Imports, Pass-Through, and the Structure of Retail Markets

Horst Raff and Nicolas Schmitt

1 Comparative Statics for the Short Run

Totally differentiating

$$c_I = c_D + \frac{(w-t)}{2} - \frac{2\beta F_I}{L(w-t)}; \tag{1}$$

$$N = \frac{\beta(\alpha - w - c_D)}{\gamma(w + c_D - \overline{p})}; \tag{2}$$

$$\overline{p} = w + \frac{kc_D}{k+1} + \frac{c_D}{2(k+1)} - \frac{(w-t)}{2}\frac{c_I^k}{c_D^k}, \tag{3}$$

and using $N = N_E(c_D/c_M)^k$, we have

$$\begin{bmatrix} a_{11} & a_{12} & 0 \\ 0 & -1 & 1 \\ 1 & a_{32} & a_{33} \end{bmatrix} \begin{bmatrix} d\overline{p} \\ dc_D \\ dc_I \end{bmatrix} = \begin{bmatrix} 0 \\ b_2 \\ b_3 \end{bmatrix} dt \tag{4}$$

where

$$a_{11} = \frac{\beta(\alpha - w - c_D)}{\gamma(w + c_D - \overline{p})^2} > 0, \tag{5}$$

$$a_{12} = -\left(\frac{\beta(\alpha - \overline{p})}{\gamma(w + c_D - \overline{p})^2} + \frac{N_E k c_D^{k-1}}{c_M^k}\right) < 0, \tag{6}$$

$$a_{32} = -\left(\frac{1+2k}{2(1+k)} + \frac{k(w-t)c_I^k}{2c_D^{k+1}}\right) < 0, \tag{7}$$

$$a_{33} = \frac{k(w-t)c_I^{k-1}}{2c_D^k} > 0, \tag{8}$$

and

$$b_2 = -\left(\frac{1}{2} + \frac{2\beta F_I}{L(w-t)^2}\right) < 0, \tag{9}$$

$$b_3 = \frac{c_I^k}{2c_D^k} > 0. \tag{10}$$

The value of the determinant is given by $|D| = -a_{11}(a_{32} + a_{33}) + a_{12}$. After some algebraic manipulation we can show that

$$|D| = -\frac{\beta(\alpha - w - c_D)}{\gamma(w + c_D - \overline{p})^2}\left[\frac{1}{2(1+k)} + \frac{k(w-t)c_I^{k-1}(c_D - c_I)}{2c_D^{k+1}}\right] - \frac{\beta}{\gamma(w + c_D - \overline{p})} - \frac{N_E k c_D^{k-1}}{c_M^k} < 0.$$

Using Cramer's Rule, we have

$$\begin{aligned}\frac{d\overline{p}}{dt} &= \frac{1}{|D|}\begin{vmatrix} 0 & a_{12} & 0 \\ b_2 & -1 & 1 \\ b_3 & a_{32} & a_{33} \end{vmatrix} \\ &= \frac{a_{12}(b_3 - a_{33}b_2)}{|D|} > 0,\end{aligned}$$

since $|D| < 0$, $a_{12} < 0$ and $(b_3 - a_{33}b_2) > 0$;

$$\begin{aligned}\frac{dc_D}{dt} &= \frac{1}{|D|}\begin{vmatrix} a_{11} & 0 & 0 \\ 0 & b_2 & 1 \\ 1 & b_3 & a_{33} \end{vmatrix} \\ &= \frac{-a_{11}(b_3 - a_{33}b_2)}{|D|} > 0,\end{aligned}$$

since $|D| < 0$, $a_{11} > 0$ and $(b_3 - a_{33}b_2) > 0$;

$$\begin{aligned}\frac{dc_I}{dt} &= \frac{1}{|D|}\begin{vmatrix} a_{11} & a_{12} & 0 \\ 0 & -1 & b_2 \\ 1 & a_{32} & b_3 \end{vmatrix} \\ &= \frac{a_{12}b_2 - a_{11}b_3 - a_{11}a_{32}b_2}{|D|} < 0,\end{aligned}$$

since $|D| < 0$, and after some algebraic transformations

$$\begin{aligned}&a_{12}b_2 - a_{11}b_3 - a_{11}a_{32}b_2 \\ &\quad = \frac{\beta(\alpha - w - c_D)}{\gamma(w + c_D - \overline{p})^2}\frac{1}{2}\left(\frac{c_D - c_I}{(w-t)} + 1 - \frac{c_I^k}{c_D^k}\right) \\ &\qquad + \left(\frac{1}{2} + \frac{2\beta F_I}{L(w-t)^2}\right)\frac{\beta}{\gamma(w + c_D - \overline{p})} > 0.\end{aligned}$$

In the short run, the pass-through rate with respect to the average retail price is also given by

$$\frac{d\overline{p}}{dt} = \frac{1}{2}\frac{c_I^k}{c_D^k} + \frac{k}{k+1}\frac{dc_D}{dt} + \frac{1}{2(k+1)}\frac{dc_D}{dt} + \frac{(w-t)}{2}\frac{c_I^k}{c_D^k}\left(\frac{k}{c_D}\frac{dc_D}{dt} - \frac{k}{c_I}\frac{dc_I}{dt}\right). \tag{11}$$

It is also easy to find examples for which the short-term pass-through rate is greater than one.