SEE Wealth Distribution (Version 1.0.0)

Dr. Willy H. Gerber

Abstract: Model to estimate the wealth distribution in a society with the SEE model.

Boson Einstein Statistic

If I consider that the wellbeing is mostly wealth we will have a Bose Einstein distribution:

$$\overline{n_s} = \frac{\sum_{n_s} n_s \, e^{-\beta n_s \varepsilon_s + \alpha}}{\sum_{n_s} e^{-\beta n_s \varepsilon_s + \alpha}} = \frac{1}{e^{-\beta \varepsilon_s + \alpha} - 1} \qquad n_s = (0,1,2,3,4,\ldots)$$

α is in physics the "chemical potential" and has to be chosen to fulfill:

$$N = \sum_i n_i$$

Boson Einstein Statistic

If I assume that the wealth has a minimum ε_{min} of and a maximum of ε_{max} the probability to find a person having wealth between ε and $\varepsilon + d\varepsilon$ is:

$$\bar{n}(\varepsilon)\frac{d\varepsilon}{\varepsilon_{max}-\varepsilon_{min}} = \frac{1}{e^{-\beta\varepsilon+\alpha}-1}\frac{d\varepsilon}{\varepsilon_{max}-\varepsilon_{min}} \qquad \varepsilon_{min} \leq \varepsilon \leq \varepsilon_{max}$$

α is in physics the "chemical potential" and has to be chosen to fulfill:

$$\int_{\varepsilon_{min}}^{\varepsilon_{max}} \frac{1}{e^{-\beta\varepsilon+\alpha}-1}\frac{d\varepsilon}{\varepsilon_{max}-\varepsilon_{min}} = N$$

Boson Einstein Statistic

Integrating:

$$N = -1 - \frac{1}{\beta(\varepsilon_{max} - \varepsilon_{min})} \ln \frac{e^{-\beta\varepsilon_{max} + \alpha} - 1}{e^{-\beta\varepsilon_{min} + \alpha} - 1}$$

and

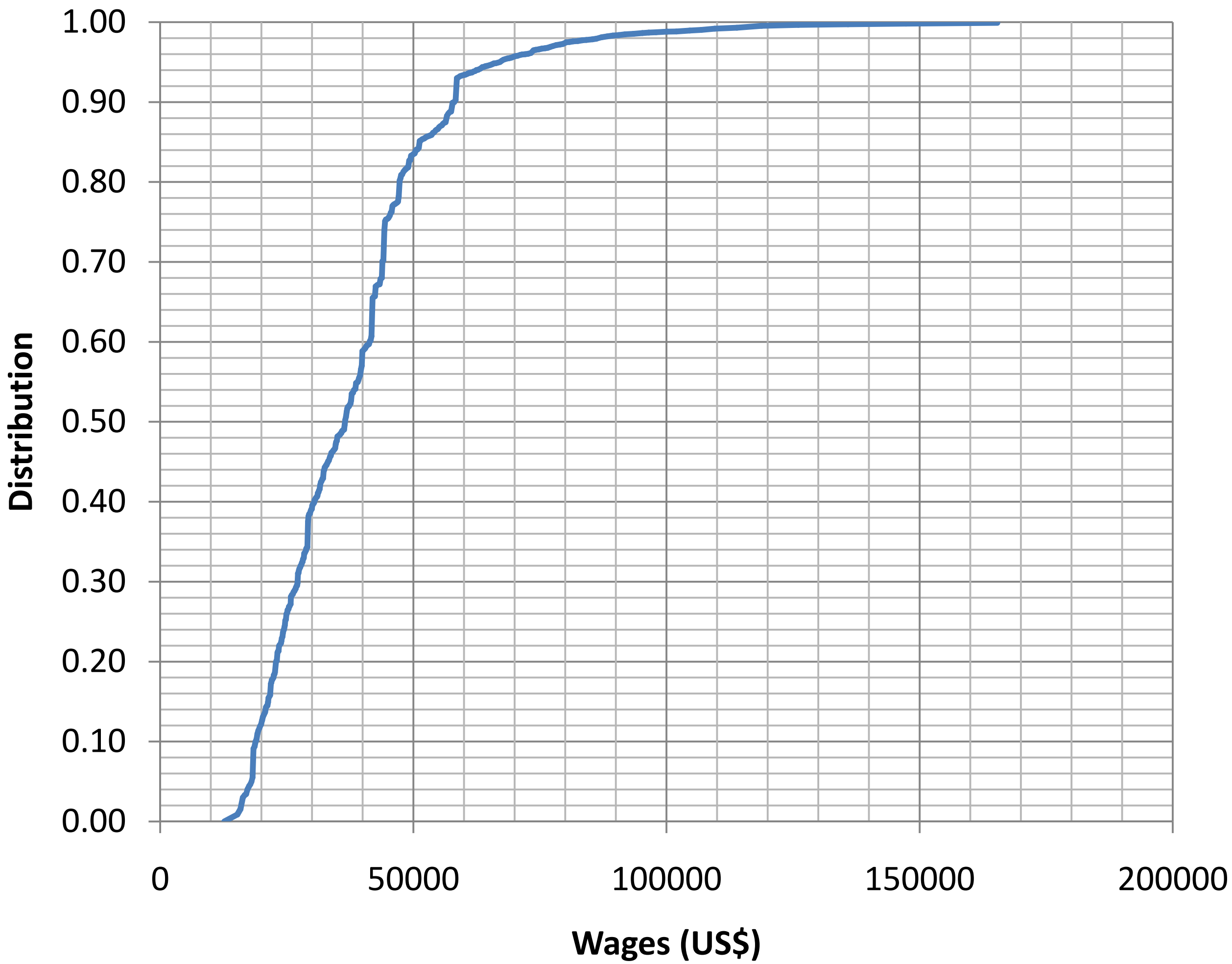
$$e^{+\alpha} = e^{\beta\varepsilon_{max}} \frac{1 - e^{-(N+1)\beta(\varepsilon_{max} - \varepsilon_{min})}}{1 - e^{-N\beta(\varepsilon_{max} - \varepsilon_{min})}} = \gamma\, e^{\beta\varepsilon_{max}}$$

with N >> 1

$$e^{+\alpha} \approx e^{\beta\varepsilon_{max}}$$ and $$\alpha \approx \beta\varepsilon_{max}$$

Boson Statistics

Wages distribution (US)



Data: OES statistics for the US market in 2005