APPENDIX - A

Transformation from linearised to the 'S' shaped cost-benefit model.

If $C_0 = \text{entry cost}$

$C_S = \text{saturation cost}$

and $b_S = \text{saturation benefit}$

We have the equation of S shaped model as:

$$b = L C^k \left( \frac{M}{N + C} - 1 \right) \quad \cdots \quad \text{I}$$

The maximum gradient of this S shaped model

$$Q = \frac{db}{dc} \quad \cdots \quad \text{II}$$

The gradient of linearised model

$$P = \frac{b_S}{C_0} = \frac{b_S}{C_S - C_0}$$

For the maximum gradient of S shaped model, the first differential I i.e. II should be zero, i.e.

$$\frac{db}{dc} = L \left[ \left( \frac{M}{N + C} - 1 \right) \left( N + C \right)^{X-1} \cdot \frac{M + C}{(N + C)^2} \right]$$  

\text{-III}

From the fact that gradient vanishes at saturation point, we have:
\[
\frac{d_b}{c_b} = 0 = \frac{x}{N + c_b} - 1 - \frac{M_c}{K(N + c_b)^2} \tag{IV}
\]

\[
b_s = L c_s^K \left( \frac{M}{N + c_b} - \right) \tag{V}
\]

Eliminating \( L \) from III and V, we have

\[
\frac{M}{Q} \int \frac{K c_M^{K-1}}{N + c_M} \frac{c_M^x}{(N + c_M)^2} \frac{1}{c_H^K} \frac{1}{c_M^{K-1}} \frac{K}{Q} c_M^{K-1} = \frac{M}{b_s} \frac{c_s^K}{N + c_b} - \frac{c_s^K}{b_s} \]

or

\[
\frac{M}{Q} \int \frac{K c_M^{K-1}}{N + c_M} \frac{c_M^x}{Q(N + c_M)^2} - \frac{c_s^K}{b_s(N + c_b)} \frac{1}{N + c_M} = \frac{K}{Q} c_M^{K-1} - \frac{c_s^K}{b_s} \tag{VI}
\]

From (IV)

\[
M = \frac{(N + c_b)^2}{N + \frac{K + 1}{K} c_b} \tag{VII}
\]