
- Machinery per employee and machinery per unit of production (0.61)
- Working capital per unit of production and gross profit per unit of production (0.29)
- Production time effectively utilised and gross profit per unit of production (0.28)
- Proportion of tailor-made items and gross profit per unit of production (0.25).

Moderately significant positive correlation (significant at 1 per cent level) holds for:
- Production of brand item and gross profit per unit of production (0.21)

**Explanation:** Increase in absolute stock of machinery, capital intensity and working capital per unit production contribute to production augmentation considerably. The overall product-mix also seems to be appropriately oriented to mechanised production since both the tailor-made items and brand items reveal direct positive relationship with profitability.
The following inverse relationships among explanatory variables (obtained from the correlation matrix) will further testify for the abortive influence of production-related determinants on employment.

- Highly significant negative correlation (significant at 0.01 per cent level) holds for:
  - Machinery per unit of production and gross profit per unit of production (-0.25)
  - Absolute stock of machinery and production of brand items (-0.24)
  - Value of production and manufacture of brand items (-0.27)

- Moderately significant negative correlation (significant at 1% level) has been obtained for:
  - Production and local sales (-0.2)
  - Production and tailor-made items (-0.2)

**Explanation:** The significant positive relationships derived from the correlation matrix (table 6.1) indicates that by augmenting capital intensity in production process together with appropriate supply of working capital and suitable utilisation of machines, a producer can create lucrative scope for multiplying profit margin. But the nature of inverse interrelationships on the other hand, denotes that impressive profit generation and accumulation may not always be synonymous with a gain in production. For example, in spite of the significant conducive effect of brand items and tailor-made items on profitability (i.e., gross profit per unit of production), a number of inverse relationships have been obtained for absolute stock of machinery and brand items, value of production and brand items and production and tailor-made items. Hence, it becomes apparent that in the long run, manufacture of either brand items or tailor-made items cannot provide the anticipated leading impact on production.

The most probable explanation for this contradiction in statistical inference may be the diversion or mopping up of surplus (i.e., profit margin) for some improbable purpose other than reinvestment for production sustainance.

The other inferences from this correlation matrix emphatically indicate that satisfactory realisation of machines’ capacity can boost the profit margin impressively (positive correlation holds for gross profit per unit of production and production capacity utilisation and for gross profit per unit of production and utilisation of working hours). But phenomenal underutilisation of capacity can be detected from the statistical findings since ‘machineries employed per unit of production’ and ‘gross profit per unit of production’ have been noticeably moving in the opposite direction.

Besides, reliance on a familiar local market has seemingly failed to bear any gainful impact on production, may be because of the lack of diversity / specification / buoyancy in the product line.

### 6.2 Regression Analysis for All Enterprises

Equation 1 to 4 in table 6.24 give estimates for absolute measures of employment potential. Equation 1 relates to total employment. The value of $R^2$ reveals that 51 per cent of variation in total employment has been explained by stock of machinery, stock of machinery per unit of production, tailor-made items, local sales and time utilisation for production purpose.

Equation 2 relates to skilled employment and here, 32 per cent of variation has been explained by stock of machinery, tailor-made items and local sales.

Equation 3 gives regression estimates for semi-skilled and unskilled employment. Here, 53 per cent of the variation has been explained by stock of machinery, stock of machinery per unit of production, tailor-made items and local sales.

Equation 4 presents regression estimates for non-production employment. The corresponding value of $R^2$ reveals that it accounted for 33 per cent of variation which has been explained by stock of machinery, tailor-made items and extent of local sales.

### 6.2.a Determinants for Absolute Measures of Employment Potential

On the basis of the above analysis, the major determinants of absolute measures of employment
Table 6.2: Result of Regression Analysis at Aggregate level

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T-values in parentheses

Significance levels:
- **Sig T:** *** 0.0000  ** .0001 to .009  * .01 to .05
potential have been identified and discussed below in descending sequence based on their statistical significance and frequency of appearance in different equations.

1. Stock of Machinery (MAC):

Absolute stock of machinery emerged as the most important factor responsible for variation in all the absolute measures of employment because an increase in stock of machinery increases the size of the unit and the larger the size, the greater will be the employment in absolute terms.

But at the same time, capital deepening amounts to a rise in stock of machinery per worker (as revealed by the close relationship between MACP and MACE in correlation analysis) and thus, employment in aggregate (alongwith the major component of semi-skilled and unskilled employment) cannot evade this apparent negative impact of increasing capital intensity.

2. Proportion of Tailor-made Items (TAILOR):

This variable emerged as the second most important determinant and it seems that an increased propagation of tailor-made items does not come in aid of production expansion, neither it can transmit the desirable benefits of mechanisation to employment generation at any skill level.

3. Proportion of Local Sales in Total Sales (LSAL):

The variable of local sales has emerged as the third important element in explaining employment variation but it is characterised by a depressing effect on production volume and thus, it restricts employment generation altogether.

4. Per cent Working Hours (or Production Time) Used Effectively (TIME):

This variable has shown positive influence only for total employment. As time utilisation for productive purpose generally becomes synonymous to machine working hours (especially, for enterprises operating in the organised sector), the leading impact of time utilisation on employment generation (in absolute terms) remains obvious.

However, certain limitation of this variable has to be taken into account. This indicator does not specify whether the machines are run / operated to their best possible capacity. Or whether it becomes practicable to attain the potential productivity within the stipulated working hours (without excessive wear and tear). Lack of specification of this indicator is thus, duely regretted, more so because, a large number of enterprises have reported lack of motivation of the manpower employed.

6.2.b Determinants of Production-based Measures of Employment Potential

Equation 5 to 8 in table 5.24 give estimates for various measures of employment generated per unit of production. In other words, this set of employment measures indicates the labour-output ratio or labour-intensity at firm-level.

Equation 5 relates to total employment per unit of production. Here, value of $R^2$ denotes that 23 per cent of variation has been explained by gross profit per unit of production, working capital per unit of production and proportion of local raw material in use.

Equation 6 presents estimates for skilled employment per unit of production. The value of $R^2$ reveals that 30 per cent of the variation has been explained by gross profit per unit of production, working capital per unit of production, proportion of local raw material in use, stock of machinery per unit of production and production of brand items.

Equation 7 gives regression estimates for semi-skilled, unskilled employment per unit of production whereby 16 per cent of variation has been explained by gross profit per unit of production, working capital per unit of production and share of tailor-made items in the product-mix.

The last equation (equation 8) in this sequence relates regression estimate for non-production employment. Here, 17 per cent of the variation has been explained by gross profit per unit of production,
volume of local sales, proportion of local raw material in use and production time utilisation (in per cent).

As revealed by the above analysis, the main determinants of production-based measures of employment potential are discussed below in descending order of their significance and their occurrence in various equations.

1. Gross Profit per unit of Production (GPP):
   This indicator has appeared as the most important determinant for all categories of production-based employment measures. **This and the employment depressing effect of profit accretion can be justifiably accredited to the increasing mechanisation of production process, heavily dependent upon labour-saving devices.**

2. Working Capital per unit of Production (WCP):
   The second most important determinant of production-based employment measures appears to be working capital per unit of production, since it appears for all the measures except for non-production employment. The inverse direction of relationship has been noted while discussing the results of correlation analysis.

3. Per cent Local Raw Material in Use (LRM):
   Except for semi-skilled, unskilled employment per unit of production, this variable appeared as the third most important determinant for explaining variation in the remaining three production-based employment measures. **The phenomenal price-rationalisation effect of production inputs, facilitating employment generation has already been explained in the section of correlation analysis.**

4. Stock of Machinery per unit of Production (MACP) and Production of Brand Items (BRAND):
   Interestingly, these two determinants have made their existence felt only for the measure of skilled employment per unit of production. **The reason for positive sign carried by both of these co-efficients is quite apparent since increasing reliance on machines and on a particular brand product amounts to increasing skill appropriation from technical personnel.**

5. Per cent Share of Tailor-made Items in Total Production (TAILOR):
   This variable appears significant only in determining semi-skilled, unskilled employment per unit of production. This co-efficient carried a negative sign and the explanation remains the same as for equation number 1 to 4.

6. Per cent Local Sales (LSAL) and Per cent Production Time Utilisation (TIME):
   These two variables appeared as significant determinants (at 1% to 5% level) in explaining variation in non-production employment per unit of production. The implication of inverse relationship between working hour utilisation and non-production employment has already been explained while highlighting the results from correlation analysis involving production-based employment measures.

   The positive sign of the co-efficient for the other significant determinant (i.e., of local sales) implicitly suggests that an increasing reliance on local sales can reduce the production cost indeed, but the benefit remains marginal since it is realised only for non-production employment who are not directly involved in the production organisation of an enterprise.

6.2.c Determinants of Cost-based Measures of Employment Potential

Equations 9 to 12 present estimates of employment generated per unit of cost. Equation 9 reveals that the regression explained 10 per cent of total variation in absolute employment per unit of cost. The significant explanatory determinants were local sales, use of local raw materials and production of brand items.

Estimate of $R^2$ in equation 10 denoted that 11 per cent of variation has been explained for skilled employment per unit of cost. Here, the variation was explained by stock of machinery per unit
of production, local sales and local raw material.

For semi-skilled, unskilled employment per unit of cost (equation no.11) the variation explained had been only 7 per cent and the explanatory determinants identified were local sales and production of brand items.

The last equation (no.12) revealed that the regression could explain 12 per cent of variation in non-production employment per unit of cost. The significant determinants represented were local sales and use of local raw materials.

The frequency of appearance of the variables and their magnitude of significance has followed more or less the same line as revealed by the corresponding correlation matrix. A brief discussion of the above-mentioned determinants has been presented here.

1. Per cent Local Sales (LSAL):
   This variable appears for all the cost-based employment variants and the sign of the co-efficient remained positive but the relevance of local market in bringing down the production-cost (may be by way of putting a curb on transportation charges) whatsoever sensible it may appear, should be accepted with proper checks.

2. Per cent Local Raw Material Used (LRM):
   This variable appears for three of the cost-based employment measures (except for semi-skilled, unskilled employment per unit of cost) and the co-efficients bear positive sign. The significance has already been elaborated while discussing the results of correlation analysis.

3. Production of Brand Items (BRAND):
   This variable appears to be significant for total employment per unit of cost and semi-skilled, unskilled employment per unit of cost. Negative sign of the co-efficients suggests a relatively unpromising bearing of brand items for cost-related job creation.

4. Stock of Machinery per unit of Production (MACP):
   This variable appears only for skilled employment per unit of cost. The explanation remains the same.

6.3 Correlation Analysis for Large Scale Sample Enterprises
The variables for correlation analysis remained the same and the first correlation matrix (obtained for absolute measures of employment with the respective explanatory variables) is presented in table 6.3 and the significant relationship(s) abiding the dependent and independent variables are discussed in brief. This is because, in all the three matrices, interrelationships among the explanatory variables remain unchanged.

The test of significance of the critical values has been carried out at 0.01 per cent and at one per cent level.

6.3.a Correlation Matrix Using Absolute Measures of Employment
The results indicate more or less the same trend as has been observed for the analysis at aggregate level (table 6.1).

- Highly significant positive correlation (significant at 0.01% level) has been observed for:
  - Total employment and production (0.73)
  - Total employment and absolute stock of machinery (0.62)
  - The remaining employment variables (i.e., skilled employment, non-production employment and semi-skilled, unskilled employment) also followed suit.

- Moderately significant positive correlation (significant at 1% level) is obtained between:
  - Total employment and utilisation of working hours for production purpose (0.22).

Explanation: Extensive mechanisation of production process in large scale enterprises implies expansion in the size of absolute employment. Utilisation of working hours for production purpose thus, becomes synonymous with the total operation period of the machines, run mainly by skilled and semi-skilled working hands and hence, a direct relationship between these two has been substantiated.
Table 6.3: Correlation Matrix Using Absolute Measures of Employment Potential for Large Scale Sample Enterprises

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</tr>
</tbody>
</table>

No. of cases: 114
1-tailed signif: *.01 **.001
Highly significant negative correlation (significant at 0.01% level) has been noted for:
- Total employment and tailor-made item (-0.32)
- Non-production employment and tailor-made item (-0.33)
- Non-production employment and brand item (-0.34)

Moderately significant negative correlation (significant at 1% level) holds between:
- Skilled and semi-skilled, unskilled employment and tailor-made items ('r' being -0.24 and -0.25 respectively)
- Total employment, skilled employment and local sales (-0.24 each)
- Semi-skilled, unskilled employment and local sales (-0.23 each)

Explanation: The general trend does not contradict the result at aggregate level very much because, even for large scale enterprises, the same limiting effect of local sales has been found to have worked against employment generation.

No significant direct relationship could be established between employment at various skill levels of a large firm and brand items though larger firms usually follow a specified line of established brand product. It is rather the non-production employment which reveals an inverse relationship with brand items.

As expected, all the absolute measures of employment reveal inverse relationship with tailor-made items, the effect being more pronounced for total employment and for non-production employment. This finding indirectly confirms that with infrastructure and other manufacturing amenities in large scale enterprises geared up mainly for products of specialised nature, catering to the varied market needs of tailor-made items remains an unviable option for large units.

Moreover, the finding implies that production increase on any front, either in brand items or in tailor-made items, would call for a significant curb on the expansion of non-production employment. In other words, larger sample units had been overburdened with non-technical employees.

6.3.b Correlation Using Production-based Measures of Employment

Analysis of correlation values yields the following inferences:
- Highly significant positive relationship (significant at 0.01% level) has been counted for:
  - Semi-skilled, unskilled employment per unit of production and growth rate of expected market demand for the product (0.3).
- Moderately significant direct relationship (significant at 1% level) have been obtained for:
  - Total employment per unit of production and growth rate of expected market demand (0.25)
  - Skilled employment per unit of production and machinery per unit of production (0.28)

Explanation: Interestingly, the inferences denote that the product performance (reflected by the demand scenario) has emerged the most important determinant for production-based employment measures in large scale enterprises. However, the direct significant relationship between expected market demand and employment generation may have been infected to some extent by over-estimation in the reporting. The other finding remains self-evident.

 Highly significant negative correlation (significant at 0.01% level) has been obtained for:
- All the production-related measures of employment and gross profit per unit of capital invested ('r' ranging from -0.36 to -0.48)
- Moderately significant inverse relationship (significant at 1% level) holds for:
  - All the production-related measures of employment (except for total employment per unit of production) and gross profit per unit of production ('r' ranging from -0.27 to -0.28)
  - Non-production employment per unit of production and tailor-made items (-0.25)
  - Non-production employment per unit of production and working capital per unit of production (-0.27)
Semi-skilled and unskilled employment per unit of production and machinery per employee (-0.23)

Explanation: The same inverse trend of relationship between profitability and production-based employment measures continued unabated for large scale sample enterprises also. Similar to the findings for absolute employment measures, it is the non-production employment per unit of production in larger units which seems to be much more inflicted by determining factors (viz., production of tailor-made items and working capital per unit of production) rather than the other three variants of production-based employment measures. In all probability, the number of administrative and non-technical personnel employed by larger sample units to manage the commercial aspects of business operation, has not always been in keeping with the production interest.

The last finding clearly brings out the employment restriction of semi-skilled and unskilled persons in larger enterprises effectuated by increasing production mechanisation and adherence to a specialised product-mix.

6.3.c Correlation Using Cost-based Measures of Employment

The only highly significant positive correlation obtained from this section of analysis is that between skilled employment per unit of production cost and machinery per unit of production (0.32).

This finding implies that increasing investment in machines can bring down the production cost considerably but its beneficial impact will be meaningfully manifested only in case of skilled employment. Greater involvement of skilled employees in the production process of larger units substantiates such a relationship.

--- Relationship Among Explanatory Variables

- Highly significant positive relationship (significant at 0.01% level) has been obtained for:
  - Production and absolute stock of machinery (0.9)
  - Production and machinery per employee (0.3)
  - Stock of machinery and machinery per employee (0.58)
  - Per cent capacity utilisation and working hours utilised effectively (0.49)
  - Machinery per unit of production and working capital per unit of production (0.31)
  - Gross profit per unit of production and gross profit per unit of capital invested (0.38)
  - Working capital per unit of production and gross profit per unit of capital invested (0.3)
  - Per cent capacity utilisation and time utilisation (0.49)
  - Production of brand items and per cent proportion of tailor-made items (0.63)

Explanation: The first four findings in the above analysis unequivocally speak for the absolute sway of mechanisation in every sphere of industrial operation in large scale enterprises — be it for production volume or for capacity utilisation or for profit generation. Moreover, a significant positive correlation between absolute stock of machinery and stock of machinery per employee suggests that commissioning of new machines may require less labour than the machines of earlier vintage. In large scale enterprises, the overall profit generation (per unit of production) is significantly related to capital productivity (or gross profit per unit of capital invested). Also, working capital has been found to be an important pre-requisite for profitability. However, no plausible explanation can be propounded for the relationship between machinery per unit of production and working capital per unit of production (apart from the fact that absolute stock of machinery and working capital are two constituents of total capital investment). Similarly, the last two of the above findings remain self-explanatory.

- Moderately significant positive correlation (significant at 1% level) had been established for the following variables:
Absolute stock of machinery and stock of machinery per unit of production (0.26)  
Machinery per employee and working capital per unit of production (0.22)  
Gross profit per unit of production and production of brand items (0.26)  
Gross profit per unit of production and per cent proportion of tailor-made items (0.23)

Explanation: The last two findings suggest that both the components of the total product-mix (i.e., brand items and tailor-made items) do have direct implication for profit generation prospect of large-scale sample enterprises.

Also, it seems that, the product-mix (comprising brand items and tailor-made items) followed by larger enterprises which appears to be profitable (from the correlation with employment measures) loses out in the long run to sustain the tempo of employment generation, possibly because of the existing surplus employment already encumbering the larger units.

- Moderately significant inverse relationship (significant at 1% level) has been noted for:
  - Stock of machinery per unit of production and gross profit per unit of production (-0.22).
  - Absolute stock of machinery and production of brand item (-0.25).
  - Total production and manufacture of brand items (-0.28).

Explanation: In spite of an all-important role played by mechanisation, some antagonistic trends can be identified unfailingly. The relationship between profitability and production mechanisation turns out to be negative.

Further, inadequacy of mechanisation in propping up production volume in the long run has seemingly led to subsequent failure of brand items in generating employment in larger units. This finding categorically projects a very likely malaise pervading the production organisation of larger sample units, that is, gross underutilisation of existing stock of machineries. This same phenomenon has already been observed for analysis at aggregate level.

6.4 Regression Analysis for Large-Scale Enterprises

Equation 1 to 4 in table 6.4 give estimates for absolute measures of employment potential.

The value of $R^2$ reveals that 52 per cent of variation in total employment has been explained by stock of machinery and tailor-made items (both significant at less than 1 per cent level), followed by machinery per unit of production, production time utilisation and per cent local sales (all significant at 1 per cent to 5 per cent level).

Equation 2 relates to skilled employment and here, 33 per cent of variation has been explained by stock of machinery and tailor-made items (both significant at less than 1 per cent level), followed by local sales and production of brand items (significant at 1 per cent to 5 per cent level).

For semi-skilled and unskilled employment, 52 per cent of the variation has been explained by stock of machinery and machinery per unit of production (both significant at less than 1 per cent level) and tailor-made items, production time utilisation (both significant at 1% to 5% level).

Equation 4 presents regression estimates for non-production employment. The corresponding value of $R^2$ reveals that it accounted for 30 per cent of variation which had been explained by absolute stock of machinery and tailor-made items (both significant at less than 1 per cent level).

6.4.a Determinants for Absolute Measures of Employment Potential

The major determinants of absolute measures of employment potential have been identified and are discussed below.

1. **Stock of Machinery (MAC):**

Absolute stock of machinery have emerged as the most important factor responsible for variation in all the absolute measures of employment potential in large unit. The explanation remains the same as has been upheld for the analysis at aggregate level because, the larger the size, the greater the employment requirement in absolute terms.

But, stock of machinery can sustain this employment generating effect provided there is no change in the technique of production and the relative factor intensities remain undisturbed.
### Table 6.4: Result of Regression Analysis for Large Scale Sample Enterprises

<table>
<thead>
<tr>
<th>Eqn. no.</th>
<th>Dependent variable</th>
<th>Constant</th>
<th>Ff</th>
<th>MAC</th>
<th>TAILOR</th>
<th>MACP</th>
<th>TIME</th>
<th>LSAL</th>
<th>BRAND</th>
<th>GPP</th>
<th>DEMAND</th>
<th>WCP</th>
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<tbody>
<tr>
<td>1.</td>
<td>EMPT</td>
<td>846.57</td>
<td>0.517</td>
<td>0.595***</td>
<td>0.245**</td>
<td>-0.162*</td>
<td>0.162*</td>
<td>-0.137*</td>
<td>0.0000</td>
<td>0.0001 to 0.009</td>
<td>.01 to .05</td>
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<td>2.</td>
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<td>409.1</td>
<td>0.303</td>
<td>0.483***</td>
<td>-0.302**</td>
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<td>0.0001 to 0.009</td>
<td>.01 to .05</td>
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<tr>
<td>3.</td>
<td>SSKIL, USKL</td>
<td>185.51</td>
<td>0.519</td>
<td>0.676***</td>
<td>-0.168*</td>
<td>-0.212**</td>
<td>0.135*</td>
<td>0.0000</td>
<td>0.0001 to 0.009</td>
<td>.01 to .05</td>
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<tr>
<td>4.</td>
<td>NONP</td>
<td>292.02</td>
<td>0.304</td>
<td>0.444***</td>
<td>-0.269**</td>
<td>0.0000</td>
<td>0.0001 to 0.009</td>
<td>.01 to .05</td>
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<tr>
<td>5.</td>
<td>EMPT/P</td>
<td>0.296</td>
<td>0.144</td>
<td>0.0000</td>
<td>0.0001 to 0.009</td>
<td>.01 to .05</td>
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<tr>
<td>6.</td>
<td>SKIL/P</td>
<td>-0.099</td>
<td>0.243</td>
<td>-0.307**</td>
<td>0.248**</td>
<td>0.0000</td>
<td>0.0001 to 0.009</td>
<td>.01 to .05</td>
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<tr>
<td>7.</td>
<td>SSKIL, USKL/P</td>
<td>-0.235</td>
<td>0.186</td>
<td>-0.037**</td>
<td>0.248**</td>
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<td>0.0001 to 0.009</td>
<td>.01 to .05</td>
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<td>8.</td>
<td>NONP/P</td>
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<td>0.142</td>
<td>-0.037**</td>
<td>0.248**</td>
<td>0.0000</td>
<td>0.0001 to 0.009</td>
<td>.01 to .05</td>
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<tr>
<td>9.</td>
<td>EMPT/C</td>
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<td>0.039</td>
<td>-0.037**</td>
<td>0.248**</td>
<td>0.0000</td>
<td>0.0001 to 0.009</td>
<td>.01 to .05</td>
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<tr>
<td>10.</td>
<td>SKIL/C</td>
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<td>-0.037**</td>
<td>0.248**</td>
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<td>0.0001 to 0.009</td>
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<td>11.</td>
<td>SSKIL, USKL/C</td>
<td>0.144</td>
<td>0.042</td>
<td>-0.037**</td>
<td>0.248**</td>
<td>0.0000</td>
<td>0.0001 to 0.009</td>
<td>.01 to .05</td>
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<td>12.</td>
<td>NONP/C</td>
<td>0.118</td>
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<td>-0.037**</td>
<td>0.248**</td>
<td>0.0000</td>
<td>0.0001 to 0.009</td>
<td>.01 to .05</td>
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*F values in parentheses

Sig T: *** 0.0000 ** 0.0001 to 0.009 * 0.01 to .05
2. Per cent Tailor-made Items (TAILOR):
The variable of tailor-made items has emerged as the second important element which exercises a negative effect on all the absolute measures of employment. It appears that increasing adoption of large scale mechanisation restricts the scope for promoting tailor-made items and greater dependence on tailor-made items will ultimately depress production in larger units (which is supported by a negative relationship between tailor-made items and value of production in the correlation analysis, although insignificant).

3. Per cent Local Sales (LSAL):
This variable has emerged as the third most important element and similar to the analysis at aggregate level, its co-efficient carries a negative sign, the only difference being that, here it explains the variation in absolute employment and skilled employment only. Significance of this inverse relationship has been already explained.

4. Per cent Working Hours Used Effectively (TIME):
This variable has shown positive influence on total employment and semi-skilled, unskilled employment. This trend has already been detected in the correlation analysis and the explanation remains the same as for the analysis at aggregate level.

5. Production of Brand Items (BRAND):
This last variable appears only in the equation for skilled employment. The positive sign in this case does refer to specific requirement for skilled manpower in producing brand items.

6.4.b Determinants of Production-based Measures of Employment Potential
Equation 5 to 8 in table 6.4 gives estimates for various measures of employment generated per unit of production.

For total employment per unit of production, only 15 per cent of variation has been explained by gross profit per unit of production and growth rate in expected market demand (both significant at less than 1 per cent level).

Equation 6 presents estimates for skilled employment per unit of production and here, the value of \( R^2 \) denotes 24 per cent of total variation being explained by manufacture of brand product, tailor made items and machinery per unit of production (all significant at less than 1 per cent level) and by gross profit per unit of production, growth rate in expected market demand (both significant at 1 to 5 per cent level).

The value of \( R^2 \) for semi-skilled, unskilled employment per unit of production denotes that 19 per cent of the total variation out here has been explained by growth rate in expected market demand, gross profit per unit of production (both significant at less than 1 per cent level) and by brand items (significant at 1 to 5 per cent level).

Equation 8 gives estimates for non-production employment per unit of production. The corresponding value of \( R^2 \) reveals that it explained 14 per cent of variation and the two variables of gross profit per unit of production and working capital per unit of production have emerged significant (at less than 1 per cent level) in this equation.

The main determinants of production-based measures of employment potential are discussed below in order of their significance and occurrence in various equations.

1. Gross Profit per unit of Production (GPP):
This variable emerged the most important significant determinant for all categories of employment per unit of production. The negative sign of its co-efficient seemingly suggests that as the economic position of a large unit improves, its dependence on mechanisation (of production process) also gets proportionately acute. And the ultimate impact of this gradual capital deepening puts a check on the extent of employment generation at all levels.

2. Per cent Growth Rate of Expected Market Demand (DEMAND):
This is the second most important variable influencing all variants of employment per
unit of production (except non-production employment). Its positive effect is especially pronounced for total employment and for semi-skilled and unskilled employment. The direct nature of this relationship has already been discussed but as mentioned previously, the merit of this result should be accepted with certain reservation.

3. Production of Brand Item (BRAND): This variable appeared to be positively significant for skilled employment per unit of production and for semi-skilled, unskilled employment per unit of production but for semi-skilled, unskilled employment per unit of production, the positive impact of brand items becomes lesser significant.

4. Stock of Machinery per unit of Production (MACP) and Per cent Tailor-made Items (TAILOR): Stock of machinery per unit of production appears to be the second most important determinant in explaining skilled employment per unit of production. The positive sign of its co-efficient indicates that for skilled employment (both in absolute terms and as production-based measure), intensive mechanisation of production technique has born distinct advantage as it improves the employment possibility of skilled personnel. For this reason, co-efficient for the variable MACP has been consistently associated with a positive sign for skilled employment per unit of production but for other production-based measures of employment, this variable ceased to be responsive enough.

The variable of tailor-made items appears as a significant determinant with negative sign in explaining skilled employment per unit of production that suggests lesser requirement of skilled personnel in manufacturing tailor-made items. This phenomenon, being discussed previously, does not need further elaboration.

5. Working Capital per unit of Production: Appearance of this explanatory variable was noted for all production-based employment measures in the analysis for enterprises in aggregate. But in this case, the influence gets restricted. Explanation for the negative sign of this co-efficient (for WCP) has been elaborated before hand. The appearance of this variable solely for non-production employment per unit of production probably indicates an impending vulnerability of non-technical employment to production fluctuation and to variation in input investment.

6.4.c Determinants of Cost-based Measures of Employment Potential

Equations 9 to 12 in table 6.4 give estimates for various measures of employment generated per unit of production cost.

Equation 9 relates to total employment per unit of cost and here, nearly 4 per cent of variation has been explained by the single significant variable of machinery per unit of production.

Equation 10 relates to skilled employment per unit of cost and the value of $R^2$ denotes that 11 per cent of the total variation has been explained by the same variable of machinery per unit of production (significant below 1 per cent level).

Equation 11 gives regression estimate for semi-skilled and unskilled employment per unit of cost. The only variable which emerged as a significant one (at 1 to 5 per cent level) is growth rate of expected market demand.

The last equation in this sequence is equation no. 12 which explains the variation in non-production employment per unit of cost. Here, 7 per cent of variation has been explained by two variables - the first has been machinery per unit of production (significant at below 1 per cent level) and the second being working capital per unit of production (significant at 1 to 5 per cent level).

The determinants for cost-based measures of employment have been discussed below.

1. Stock of Machinery per unit of Production (MACP): This variable had appeared for all the three variants of cost-based employment measures (except for semi-skilled, unskilled employment per unit of cost). Sign associated with the
co-efficients remains positive which affirms the overwhelming influence of capital deepening process on rationalisation of production cost that can bear a favourable impact on employment generation in larger enterprises. Significance of this phenomenon has already been explained.

2. Per cent Growth Rate in Expected Market Demand for the Product (DEMAND) :
   This variable appears only for semi-skilled, unskilled employment per unit of cost. However, validity of this finding does appear to be somewhat irresolute because in this analysis, this variable has been conceived as a dummy indicator and thus, it may have been biased to some extent by personal opinion of the respondents. Moreover, demand being a derived phenomenon, cannot possibly exercise such a direct singular influence on employment generation prospect.

3. Working Capital per unit of Production (WCP) :
   Just like in the analysis for large units involving production-based measure of employment, this variable appeared only for non-production employment per unit of cost and as expected, the co-efficient bears a negative sign. Explanation remains the same.

6.5 Correlation Analysis for Sample Small Scale Enterprises
   In this section, the results of correlation analysis for small scale units are presented with the help of a correlation matrix (shown in table 6.5) which corresponds to the absolute measures of employment for small scale sample enterprises in conjunction with other explanatory variables used in the study. No separate correlation matrices are presented for production-based and cost-based employment measures because interrelationships obtained among the explanatory variables remained unchanged for these two consecutive matrices.

   Significance of the Pearson's product-moment correlation co-efficients are tested at 0.01% and 1% level of significance.

6.5.a Correlation Matrix Using Absolute Measures of Employment :
   Table 6.5 revealed the following results :

   - Highly significant negative correlation (significant at 0.01 per cent level of significance) has been observed for:
     - Total employment and gross profit per unit of production (-0.25)
     - Semi-skilled, unskilled employment and gross profit per unit of production (-0.38)
   - Moderately significant negative correlation (significant at 1% level) has been noted for:
     - Total employment and working capital per unit of production (-0.26)
     - Total employment and proportion of local sales (-0.31)
     - Skilled employment and gross profit per unit of production (-0.25)
     - Skilled employment and proportion of local sales (-0.26)
     - Semi-skilled, unskilled employment and working capital per unit of production (-0.27)

   Explanation : The correlation analysis results for small scale sample enterprises reveal considerably different trends when compared to the analysis results (involving absolute employment measures) for larger enterprises and for industries in aggregate.

   In this case, neither the volume of production, nor the absolute stock of machinery has been found to be important enough for influencing the volume of employment generation.

   It is profitability instead which appeared in significant association with nearly all of the absolute employment measures and quite expectedly, the direction of relationships remained inverse. This finding presents a striking difference when compared to the correlation analysis for large units and for units in aggregate wherein the variable of profitability appears in relation to the production-based employment measures and not for any measures of absolute employment.
Table 6.5: Correlation Matrix for Small Scale Sample Enterprises Using Absolute Measures of Employment

<table>
<thead>
<tr>
<th></th>
<th>1</th>
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<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
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<td>0.89</td>
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<td>-0.09</td>
<td>-0.34</td>
<td>-0.26</td>
<td>0.05</td>
<td>-0.1</td>
<td>-0.31</td>
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<td>-0.02</td>
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<td>-0.25</td>
<td>-0.22</td>
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<td>-0.03</td>
<td>0.15</td>
<td>-0.02</td>
<td>0.07</td>
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<tr>
<td>3. NONP</td>
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<td>0.38</td>
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<td>0.1</td>
<td>0.01</td>
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<td>-0.1</td>
<td>0.01</td>
<td>0.04</td>
<td>0.05</td>
<td>0.09</td>
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<td>0.09</td>
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<td>-0.2</td>
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<td>-0.04</td>
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<td>0.07</td>
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<td>0.07</td>
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No. of cases: 94, 1-tailed Signif: *.01 **.001
This inverse nature of relationship obtained for profit generation and employment creation indicates two possibilities. The first is the ubiquitous employment-restrictive effect of production technique. Secondly, some gross maladjustment in production organisation which jeopardized the economic competence of small units. Such an apprehension gains ground from at least two findings. First, no relationship can be identified between the nature of product-mix and employment generation.

In other words, product profile in most of the small units has been proved to be rather heterogenous or amorphous and hence, it cannot lend the needed support to employment sustainance at any specific skill level.

Secondly, significant inverse relationship has been obtained between working capital per unit of production and absolute employment. The largest component of total employment, i.e., semi-skilled and unskilled employment, also points in the same direction. Incidentally, it should be mentioned that the occurrence of such a trend has already been noted while carrying out the analysis at aggregate level and for large scale units wherein the production-based employment measures reveal a similar relationship with working capital per unit of production. The explanation also remains the same (that is, working capital investment being a component of total capital expenditure, characteristically reflects the labour-saving effect of physical capital).

Total employment and skilled employment in the sample small scale enterprises have yielded an inverse relationship with the variable of local sales which signifies that even for a small firm, over-dependence on a market of limited size, may not be that conducive for its prospect of job creation. Also, products meant for local market may not always permit ample scope for skill utilisation. In this case, the need of the hour should be an appropriate utilisation of the available skilled hands, which frequently remains elusive for most of the small scale units to achieve.

6.5.b Correlation Matrix Using Production-based Measures of Employment

- Highly significant positive correlation (significant at 0.01% level) has been observed for:
  - All the production-based measures of employment and machinery per unit of production (\(r\) ranging from 0.3 to 0.46)
  - Non-production employment per unit of production and proportion of local raw material in use (0.32)

Explanation: In spite of the principally labour-intensive production technique followed by the majority of small scale units, the salutary effect of mechanisation on employment cannot be invalidated altogether. It seems that use of machines in production can improve upon the product quality considerably and by sustaining reasonable production volume, it can assist employment generation.

The phenomenal relationship between non-production employment per unit of production and per cent local raw material in use has been apprised in the analysis at aggregate level also (\(r\) being 0.27). The explanation remains the same because most of employees in small scale sector perform responsibilities of multifarious nature.

- Highly significant negative correlation (significant at 0.01 level) has been noted for:
  - All the production-based measures of employment and working capital per unit of production (\(r\) ranging from -0.34 to -0.47) except for non-production employment
  - Total employment per unit of production and brand item (-0.38)
  - Total employment per unit of production and tailor-made item (-0.39)
  - Semi-skilled, unskilled employment per unit of production and brand item (-0.52)
  - Semi-skilled, unskilled employment per unit of production and tailor-made item (-0.43)
Skilled employment per unit of production and per cent production hours used effectively (-0.32)

- Moderately significant negative correlation (significant at 1 per cent level) has been revealed between:
  - Skilled employment per unit of production and per cent capacity utilisation (-0.26)
  - Semi-skilled, unskilled employment per unit of production and working capital per unit of production (-0.27)
  - Non-production employment per unit of production and gross profit per unit of production (-0.27)
  - Non-production employment per unit of production and per cent production time used effectively (-0.25)

Explanation: It becomes evident from the above result that most of the production-based measures of employment hold inverse relations with a large number of performance indicators.

The two variables of profit generation per unit of production and working capital invested per unit of production display significant negative relationship with nearly all of the production-based employment measures. This phenomena has already been observed and discussed for analysis at aggregate level.

The miscellaneous nature of product-mix followed by small scale sector has been reflected here more discretely since the main production-based employment measures (i.e., total employment per unit of production and semi-skilled, un-skilled employment per unit of production) demonstrate steady inverse relationships with production of both brand item and tailor-made item. Therefore, it can be suitably inferred that the product-mix of small scale sector is severely handicapped in producing a wholistic impact on employment generation at all skill levels.

Lastly, a rather contrasting finding has been revealed by the analysis — that is, skilled employment per unit of production bears an inverse relationship with both per cent capacity utilisation and per cent working hours used productively. The non-production employment also followed suit (having inverse relationship with production time utilisation). This, in spite of a direct significant relationship noted between stock of machinery per unit of production and all of the production-based measures of employment.

This apparent contradiction may have arisen out of a confused or undefined product profile of small scale sector (not conforming to the potential capacity of machineries available) which deters judicious utilisation of the available skilled manpower. The simultaneous appearance of skilled employment per unit of production and non-production employment per unit of production in a number of relationships implicitly suggests that, in all probability a majority of small scale units prefer to engage skilled personnel to execute the administrative (or non-technical) responsibilities. A strategy like this, remains a well-known cost-saving device for many of the continually cash-strapped smaller concerns.

- Interrelationship among explanatory variables:
  - Highly significant positive correlation (significant at 0.01 per cent level) was obtained for the following variables:
    - Absolute stock of machinery and production (−.73)
    - Machinery per employee and machinery per unit of production (0.54)
    - Gross profit per unit of production and per cent working hours effectively utilised for production purpose (0.42)
    - Working capital per unit of production and gross profit per unit of production (0.68)
  - Moderate positive correlation (significant at 1 per cent level) has been noticed for:
Per cent capacity utilisation and gross profit per unit of production (0.24)

**Explanation**: The above findings are amply suggestive of the overwhelming sway of mechanisation on production process as production level and profit generation demonstrate close direct relationship with investment in stock of machinery, extent of capacity utilisation and use of working hours. The other important element in total capital expenditure (i.e., working capital per unit of production) also displays a direct significant relationship with profitability. Therefore, it can be inferred that, in spite of their characteristic labour intensive nature, small scale enterprises cannot eschew their dependence on mechanisation. Also, suitable provision of working capital (as production finance) has been a crucial determinant of economic viability for small scale enterprises.

- High negative significant correlation holds between:
  - Machinery per unit of production and gross profit per unit of production (-0.42)

**Explanation**: The same discordant trend between capital intensity and profitability which was earlier detected in the correlation analysis for industrial units in aggregate and for large scale sector, has also been observed for sample small scale enterprises. The reason for such an occurrence has already been discussed.

6.5.c **Correlation Analysis Using Cost-based Measures of Employment**

- Highly significant positive correlation (significant at 0.01 level) had been noted for:
  - Skilled employment per unit of cost and per cent local raw materials used (0.34)
  - Non-production employment per unit of cost and proportion of local raw materials in use (0.35)
  - Non-production employment per unit of cost and stock of machinery per unit of production (0.33)

- Moderately significant positive relationship (significant at 1% level) had been traced for:
  - Total employment per unit of cost and stock of machinery per unit of production (0.24)
  - Total employment per unit of cost and proportion of local sales (0.25)
  - Skilled employment per unit of cost and stock of machinery per unit of production (0.25)

**Explanation**: The basic pattern of relationship revealed by the above results clearly denotes that the phenomenal capital deeping (i.e., increasing stock of machinery per unit of production) in the production process produces a direct conducive influence on employment generation per unit of cost in small scale sample units.

Another noteworthy aspect of this finding reflects that two of the variants of cost-based measures of employment (i.e., skilled employment per unit of cost and non-production employment per unit of cost) exercise a similar type of significant relationship with at least two of the explanatory variables (i.e., use of local raw materials and stock of machinery per unit of production). Such a phenomenon has already been detected and discussed while carrying out the analysis for production-based employment measures for smaller units.

The cost-advantage derived from depending on a local market seemed to be somewhat limited considering its impact on job creation.

A comparison of both the analysis (one involving production-based employment measures and the other cost-based employment measures) has brought out a notable difference in the pattern of relationships. The production-based employment measures have been identified in association with a greater number of explanatory variables whereas for the cost-based measures of employment, the number of related variables was considerably reduced. The most probable justification for such a trend should be interpreted in terms of the aggregate influence exercised by myriads of factors with diverse characteristics which affects the production organisation in small scale sector.
Finally, it should be admitted that very few factors can be identified from the analysis which actually renders production process in the small sector more cost-efficient.

- Highly significant negative correlation (significant at 0.01% level) are obtained for:
  - Total employment per unit of cost and manufacturing of brand items (-0.57)
  - Semi-skilled, unskilled employment per unit of cost and manufacture of brand items (-0.66)
  - Semi-skilled, unskilled employment per unit of cost and production of tailor-made items (-0.36)

- Moderately significant negative correlation (significant at 1 per cent level) is noted between:
  - Total employment and production of tailor-made items (-0.3)

Explanation: The confused or undefined product characteristic of small scale sector has been evinced again by the above findings.

Hence, it can be duly inferred that the product-mix adopted by the sample small scale units cannot induce any conducive effect either on production or on production cost and thus, it cannot possibly further the concomitant goal of employment generation.

6.6 Regression Analysis for Small Scale Enterprises

Equations 1 to 4 in table 6.6 give estimates for absolute measures of employment potential. The value of $R^2$ for total employment denotes that 23 per cent of variation in total employment has been explained by gross profit per unit of production (significant at less than 1 per cent level), stock of machinery and proportion of local sales (both significant at 1 to 5 per cent level).

Equation 2 relates to skilled employment and here, 11 per cent of the total variation has been explained by gross profit per unit of production and proportion of local sales (both significant at 1 to 5 per cent level).

For semi-skilled and unskilled employment 18 per cent of variation is explained by gross profit per unit of production (significant at less than 1 per cent level) and stock of machinery per unit of production (significant at 1 to 5 per cent level). For non-production employment, none of the variables has been found to be significantly explanatory.

6.6.a On the basis of the above analysis, the major determinants for absolute measures of employment potentials have been identified and are discussed below.

1. Gross Profit per unit of Production (GPP):
   - This variable has been found to be the most important in explaining all the three variants of absolute employment measures. The inverse nature of this particular relationship has already been discussed while explaining results of correlation analysis for smaller enterprises.
2. Per cent Local Sales (LSAL):
   - Appearance of this variable with a negative sign of its co-efficient has substantiated the same trend identified while carrying out the correlation analysis for small scale sector.
3. Stock of Machinery per unit of Production (MACP):
   - The significance and inverse nature of this variable has already been explained in the respective section of correlation analysis.

6.6.b Determinants of Production-based Measures of Employment Potential

Equations 5 to 8 in table 6.6 give regression estimates for various measures of employment generated per unit of production.

Equation 5 relates to total employment per unit of production. Here, 65 per cent of the total variation has been explained by gross profit per unit of production and production of brand items (both significant at less than 1 per cent level).

For skilled employment generated per unit of production, 67 per cent of the total variation has been explained by gross profit per unit of production, per cent local raw material in use, stock of machinery per unit of production (all three significant at less than 1 per cent level) and absolute stock of machinery (significant at 1 to 5 per cent level).

Equation 7 refers to semi-skilled, unskilled employment per unit of production. In this case, 62 per cent of the total variation has been explained by gross profit per unit of production and production of brand items (both significant at less than 1% level).
Table 6.6: Results of Regression Analysis for Small Scale Enterprises

<table>
<thead>
<tr>
<th>Eqn no.</th>
<th>Dependent variable</th>
<th>Constant</th>
<th>$R^2$</th>
<th>GPP</th>
<th>MACP</th>
<th>MAC</th>
<th>LSAL</th>
<th>BRAND</th>
<th>LRM</th>
<th>TIME</th>
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<td>0.183**</td>
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<td>0.259**</td>
<td>-0.212*</td>
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<td>0.486*</td>
<td>-0.172***</td>
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$t$-values in parentheses
SigT *** 0.0000 **0.0001 to 0.009 *0.0 to 0.05
For non-production employment generated per unit of production, the corresponding value of $R^2$ revealed that it explained 30 per cent of variation in this measure and three variables of stock of machinery per unit of production, proportion of local raw material in use (significant at less than 1 per cent level) and per cent utilisation of production time (significant at less than 1 per cent level) have emerged significant.

Before going into the main body of this analysis, it should be mentioned that the value of $R^2$ has improved remarkably while carrying out the analysis for production-based employment measures and the number of explanatory variables entered was somewhat higher than that for the analysis corresponding to absolute employment measures.

1. **Gross Profit per unit of Production (GPP):**
   This variable appeared to be the most important significant determinant in explaining employment at all skill levels. The direction of relationship remains inverse and this phenomenon has already been discussed while interpreting the results of correlation analysis for small units.

2. **Production of Brand Item (BRAND):**
   It is to be specifically noted that 'manufacture of brand item' has appeared as a significant explanatory variable for two of the production-based employment measures (i.e., for total employment-per unit of production and semi-skilled, unskilled employment per unit of production) but the variable of 'per cent proportion of tailor-made items produced' did not show up as a significant determinant in this part of regression analysis.

   Hence, it seems that the employment-depressing effect of tailor-made items is relatively less apparent when compared to that of the brand items. The limited scope of brand items in promoting employment generation in small scale units has assumed a persistent dimension, probably because manufacturing and marketing of brand items remains a costlier affair for smaller units to manage.

3. **Per cent Local Raw Material in Use (LRM):**
   Similar to the analysis at aggregate level, this variable appears as the third most important significant explanatory variable. The only difference is that while LRM explains variation in three of the production-based employment measures at aggregate level, for small scale sector it appears only for skilled employment per unit of production and non-production employment per unit of production. Such a phenomenon has already been reported and discussed in previous sections.

4. **Absolute Stock of Machinery (MAC) and Stock of Machinery per unit of Production (MACP):**
   These two variables appeared in conjunction while explaining the variation in skilled employment per unit of production and the latter one (i.e., MACP) appeared for non-production employment per unit of production. The signs associated with the co-efficients are positive for MACP and negative for MAC. This implies that level of employment (in general) in small scale units moves in the opposite direction to an increasing stock of machinery but for skilled employees (many of whom participate in non-technical/administrative responsibilities as well) production mechanisation embodies specific advantage. The reason is apparent.

5. **Per cent Working Hours Used Effectively for Production Purpose (TIME):**
   This last variable appears only for non-production employment per unit of production. The unique appearance of this variable for non-production employment per unit of production
has already been discussed.

Last of all, it should be mentioned that the most notable reason for improvement in the values of $R^2$ while carrying out the analysis for production-based employment measures lies in the fact that employment generation in smaller units gets affected by diverse and complicated elements all of which are not necessarily determined by an investigation of absolute employment measures only. The overall production level in a small scale enterprise on the other hand, can assimilate and reflect the aggregate influence of all these underlying elements more distinctly.

6.6.c Determinants of Cost-based Measures of Employment Potential

The estimates for employment generated per unit of cost of production are investigated in equation number 9 to 12 and the results are represented by table 6.6.

For total employment generated per unit of production cost, nearly 40 per cent of the variation has been explained by three variables in total — stock of machinery per unit of production and utilisation of local raw material (significant at 1 to 5 per cent level) and manufacture of brand products (significant at less than 0.01 per cent level).

Nearly 30 per cent of variation in skilled employment per unit of production cost has been explained by stock of machinery per unit of production, utilisation of local raw material (both significant at less than 0.01 per cent level) and absolute stock of machinery, extent of local sales, production of brand items (all significant at 1 to 5 per cent level).

The third equation (no. 11) gives regression estimates for semi-skilled, unskilled employment per unit of production cost. The value of $R^2$ explained nearly 44 per cent of total variation and the variable of production of brand items emerged as the only significant determinant (significant at less than 0.01 per cent level).

For non-production employment per unit of production cost, nearly 36 per cent of total variation is being explained by four variables in total. These are absolute stock of machinery, utilisation of local raw materials, gross profit per unit of production (all significant at less than 0.01 per cent level) and stock of machinery per unit of production (significant at 1 to 5 per cent level).

1. Absolute Stock of Machinery (MAC) and Machinery Per unit of Production (MACP):

These two variables appear for three variants of the cost-based employment measures. The emergence of stock of machinery per unit of production as a significant variable with positive sign for three of the equations (excluding only semi-skilled, unskilled employment per unit of cost) indicates that an increase in machinery-output ratio usually reduces the cost of generating employment. In other words, greater use of machines in production can contribute conspicuously to the desirable cost-saving effect.

However, for a given volume of output, the labour-saving effect of increase in stock of machinery can dominate over its cost-reducing effect, thereby reducing employment created per unit of production cost. This explains the negative sign of the co-efficient of absolute stock of machinery in two of the regression equations (i.e., for skilled/non-production employment per unit of production cost).

But this distinctive negative influence exercised by MACP on skilled/non-production employment per unit of cost may have signified wastage of precious production time and underutilisation of production capacity which can eventually render employment expansion (for skilled personnel) unviable or a costly affair. This is more so because, shortfall in capacity utilisation of machines will eventuate to cost escalation (by increasing the working expenses under the head of physical capital account and maintenance).

2. Utilisation of Local Raw Material (LRM):

Appearance of local raw material utilisation as a significant variable in three of the
equations (except for semi-skilled, unskilled employment per unit of cost) and the positive sign of its co-efficients for all the three measures suggests that greater use of local raw material is largely concomitant with lower cost of production. This in turn, can reduce the cost of propagating employment and thereby, leading to better scope for employment generation in smaller units.

3. Manufacturing of Brand Items (BRAND):
Presence of brand items as a significant variable, with a positive sign of its co-efficient for skilled employment per unit of cost and with a negative sign for total/semi-skilled, unskilled employment per unit of cost is perceptibly the continuation of the same trend which has already been observed for similar relationships from the correlation analysis.

4. Per cent Local Sales (LSAL):
This variable emerged as the significant determinant only for skilled employment per unit of cost with a positive sign in its co-efficient. It should be noted here that co-efficient of this determinant, local sales, carries a negative sign in the analysis involving absolute employment measures (for smaller sample units). Such a deviation indicates that the employment-reducing effect of a limited market is more marked than its output-depressing effect, that too for skilled employment only. That is to say, for employment in aggregate and for employment generation at other skill levels (viz., for semi-skilled, unskilled employment and non-production employment), the intrinsic advantages of a local market cannot compensate for the output-depressing effect of a limited product range. In other words, the typical benefits of a local market can bring down the cost of employment generation in small scale units indeed, but only for skilled personnel. It may be because the actual level of employment in most of the small units is already close to the irreducible minimum of labour force required to carry on the firm’s activity and under such situation, it is only the skilled employment which enjoys some scope for further expansion.

5. Gross Profit per Unit of Production (GPP):
This variable came out to be the last factor, with a direct influence on non-production employment per unit of cost. The exact nature of this determinant could not be ascertained owing to lack of conformity.