which boils down to the problem of maximizing the per period surplus:

$$\begin{aligned} \Pi &= n^\alpha L - wL - rK \\ &= n^\alpha L - wL\left(1 + \tfrac{r(n+1)}{2}\right) \end{aligned} \tag{6}$$

The first-order condition for n gives

$$n = \left(\frac{2\alpha}{wr}\right)^{\frac{1}{1-\alpha}} \tag{7}$$

We assume that firms bid away their surplus by competing for workers, so that the wage rate is determined by the zero profit condition:

$$n^\alpha = w\left(1 + \tfrac{r(n+1)}{2}\right) \tag{8}$$

We can then solve the model in closed form. The wage w is

$$w = 2\left(\frac{\alpha}{r}\right)^\alpha \left(\frac{1-\alpha}{2+r}\right)^{1-\alpha} \tag{9}$$

Optimal chain length is

$$n = \frac{\alpha}{1-\alpha}\left(1 + \frac{2}{r}\right) \tag{10}$$

so that productivity per worker is

$$\left(\frac{\alpha}{1-\alpha}\right)^\alpha \left(1 + \frac{2}{r}\right)^\alpha \tag{11}$$

and total output Y is

$$Y = n^\alpha L = \left(\frac{\alpha}{1-\alpha}\right)^\alpha \left(1 + \frac{2}{r}\right)^\alpha L \tag{12}$$

Note that the wage, productivity and output are declining in the borrowing rate r, which incorporates the risk premium $r - \varepsilon$. The reason for the negative impact of the borrowing rate on real variables in spite of the absence of the