Own and Cross Pass-Through in a Structural Framework

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Introduction

Pass-through reflects the degree to which marginal cost shocks are passed on to price and may be interpreted as a counterpart of elasticity in non-competitive environments. Nevertheless, while own and cross price elasticities have been widely exploited in market delineation, cross-pass-through that represents the price response to shifts in marginal costs of closely related products, has largely been ignored in the literature, especially in the retail level analysis (Besanko et al. 2005). These effects may be present if, for example, manufacturer wholesaler promotional actions on certain brands/products lead to a retailer altering prices for competing brand-products. The importance of modeling cross-pass-through cannot be underestimated provided that ignoring the potential cross effects biases the pass-through estimates.

A notable exception that addresses cross-pass-through effects is Besanko et al. (2005), which rely on a reduced form analysis exploiting rich data on the firm marginal cost. While this sheds light on firm performance and market structure across industries, few cost data are readily available to researchers, rendering this approach less practical.

Objective

The objective of this paper is to develop a structural framework for own and cross-pass-through that does not rely on the availability of wholesale prices. To do so, we extend Baggio and Pflicker (2003) approach to embrace multiple products, meanwhile allowing for potential cross effects between the products. We further employ a consumer demand model explicitly derived from the consumer theory to develop pass-through functional forms. This resolves the ambiguity resulting from the use of ad hoc demand specifications that underlie a large body of empirical studies. We illustrate the empirical value of our structural model in an application to retail pass-through for national and store brand yogurt in a Midwestern US city.

Data

Widely produce-level data on yogurt prices and unit values are provided by the Information Resources Incorporated. The study is conducted on a US Midwestern city given a high retail concentration in the period of 2001 to 2006. Analysis is carried out at the brand level provided that yogurt manufacturing in the US resembles an oligopoly.

Methodology

Marginal cost pricing is characteristic of perfectly competitive markets, therefore any disproportionate price response to a marginal cost shock is reflective of non-competitive behavior.

To derive price response in general terms, assume firm maximize profit:

$$\pi(w) = \max_{x} \left( \sum_{i=1}^{n} p_{i}(x_{i}) - c_{i}(x_{i}) \right)$$

Market equilibrium is characterized by firm optimality relations that enforce a range of competitive scenarios:

$$p_{f} = \left( \sum_{f=1}^{n} p_{f} x_{f} = w_{f}, \forall f \in 1, n \right)$$

Applying comparative statics to (7), we obtain a system of equations that can be used to compute pass-through estimates:

$$\frac{dp_{i}}{dw_{i}} = \frac{\partial p_{i}}{\partial x_{i}} \sum_{j=1}^{n} \frac{\partial x_{j}}{\partial w_{i}}, \forall i \in 1, n$$

Definition 1: Own pass-through.

$$\frac{dp_{i}}{dw_{i}} = \sum_{j=1}^{n} \frac{\partial p_{i}}{\partial x_{j}} \frac{\partial x_{j}}{\partial w_{i}}, \forall i \in 1, n$$

Definition 2: Cross pass-through.

$$\frac{dp_{i}}{dw_{i}} = \sum_{j=1}^{n} \frac{\partial p_{i}}{\partial x_{j}} \frac{\partial x_{j}}{\partial w_{i}}, \forall i \in 1, n$$

To obtain pass-through estimates in (4)(5), we solve (6) that represents (5) in matrix form with:

$$\begin{bmatrix}
\frac{\partial x_{1}}{\partial w_{1}} & \cdots & \frac{\partial x_{n}}{\partial w_{1}} \\
\vdots & \ddots & \vdots \\
\frac{\partial x_{1}}{\partial w_{n}} & \cdots & \frac{\partial x_{n}}{\partial w_{n}}
\end{bmatrix}
= \begin{bmatrix}
1 & 0 \\
0 & 1
\end{bmatrix}$$

where

$$A_{i,j} = \frac{\partial p_{i}}{\partial x_{j}}$$

Finally, to obtain $\frac{dp_{i}}{dw_{i}}, \forall i \in 1, n$, we specify a particular inverse demand model.

An Inverse Demand Function

We adopt a specification used by Baggio and Chavas (2009):

$$\rho(O,x_{i}) = \sum_{f=1}^{n} \alpha_{f} x_{f} - \beta(O) - \gamma(O) \sum_{f=1}^{n} \alpha_{f} x_{f}$$

where

$$\alpha_{f} = \exp(\sum_{i=1}^{n} \beta_{i})$$

$$\beta(O) = \exp(\sum_{i=1}^{n} \beta_{i})$$

$$\gamma(O) = \exp(\sum_{i=1}^{n} \beta_{i})$$

References

