CHAPTER - VI.

A STUDY OF "RESPONSE" OF CAPITAL-LABOUR RATIO TO THE GROWTH RATE OF LABOUR PRODUCTIVITY FOR THE POTENTIAL RECUCTION OF EXCESS CAPACITY.

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6.0: Capital labour ratio represents the intensity of industry in the production operation. A higher amount of capital per man may raise the productivity of man not only by quantity but also by quality of production. It is a going and needed test of every entrepreneur to select an optimum combination of capital and labour in production operation for better income which highly encourage him to see the use of capital and capital series corrected for rates of capacity utilization.[1] So, the estimation of another production function requires observation on capital for capacity utilization.

As long as 1932 Hicks noted that in the absence of technological change an increasing capital/labour ratio might induce a tendency to-wards a diminishing elasticity of substitution, thereby at least implicitly recognizing the possibility of a variable elasticity of substitution.[2] This statement seems to have encouraged writers to introduce the Variable Elasticity of Substitution (VES) production function of one form or another designating them homothetic or transcendental production function.[3]

6.1: The VES Production Function: As a Measure of Intensity:

The VES production function explicity permits the capital labour ratio to be an explanatory variable of productivity.[4] A comprehensive study by Hilde-brand and Liu has shown the weakness of the CES production function in which efficiency parameter has a downward bias because of omission of the variable (K/L), for which it does not explain the productivity variation in a majority of industries.[5] The VES production function overcomes this defect of the CES. The function can be stated as:

$$V = A\left[\delta K^{-\rho} + (1-\delta)\left(K/L\right)^{-\mu(1+\rho)} . L^{-\rho}\right]^{-\frac{1}{\rho}} \quad \ldots 6.1$$

The function can be stated in stochastic form.[6] Here A, δ and ρ are efficiency, distribution and substitution parameter respectively. In this function μ is important parameter which holds an important explanation as when $\mu > 0$, a higher product per man is obtained by increasing the capital per worker, or in other words by introducing a more capital intensive process of production.[7] When $u = 0$, we get identical results from the CES and the VES production function.

The VES differs from CES in one important respect. The CES requires that the elasticity of substitution be the same at all points of an iso-quant, independent of the level of output, hence at all points of the iso-quant map. The VES on the other hand, requires that this substitution parameter should be the same only when on the ray from the origin.[8] In this analysis we are interested to through light on the response of capital. For this we break the function fo find out u and other parameters. We write again the VES production function for steps towards modification.

$$V = A\left[\delta K^{-\rho} + (1-\delta)\left(\frac{K}{L}\right)^{-u(1+\rho)} . L^{-\rho}\right]^{-\frac{1}{\rho}}$$

For modification we have,

$$V = A\left[L^{-\rho}\left\{\delta\left(\frac{K}{L}\right)^{-\rho} + (1-\delta)\left(\frac{K}{L}\right)^{-u(1+\rho)}\right\}\right]^{-\frac{1}{\rho}}$$

$$V = AL\left[\left(\frac{K}{L}\right)^{-\rho}\left\{\delta + (1-\delta)\left(\frac{K}{L}\right)^{-u(1+\rho)+\rho}\right\}\right]^{-\frac{1}{\rho}}$$

$$= A.L.\frac{K}{L}\left[\delta + (1-\delta)\left(\frac{K}{L}\right)^{-u(1+\rho)+\rho}\right]^{-\frac{1}{\rho}}$$

Now,

$$\frac{V}{L} = A.\frac{K}{L}\left[\delta + (1-\delta)\left(\frac{K}{L}\right)^{-u(1+\rho)+\rho}\right]^{-\frac{1}{\rho}}$$

Taking log of both sides,

$$\log\left(\frac{V}{L}\right) = \log A + \log\left(\frac{K}{L}\right) - \frac{1}{\rho} \log \left[\delta + (1-\delta)\left(\frac{K}{L}\right)^{-u(1+\rho)+\rho} \right]$$

When $f(u, \rho) = \log \left[\delta + (1-\delta)\left(\frac{K}{L}\right)^{-u(1+\rho)+\rho} \right]$

We have,

$$\log\left(\frac{V}{L}\right) = \log A + \log\left(\frac{K}{L}\right) - \frac{1}{\rho} \left[f(u, \rho) \right].$$

Now Taylor's series expression of two variables commited as u and ρ in the familiar form,(9)

$$f(u+0,\ 0+\rho) = f(0,0) + \left(u\frac{\partial}{\partial u} + \rho\frac{\partial}{\partial v}\right) f(0,0) + \frac{1}{\lfloor 2}\left(u\frac{\partial}{\partial u} + \rho\frac{\partial}{\partial v}\right)^2$$

$$f(0,0) + \frac{1}{\lfloor 3}\left(u\frac{\partial}{\partial u} + \rho\frac{\partial}{\partial v}\right)^3 f(0,0) + \ldots\ldots\ldots\ldots\ldots$$

taking $f(u, \rho)$ as $f(u, v)$

for convenience.

So, $f(u,v) = \log \left[\delta + (1 - \delta)\left(\frac{K}{L}\right)^{-u(1+v)+v} \right]$

when $u = 0$ and $v = 0$

$$f(0,0) = \log \left[\delta + (1 - \delta) \right] . 1 = \log 1 = 0.$$

Now $\left[u\frac{\partial}{\partial u} + \rho \frac{\partial}{\partial v} \right] f(u, v)$

$$= \left[u\frac{\partial}{\partial u} + \rho \frac{\partial}{\partial v} \right] \left[\log \left\{ \delta + (1 - \delta)\left(\frac{K}{L}\right)^{-u(1+v)+v} \right\} \right].$$

$$= \frac{\left[u (1 - \delta) \{ -(1+v) \} \left(\frac{K}{L}\right)^{-u(1+v)+v} . \log\left(\frac{K}{L}\right) + \rho (1 - \delta) (-u+1)\left(\frac{K}{L}\right)^{-u(1+v)+v} . \log\left(\frac{K}{L}\right) \right]}{\left\{ \delta + (1 - \delta)\left(\frac{K}{L}\right)^{-u(1+v)+v} \right\}^2}$$

When $u = 0$ and $v = 0$ i.e. the expression for

$$\left(u\frac{\partial}{\partial u} + \rho \frac{\partial}{\partial v} \right) f(0,0) = u \{ (1 - \delta)(-1) \} \log\left(\frac{K}{L}\right) + \rho (1 - \delta) \log\left(\frac{K}{L}\right)$$

$$= \log\left(\frac{K}{L}\right) \{ \rho(1 - \delta) - u(1 - \delta) \}$$

$$= (1 - \delta)(\rho - u) \log\left(\frac{K}{L}\right)$$

Again for $\frac{1}{2}\left(u\frac{\partial}{\partial u}+\rho\frac{\partial}{\partial v}\right)^2 f(u, v).$

$$= \frac{1}{\underline{|2}}\left(u\frac{\partial}{\partial u}+\rho\frac{\partial}{\partial v}\right)^2 \left[\log\left\{\delta + (1-\delta).\left(\frac{K}{L}\right)^{-u(1+v)+v}\right\}\right]$$

$$= \frac{1}{\underline{|2}}\left(u^2\frac{\partial^2}{\partial u^2} + 2u\rho\frac{\partial^2}{\partial u\partial v} + \rho^2\frac{\partial}{\partial v^2}\right)\left[\log\left\{\delta + (1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v}\right\}\right]$$

for convenience the part defferentiation is assigned here as for 3rd form.

$$\left[\frac{\partial^2}{\partial u^2}\right] = \frac{u^2\left[(1-\delta)(1+v)^2\left(\frac{K}{L}\right)^{-u(1+v)+v}.\left\{\log\left(\frac{K}{L}\right)\right\}^2 X\left\{\delta+(1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v}\right\} - (1-\delta)\left\{-(1+v)\right\}.\left(\frac{K}{L}\right)^{-u(1+v)+v}.\log\left(\frac{K}{L}\right)X(1-\delta)\left\{-(1+v)\left(\frac{K}{L}\right)^{-u(1+v)+v}.\log\left(\frac{K}{L}\right)\right]}{\left\{\delta + (1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v}\right\}^2}$$

$$= \frac{u^2\left[(1-\delta)(1+v)^2\left(\frac{K}{L}\right)^{-u(1+v)+v}.\left\{\log\left(\frac{K}{L}\right)\right\}^2 X\left\{\delta+(1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v}\right\} - (1-\delta)^2(1+v)^2\left\{\left(\frac{K}{L}\right)^{-u(1+v)+v}\right\}^2\left\{\log\left(\frac{K}{L}\right)\right\}^2\right]}{\left\{\delta + (1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v}\right\}^2}$$

$$= \frac{u^2 \left[(1-\delta)(1+v)^2 \left(\frac{K}{L}\right)^{-u(1+v)+v} \cdot \left\{ \log\left(\frac{K}{L}\right) \right\}^2 \left\{ \delta + (1-\delta) \cdot \left(\frac{K}{L}\right)^{-u(1+v)+v} - (1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v} \right\} \right]}{\left\{ \delta + (1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v} \right\}^2}$$

$$= \frac{u^2 \, \delta \, (1-\delta)(1+v)^2 \left(\frac{K}{L}\right)^{-u(1+v)+v} \left\{ \log\left(\frac{K}{L}\right) \right\}^2}{\left\{ \delta \, (1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v} \right\}^2}$$

For $\rho^2 \frac{\partial^2}{\partial v^2} = \frac{\rho^2 \left[(1-\delta)(-u+1)^2 \left(\frac{K}{L}\right)^{-u(1+v)+v} \cdot \left\{ \log\left(\frac{K}{L}\right) \right\}^2 X \left\{ \delta + (1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v} \right\} - (1-\delta)(-u+1)\left(\frac{K}{L}\right)^{-u(1+v)+v} \cdot \log\left(\frac{K}{L}\right) X (1-\delta)(-u+1) \cdot \left(\frac{K}{L}\right)^{-u(1+v)+v} \cdot \log\left(\frac{K}{L}\right) \right]}{\left\{ \delta + (1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v} \right\}^2}$

$$= \frac{\rho^2 \left[(1-\delta)(-u+1)^2 \left(\frac{K}{L}\right)^{-u(1+v)+v} \cdot \left\{ \log\left(\frac{K}{L}\right) \right\}^2 X \left\{ \delta + (1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v} \right\} - (1-\delta)^2(-u+1)^2 \left\{ \left(\frac{K}{L}\right)^{-u(1+v)+v} \right\}^2 \left\{ \log\left(\frac{K}{L}\right) \right\}^2 \right]}{\left\{ \delta + (1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v} \right\}^2}$$

$$= \frac{\rho^2 \left[(1-\delta)(-u+1)^2 \cdot \left(\frac{K}{L}\right)^{-u(1+v)+v} \cdot \left\{ \log\left(\frac{K}{L}\right) \right\}^2 \left\{ \delta + (1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v} - (1-\delta)\cdot\left(\frac{K}{L}\right)^{-u(1+v)+v} \right\} \right]}{\left\{ \delta + (1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v} \right\}^2}$$

$$= \frac{\rho^2 \delta (1-\delta)(-u+1)^2 \left(\frac{K}{L}\right)^{-u(1+v)+v} \cdot \left\{ \log\left(\frac{K}{L}\right) \right\}^2}{\left\{ \delta + (1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v} \right\}^2}$$

For; $$2 \rho u \frac{\partial^2}{\partial u \partial v} = \frac{2 \rho u \left[(1-\delta) \{ -(1+v) \} (-u+1) \left(\frac{K}{L}\right)^{-u(1+v)+v} \cdot \left\{ \log\left(\frac{K}{L}\right) \right\}^2 \times \left\{ \delta + (1-\delta)\cdot\left(\frac{K}{L}\right)^{-u(1+v)+v} \right\} - \left\{ (1-\delta)(-u+1)\cdot\left(\frac{K}{L}\right)^{-u(1+v)+v} \cdot \log\left(\frac{K}{L}\right) \right\} \times (1-\delta) \{ -(1+v) \} \left(\frac{K}{L}\right)^{-u(1+v)+v} \cdot \log\left(\frac{K}{L}\right) \right]}{\left\{ \delta + (1-\delta)\cdot\left(\frac{K}{L}\right)^{-u(1+v)+v} \right\}^2}$$

$$= \frac{2 \rho u \left[(1-\delta) \{ -(1+v) \} (-u+1)\cdot\left(\frac{K}{L}\right)^{-u(1+v)+v} \left\{ \log\left(\frac{K}{L}\right) \right\}^2 \left\{ \delta + (1-\delta)\cdot\left(\frac{K}{L}\right)^{-u(1+v)+v} \right\} - (1-\delta)^2 \{ -(1+v) \} (-u+1) \left\{ \left(\frac{K}{L}\right)^{-u(1+v)+v} \right\}^2 \left\{ \log\left(\frac{K}{L}\right) \right\}^2 \right]}{\left\{ \delta + (1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v} \right\}^2}$$

$$= \frac{2\rho u \left[(1-\delta)\{-(1+v)\}(-u+1)\left(\frac{K}{L}\right)^{-u(1+v)+v} \cdot \{\log(\frac{K}{L})\}^2 \{\delta + (1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v} - (1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v}\} \right]}{\{\delta + (1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v}\}^2}$$

$$= \frac{2\rho u \delta (1-\delta)\{-(1+v)\}(-u+1)\left(\frac{K}{L}\right)^{-u(1+v)+v} \{\log(\frac{K}{L}()\}^2}{\{\delta + (1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v}\}^2}$$

taking u = 0 and v = 0, Then arranging we have,

$$= \frac{1}{\lfloor 2} \left[u^2 \delta (1-\delta) \{\log(\frac{K}{L})\}^2 + \rho \delta (1-\delta) \{\log(\frac{K}{L})\}^2 - 2\rho u \delta (1-\delta) \{\log(\frac{K}{L})\}^2 \right]$$

$$= \frac{1}{2} \left[\delta (1-\delta) \{\log(\frac{K}{L})\}^2 \{u^2 + \rho^2 - 2\rho u\} \right]$$

$$= \frac{1}{2} \delta (1-\delta)(\rho - u)^2 \{\log(\frac{K}{L})\}^2$$

For forth term we have,

$$\frac{1}{\lfloor 3} \left[u \frac{\partial}{\partial u} + \rho \frac{\partial}{\partial v} \right]^3 \left[\log\{\delta + (1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v}\} \right]$$

$$= \frac{1}{6} \left[u^3 \frac{\partial}{\partial u^3} + 3u^2\rho \frac{\partial}{\partial u^2 \partial v} + 3u\rho^2 \frac{\partial^2}{\partial v^2 \partial u} + \rho^3 \frac{\partial^3}{\partial v^3} \right] \left[\log\{\delta + (1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v}\} \right]$$

For convenience the part differentiation is assignable as for:

$$u^3 \frac{\partial}{\partial u^3} = \frac{u^3 \left[\delta(1-\delta)\{-(1+v)\}^3 \left(\frac{K}{L}\right)^{-u(1+v)+v} \{\log(\frac{K}{L})\}^3 \times \{\delta+(1-\delta)(\frac{K}{L})^{-u(1+v)+v}\}^2 - \delta(1-\delta)(1+v)^2(\frac{K}{L})^{-u(1+v)+v} \{\log(\frac{K}{L})\}^2 \times 2\{\delta+(1-\delta)(\frac{K}{L})\}^{-u(1+v)+v} \times (1-\delta)(\frac{K}{L})^{-u(1+v)+v} \{-(1+v)\} \log(\frac{K}{L}) \right]}{\{\delta+(1-\delta)(\frac{K}{L})^{-u(1+v)+v}\}^4}$$

$$= \frac{u^3 \left[\delta(1-\delta)\{-(1+v)\}^3 . (\frac{K}{L})^{-u(1+v)+v} \times \{\delta+(1-\delta)(\frac{K}{L})^{-u(1+v)+v}\}^2 - 2\delta(1-\delta)^2 \{\delta+(1-\delta)(\frac{K}{L})^{-u(1+v)+v}\}\{-(1+v)\} \{(\frac{K}{L})^{-u(1+v)+v}\}^2 \{\log(\frac{K}{L})\}^3 \right]}{\{\delta+(1-\delta)(\frac{K}{L})^{-u(1+v)+v}\}^4}$$

$$= \frac{u^3 \left[\delta(1-\delta)\{-(1+v)\}^3 (\frac{K}{L})^{-u(1+v)+v} \times \{\delta+(1-\delta)(\frac{K}{L})^{-u(1+v)+v}\} \{\delta+(1-\delta)(\frac{K}{L})^{-u(1+v)+v} - 2(1-\delta)(\frac{K}{L})^{-u(1+v)+v}\} \right]}{\{\delta+(1-\delta)(\frac{K}{L})^{-u(1+v)+v}\}^4}$$

When $u = 0$ and $v = 0$ we have,

$$= -u^3 \left[\delta(1-\delta)(2\delta-1)\left\{ \log\left(\frac{K}{L}\right) \right\}^3 \right.$$

$$\text{For, } \rho^3 \frac{\partial^3}{\partial v^3} = \frac{\rho^3 \left[\delta(1-\delta)(-u+1)^3 . \left(\frac{K}{L}\right)^{-u(1+v)+v} \left\{ \log\left(\frac{K}{L}\right) \right\}^3 \times \left\{ \delta + (1-\delta).\left(\frac{K}{L}\right)^{-u(1+v)+v} \right\}^2 - \left\{ \delta(1-\delta)(-u+1)^2 . \left(\frac{K}{L}\right)^{-u(1+v)+v} \left\{ \log\left(\frac{K}{L}\right)^2 \times 2 \left\{ \delta + (1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v} \right\} \times \left\{ (1-\delta)(-u+1)\left(\frac{K}{L}\right)^{-u(1+v)+v} . \left\{ \log\left(\frac{K}{L}\right) \right\} \right]}{\left\{ \delta + (1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v} \right\}^4}$$

$$= \frac{\rho^3 \left[\delta(1-\delta)(-u+1)^3 \left(\frac{K}{L}\right)^{-u(1+v)+v} . \left\{ \log\left(\frac{K}{L}\right) \right\}^3 \left\{ \delta + (1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v} \right\}^2 - 2\delta(1-\delta)^2(-u+1)^3 \times \left\{ \left(\frac{K}{L}\right)^{-u(1+v)+v} \right\}^2 \left\{ \log\left(\frac{K}{L}\right) \right\}^3 \right]}{\left\{ \delta + (1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v} \right\}^4}$$

$$= \frac{\rho^3 \left[\delta(1-\delta)(-u+1)^3 \left(\frac{K}{L}\right)^{-u(1+v)+v} \left\{ \log\left(\frac{K}{L}\right) \right\}^3 \times \left\{ \delta + (1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v} \right\} \left\{ \delta + (1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v} - 2(1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v} \right\} \right]}{\left\{ \delta + (1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v} \right\}^4}$$

When $u = 0$ and $v = 0$, we have

$$= \rho^3 \left[\delta (1 - \delta) \{ \log (\tfrac{K}{L}) \}^3 \{ 1 - 2(1 - \delta) \} \right]$$

$$= \rho^3 \left[\delta (1 - \delta) (2 \delta - 1) \{ \log (\tfrac{K}{L}) \}^3 \right]$$

$$\text{for } 3 u^2 \rho \frac{\partial^2}{\partial u^2 \partial v} = \frac{\begin{array}{l} 3 u^2 \rho \left[\delta (1-\delta)(1+v)^2(-u+1).(\tfrac{K}{L})^{-u(1+v)+v} \right. \\ . \{ \log(\tfrac{K}{L}) \}^3 X \{ \delta + (1-\delta).(\tfrac{K}{L})^{-u(1+v)+v} \}^2 - \\ \delta (1-\delta)(1+v)^2 (\tfrac{K}{L})^{-u(1+v)+v} . \{ \log(\tfrac{K}{L}) \}^2 \\ X\, 2 \{ \delta + (1-\delta)(\tfrac{K}{L})^{-u(1+v)+v} \} X (1-\delta)(\tfrac{K}{L})^{-u(1+v)+v} \\ \left. (-u+1).\log(\tfrac{K}{L}) \right] \end{array}}{\{ \delta + (1 - \delta) (\tfrac{K}{L})^{-u(1+v)+v} \}^4}$$

$$= \frac{\begin{array}{l} 3 u^2 \rho \left[\delta(1-\delta)(1+v)^2(-u+1).(\tfrac{K}{L})^{-u(1+v)+v} \{ \log(\tfrac{K}{L}) \}^3 \right. \\ X \{ \delta + (1-\delta)(\tfrac{K}{L})^{-u(1+v)+v} \}^2 - 2 \delta (1-\delta)^2 (1+v)^2 (-u+1) \\ \{ \delta + (1-\delta)(\tfrac{K}{L})^{-u(1+v)+v} \} \{ (1-\delta) \} \{ (\tfrac{K}{L})^{-u(1+v)+v} \}^2 \\ \left. \{ \log(\tfrac{K}{L}) \}^3 \right] \end{array}}{\{ \delta + (1 - \delta) (\tfrac{K}{L})^{-u(1+v)+v} \}^4}$$

$$= \frac{3u^2\rho \left[\delta (1-\delta)(1+v)^2(-v+1)\left(\frac{K}{L}\right)^{-u(1+v)+v} \left\{ \log\left(\frac{K}{L}\right) \right\}^3 \left\{ \delta+(1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v} \right\} \left\{ \delta+(1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v} - 2(1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v} \right\} \right]}{\left\{ \delta+(1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v} \right\}^4}$$

When $u = 0$ and $v = 0$ then we have,

$$= 3u^2\rho \left[\delta (1-\delta) \left\{ \log\left(\frac{K}{L}\right) \right\}^3 \left\{ 1 - 2(1-\delta) \right\} \right]$$

$$= 3u^2\rho \left[\delta (1-\delta)(2\delta-1) \left\{ \log\left(\frac{K}{L}\right) \right\}^3 \right.$$

For $3u\rho^2 \frac{\partial^2}{\partial v^2 \partial u} =$

$$\frac{3u^2\rho^2 \left[\delta(1-\delta)(-u+1)^2 \left\{ -(1+v) \right\} \left(\frac{K}{L}\right)^{-u(1+v)+v} . \left\{ \log\left(\frac{K}{L}\right) \right\}^3 X \left\{ \delta+(1+\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v} \right\}^2 - \delta(1-\delta)(-u+1)^2 . \left(\frac{K}{L}\right)^{-u(1+v)+v} . \left\{ \log\left(\frac{K}{L}\right) \right\}^2 X2 \left\{ \delta+(1-\delta).\left(\frac{K}{L}\right)^{-u(1+v)+v} \right\} X \left\{ (1-\delta) \left\{ -(1+v) \right\} . \left(\frac{K}{L}\right)^{-u(1+v)+v} \left\{ \log\left(\frac{K}{L}\right) \right\} \right\} \right]}{\left\{ \delta+(1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v} \right\}^4}$$

$$= \frac{\begin{array}{l} 3u\rho^2 \left[\delta(1-\delta)(-u+1)^2 \{-(1+v)\} \left(\frac{K}{L}\right)^{-u(1+v)+v} . \{\log\left(\frac{K}{L}\right)\}^3 \right. \\ \times \{\delta+(1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v}\}^2 - 2\delta(1-\delta)^2(-u+1)^2 \{-(1+v)\} \\ \left. \times \{\delta+(1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v}\} \{\left(\frac{K}{L}\right)^{-u(1+v)+v}\}^2 \{\log\left(\frac{K}{L}\right)\}^3 \right] \end{array}}{\{\delta+(1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v}\}^4}$$

$$= \frac{\begin{array}{l} 3u\rho^2 \left[\delta(1-\delta)(-u+1)^2 \{-(1+v)\} \left(\frac{K}{L}\right)^{-u(1+v)+v} . \{\log\left(\frac{K}{L}\right)\}^3 \right. \\ \times \{\delta+(1-\delta).\left(\frac{K}{L}\right)^{-u(1+v)+v}\} \{\delta+(1-\delta).\left(\frac{K}{L}\right)^{-u(1+v)+v} \\ \left. -2(1-\delta).\left(\frac{K}{L}\right)^{-u(1+v)+v}\} \right] \end{array}}{\{\delta+(1-\delta)\left(\frac{K}{L}\right)^{-u(1+v)+v}\}^4}$$

when $u = 0$ and $v = 0$ then we have

$$= -3u\rho^2 \left[\delta(1-\delta) \{\log\left(\frac{K}{L}\right)\}^3 \{1-2(1-\delta)\} \right]$$

$$= -3u\rho^2 \left[\delta(1-\delta)(2\delta-1) \{\log\left(\frac{K}{L}\right)\}^3 \right]$$

Now, rearranging the forth term we have,

$$\frac{1}{6} \left[\rho^3 \delta(1-\delta)(2\delta-1) \{\log\left(\frac{K}{L}\right)\}^3 - 3\rho^2 u \delta(1-\delta)(2\delta-1) \{\log\left(\frac{K}{L}\right)\}^3 \right.$$
$$\left. +3\rho u^2 \delta(1-\delta)(2\delta-1) \{\log\left(\frac{K}{L}\right)\}^3 - u^3 \delta(1-\delta)(2\delta-1) \{\log\left(\frac{K}{L}\right)\}^3 \right]$$

$$= \frac{1}{6} \left[\delta(1-\delta)(2\delta-1) \{ \log(\tfrac{K}{L}) \}^3 \{ \rho^3 - 3\rho^2 u + 3\rho u^2 - u^3 \} \right]$$

$$= \frac{1}{6} \left[\delta(1-\delta)(2\delta-1)(\rho - u)^3 \{ \log(\tfrac{K}{L}) \}^3 \right]$$

Finally,

$$\log(\tfrac{V}{L}) = \log A + \log(\tfrac{K}{L}) - \frac{1}{\rho} \left[0 + (1-\delta)(\rho - u)\log(\tfrac{K}{L}) + \tfrac{1}{2}\delta(1-\delta)(\rho - u)^2 \{ \log(\tfrac{K}{L}) \}^2 + \frac{1}{6}\delta(1-\delta)(2\delta - 1)(\rho - u)^3 \{ \log(\tfrac{K}{L}) \}^3 \right]$$

$$= \log A + \log(\tfrac{K}{L}) - \frac{1}{\rho}(1-\delta)(\rho - u)\log(\tfrac{K}{L}) - \frac{1}{2\rho}\delta(1-\delta)(\rho - u)^2 \{\log(\tfrac{K}{L})\}^2 - \frac{1}{6\rho}\delta(1-\delta)(2\delta-1)(\rho - u)^3 \{ \log(\tfrac{K}{L}) \}^3.$$

Hence,

$$\log(\tfrac{V}{L}) = \log A + \{1 - \frac{1}{\rho}(1-\delta)(\rho - u)\}\log(\tfrac{K}{L}) - \frac{1}{2\rho}\delta(1-\delta)(\rho - u)^2 \{\log(\tfrac{K}{L})\}^2 - \frac{1}{6\rho}\delta(1-\delta)(2\delta-1)(\rho - u)^3 \{\log(\tfrac{K}{L})\}^3 \qquad \ldots\ldots (6.2)$$

The above expression of VES production function is verified with the expression of CES production function by taking $u = 0$. The expression for CES production function is as follows:

$$\log(V/L) = \log A + \delta\log(K/L) - \frac{\rho\delta(1-\delta)}{2}\left[\log(K/L)\right]^2 - \frac{\rho^2(1-\delta)(2\delta-1)}{6}\left[\log(K/L)\right]^3 \qquad \ldots\ldots (6.3)$$

Now we regress $\log(V/L)$ on $\log(K/L)$, $[\log(K/L)]^2$ and $[\log(K/L)]^3$ and find out the co-efficients for the expression of VES production function as mentioned in equation No. 6.2 . From the Co-efficients of the expression we find out the value of the parameters for the VES production function.

6.2: The Empirical Response of the Function in Registered Manufacturing Sector of West Bengal:

We study this attention on West Bengal for Registered Manufacturing Sector wherein 8(eight) 3-digited industry groups of census sector have been chosen as sample to catch a literature on the 'response' of capital to the productivity of labour. We use the data from the census factories in the ASI Frame which bears the records for the year 1977-78.[10] Through the cross section data we find the following results:

Industry Group 251.

Jute and Mesta spinning and Weaving.

Equation for number of observations: 33.

$$3.3701-1.6543 \log(\tfrac{K}{L})+0.6408 \left[\log(\tfrac{K}{L})\right]^2-0.054870 \left[\log(\tfrac{K}{L})\right]^3$$

S.E. (1.4479) (0.7176) (0.1383) (0.015120)

$t^*_{(29)}$ (2.5901) (-2.3053) (4.6321) (-3.6289)

$T^t_{29} = 1.699$ $F^*_{(3,29)} = 19.369$ $F^t_{(3,29)} = 4.68$ $R^2 = 0.67$ $D^W = 1.5131$

From the equation we have

$$\log A = 3.3701$$

So, $A = \text{antilog } 3.3701 = 5624.$

Again, (by 2nd co-efficient)

$$1 - \frac{1}{\rho}(1 - \delta)(\rho - \mu) = -1.6543$$

So,

$$-\frac{1}{\rho}(1-\delta)(\rho-\mu) = -2.6543 \quad \ldots\ldots\ldots \quad (6.4)$$

Another Co-efficient (2nd.)

$$-\frac{1}{2\rho}\delta(1-\delta)(\rho-\mu)^2 = 0.6408 \quad \ldots\ldots \quad (6.5)$$

From 6.4 and 6.5 we have,

$$\delta(\rho-\mu) = -0.1207097 \quad \ldots\ldots \quad (6.6)$$

Again we have, (from 3rd and 4th Co-efficient):

$$\frac{-\frac{1}{6\rho}\delta(2\delta-1)(\rho-\mu)^3(1-\delta)}{-\frac{1}{2\rho}\delta(1-\delta)(\rho-\mu)^2} = \frac{-0.054870}{0.6408}$$

$$\text{or, } (2\delta-1)(\rho-\mu) = -0.0285424 \quad \ldots\ldots \quad (6.7)$$

Dividing (6.7) by (6.6) we have,

$$2-\frac{1}{\delta} = 0.0285424$$

Hence $\delta = 0.5670396$

So, $\rho-\mu = -0.212877$

$\rho = -0.0347237.$

and $\mu = 0.1781533.$

Here we construct the VES function by the parameters:

$$V = 5624\left[0.5670396K^{0.0347237} + (1-0.5670396) \cdot (K/L)^{-0.1781533(1-0.0347237)} \cdot L^{-0.0347237}\right]^{\frac{1}{0.0347237}}$$

Industry Group 313.

Manufacture of Drugs and Medicines.
Equation for number of observation : 15.

$$0.9956-5.48131\log(K/L)+256.44\,[\log(K/L)]^2-169.03\,[\log(K/L)]^3$$

S.E. (0.1745) (6.1998) (48.781) (32.343)

t^*_{11} (5.7041) (-0.8841) (5.2569) (-5.2264)

$T^t_{11} = 1.796$ $F^*_{(3,11)} = 11.4000$ $F^t_{(3,11)} = 3.59$

$R^2 = 0.76$ $D^W = 1.5809.$

From the Co-efficients of the equation we find out the parameters by previous Method:

Here,

$A = 9.900$

$\delta = 0.502792$

$\rho = -3.018431$

$\mu = 42.364856.$

By these parameters we construct the VES production function for the Industry Group:

$$V = 9.900\,[0.502792\,K^{3.01843} + (1-0.502792)\,.(K/L)^{-42.364856(1-3.018431)}\,.L^{3.018431}]^{\frac{1}{3.018431}}$$

Industry Group 330.

Iron and Steel Industries.

Equation for number of observations :21.

$$-6.8074+4.4950\log(K/L)-0.4589[\log(K/L)]^2+0.00014996[\log(K/L)]^3$$

S.E. (8.1582) (3.8023) (0.4396) (0.00036462)

$t^*_{(17)}$ (- 0.8344) (1.1822) (-1.0438) (0.4113)

$T^t_{(17)} = 1.740$, $F^*_{(3,17)} = 4.3286$ $F^t_{(3,17)} = 3.20$

$R^2 = 0.43$ $D^W = 1.7038$

From the co-efficients of the equation we find out the parameters as;

$A = .6418E-05.$

$\delta = 0.5004146$

$\rho = 0.0187531$

$u = 0.1499461.$

By these parameters the production function is:

$$V = .6418E-05 \left[0.5004146\, K^{-0.0187531} + (1 - 0.5004146) \cdot (K/L)^{-0.1499461(1+0.0187531)} \cdot L^{-0.0187531}\right]^{-\frac{1}{0.0187531}}$$

Industry Group 331.

Foundries for casting and forging iron and steel.

Equation for number of observations : 15.

$$-1.1395 + 457.21 \log(K/L) - 227.32 [\log(K/L)]^2 - 0.2957 [\log(K/L)]^3$$

S.E.	(0.7365)	(294.21)	(147.35)	(1.7428)
$t^*_{(11)}$	(- 1.5471)	(1.5540)	(- 1.5375)	(0.1696)

$T^t_{(11)} = 1.796$ $F^*_{(3,11)} = 4.7648$ $F^T_{(3,11)} = 3.59$

$R^2 = 0.57$ $D^W = 2.7403.$

From the Co-efficients of the equation the parameters are:

$A = .1379$

$\delta = 0.4995653$

$\rho = 0.0005479$

$u = 0.4992606$

By these parameters the production function is:

$$V = 0.1379 [0.4995653 K^{-0.0005479} + (1-0.4995653) . (K/L)^{-0.4992606(1+0.000547)} . L^{-0.000547}]^{-\frac{1}{0.000547}}$$

Industry Group: 340.

Manufacture of fabricated metal products such as metal cans from tin-plate, terne plate or enamelled sheet metal, metal shipping containers barrels, drums, kegs, pails, safes vaults, enamelled sanitary products.[11]

Equation for number of observations : 18.

$$3.7263 + 1.4601 \log(K/L) - 0.7262 [\log(K/L)]^2 + 0.091903 [\log(K/L)]^3$$

S.E (16.178) (11.582) (2.7262) (0.2111)

$t^*_{(14)}$ (0.2303) (0.1261) (-0.2664) (0.4363)

$T^t_{(14)} = 1.761 \quad F^*_{(3,14)} = 4.0286 \quad F^t_{(3,14)} = 3.34$

$R^2 = 0.46 \qquad D^W = 2.0048.$

From the Co-efficients of the equation the parameters are:

$A = 5325$

$\delta = 0.5137303$

$\rho = 1.6235427$

$u = 3.1597109$

Hence the VES production function for the industry Group:

$$V = 5325 \left[0.5137303 K^{-1.6235427} + (1 - 0.5137303) . (K/L)^{-3.1597109(1+1.6235427)} . L^{-1.6235427} \right]^{-\frac{1}{1.6235427}}$$

Industry Group : 231.

Cotton spinning, weaving, shrinking, sanforizing mercerising and finishing of cotton textiles in mills.

The equation for number of observations: 18.

$$3.7401 - 315.89\log(K/L) + 81.033[\log(K/L)]^2 - 6.8947[\log(K/L)]^3$$

S.E. (124.94) (102.99) (28.143) (2.5497)

$t^*_{(14)}$ (3.2978) (-3.0671) (2.8794) (- 2.7041)

$T^t_{(14)} = 1.761$ $F^*_{(3,14)} = 12.146$ $F^t_{(3,14)} = 3.34$

$R^2 = 0.72$ $D^W = 1.4298$

From the co-efficients of the equation the parameters are as noted:

$A = 5496$

$\delta = 0.5623738$

$\rho = -0.0003139$

$u = 0.2276655$

By these parameters the VES production function for the industry group .

$$V = 5496 [0.5623738 K^{0.0003139} + (1 - 0.5623738) . (K/L)^{-0.2276655} (1 - 0.0003139 . L^{0.0003139}] - \frac{1}{0.0003139}$$

Industry group: 356

Manufacture alteration and repair of general items of non-electrical machinery, components, equipment and accessories.

The equation for number of observations: 6.

$$-61.331 + 47.825 \log(K/L) - 11.666[\log(K/L)]^2 + 0.9483 [\log(K/L)]^3$$

S.E. (37.657) (26.850) (6.3096) (0.4886)

t_2^* (-1.6281) (1.7812) (-1.8490) (1.9409)

$T_2^t = 2.920 \quad F^*_{(3,2)} = 32.044 \quad F^t_{(3,2)} = 19.2$

$R^2 = 0.98 \quad D^W = 1.3563$

From the Co-efficient of the equation the following parameters are;

$A = .2143\ E - 60$

$\delta = 0.5610143$

$\rho = 0.0020816$

$u = 0.2241262.$

By this parameters the function is:

$$V = .2143E\text{-}60[0.5610143\ K^{-0.0020816} + (1 - 0.5610143) . (K/L)^{-0.2241262(1+0.0020816)} . L^{0.0020816}]^{-\frac{1}{0.0020816}}$$

Industry, Group : 343.

Manufacture of hand tools and genereal hardware.

The equation for number of observations: 8.

$$26.459-13.857 \log(K/L) + 2.6234 [\log(K/L)]^2 - 0.1463 [\log(\frac{K}{L})]^3$$

S.E.	(182.65)	(102.02)	(18.402)	(1.0663)
t_4^*	(0.1449)	(-0.1358)	(0.1426)	(0.1372)

$T_4^t = 2.132$ $F^*_{(3,4)} = 0.8528$ $F^t_{(3,4)} = 6.39$

$R^2 = 0.39$ $D^W = 1.8372.$

Since, the co-efficients are statistically very insignificant, we set the K'menta approximation of the CES production function for the same number of observation. The equation for K'menta approximation is;

$$-1.4834 + 0.6227 \log L - 134.85 \log(K/L) + 68.235 [\log(K/L)]^2$$

S.E.	(0.5723)	(0.1318)	(392.11)	(196.12)
t_4^*	(-2.5920)	(3.9662)	(-0.3439)	(o.3479)

$T_4^t = 2.132$ $F^*_{(3,4)} = 9.8825$ $F^t_{(3,4)} = 6.39$

$R^2 = 0.88$ $D^W = 2.3577.$

So, for the industry group 343 we are away from decision making as the number of observations are not sufficient to have a good fit multiple regression line.

From the results we find the fact that the VES production function is consistent and dominant in some important homogeneous and finer class of industries under Registered Manufacturing sector of West Bengal. It lends substential support to the fact that the VES production function is a more relevant hypothesis for Indian industries compare to the homogeneous production function. The capital labour ratio variable is also an extremely important variable which cannot be ignored in explaining productivity.[12]

Most of the studies relating to estimation of production function show a decline in the capital productivity and an increase in labour productivity, Mostly because of capital intensity in Indian Industries.[13] We find no exception for this. Here we have no answer for other place in India where investors increase capital intensity and follow labour displacing technology when labour productivity is high. We have answer for West Bengal.

Here for all these industries since, $\mu > 0$, a higher product per man is obtained by increasing the capital per worker, So, capital intensive method of production is preferred to all the seven industry groups in West Bengal. Here more and more capital in need of higher productivity of labour is likely to induce the manufacturing unit to use more capacity in existence. It reveals that the investors of West Bengal industries increase their capital intensity in industry as here labour productivity is sufficiently low for which investigation may be of exploratory type.

6.3: The Exploration of Function of the Units under the Industry Groups:

For jute and mesta spinning, weaving and finishing works (industry group 251) under factory system, mainly in Howrah and hooghly area, we find tragic suffering of the industry which once had a dominant role in economic life of Bengal. The competition from substitutes violently disrupted the industry as jute manufactures are now commanding uneconomic prices in the international markets. Besides set-back here 'almost all factories produce only certain type of goods required traditionally so far as in certain markets'.(14) The recruitment in jute industries has already been stoped for a decade and in some units the staffs are eager for taking early retirement. Few jute mills are engaged in selling their land to building promoters. In almost all factories there exist old, worn-out and obsolete machinery. Only a few jute mills are running in well condition as, Calcutta Jute Mfg. Co. Ltd., Anglo Indian Jute Mill, Aucland Jute Mills, Kelvin Jute Co. Ltd., Hukumchand Jute Mills, Birla Jute Mfg. Co. Ltd. Empire Jute and Baranagar Jute fey Co. ltd. Many are likely to be closed as loans and subsidies won't pull them a long time. These are Union Jute Co. Ltd., (Cal),Khardh Jute Mill at Titagarh, Anglo Indian Low Jute Mill at Jagatdal, Sri Ram Jute Mill, Sri Hanuman Jute Mill, Premchand Jute Mill, Naskarpur Jute Mill Co. Ltd and Wellington Jute Mill at Rishra in Hooghly.

Now, research on jute is a positive endeavour to diversify production as it is sometimes combined with wool in carpets and with cotton, linen or silk in draparies or novalty dress fabrics. The outcome of research has proved that the effect of capital for modern dyeing, printing bleaching and artistic weaving is a fillip to the productivity of labour.

The pharmaceutical works, under industry group 313, in West Bengal had been developed in early sixties, when many establishments and Cahoots came into force. The then production of Ayurvadic medicines in the form of granule, Kejal, liquid, oil, powder, ointment and syrup have imposed impression in the minds of people through the establishments like Sadhana Aushadhalaya and Dabar. Homoeopathic medicines being the cheapest among all types of drugs and medicines are now becoming popular in poor mass for which the Economic Homeo Pharmacy and National Homeo Laboratary wage into better days. For the production of bio-chemic and chemical medicines many units set up modern machines which are although not ahead of their times for quality production but indispensable for labour productivity and market. We observe modern set of machines in these units like Bengal Chemical & Pharmaceutical Works Ltd., Smith Stanistreet, Albert Devid Ltd., Dey's Medical Store (Mfg), East India Pharmaceutical Works Ltd., Standard Pharmaceutical Works Ltd.&Rallis India Ltd. (Pharmaceutical Div.). Due to dessidence with labour organisation for modern machines few units like Dy-SE Chems Ltd., EMKE Pharmaceutical Ltd. BMG Pharmaceutical &Balahari Sarkar and Bros. have designed in themselves to create ill will as they can't go through helve after the hatchet.

Even greater efficiency and speed were achieved with the introduction of the continous casting method in different steel mills under industry Group 330 in West Bengal, the total production in the year 1988 was not a cut above the production for the year 1978. The causes for deterioration of production in different units were surveyed. The entrepreneurs from the units like K.R. Steel Uniouns Pvt. Ltd. at Nadia, Hind Wire Industries Ltd at Sukchar, Bengal Steel Industries Pvt. Ltd. at Agarpara, Bharartya (Com) Co. Pvt. Ltd in 24 Parganas, Chaliha Rolling Mills Pvt. Ltd. in Calcutta, Swastika Steel & Allied product, Bhagawati Steel (P) ltd. and Chowdhury Iron Co. (P) Ltd. at Howrah opened that the producers from outside states regularly rig the market and brought them to a stalemate. By this many units at Howrah as Aluminium cables & Conductors Pvt. Ltd., G & H Show Pvt. Ltd., Golden Steel Corporation Pvt. Ltd., Liluah Steel Wire Co. Ltd., Grand Smithy Works, Kuram Iron & Steel Works and Rishi Rolling Mills are likely to be closed within few days. Many foundry units under industry groups 331 at Banaras Road of Howrah keep their shop open to collect raw materials and sell the same at a premium outside the state. About labour few entrepreneurs let the cat out of the bag that capital is the compromising factor for greater productivity in their units. But labour organisations stand for popular believe against modernisation. It comes into light when we see that IISCO at

Burnpur and D.S.P. at Durgapur modernisation schemes which would offer vast opportunities for growth and development of small scale and ancillary industries in the state , are now a bone of contention among trade unions.

For fabricated metal products, under industry group 340 few units are important for their contribution. These are Containers & Cloures Ltd. at Naihati, The Metal Box Company of India Ltd. in Calcutta, Industrial Container Ltd. at Paharpur, Annapurna Metal Works near Bondel Road Rly. Crossing, Sri Iron Foundry and Engg. Works Pvt Ltd. at Liluah, the Oriental metal Industries Pvt. Ltd. at Agarpara, Pioneer Industrial Works Pvt. Ltd. and Dewarance & Mecneill Co. Ltd. in Calcutta. They produce the quality but not as much as needful for export business. Few established units did not make an effort to build up financial strength even during periods of good business. It has been found that the units like Bal Gopal Bose Iron Co.(P) Ltd. at Kiddirpore, the oriental Metal Industries Pvt. Ltd. at Agarpara and India Industries (P) Ltd. at Salkia are not interested to run their units and wanting to close them down to show sickness with the hope that they will get compensation for land, building and equipment at market prices. By compensation they want to start either new business or a new unit outside the state. Although for this type of situation the interest of labours is safeguarding by the Working Group of Central Trade Unions.[15]

Like other traditional industries Cotton has been afflicted with sickness, although many units in West Bengal have not been formally declared, but have become sickness prone. For this we state that from 1980 to 1988 only one cotton mill entered in the industry and with this we count 42 working units in the state. For that period more or less 324 additional looms and 206 thousand spindles have been installed with more employment in the industry. But additional machine and men gave nothing as when we see that total production of piece goods was 124800 thousand meters in the year 1980 and 73754 thousand meters in the year 1988. So, also the total production of yarn was 72164 thousand kgs. in the year 1980 and 66956 thousand kgs in the year 1988. It shows that the industry has failed to achieve the desire capacity utilisation as Productivity of labour is sufficiently lower than the productivity of labour of same industry in Maharastra. In early years of seventies many cotton textiles Mills in West Bengal had been fallen in labour trouble; everywhere found ca'canny which was connived at union-leaders' dream for socialism. Being hoplessly unsuitable for compromise ' few owners milked their enterprises dry, declared them closed, then handed it over to the Govt.'(16) In such situation mationalisation of units like Manindra Mills at Cossimbazar, Sri Annapurna Cotton Mills at Shyamnagar, Podder Projects Ltd. at Garden Reach, Vinod Textiles Industries at Jugberia, Basanti Cotton Mills Ltd. at Panihati, New Gujrat Cotton Mills at Uluberia and Arati Cotton Mills at Dasnagar had been carried for interest of the labours. But what about productivity when the free new management redesigned their units? For improvement of quality and quantity of production to withstand competition in the market, the belief of the labour organisations on modernisation/ rationalisation in state industries' is conditioned by leftist politicians in power. Being in doubt on state Govt's sincerity for owners interest, many units thus cut back their production by depicting the activity with greater excess capacity.

One wonders why units under industry group 356 — producing non-electrical machinery, compounds and equipments comprised of air / gas compressor, ball-bearing, Booster pumps, centrifugal machines, cranes, crushers, derricks, foof-valves, worn gears and mechanised jackets — have not been increased for a long time. It is true that the growing use of electrical machineries expressed the demand for oil-engine and hence the accessories for alteration and repair. The producers of Gujrat, Maharastra and Delhi are now in market with well-finished machinaries and equipments cheaper than those of Calcutta-Howrah which once earned itself the name, Sheffield in India for experties in manufacturing machinery equipment. Only few units are reletively long in existence and advance in years as International Combustion (India) Ltd. at Hoogly, Johnstone Pump(P) Ltd. at Panihati, Flender Macnell Gears Ltd. and Garden Reach Workshop Ltd. in Calcutta. Many units are in bad shape as Viswa Engineering Works at Belurmath, Kusum Engg. Co. Ltd. at Sukchar, C. Comers & Sons Ltd. in Calcutta, Baroja Vegal Pumps (P) Ltd. at Batanagar and Tecalmit (Hind) Ltd. in 24-Parganas.

The high wage in big units is now an envy of workers in small units by turmoil which turning the entreprenures to run their units at below the mediocre level. It sets in a chain of reaction at small and smaller units.

Industrial units in West Bengal are now facing so many exogeneous and indegeneous problems which limit their function and finally force them to run into the mediocre performance at below the level. Here not all but few problems are out of the common. May be manufacturers would beset with difficulties of distribution, face the rig of market, get changes of preference, see stortage of power, raw materials, transport and would experience detariorating industrial relation by many reasons and what may we not say all these are descended from modern manufacturing and business activity wherein entrepreneurs are to gain on some one in a race to outweigh the rivals' reaction. But, if they are forced to bent on doing something, no one will be so callous to suffering. So, their preference reveal to run enterprises with greater excess capacity in which only addition of techoology responds to productivity.

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