

5.2.1 Tradeable Permits

$$\max_{L,S,K} \quad f(L,S,K) - wL - pS - rK$$

$$f_L=w\qquad f_S=p\qquad f_K=r$$

$$T=\left.p(S-Q)\right|$$

$$S^*=S$$

$$\begin{aligned}f(L,S,K)&=f_LL+f_SS+f_KK\\wL+pS&=f(L,S,K)-f_KK\end{aligned}$$

$$Y \equiv wL + \textcolor{red}{(1-\alpha)Qp} + \textcolor{brown}{T} + r\bar{K}$$

$$\begin{aligned}Y &= wL \textcolor{brown}{+ (1-\alpha)Qp} \textcolor{blue}{+ p(S-Q)} \textcolor{red}{+ r\bar{K}} \\ Y &= wL \textcolor{brown}{+ Qp} \textcolor{blue}{- \alpha Qp} \textcolor{red}{+ pS} \textcolor{brown}{- Qp} \textcolor{red}{+ r\bar{K}} \\ Y &= f(L,S,K) \textcolor{brown}{- f_KK} \textcolor{blue}{- \alpha Qp} \textcolor{red}{+ r\bar{K}} \\ Y &= f(L,S,K) \textcolor{brown}{+ r(\bar{K}-K)} \textcolor{blue}{- \alpha Qf_S}\end{aligned}$$

$$\begin{aligned}\max_S \quad & U(Y,S^*) \\ \max_S \quad & U\left(f(L,S,K)+r(\bar{K}-K)\textcolor{blue}{- f_S\alpha Q},S^*\right)\end{aligned}$$

$$\begin{aligned}\frac{\partial U}{\partial S} &= U_Y\left(f_S\textcolor{blue}{- f_{SS}\alpha Q}\right) + U_S \stackrel{!}{=} 0 \\ f_S &= -\frac{U_S}{U_Y}\textcolor{blue}{+ f_{SS}\alpha Q}\end{aligned}$$