APPENDIX: THE LOG-LIKELIHOOD FUNCTION FOR KUHN-TUCKER MODEL

The purpose of this appendix is to provide the interested reader with the details of the log-likelihood function used in the empirical section of the manuscript. The log-likelihood function below is specific to a Kuhn Tucker Model given four choice alternatives and errors drawn from a GEV distribution with correlation between alternatives (1,2) and (3,4). The contribution to the log-likelihood function for an individual who chooses consumption pattern ω is given by:

$$
\begin{aligned}
\ln \mathrm{L} = & -\sum_{j=1}^{2} \frac{d_j g_j}{\mu\theta^S} - \sum_{j=3}^{4} \frac{d_j g_j}{\mu\theta^N} \\
& - \left[\exp\left(\frac{-g_1}{\mu\theta^S}\right) + \exp\left(\frac{-g_2}{\mu\theta^S}\right)\right]^{\theta^S} - \left[\exp\left(\frac{-g_3}{\mu\theta^N}\right) + \exp\left(\frac{-g_4}{\mu\theta^N}\right)\right]^{\theta^N} \\
& + (d_1 + d_2)(\theta^S - 1)\log\left[\exp\left(\frac{-g_1}{\mu\theta^S}\right) + \exp\left(\frac{-g_2}{\mu\theta^S}\right)\right] \\
& + (d_3 + d_4)(\theta^N - 1)\log\left[\exp\left(\frac{-g_3}{\mu\theta^N}\right) + \exp\left(\frac{-g_4}{\mu\theta^N}\right)\right] \\
& + (d_1 d_2)\log\left(1 - \frac{\theta^S - 1}{\theta^S}\left[\exp\left(\frac{-g_1}{\mu\theta^S}\right) + \exp\left(\frac{-g_2}{\mu\theta^S}\right)\right]\right)^{-\theta^S} \\
& + (d_3 d_4)\log\left(1 - \frac{\theta^N - 1}{\theta^N}\left[\exp\left(\frac{-g_3}{\mu\theta^N}\right) + \exp\left(\frac{-g_4}{\mu\theta^N}\right)\right]\right)^{-\theta^N} \\
& + \log\left|J_\omega\right| + (d_1 + d_2 + d_3 + d_4)\log(\mu),
\end{aligned}
\qquad \text{(A1)}
$$

where

$$
d_i = \begin{cases} 1 & x_i > 0 \\ 0 & otherwise \end{cases}
$$

The Jacobian transformation terms in equation (A1) are given by:

$$
J_\omega = F_j \quad \text{for } \omega = \{j\},\ j = 1,2,3,4. \qquad \text{(A2)}
$$

$$
J_\omega = \prod_{j\in\omega} F_j - \prod_{j\in\omega} z_j \quad \text{for } \omega = \{1,2\},\{1,3\},\{1,4\},\{2,3\},\{2,4\}, \text{ and } \{3,4\}. \qquad \text{(A3)}
$$

$$J_\omega = \prod_{j\in\omega} F_j + 2\prod_{j\in\omega} z_j - \sum_{j\in\omega} F_j \left(\prod_{\substack{k\in\omega \\ k\neq j}} z_k \right) \text{ for } \omega = \{1,2,3\}, \{1,2,4\}, \{1,3,4\}, \text{ and } \{2,3,4\}. \tag{A4}$$

and

$$\begin{aligned} J_\omega = {} & F_1F_2F_3F_4 - 3z_1z_2z_3z_4 + 2\left(F_1z_2z_3z_4 + F_2z_1z_3z_4 + F_3z_1z_2z_4 + F_4z_1z_2z_3\right) \\ & -\left(F_1F_2z_3z_4 + F_1F_3z_2z_4 + F_1F_4z_2z_3 + F_2F_3z_1z_4 + F_2F_4z_1z_3 + F_3F_4z_1z_2\right) \text{ for } \omega = \{1,2,3,4\} \end{aligned} \tag{A5}$$

where

$$z_j \equiv \frac{p_j}{y - \sum_{k=1}^{4} p_k x_k} = \frac{\partial \varepsilon_k}{\partial x_j} \ \forall\ k \neq j, \tag{A6}$$

$$F_j \equiv \frac{1}{x_j + \theta} + z_j = \frac{\partial \varepsilon_j}{\partial x_j} \ \forall\ j, \tag{A7}$$