



ECONOMICS COMMITTEE NEWSLETTER

Contents

<i>Welcome</i>	2
<i>Call for Articles</i>	2
<i>Pass-Through, Common Impact, and Structural Modeling in Indirect Purchaser Class Certification</i>	
By Michelle M. Burtis, Darwin V. Neher, Neill Norman, Marshall Yan	3
<i>Revenue Sharing Agreements: Do They Restrict Competition?</i>	
By Elizabeth Newlon, Kristin Terris, Thomas McCarthy	9
<i>Revenue Sharing Agreements: Do They Restrict Competition?</i>	
<i>Comment</i>	
By Stephen Stockum, John Gale, and Su Sun	14
<i>Resale Price Maintenance and the Rule of Reason</i>	
By Allison I. Holt and Laura A. Malowane	18
<i>Committee Leadership</i>	
<i>Contact Information</i>	23
<i>24</i>	

Pass-Through, Common Impact, and Structural Modeling in Indirect Purchaser Class Certification

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1. Introduction

In an antitrust case, when a proposed class of indirect purchasers claims injury due to alleged anticompetitive conduct on the part of defendants, the question of “pass-through” — whether and in what amount an anticompetitive overcharge is “passed through” from the defendants’ direct customers to the proposed class members — is often a key issue. In order to prove using common evidence that a class of indirect purchasers has been affected, plaintiffs must demonstrate that a common method exists to determine whether defendants’ direct customers passed through an overcharge to the indirect purchasers. That is, to establish “common impact,” or fact of injury, the proposed class members must set forth a model or methodology using common evidence to show that the prices they paid were affected by the alleged conduct, even though the defendants did not sell directly to the proposed class members, did not set the prices proposed class members paid, and may not have sold the same type of products proposed class members purchased.

There is considerable literature related to the modeling, and empirical measurement, of cost pass-through in industries and by firms.² A question that has arisen recently is whether a “structural” econometric model of pass-through can provide a common methodology that establishes the existence of pass-through to a proposed class of indirect purchasers.³ In this paper we argue that the use of structural modeling for this purpose must be met with considerable skepticism. Some structural models commonly used by economists rely on assumptions from which a positive pass-through rate follows as a mathematical necessity. An econometric analysis of pass-through that relies on such a model is plainly inappropriate, because the model assumes the conclusion it sets out to prove; regardless of actual pass-through decisions made by intermediary firms in the marketplace, the model inevitably finds a positive pass-through rate.

2. Structural Models and Assumed Pass-Through

A structural econometric model typically has multiple equations, each of which describes economic behavior or is an identity.⁴ For example, a supply equation, a demand equation and an identity that sets supply equal to demand together constitute a structural model. These equations are derived from economic theory. Statistical estimation of a structural model allows one to make inferences about the nature of the behavior of economic actors, such as the elasticity of demand of consumers or the elasticity of supply of producers.⁵

One recently proposed method for the analysis of cost pass-through in the context of establishing common impact in an indirect purchaser case relies on a common form of structural model, which includes a model of end-user product demand and certain simplifying assumptions about firms' costs and pricing behavior. In particular, the model assumes that marginal costs are constant and that observed prices are the result of simplified profit-maximizing conduct by competing firms. Prices therefore satisfy certain mathematical conditions that obtain when profit is maximized within the particular simplified specifications of demand, cost, and competition that the model adopts.

This form of structural model, and its variants, is part of a broader set of structural models that have served as the foundation for economic analysis of a wide range of questions, including, for example, the analysis of demand for and substitution between differentiated products, such as cars and breakfast cereal, the analysis of vertical contracts between manufacturers and retailers, the analysis of U.S. import quota policies, and merger simulation in antitrust analysis.⁶

However, the assumptions of the model described above have two important consequences that make it inappropriate for establishing common pass-through, or common impact in the context of indirect purchaser class certification. First, cost pass-through rates are inferred *without* using data on direct purchasers' actual input costs, including the allegedly collusive prices charged by upstream manufacturers.⁷ In a research context, this is a great convenience, as input cost data are typically scarce. However, the model's mathematical conditions that guarantee the existence of profit-maximizing prices also imply that pass-through rates are necessarily positive.⁸ The results from such a model can be interpreted only as a prediction about pass-through rates conditional on the underlying assumption in the model about price-setting conduct. That is, the model does not directly measure pass-through, nor does it test for the existence of pass-through. Moreover, the predicted pass-through rates are averages, as the model can only control for a limited set of demand characteristics. Thus, the model would not generally be capable of determining whether or not an individual indirect purchaser was impacted.

Because the underlying assumptions of the model constrain the result it produces, the use of this model in this class certification context is clearly inappropriate. Indirect purchaser plaintiffs must show that a method exists that can demonstrate whether or not an overcharge is passed through to all class members using evidence common to the proposed class. A structural model of the type we have described in which pass-through is positive by assumption, does not meet this burden; it simply *assumes* the conclusion that pass-through will occur.⁹

One particular example used to support the argument that pass-through can be determined by a common method is the structural model found in the 2008 analysis by Donghun Kim and Ronald Cotterill.¹⁰ Kim and Cotterill use a structural model to

estimate cost pass-through rates for various types of processed cheese. However, they do so *without using any cost data*, and thus, without directly analyzing how prices may change with cost changes. Kim and Cotterill first estimate a demand system for the various types of processed cheese. In their analysis, they consider two assumed competition scenarios: 1) the firms compete with one another by simultaneously choosing their respective prices to maximize their individual profits; and 2) the firms collude with one another to pick their prices to maximize their joint profits. Under each competition scenario, the authors assume that each firm would pick an optimal price that maximizes the firm's relevant profits (individual or joint) given the estimated demand system and their constant marginal cost. These behavioral assumptions, in the context of the structures they impose, imply a mathematical relationship between the firm's optimal, profit-maximizing price and its marginal cost. Marginal cost, however, is not observed; it is inferred based on the observed price, the assumption that marginal cost is constant, and the assumed pricing behavior of the firm.

The key assumption relied upon by Kim and Cotterill is that within their simplified setting, for each firm, there exists an optimal price (or prices) that maximize the firm's profits. In their model, a unique profit-maximizing price exists only if the demand function satisfies certain mathematical conditions. However, the very conditions that guarantee the existence of a profit-maximizing price also guarantee a positive pass-through rate; that is, the existence of a profit-maximizing price also guarantees that firms will increase price in response to an increase in marginal cost. Therefore, the approach in Kim and Cotterill cannot be used to determine whether there is cost pass-through on a class wide basis as the approach assumes a positive pass-through rate by design.¹¹

The link between a unique profit-maximizing price and a positive cost pass-through rate is mathematical. A profit-maximizing firm in Kim and Cotterill's setting is one that sets price so that marginal revenue (which is specified via Kim and Cotterill's assumed demand structure) is equal to marginal cost (assumed to be constant). At this price, the incremental revenue realized due to a one-unit output increase (or, equivalently, a price reduction that elicits a one-unit increase in demand) is equal to the incremental cost of an additional unit of output.

Two further mathematical conditions relied upon by Kim and Cotterill ensure that profits reach a maximum when marginal revenue and marginal cost are equal. At any price greater than the optimal price, the firm must be able to increase profits by cutting its price and increasing output; that is, marginal revenue must exceed marginal cost. At any price less than the optimal price, the firm must be able to increase profits by increasing its price; that is, marginal revenue must be less than marginal cost. Taken together, these conditions imply that marginal revenue must be an increasing function of price.

Now consider the impact of an increase in marginal cost. A profit-maximizing firm, in the setting specified by Kim and Cotterill, must choose a new price so that marginal revenue is once again equivalent to marginal cost. That is, because marginal cost has increased and the condition for profit-maximization is marginal cost equal to marginal revenue, marginal revenue must also increase. Because marginal revenue is an increasing function of price, it follows that a profit-maximizing firm will raise its price in response to an increase in marginal cost. The condition of profit-maximization (e.g. marginal revenue equals marginal cost) in this stylized setting therefore insures a positive pass-through rate.

3. Conclusion

Structural econometric models are useful analytical tools and can provide valuable insights. However, the use of a structural model requires a clear understanding of the economic assumptions that inform the model. It is critical that the model be constructed so that it is able to suitably address the economic question to which it is being applied. As we have discussed above, a structural model that assumes constant marginal costs and simplified profit-maximizing conduct on the part of individual firms may implicitly assume a positive pass-through of cost changes. Such a model is simply the wrong tool to investigate the existence of cost pass-through, because the model assumes an answer to the question it seeks to address.

Analyzing pass-through is important and necessary in determining whether a class of indirect purchasers was commonly impacted by an increase in price to direct purchasers. That is, pass-through of cost changes cannot simply be assumed. Economics recognizes that prices may be “rigid,” in certain circumstances, that is, not responsive to changes in economic variables, such as cost, and thus, indicating the absence of pass-through.¹² Various empirical studies have found that prices do not always respond to changes in supply and demand.¹³ The reasons that real-world pricing may not behave as the simple theoretical models predict include product heterogeneity, the costs associated with changing prices, the responsiveness of buyers to changing prices that may lead sellers to absorb cost increases, varying consumer preferences for product availability that may affect prices and price changes, the length of time buyers and sellers do business, demand variability, and industry concentration.¹⁴

Given that pass-through is an empirical issue, it is important to apply empirical tools that have the ability to answer the question of whether or not cost changes are passed through. Structural models designed for other purposes, like the Kim-Cotterill model described above, do not have this capacity, and thus are not useful in these circumstances.

¹ The authors are economists at Cornerstone Research. The views expressed in this article are those of the authors and do not necessarily represent the views of Cornerstone Research.

² For a recent theoretical contribution, see Glen E. Weyl & Michal Fabinger, *Pass-through as an Economic Tool* (Mimeo 2009). For empirical analyses, see Orley Ashenfelter, David Ashmore, Jonathan B. Baker & Signe-Mary McKernan, *Identifying the Firm-specific Cost Pass-Through Rate* (Fed. Trade Comm'n, Working Paper No. 217, 1998); David Besanko, David Dranove & Mark Shanley, *Exploiting a Cost Advantage and Coping with a Cost Disadvantage*, 47(2) MGMT. SCI. 221 (Feb. 2001); David Besanko, Jean-Pierre Dube & Sachin Gupta, *Own-Brand and Cross-Brand Retail Pass-Through*, 24(1) MARKETING SCI. 123 (Winter 2005); and Donghun Kim & Ronald W. Cotterill, *Cost Pass-Through in Differentiated Product Markets: The Case of U.S. Processed Cheese*, 56(1) J. OF INDUS. ECON. 32 (Mar. 2008). Each of these papers contains a further discussion of related literature.

³ See, e.g., Order Granting IP Plaintiffs' Motion For Class Certification And Denying Motions To Exclude Expert Opinions at 20, *In re Static Random Access Memory (SRAM) Antitrust Litigation*, No. C 07-01819 CW (N.D. Cal. Nov. 25, 2009) ("[Plaintiffs' expert] proposes two different types of regression models that will establish that the fact of injury can be shown on a class-wide basis using common proof: a reduced form model and a structural model.") See also Order Denying Class Certification at 62, *California v. Infineon Technologies AG*, No. C 06-4333 PJH (N.D. Cal. Sept. 5, 2008) ("[Plaintiffs' expert] continues ... For purposes of addressing this secondary, and critical, issues whether the direct purchasers "passed through" their overcharges to plaintiffs, there are three additional approaches that are set forth in published literature and which are capable of providing an empirical answer – the before and after method of analysis, which examines the effect of cost increases on producer prices; structural econometric models of supply and demand; and the reduced form econometric model of industry prices").

⁴ See Peter Reiss & Frank Wolak, *Structural Econometric Modeling: Rationales and Examples From Industrial Organization*, *i6A HANDBOOK OF ECONOMETRICS* 4217, 14 (Elsevier 2007).

⁵ Another type of model, a reduced form econometric model, considers economic and statistical relationships without necessarily explicitly imposing a formal theoretical structure at the level of the decisions of individual economic actors. See *id*. There are issues, not addressed here, with the application of reduced form models in the context of whether a class of indirect purchasers has been commonly impacted. For example, a reduced form model with coefficients assumed to be the same across a group of heterogeneous products or consumers provides only a measure of the average pass-through rate across that group. Such a reduced form model would not be capable of determining whether or not an individual indirect purchaser was impacted.

⁶ See Steven Berry, James Levinsohn & Ariel Pakes, *Automobile Prices in Market Equilibrium*, 63 ECONOMETRICA 841 (Jul. 1995); Steven Berry, James Levinsohn & Ariel Pakes, *Differentiated Products Demand Systems from a Combination of Micro and Macro Data: The New Car Market*, 112 THE J. OF POL. ECON. 68 (Feb. 2004); Aviv Nevo, *Measuring Market Power in the Ready-to-Eat Cereal Industry*, 69 ECONOMETRICA 307 (Mar. 2001); Aviv Nevo, *Mergers with Differentiated Products: The Case of the Ready-to-Eat Cereal Industry*, 31(3) RAND J. OF ECON. 395 (2000); Sofia Berto Villas-Boas, *Vertical Relationships Between Manufacturers and Retailers: Inference With Limited Data*, 74 REV. OF ECON. STUD. 625 (2007); and Pinelopi Koujianou Goldberg, *Product Differentiation and Oligopoly in International Markets: The Case of the U.S. Automobile Industry*, 63 ECONOMETRICA 891 (July 1995).

⁷ This type of structural modeling was relied upon in establishing injury in fact in the SRAM indirect purchaser case. See Order, *In re Static Random Access Memory*, at 21 ("The structural model can be used regardless of whether component cost information is available. This model uses end-use purchase price information and analyzes market supply and demand to determine the presence of pass-through.")

⁸ Note that the precise functional form used to estimate demand further restricts the range of pass-through values that can be derived from a structural model of demand. This fact has long been recognized. See T. Bresnahan & P. Reiss, *Dealer and Manufacturer Margins*, 16(2) THE RAND J. OF

ECON. 253 (Summer 1985); and G. Kosicki & M. Cahill, *Economics of Cost Pass-Through and Damages in Indirect Purchaser Antitrust Cases*, 51(3) THE ANTITRUST BULL. 599 (Fall 2006). See also *infra* note 9.

⁹ The limitations of particular structural frameworks as bases for measuring pass-through are well understood. For example, Weyl and Fabinger conclude that certain constraints in a structural model “drive the analysis of an ‘empirically estimated’ model, or the analytical conclusion of a theoretical analysis, entirely independently of the data or the intuitive economic environment.” Weyl & Fabinger, *supra* note 2, at 39. Besanko et. al. (2005) reject a structural approach to measuring pass-through because their chosen approach “permits us to estimate pass-through without constraints on the range of pass-through that are implicit in a structural model.” Besanko, Dube & Gupta, *supra* note 2, at 124. See also Besanko, Dranove & Shanley, *supra* note 2.

¹⁰ Kim & Cotterill, *supra* note 2, at 32.

¹¹ Determining whether pass-through is positive is not the research goal of Kim and Cotterill’s paper. Their focus is on the effect on pass-through of their different assumptions about competition. With the price-marginal cost relationship they estimate, they simulate how price may change in response to a marginal cost change and calculate the corresponding cost pass-through rates.

¹² See, e.g., Dennis W. Carlton, *The Theory and the Facts of How Markets Clear: Is Industrial Organization Valuable for Understanding Macroeconomics?*, in R. SCHMALENSEE AND R. D. WILLIG: HANDBOOK OF INDUSTRIAL ORGANIZATION (North-Holland, 2nd edition, 1990).

¹³ In one study, an analysis of transaction price data showed “significant” price rigidity, low correlation of prices across buyers, even for what appeared to be homogenous products, and differences in the costs of changing prices across buyers for the same product. Dennis Carlton, *The Rigidity of Prices*, 76 AMER. ECON. REV. 637 (Sept. 1986). This paper also summarized earlier empirical work that found prices that failed to respond to supply and demand.

¹⁴ There are many papers and textbooks devoted to the varied pricing strategies firms may adopt, which include strategies in which prices vary across customers for the same product at the same time, and in which prices may not change as a result of cost changes. An “everyday-low-price strategy” is one in which “low” prices are maintained for an extended period of time. A “high-low-price strategy” is one in which “higher” prices are offered on a day to day basis but discounts are offered at various times. These pricing strategies are discussed in Daniel Levy, et. al., *The Magnitude of Menu Costs: Direct Evidence from Large U.S. Supermarket Chains*, 112 Q. J. OF ECON. 791 (1997). According to a “loss leader pricing strategy” a certain product (such as a highly advertised brand) is marked down to build traffic and generate sales for other products in the store. The loss leader pricing strategy is discussed in, for example, Hess D. James & Eitan Gerstner, *Loss Leader Pricing and Rain Check Policy*, 6 MARKETING SCI. 358 (1987). Focal pricing is setting prices based on a certain convention, for example prices ending with a “9” to give a more favorable price perception to customers. Focal pricing strategies are discussed in, for example, Eric Anderson, *The Role of Price Endings: Why Stores May Sell More at \$49 than \$44* (May 2000), available at SSRN: <http://ssrn.com/abstract=232542>. There is also a broad literature in the area of marketing, that studies and analyzes the way firms set prices and the strategies associated with pricing. See, e.g., THOMAS T. NAGLE & JOHN E. HOGAN, THE STRATEGY AND TACTICS OF PRICING, A GUIDE TO GROWING MORE PROFITABLY 1-13, 149-174 (Pearson Prentice Hall, 4th edition 2006).