

**Empirical Models of Manufacturer-Retailer Interaction:
A Review and Agenda for Future Research**

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Introduction

The nature of the interaction between manufacturers and retailers has received a great deal of attention in the last fifteen years. One major line of empirical research focuses on the balance of power between them. Research in this area ranges from reduced form models quantifying aggregate profit and other related trends for manufacturers and retailers to structural models that test alternative forms of manufacturer-retailer pricing interaction or determine how total channel profit is split between the two parties. Another major line of research addresses the sources of leverage for each party, e.g., trade promotions and their pass-through, customer information from loyalty programs, manufacturer advertising, product assortment in general, and private label assortment in particular. The purpose of this article is to (a) synthesize what has been learnt about the nature of the interaction between manufacturers and retailers and the effectiveness of each party's sources of leverage, and (b) highlight gaps in our knowledge that future research should attempt to fill.

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The framework that guides our discussion is provided in Figure 1. The three concentric ovals in the figure represent three levels of knowledge we have accumulated about manufacturer-retailer interactions. The inner-most oval represents what we know most about – the nature of pricing interaction, the leverage of private labels, and trade promotions by manufacturers and their pass-through by wholesalers and retailers. The middle oval represents areas where empirical insights are still limited and where more needs to be done – the role of advertising in the interaction between manufacturers and retailers, how the nature of the interaction influences the retailer's product assortment decisions, and how the customer data that are increasingly captured through retailers' loyalty programs are being used to shift the power balance and/or

create win-win opportunities for manufacturers and retailers. The outermost oval represents areas in which most of the work is theoretical and where much more empirical work is needed. The arrows emanating from the center of the figure represent changes in the environment and new opportunities for research that we believe will be instrumental in improving our understanding of the issues in the outer ovals. In the remainder of this article, we synthesize what we have learned in each area and conclude with an agenda for future research guided by the changes and opportunities noted in the Figure.

The Pricing Interaction Between Manufacturers and Retailers

In recent years, researchers have begun to explicitly capture the vertical strategic interaction between manufacturers and retailers using structural econometric models. Some researchers focus on inferring the nature of the manufacturer-retailer interaction, while others assume the nature of the interaction and use the estimated model to perform policy analyses.

Sudhir (2001) and Che, Sudhir, and Seetharaman (2007) use non-nested model tests to select whether Manufacturer-Stackelberg (MS) or Vertical Nash relationships (VN) better describe the manufacturer-retailer relationship. They find support for the MS relationship and also find that retailers maximize category profits not just brand profits. Kadiyali, Vilcassim, and Chintagunta (2000) analyze price interactions using a conjectural variations (CV) approach, whereby a structure is not imposed on the reaction function between manufacturers and retailers, but inferred from the estimated CV parameter. They find that their CV model fits better than either VN or MS. Using a similar approach, Villas-Boas and Zhao (2005) find small but statistically significant deviations from the MS model. An alternative approach to flexibly determine the nature of vertical interaction has been proposed by Draganska, Klapper, and Villas-Boas (2009). These authors develop and estimate a Nash bargaining model of

manufacturer-retailer interactions, which allows for a behavioral interpretation of the deviations from MS or VN by relating these deviations to bargaining power.

How does the manufacturer-retailer interaction affect retail and wholesale prices? What fraction of the overall channel margins go to the manufacturer versus the retailer? How is this affected by their relative bargaining power? Kadiyali et al. (2000) find that retailers' share of channel profits are greater than those of manufacturers, varying from a low of 57% to a high of 72% for the categories they study. In contrast, Villas-Boas and Zhao (2005) report retail margin shares of 50% for the smaller brands and 40% for the dominant brand, suggesting evidence of manufacturer power.

Draganska et al.'s (2009) Nash bargaining model distinguishes between bargaining power and bargaining position -- the net gain in profit relative to profit when bargaining fails. For single product markets, bargaining power of an agent is shown to be the fraction of the channel profits that accrues to the agent - thus giving a structural interpretation to the channel profits share measure used in earlier research. Draganska et al. find that bargaining power largely favors manufacturers but depends on the negotiation partner. The power split in the channel also varies by the size of the firms, the store brand share and positioning and the assortment carried by the retailers.

More research is needed to reconcile these divergent findings. Villas-Boas and Zhao (2005) and Draganska et al. (2008) find evidence of manufacturer power in a setting where wholesale price is unobserved and in Draganska et al. (2009) retailers are allowed to compete with each other while Kadiyali et al. (2000) find evidence of retailer power in a setting where wholesale price is observed and retailers are assumed to be local monopolists. The former is in line with Farris and Ailawadi (1992) and Ailawadi, Borin, and Farris (1995), who do not find

support for increasing retailer profitability in aggregate industry trends. Future research needs to empirically investigate bargaining power in a setting where wholesale price is observed across multiple retailers in different categories to resolve this. Natural or field experiments could be used to calibrate model assumptions, as counterfactual bargaining outcomes are seldom observed.

Overall, even though there are some departures from the MS model, it is the workhorse for modeling manufacturer-retailer interactions. Many papers involving manufacturer-retailer interactions now *assume* MS to address issues of optimal targeting (Besanko, Dubé, and Gupta 2003; Pancras and Sudhir 2007); slotting allowances (Israelevich 2004); value of distribution channel (Chu, Chintagunta, and Vilcassim 2007); channel mergers (Villas-Boas 2007); brand equity measurement (Goldfarb, Lu, and Moorthy 2007); and dynamic demand for durable tied goods like razors and razor blades (Hartmann and Nair 2008).

The Leverage of Private Label

In recent years, empirical researchers have presented convincing evidence about the role that private labels play in the interaction between manufacturers and retailers and the leverage they provide to the latter. One area of enquiry relates to retail margins on private labels versus national brands. That retail percentage margins are higher on private label than on national brands can be stated as an empirical generalization (Hoch and Banerji 1993; Ailawadi and Harlam 2004; Pauwels and Srinivasan 2004). However, private labels are sold at retail prices that are 20-30% lower than national brands, so private labels do not always provide a dollar margin advantage to retailers (Ailawadi and Harlam 2004).

Another area relates to whether private label is an effective bargaining tool for retailers. Ailawadi and Harlam (2004) show, in a cross-category analysis, that a retailer's national brand margin increases with its private label share in a category, after controlling for the fact that

retailers may push private label more in profitable categories. Pauwels and Srinivasan (2004) find that when a retailer introduces a private label, its unit margin on national brands increases. They also find that the entry hurts the performance of second tier national brands but may be beneficial for premium priced national brands. Meza and Sudhir (2008) confirm that increased competition from a private label lowers national brand wholesale prices. They also find that national brands that are imitated by a private label, and thus face more intense competition, have prices lower than predicted by the MS model, while the wholesale prices of non-imitated national brand prices are consistent with the MS model, suggesting that the retailer gains bargaining power from the introduction of private labels.

A third area relates to whether private labels engender store loyalty among consumers. On one hand, correlational and survey based studies suggest a positive association between private label use and consumer loyalty to the retailer (Ailawadi, Gedenk, and Neslin 2001; Corstjens and Lal 2000). Sudhir and Talukdar (2004) provide further, albeit indirect, support for this association. On the other hand, Singh and Hansen (2008) find that heavy store brand users are most likely to defect when a low price retailer like Wal-Mart enters the market. Ailawadi, Pauwels, and Steenkamp (2008) reconcile these findings, showing that, after controlling for endogeneity, there is an inverted-U effect of private label share on share of wallet. Share of wallet initially increases with their private label purchases from a given retailer, but, the effect turns negative for very high private label share.

This work implies that private label is a strong weapon in a retailer's arsenal when it comes to negotiating with manufacturers. But, the margin advantage of private label is not a given. Retailers must keep their private label costs low but they must also improve quality and differentiate their offerings if they want to reduce the retail price gap with national brands. This

balancing act between cost containment and quality improvement is even more important now as many retailers try to develop a multi-tier private label strategy with value and premium private label products (Geyskens, Gielens, and Gijsbrechts 2008). They have a similar tight rope to walk when it comes to consumer loyalty -- it is important to get consumers to buy some private label products, but, pushing private label too far may hurt consumer loyalty. It is in manufacturers' interest to understand the benefits and limitations of private label so that they can negotiate effectively with retailers and develop win-win strategies for co-existing with private labels.

Pass-Through of Manufacturer Trade Promotions

In the U.S. consumer packaged goods (CPG) industry alone companies spend more than \$75 billion on trade promotions annually (Dreze and Bell 2003), approximately 60% of their total marketing budget (Trade Promotion Report 2005). Pass-through is a key measure of trade spending effectiveness. The American Marketing Association defines pass-through as "The number or percentage of sales promotion incentives offered to wholesalers or retailers by manufacturers that are extended to consumers by those channel members." The last five years have seen substantial empirical research on the magnitude and drivers of pass-through. Besanko, Dube, and Gupta (2005, hereafter BDG) investigate own and cross-brand pass-through while Pauwels (2007, hereafter KP) investigates the dynamics of these phenomena; Meza and Sudhir (2006) focus on pass-through timing; Ailawadi and Harlam (2008, hereafter AH) and Nijs et al. (2009, hereafter NM) quantify the magnitude of pass-through and explain variations across manufacturers and retailers respectively.

Pass-through is often measured as the ratio of a change in retail price to a change in the cost of goods, i.e. dp/dc (Tyagi 1999). This measure works well for off-invoice or scan/bill-back discounts that apply to specific items in specific weeks. AH measure pass-through as the ratio of total retail promotion spending to total trade promotion funding provided by the manufacturer.

This measure separates regular from promotional price changes and accounts not just for off-invoice and scan/bill-back discounts but also for lump-sum payments and other forms of trade promotion funds that are not tied to individual items and/or weeks (McAlister 2007).

Estimates of mean retailer pass-through rates using times-series data vary between .69 (NM) and .83 (BDG). Median calculated pass-through is .75 (AH) for manufacturers providing at least some trade funding. Thus, across a variety of data sources and measures, the empirical generalization that average retailer pass-through is less than 100% holds. Wholesaler pass-through rates to retailers average 1.06, suggesting wholesalers require a demand increase to break-even on trade-deals offered by manufacturers (NM).

However, average pass-through estimates are of limited value for manufacturers evaluating their trade-promotion programs because of the high variation around the average. NM report a standard deviation of .40 and AH report even greater variation across manufacturers, with 0 pass-through in 34% of the cases and pass-through greater than 250% in approximately 14% of the cases. Channel power can partially explain these variations: (1) Large manufacturers get more pass-through from retailers (AH); (2) Large retailers get more pass-through from wholesalers (NM); and (3) High market share products get more retailer pass-through (BDG, KP, AH, NM). Further, contrary to conventional wisdom, AH report that retailers promote as many as 15% of manufacturers' products without any direct manufacturer funding. They find that this is more likely for large share manufacturers in profitable and promotion sensitive categories but more research is needed to understand other retailer motivations to promote products.

NM show that manufacturers and wholesalers can avoid offering unprofitable trade-deals by utilizing estimates of pass-through, price elasticity, and margins. Relative to a scenario where each retailer receives the same 10% off-invoice cost cut, selective use of trade promotions could

lead to a 56% reduction in the number of deals, an 86% improvement in deal profitability, and a 40% reduction in promotional costs. Future work should focus on establishing normative guidelines for trade spending and pass-through by both wholesalers and retailers. Also, empirical work has focused on pass-through in the form of price promotions but non price support in the form of displays, preferential shelf space, and other in-store merchandising is also important to manufacturers. More work is needed to uncover how retailers make these decisions and what role, if any, their trade promotion funds play in achieving non price support.

Meza and Sudhir (2006) document differences in pass-through across time for seasonal products whose demand elasticities differ across high and low demand periods, hence dp/dc may reflect not only pass-through but also variation in demand elasticities. Using a structural approach, they control for demand elasticities across different periods. In two categories (tuna and beer), they find high-share items that are used as loss-leaders get very high pass-through, but the rest get virtually no pass-through during regular periods. In contrast, all items in the category get roughly equal but smaller pass-through in high demand periods. In essence, pass-through is deep but narrow in regular periods and broad but shallow in high demand periods. More research is warranted on the timing and depth versus frequency of promotion pass-through.

Finally, the notion of cross-brand pass-through has generated some controversy in the literature. BDG report cases of both positive and negative cross-brand pass-through. McAlister (2007) refutes the existence of these effects and shows that their statistical significance in BDG's analysis is at least partly due to inadvertent overstatement of sample size. In a rejoinder, Dube and Gupta (2008) recognize that the number of cases of significant cross-brand pass-through is substantially lower than in BDG but show that overall model fit is improved when they allow for cross-brand pass-through effects and by using Bayesian methods that have increased power to

model individual-level brand effects. In a related but aggregate analysis, AH find evidence of substantial subsidization of promotions across categories and even departments and from national brands to private label. They do not, however, find evidence of cross-brand pass-through across manufacturers within a category. Future research should consider in what forms, if at all, cross pass-through occurs? What are its drivers? How do the use of allocation rules for trade funds and accounting metrics influence the strength of these effects (McAlister 2007)?

The Understudied Leverage of Advertising, Assortment, and Loyalty Programs

Advertising

The literature on manufacturer/retailer interactions reviewed earlier studies how manufacturers and retailers *split* the pie, but says little about how each side invests in *growing* the pie. Multi-stage games with multiple strategic interactions (e.g., wholesale price and advertising) are difficult relative to simpler games (e.g., wholesale price alone). A more holistic picture of channel interactions would likely include the effects and determinants of advertising, product quality, and retail distribution. Of these factors, advertising is a natural choice to study first. Firms can adjust their advertising expenditures relatively easily, advertising varies substantially over time and space, and data on advertising expenditures are readily available.

The literature generally finds that advertising is relatively ineffective and often unprofitable. Assmus, Farley and Lehmann's (1984) meta-analysis reports an average advertising elasticity of 0.15. Lodish et al. (1995) summarize a large number of field experiments across product categories, finding that the advertising elasticity is about 0.26 for new brands, and 0.05 for established brands. Sethuraman and Tellis' (1989) meta-analysis finds that price elasticity is about 20 times larger than advertising elasticity.

The question arises, if advertising is so unprofitable, why do firms do so much of it? Several potential explanations exist, but prominent among them is the potential effect of advertising on retailers. If advertising affects consumer demand, and retailers respond to changes in consumer demand, then advertising must affect retailers' actions. We all "know" the fundamental idea that advertising pull increases channel push proposed by Farris and Reibstein (1984) and Olver and Farris (1989). There is also some work on the effect of advertising on manufacturer versus retailer prices and margins (e.g., Steiner 1973; Kaul and Wittink 1995). Yet very few papers on advertising effectiveness or channel interaction allow for or estimate such strategic interactions. Measuring the effect of advertising on sales without modeling the dependence of price and retail distribution on advertising, potentially under-estimates the full impact of advertising. Future research should develop a more holistic modeling framework that includes these intermediate effects of advertising on channel decisions.

Loyalty Programs

Information gathered through loyalty programs (LPs) is playing an increasingly important role in retailers' decisions. The LP infrastructure not only provides detailed consumer insights, but also allows retailers to deliver a variety of targeted marketing activities to selected households via customized direct mail/E-mail, check-out coupons, or customized communications on the web (Zhang and Wedel 2009). These programs are reshaping the way manufacturers and retailers interact with each other. For example, the leading online grocer Peapod Inc. offered special promotion services to consumer product manufacturers through its Peapod Interactive division which implemented and monitored various customized promotions for each manufacturer sponsor (Holleran 1997). Drug store chain CVS partners with manufacturers to deliver targeted promotions through its LP. The manufacturers pay a

membership fee and provide monetary support for those promotions. In exchange, they receive detailed reports about the performance of their products with different segments of CVS customers, and can target selected households and take advantage of cross-selling opportunities.

There has been extensive research on the effect (or lack thereof) of LPs on consumer purchase behavior, customer retention, customer life time values, and the firm's sales/financial outcomes (e.g. Bolton, Kannan, and Bramlett 2000; Lal and Bell 2003; Leenheer et al. 2007; Lewis 2004; Sharp and Sharp 1997; Taylor and Neslin 2005), but little is known about how LPs are changing the power balance between manufacturers and retailers. Collaboration through LPs can provide benefits for both parties (e.g., Pancras and Sudhir 2007). Manufacturers can achieve higher return on their trade promotion spending due to the enhanced targeting capability; and be shielded from competitive reactions because customized promotions through LPs are not easily observed by competitors (Zhang and Wedel 2009). Retailers can piggy-back on manufacturers' financial support to increase their store loyalty, shopping basket size, and customer retention.

While collaboration through LP is likely to increase the size of the pie, it is less certain how the division of the pie may be changed. Which party will gain power -- retailers who own information or manufacturers who have financial resources? Many other important questions also remain. For example, what is the net gain for the retailer vs. manufacturer to collaborate in an LP? How does it change a retailer's bargaining power for other products not covered by the LP? How does it affect a retailer's private label performance? What types of LP designs are more conducive to creating win-win opportunities? With the increasing prevalence of retail loyalty programs, academic research needs to catch up in answering these pressing questions.

Product Assortment

In contrast with the vast amount of research on consumer response to product assortment (for an excellent overview see Broniarczyk 2008), there is scant research on how manufacturers

and retailers interact to determine the composition of the assortment. With the proliferation of SKUs and product categories, retailers have found it difficult to directly manage every category and often outsource category management to a leading manufacturer, referred to as the category captain (Kurtuluş and Toktay 2004). The retailer shares information on sales, pricing, shelf space data etc. with the captain. The captain designs a strategic plan for the category, encompassing recommendations on which products to include and how to allocate space among them. In this set-up, the retailer benefits from the knowledge and resources available to the category captain.

However, the objectives of both parties are not perfectly aligned. The captain may gain substantial power if its recommendations (1) increase the captain's presence on the shelf and (2) soften competition from rival manufacturers and the retailer's private label. Hence, blind trust could hurt the retailer's private label development, profit margins, and long-term profitability. To contain these potential adverse effects, retailers critically study the category plans provided by the captain and/or ask a rival manufacturer to draw up an alternative plan. Therefore, manufacturers walk a fine line between fulfilling their own objectives and those of the retailer.

With the recent advent of commercial software solutions for assortment planning, retailers are taking back control over the management of product categories (Mantrala et al., 2008). Consequently, retailers increasingly demand new products to add value over and above the existing assortment. In addition, they ask for consumer-driven innovations that provide value at the store-level. New products cannot be expected to do well in every store region. Their success will depend on store characteristics, socio-demographics of the store region, and the nature of local competition within the category. As a result, leading manufacturers such as Unilever and P&G invest heavily in marketing intelligence to assist retailers with knowledge of their consumers and product categories.

Category captainship in assortment decisions raises a lot of interesting questions. First, what criteria do the captain and retailer use when assessing the attractiveness of a specific category configuration? Potential objectives include (growth of) profitability, sales, and market share. The answer will likely depend on the role of the category (Dhar, Hoch, and Kumar 2001). Second, how do captains balance their own and the retailer's objectives? In their study on assortment optimization in a grocery retail setting, Rooderkerk, van Heerde, and Bijmolt (2008) assume a weighted objective function which balances the expected category profit of the retailer and the captain. The weight parameter is interpreted as an indicator of the relative power of the captain compared to the retailer. Third, to what extent are retailer and captain able to create win-win situations with product assortments? In new product categories this may be possible by growing the total pie. In mature categories, the only possible way may be at the expense of other manufacturers. However, win-win situations in the short run could increase the dependence of the retailer on the category captain in the long run. Fourth, how does the retailer's desire to grow private label come into play? The retailer may wish to balance the category profit in the short run and the growth of the private label in the long run (Meza and Sudhir 2008). Fifth, what are the consequences for the consumer? Would a powerful category captain soften competition leading to reduced variety and higher prices? Finally, in response to the current trend of retailers taking back control over their assortment, future research could focus on what additional data manufacturers should gather to improve the quality of joint decision making. Consequently, an interesting challenge will be to determine how these different data sources can be combined to increase profitability of all channel partners.

Future Research Directions

Figure 1 highlighted some major trends in the retail environment that can fill some of the

research gaps we have identified so far but also open up a new realm of possibilities for capturing and using information. First, technological advances that allow us to capture rich customer level transaction data, change an in-store environment at very short notice and monitor its impact, and capture detailed in-store browsing and purchase behavior through RFIDs, will allow both manufacturers and retailers to better understand consumer response to their respective efforts and therefore influence their interactions. Second, much of the work we summarize in this article has been done on a small number of grocery and general household product categories in the U.S. (and in some cases West European) grocery format. Many environmental trends are changing: retail formats have proliferated, consumer purchases can be tracked across stores and store formats, data have become available in new categories, new markets, and new formats. We will be better able to test our current findings and learn more about how manufacturers and retailers interact to determine format choice, prices, and contracts. As an example, more comprehensive customer purchase data will help us understand whether manufacturer trade-dollars assigned to one channel may be “taken away” or “given to” another channel.

Third, changes in the legal system have occurred that directly influence manufacturer-retailer interaction but have gone relatively unnoticed by academic researchers. Until 1997, resale price maintenance was *per se* illegal in the U.S. However, in 1997, the U.S. Supreme Court ruled that maximum resale price maintenance was no longer *per se* illegal, and in 2007, it ruled that minimum resale price maintenance was no longer *per se* illegal. This has important ramifications for how manufacturers set and influence retail prices, and the effect on the general level of pricing and retailer service across different industries, retail formats, and brands.

By definition of the word “interaction” in the title of this paper, the relationship between manufacturer and retailer will depend upon the information flow, information asymmetry, and

information “signaling” between them. It is clear that the advent of new channels (e.g. DTC selling for manufacturers) and new data collection mechanisms for retailers and manufacturers alike (e.g. RFID technology, Larson et. al 2005, Hui et al. 2008a and 2008b), have the potential to change the power structure in the channel. A classic framework of marketing is that retailers play the role of intermediary and part of that role is the information flow or “touch points” with the consumer; but, what if the manufacturer “doesn’t need the retailer as much for this?” We believe that information technology has the potential to influence many of the empirical results described in this paper. As examples:

[1] Will retailer pass-through be as obscure to the manufacturer or will this become readily transparent? If yes, will this change the amount of pass-through? Will it allow retailers to do cross-brand pass-through if the manufacturer can “see it”? Will it change the timing of pass through such that money “in the door” has to go more quickly “out the door”? Our belief is that this is the kind of data that will become available and hence an event study that extends the work of Ailawadi and Harlam (2009) and Nijs et al. (2009) to have a time-varying aspect to it will become feasible.

[2] In the work of Draganska et al (2009), one of the aspects studied is the understanding of power in the channel via a Nash bargaining game embedded within a structural choice framework. How much does bargaining power change over time? Will we finally be able to answer the question of “Are retailers becoming more powerful over time?” Longer time series of data sets and ones that are measured more accurately will allow for this analysis.

[3] Customer loyalty programs are a significant part of many retailers’ strategy today. As described in Breugelmans and Zhang (2009), manufacturers and retailers can strengthen collaboration through innovative loyalty program designs. New questions arise as technology

improves: What role will manufacturers and retailers play in each other's loyalty programs? Will retailers be able to understand the impact of loyalty in one channel (say offline) on loyalty on an on-line channel? Will improved measurement of loyalty and its transparency lead to greater interaction between manufacturers and retailers? How should loyalty programs be designed so that loyalty is a shared goal and not one that each party is fighting to achieve? Large scale customer relationship programs (e.g. HomeMadeSimple.com by Procter &Gamble) that provide data on tens of millions of customers to CPG manufacturers may also alter the relative push-pull power structure between manufacturers and competing retailers.

[4] It is hard to argue that private labels would not gain greater strength as a result of improved information. Private labels' effectiveness would certainly increase through improved targeting and this might create interesting incentives for manufacturers to extract greater profits in product categories where they have greatest power. That is, the manufacturer may extract where he/she can, and realize the battle is difficult and becoming more so in other categories.

Regardless of the direct impact that technology has on the manufacturer-retailer interaction, what will certainly improve for researchers going forward is the availability of individual-level data. This panel data structure will be key to bring in phenomenon such as variety seeking and subsequent assortment optimization (e.g. Rooderkerk et al. 2008), state dependence (e.g. Erdem and Keane 1996; Che et al. 2007), and forward-looking behavior (e.g. Narayanan and Manchanda 2008) into models of manufacturer-retailer interactions. With these established phenomena in place, this can only help researchers isolate that part of the manufacturer-retailer interaction that is truly attributable to each of them.

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FIGURE 1: GUIDING FRAMEWORK

