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Comment on 'Corporate Risk Management for Multinational Corporations: Financial and Operational Hedging Policies'

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1. Summary and Critique

The paper by B. Chowdhry and J. Howe examines if production delocalization can play a useful role for corporate exchange rate risk management. Such "operational hedging" transfers the production costs into the foreign currency area and may thus reduce the operating exposure of a firm. The authors claim that operational hedging emerges only if a firm faces a combination of exchange rate and demand uncertainty. Exchange rate uncertainty alone cannot justify production delocalization because it can be hedged with foreign exchange instruments. Only the interaction of exchange rate risk with demand uncertainty can justify delocalization to the extend that market incompleteness prevents insurance of demand risk.

The authors derive their conclusions from *ad hoc* assumptions which lack proper microfoundations. They concede this flaw in a short note on page 4 without fixing it. Two assumptions are in contradiction to microeconomic principles: First, the authors assume that local prices of a multinational firm are fixed in advance and do not change for any given exchange rate change. Second, they assume that the quantity sold in each market and the exchange rate are independent variables. Both assumptions present a dubious starting point and need to be rectified.

The following section tries to clean up their model setting. Thereafter, I proceed to the central claim of the paper about the necessity of both demand and exchange rate uncertainty for delocalizations. It turns out this claim cannot be sustained if firm pricing behavior is properly modeled.

2. A Simple Model

The authors' modelling approach can be greatly improved by assuming a price elastic foreign demand function $X(p)$. For simplicity we can assume that this de-

mand functions is isoelastic. For for a local currency price p and a price elasticity $\epsilon > 1$, we have

$$X(p) = p^{-\epsilon}.$$

Furthermore, let c and c^* denote the home and foreign unit production cost. The profit optimization for a given nominal exchange rate s requires for home production

$$\prod(s, c) = \max_p [spX(p) - cX(p)]$$

and for foreign production

$$\prod(s, c^*) = \max_p [spX(p) - sc^*X(p)].$$

The first-order conditions imply for home and foreign production

$$p(s, c) = \frac{\epsilon c}{\epsilon - 1}\frac{1}{s}, \tag{2.1}$$

$$X(s, c) = \left(\frac{\epsilon c}{\epsilon - 1}\right)^{-\epsilon} s^{\epsilon}, \tag{2.2}$$

$$\prod(s, c) = \frac{1}{\epsilon}\left(\frac{\epsilon c}{\epsilon - 1}\right)^{1-\epsilon} s^{\epsilon}, \tag{2.3}$$

$$p(s, c^*) = \frac{\epsilon c^*}{\epsilon - 1}, \tag{2.4}$$

$$X(s, c^*) = \left(\frac{\epsilon c^*}{\epsilon - 1}\right)^{-\epsilon}, \tag{2.5}$$

$$\prod(s, c^*) = \frac{1}{\epsilon}\left(\frac{\epsilon c^*}{\epsilon - 1}\right)^{1-\epsilon} s, \tag{2.6}$$

respectively.

Equation (2.1) Shows that the foreign market price of an exporting firm is inversely related to the exchange rate. An exporting firm prices (under constant elasticity of demand) at a fixed mark-up over its domestic production costs c. Any exchange rate change is passed through to the foreign market price. This has two implications for the Chowdhry and Howe set-up: First, assuming that the local price $p(s, c)$ is constant violates the first-order condition of a price setting exporter. Second, sales volume $X(s, c)$ and the exchange rate s cannot be independent variables.

Instead both variables should have a near perfect correlation as shown by Equation (2.2).

3. Optimal Locational Choices

Let's follow the authors example and study the locational choice for the production facility. A benchmark case has zero set-up costs. The firm profits are given by the maximum of the two profit functions; that is

$$\prod^{\max}(s) = \max\left[\prod(s, c), \prod(s, c^*)\right].$$

Let for example $c = c^* = E(s) = 1$, then production is domestic if $s > 1$ and foreign if $s < 1$. A devaluation ($s > 1$) of the home currency favors domestic production.

The difference $\prod^{\max}(s) - \prod(s, c) \geq 0$ presents a (real) option premium for having production capacities in the foreign currency area. The firm establishes such production opportunities if their expected benefit exceed the set-up costs (assumed to be zero in our benchmark). The option is exercised in our example if $s > 1$.

This shows that "operational hedging" might simply be cashing in on real investment options. No demand uncertainty (shock to the demand function) is needed to motivate why multinationals maintain simultaneously production opportunities in more than one currency area. Interpreting foreign production facilities as real options has become an integral part of modern investment theory. A very fine treatment is found in Dixit and Pindyck (1994).

Reference

Dixit, A. and Pindyck, R. (1994) *Investment under Uncertainty*, Princeton University Press, Princeton.