Disclosure in the Presence of Dual Distribution Channels

Anil Arya

Ohio State University

Brian Mittendorf

Ohio State University

Disclosure in the Presence of Dual Distribution Channels

Abstract

A long-standing view of disclosure is that firms privy to market-relevant information can be reluctant to disclose such information out of concern that it will attract entry by competitors. This paper posits that this intuitive view, rooted in traditional views of distribution, may warrant a second look. The premise here is that as traditional distribution channels have evolved, so too should our view of disclosure. In particular, the proliferation of direct-to-consumer channels (e.g., e-commerce) has led to dual distribution becoming a familiar and prominent industrial form. We show that under dual distribution – when a supplier utilizes both a traditional retailer and a direct sales arm to reach consumers – a retailer's view of disclosure is radically altered. By disclosing information publicly, a retailer does indeed risk entry, but such entry also favorably shifts its relationship with the supplier. The supplier's response to entry is to treat the incumbent retailer more as a strategic partner and the entrant more as a strategic threat, leading it to soften its pricing to the retailer. This, in turn, can lead the retailer to disclose and encourage entry. Besides demonstrating the efficacy of proprietary disclosures under dual distribution, the results also suggest that an understanding of the interplay between vertical (supply) and horizontal (competitive) markets can play a critical role in understanding disclosure practices.

1. Introduction

Conventional wisdom suggests that firms are reluctant to provide detailed and transparent public disclosures due to competitive ramifications. In particular, firms who are privy to retail demand information are typically viewed as being hesitant to provide details publicly out of fear that such disclosures will attract the attention of potential entrants. Such an intuitive perspective on disclosure has been widely supported by theoretical research on disclosure though, admittedly, the empirical evidence supporting this "proprietary cost hypothesis" is limited.

In this paper, we present one explanation for why firms may be more willing to disclose their proprietary information than traditional views would suggest. The premise underlying the result is that traditional views of competitive consequences of disclosure are rooted in traditional views of sales and distribution; however, as sales and distribution networks have evolved, so should our thinking about competitive effects of disclosure. To elaborate, the traditional distribution channel is one where a producer (supplier) sells to a firm (retailer) that, in turn, sells to consumers. When the retailer serves as the only distribution outlet, it is apprehensive of any entrant that has the potential to erode its retail market share. As a consequence, when the retailer's experience makes it privy to information about consumer demand, it opts to withhold such information wary that news of high consumer demand will spur entry.

That said, it has long been recognized that certain industries are characterized by "dual distribution", an arrangement wherein the supplier of a product to the retailer also supplies the product directly to consumers. In effect, from the supplier's perspective, the retailer is now both its wholesale customer and its retail rival. Such dual distribution arrangements have historically arisen in the cases of company-owned franchises competing with independent franchises, company-owned outlets competing with retail stores, and the like. As a result, in the past, dual distribution has been viewed as a niche industrial

structure. However, the rapid emergence of the internet as an electronic marketplace has brought dual distribution to the forefront. In particular, e-commerce has led to a vast proliferation of circumstances where a supplier has its own direct-to-consumer online sales channel coexistent with sales through traditional "bricks and mortar" retail stores (Tedeschi 2005).

In light of the newfound prevalence of dual distribution, the present paper revisits the traditional views of disclosure and entry deterrence. We find that dual distribution radically shifts a retailer's incentives, both in terms of its attitude toward entry and its desire to publicly disclose its proprietary information.

With dual distribution, the supplier views the retailer as a competitive threat and treats it accordingly, thereby undercutting the retailer's success. Such competitive encroachment by the supplier has led many to foretell the end of traditional retailing. However, if a competing product is introduced by a third party, say a new entrant, the supplier's stance toward its traditional retailer shifts. The entrant receives the bulk of the supplier's competitive focus, and the retailer is instead viewed as a strategic partner in competition against the entrant. In particular, to bolster the retailer's ability to compete against the entrant, the supplier offers wholesale price discounts. These price discounts can be so pronounced that the retailer actually desires entry by rivals. In short, the age-old adage that "an enemy of my enemy is my friend" guides the supplier's posture and may provide support for the resilience of traditional retailers.

As a result of the above forces, the retailer's perspective on disclosure too changes. The retailer may sidestep entry deterrence, instead opting to disclose demand information, knowing that entry by rivals has the upside of creating a more familial relationship with its supplier. The determining factor in such a decision turns out to be the degrees of intra- and inter-brand competition. The greater the competitive intensity between the retail channel and the supplier's direct-to-consumer channel (i.e., intra-brand competition), the more the retailer is concerned about the supplier poaching its territory; this, in turn, leads the retailer

to take a positive stance towards disclosure. Similarly, the greater the competitive intensity between the supplier's products and those of the entrant (i.e., inter-brand competition), the more entry is viewed as a threat by the supplier and the stronger the alliance between the supplier and its retailer; this, in turn, also leads the retailer to view disclosure favorably.

Besides demonstrating the subtleties introduced by dual distribution as it pertains to theoretical models of disclosure, the current analysis may also provide some guidance to empirical studies weighing capital market and agency benefits with proprietary costs of disclosure. As alluded to at the outset, despite the appeal of the notion that firms limit disclosures for competitive reasons, the empirical evidence supporting this view is mixed at best (see, e.g., Beyer et al. 2010 and Berger 2011). Even when it comes to the most intuitive notion that firms withhold disclosures to discourage entry, the evidence has been equivocal. Survey results (Graham et al. 2005) and anecdotal evidence support the idea that executives want to avoid giving away company "secrets" to avoid the attention of entrants. Consistent with this, Guo et al. (2004) find that greater barriers to competitive entry among Biotech IPOs (e.g., patent protection) are associated with greater disclosure. On the other hand, Karuna (2010) and Li (2010) each find evidence that competitive threats from entrants may actually lead firms to increase disclosures. The disconnect between conventional wisdom and the lack of empirical consensus to support this view may be explained in part by the present study.

In particular, the point emphasized in this paper is that proprietary costs of disclosure to potential entrants may be more muted (even becoming benefits) in the presence of dual distribution – disclosure changes not just the retail environment but also the supply environment. In examining the proprietary cost hypothesis, substantial effort has been devoted toward measurement of industry concentration and competitive intensity, i.e., the horizontal industry structure. The current analysis suggests that jointly controlling for vertical industry structure may be equally vital.

Broadly viewed, the results in this paper suggest that key developments in industrial origination and the evolution of distribution channels can inform accounting practice and vice versa. Thus, a holistic view of firm accounting practices requires a view of how that firm fits into broader strategic interplay, not just among competitors, but also among suppliers, customers, and particularly parties that serve more than one such role.

The paper builds on two primary streams of literature: competitive effects of disclosure and the consequences of dual distribution. In terms of the first stream, the interaction between a firm and its competitors vis-a-vis disclosure is well studied. While some of this research has focused on how disclosures affect competition between incumbent firms (e.g., Darrough 1993; Raith 1996), substantial attention has been devoted to the notion that, much to the dismay of incumbents, information release may encourage entry. Hwang and Kirby (2000) combines these two considerations in a model where disclosure has offsetting effects in that it can soften competition between incumbent firms and but can also increase competition by attracting entry.

A seminal study regarding the role of information release on entry is Milgrom and Roberts (1982) which shows that a firm may undertake seemingly irrational operating decisions as a means of distorting information and discouraging entry. Newman and Sansing (1993) examine the disclosure desire of an incumbent when both entrants and capital markets are privy to the information. This stream has also been extended to examine the efficacy of information aggregation (Park and Seo 2008), and to highlight the interaction between proprietary and nonproprietary information disclosure (Dye 1986). In each case, the underlying theme is that a firm may distort its information release as a means of limiting entry. In contrast, the present paper presents a scenario wherein dual distribution channels can foster disclosure that encourage entry.

While this paper's contribution lies in identifying the consequences of dual distribution for standard views of disclosure, it is of course not the first to examine dual distribution. Extant work has examined the benefits of dual distribution, including

reaching consumers with heterogeneous tastes, better monitoring independent distributors, and signaling product quality (e.g., Gallini and Lutz 1992; Vinhas and Anderson 2005). Dual distribution also creates concerns of supplier encroachment and unbalanced traffic in the distribution channel (e.g., Kalnins 2004; Vinhas and Anderson 2005). The issue of excessive supplier encroachment plays a critical role in the present paper as well. In particular, concerned of the supplier's tendency to aggressively poach its retail territory, the traditional retailer may opt to disclose its proprietary information in order to prop up a rival, which, in turn, shifts the supplier's encroachment posture in the retail market.

The paper proceeds as follows. Section 2 presents the model. Section 3 presents the results: 3.1 identifies circumstances under which an entrant will choose to penetrate the market; 3.2 details how the supplier will adjust wholesale price terms in response to entry; accounting for the entrant's decision and the supplier's pricing, 3.3 derives the retailer's optimal disclosure policy; 3.4 highlights the critical role of dual distribution by contrasting the results with those obtained under traditional single-distribution; 3.5 considers robustness of the results under a more general bargaining framework. Section 4 concludes.

2. Model

A firm, denoted F, makes a product that can be distributed to consumers via multiple channels. In particular, the firm can sell its product to consumers through (i) a traditional retail store managed by an independent retailer, denoted R, and (ii) its own direct-to-consumers outlets (including self-managed online stores). The firm faces potential competition from an entrant, E, who can offer consumers a substitute product; entry requires an (upfront) investment of I, $I > 0$. To eliminate any obvious reasons for either F or R to desire entry by E, we presume E is an independent provider in that it does not rely on F for inputs nor does it rely on R to distribute its product. Also, for simplicity, the cost of producing goods for each party is normalized to zero. The degree of

substitutability among the firm's own products offered through different channels is reflected by γ, $\gamma \in [0,1]$, where higher values of γ reflect greater intra-brand substitution. The degree of substitutability among the firm's products and those of the entrant is reflected by κ, $0 < \kappa \leq \gamma$, with higher values of κ reflecting greater inter-brand substitution. The condition $\kappa \leq \gamma$ reflects the fact that inter-brand substitution is less than intra-brand substitution. That is, products made by *F* but sold via different outlets are inherently less differentiated than goods produced and distributed by a different entity *E*.

Consumer demand is captured by the usual linear (inverse) demand functions: $p_F = a - q_F - \gamma q_R - \kappa q_E$, $p_R = a - q_R - \gamma q_F - \kappa q_E$, and $p_E = a - q_E - \kappa q_F - \kappa q_R$, where p_i denotes the retail price for *i*'s good, q_i denotes *i*'s quantity, and a, $a > 0$, reflects the standard demand intercept.

At the outset, prior to *E*'s entry decision, consumer demand is uncertain. The incumbent retailer gets an early (and perhaps imperfect) read of demand. Without loss of generality, say $a = a_1 + a_2$, where a_1 denotes the retailer's early read and a_2 reflects its residual uncertainty. The components of demand, a_1 and a_2, are independently distributed, and a_i, $i = 1,2$, is distributed over the interval $(\underline{a}_i, \overline{a}_i)$ according to the distribution function $F_i(a_i)$ with mean μ_i and variance σ_i^2. Subsequent to *E*'s entry decision, residual uncertainty is resolved and all market participants learn a. At this time, *F* determines the (unit) wholesale price for products sold by *R*, and then market participants choose their respective retail quantities.

The focus of this paper is on retailer disclosure. That is, fully cognizant that a disclosure of its early read of demand can affect *E*'s entry choice, what is *R*'s preferred disclosure policy? To ensure a nontrivial entry decision, we presume I is large enough that *E* does not enter unless it is nudged to do so by new information, and I is small enough that the most favorable information would certainly prompt entry. (The precise conditions on *I* are provided in the appendix.) Notice the model is designed to focus on the effects of disclosure on entry decisions by presuming a symmetric information environment

post-entry. That said, similar results can be derived if residual information differences remain during post-entry competition. In that event, disclosure can affect both entry (as in here), as well as subsequent production choices (as recently synthesized in Bagnoli and Watts 2011).

We work backwards in the game to determine outcomes under both disclosure and no disclosure regimes, and then examine the retailer's preferred disclosure policy. The timeline of events for the setting is summarized in Figure 1.

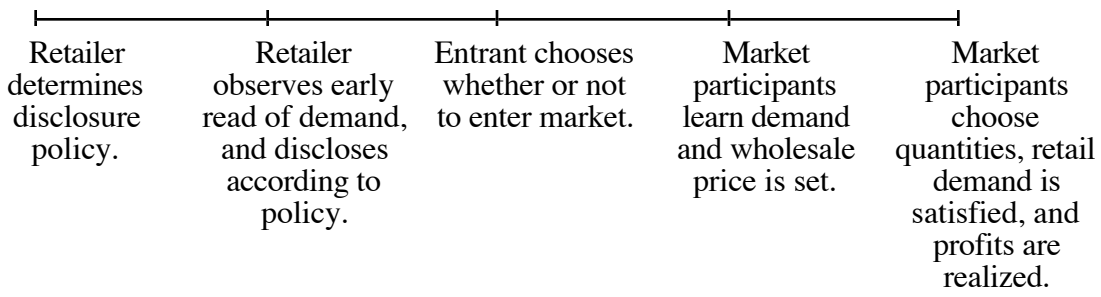


Figure 1: Timeline

3. Results

To examine the effect of dual distribution on the retailer's incentives to disclose proprietary information to potential entrants, we will first examine the circumstances under which entry occurs and then examine how entry affects the input price charged to *R*. These issues together provide the foundation for demonstrating how *R* selects its disclosure policy.

3.1. Entry Decision

To identify the circumstances under which *E* will choose to enter the market, we begin by examining the equilibrium outcome in the event of entry. In this case, for a given wholesale price, *F*, *R*, and *E*, choose their quantities to maximize profits, solving (1), (2), and (3), respectively.

$$\underset{q_F}{Max}\ \ p_F q_F + w q_R \Leftrightarrow \underset{q_F}{Max}\ \ [a - q_F - \gamma q_R - \kappa q_E] q_F + w q_R; \tag{1}$$

$$\underset{q_R}{Max}\ \ p_R q_R - w q_R \Leftrightarrow \underset{q_R}{Max}\ \ [a - q_R - \gamma q_F - \kappa q_E] q_R - w q_R; \text{ and} \tag{2}$$

$$\underset{q_E}{Max}\ \ p_E q_E - I \Leftrightarrow \underset{q_E}{Max}\ \ [a - q_E - \kappa q_F - \kappa q_R] q_E - I. \tag{3}$$

In (1), the first term reflects F's retail profit, whereas the second reflects its wholesale profit. Similarly, (2) reflects both R's retail revenue and wholesale cost of procurement. Finally, (3) reflects E's retail profit less the cost of entry. Jointly taking the first-order conditions of (1), (2), and (3) reveals the equilibrium quantities in (4) as a function of the prevailing wholesale price, with "~" denoting the outcome under entry:

$$\tilde{q}_F(w) = \frac{a[2-\gamma][2-\kappa] + [2\gamma - \kappa^2]w}{2[2-\gamma][2+\gamma-\kappa^2]};\ \tilde{q}_R(w) = \frac{[2-\kappa][a(2-\gamma) - w(2+\kappa)]}{2[2-\gamma][2+\gamma-\kappa^2]}; \text{ and}$$

$$\tilde{q}_E(w) = \frac{a[2+\gamma-2\kappa] + \kappa w}{2[2+\gamma-\kappa^2]}. \tag{4}$$

The consequence of the wholesale price on equilibrium quantities in (4) exhibits intuitive characteristics. In particular, the traditional retailer's quantity is decreasing in its wholesale price; in contrast, the quantities of the other parties is increasing in the wholesale price, reflecting their desire to pick up the slack left by the retailer. Interestingly, this latter feature arises even with the incumbent firm: even though greater wholesale prices stand to boost wholesale profit, the firm nonetheless cannot resist the temptation to poach its wholesale customer's retail territory. These features together inform the firm's chosen wholesale price, as in (5):

$$\underset{w}{Max}\ \ [a - \tilde{q}_F(w) - \gamma \tilde{q}_R(w) - \kappa \tilde{q}_E(w)]\tilde{q}_F(w) + w\tilde{q}_R(w). \tag{5}$$

The first order condition of (5) reveals the firm's wholesale price, $\tilde{w}$. Using this in the quantity expressions in (4), then reveals equilibrium retail quantities. The equilibrium

is summarized in Proposition 1. (Formal proofs of all propositions are provided in the appendix.)

Proposition 1. With entry, the equilibrium outcome is

(i) $\tilde{w} = 2a[2-\gamma][2-\kappa][4-\gamma^2-3\kappa^2+\gamma(2+\kappa^2)]A$;

(ii) $\tilde{q}_F = a[2-\gamma][2-\kappa][8+2\gamma-3\kappa^2]A$;

(iii) $\tilde{q}_R = a[2-\kappa][8(1-\gamma)+\gamma\kappa^2]A$; *and*

(iv) $\tilde{q}_E = a[32-24\kappa-12\kappa^2+6\kappa^3+2\gamma\kappa(6+3\kappa-2\kappa^2)-\gamma^2(12-2\kappa-\kappa^2)]A$,

where $A = [64-48\kappa^2+6\kappa^4-4\gamma(6-\kappa^2)(\gamma-\kappa^2)]^{-1}$.

Given the ensuing equilibrium, the question of interest here is when the entrant actually opts to enter the market. For any realized demand, a, the entrant's profit from entry equals:

$$[a-\tilde{q}_E-\kappa\tilde{q}_F-\kappa\tilde{q}_R]\tilde{q}_E - I = a^2[z(\kappa,\gamma)]^2 - I, \text{ where}$$

$$z(\kappa,\gamma) = [32-24\kappa-12\kappa^2+6\kappa^3+2\gamma\kappa(6+3\kappa-2\kappa^2)-\gamma^2(12-2\kappa-\kappa^2)]A. \quad (6)$$

Given (6), if R discloses a_1, E's expected profit from entry, conditioned on the observed signal, is $E_{a|a_1}\left\{a^2[z(\kappa,\gamma)]^2 - I\right\} = [(a_1+\mu_2)^2+\sigma_2^2][z(\kappa,\gamma)]^2 - I$. Thus, given disclosure, E enters the market if and only if $[(a_1+\mu_2)^2+\sigma_2^2][z(\kappa,\gamma)]^2 - I > 0$, or $a_1 > \left[\sqrt{I-\sigma_2^2[z(\kappa,\gamma)]^2}\right] \Big/ z(\kappa,\gamma) - \mu_2$. These conditions for entry are summarized in the next proposition.

Proposition 2.

(i) The entrant joins the market if and only if the retailer discloses $a_1 > a_1^*$, *where*

$$a_1^* = \frac{\sqrt{I-\sigma_2^2[z(\kappa,\gamma)]^2}}{z(\kappa,\gamma)} - \mu_2; \textit{ and}$$

(ii) The probability of entry under disclosure is $1 - F_1(a_1^*)$.

Given the scenario wherein a potential entrant begins the game "on the sidelines" but can be induced to enter if a firm discloses sufficiently attractive demand, the next issue is to examine the consequences of entry on the discloser. As one may expect, disclosure that induces entry has deleterious consequences on the retailer vis-a-vis additional retail competition. As it turns out, however, the overall effect depends also on the wholesale pricing consequences, and these consequences can be of first-order importance. We next identify wholesale pricing and its link to entry.

3.2. Entry and Wholesale Pricing

Conventional wisdom suggests that a firm is reluctant to disclose favorable demand information publicly since doing so can only attract additional competition. With dual distribution, however, this thinking is incomplete since entry alters the outcome in the wholesale market. To examine this feature, first consider the retail and wholesale outcome in the absence of entry. In particular, absent entry, F and R choose their quantities to maximize profits, solving (7) and (8), respectively.

$$\underset{q_F}{Max}\ \ p_F q_F + w q_R \Leftrightarrow \underset{q_F}{Max}\ \ [a - q_F - \gamma q_R] q_F + w q_R \text{; and} \tag{7}$$

$$\underset{q_R}{Max}\ \ p_R q_R - w q_R \Leftrightarrow \underset{q_R}{Max}\ \ [a - q_R - \gamma q_F] q_R - w q_R. \tag{8}$$

Jointly solving the first-order conditions of (7) and (8) reveals the equilibrium quantities in (9) as a function of the prevailing wholesale price, with "^" denoting the outcome in the absence of entry:

$$\hat{q}_F(w) = \frac{a[2-\gamma] + \gamma w}{4-\gamma} \text{ and } \hat{q}_R(w) = \frac{a[2-\gamma] - 2w}{4-\gamma^2}. \tag{9}$$

Given retail quantities, the firm's chosen wholesale price is the solution to (10):

$$\underset{w}{Max}\ \ [a - \hat{q}_F(w) - \gamma \hat{q}_R(w)] \hat{q}_F(w) + w \hat{q}_R(w). \tag{10}$$

The first order condition of (10) reveals the firm's wholesale price, $\hat{w}$. This, when substituted in quantities in (9), yields retail quantities in the event of no entry. The no entry equilibrium is summarized in Proposition 3.

Proposition 3. In the absence of entry, the equilibrium outcome is

(i) $\hat{w} = \dfrac{a[8 - 4\gamma^2 + \gamma^3]}{2[8 - 3\gamma^2]}$;

(ii) $\hat{q}_F = \dfrac{a[2 - \gamma][4 + \gamma]}{2[8 - 3\gamma^2]}$; *and*

(iii) $\hat{q}_R = \dfrac{2a[1 - \gamma]}{8 - 3\gamma^2}$

Given the equilibria under entry and no entry in Propositions 1 and 3, respectively, the key question here is how such entry affects the retailer. The traditional view is that entry by a competitor erodes retail profit and, hence, is unwelcome. This view is confirmed in a comparison of $\tilde{q}_R(w)$ and $\hat{q}_R(w)$ for a given wholesale price:

$$\tilde{q}_R(w) - \hat{q}_R(w) = -\frac{\kappa[a(2 + \gamma - 2\kappa) + \kappa w)]}{2[2 + \gamma][2 + \gamma - \kappa^2]} < 0. \tag{11}$$

In other words, for a given wholesale price, entry undercuts the retailer's market share, which, in turn, undercuts its profits. The critical consideration then is what effect, if any, entry has on the wholesale price. As it turns out, entry substantially alters how the vertically integrated firm views the retailer.

To elaborate, in the absence of entry by an outsider, the firm primarily views the retailer as a competitive threat. In principle, the firm would have a more nuanced view in that the retailer is a retail threat but is also a wholesale customer, and efforts would be taken to cultivate both retail and wholesale profits. The element preventing this, however, is that the greater the potential wholesale profit (i.e., the greater w), the greater the firm's ex post aggressiveness in the retail market as evidenced by the fact that $\hat{q}_F(w)$ is increasing in w. Given this conundrum, then, the firm's primary posture is one of retail aggression. This

posture is seen most clearly for $\gamma = 1$, where perfect substitutability of products prompts the firm to foreclose its independent retail channel (i.e., $\hat{q}_R = 0$) and directly provide products to consumers as a monopolist.

In contrast, entry creates a more subtle posture for F. With entry, there are essentially three channels to the consumers, and F maintains a level of control over two of those because it supplies inputs to R. Thus, F's main worry is E, the competitor over whom it has no control. Due to this, entry makes F view R more as a strategic partner than a competitive threat. The de facto alliance that F and R form translates into a lower wholesale price being charged to R. The lower wholesale price, in turn, ensures that more consumer purchases flow through the firm and its surrogate and away from the entrant. The firm willingly undertakes this tradeoff since a wholesale price above cost ensures that a sizable portion of R's retail profits are siphoned away by F in the wholesale realm. This intuition is confirmed in the following proposition.

Proposition 4.

(i) Entry reduces the prevailing wholesale price for the retailer, i.e., $\tilde{w} < \hat{w}$.

(ii) The wholesale price benefit of entry is increasing in the degree of competition from the entrant, i.e., $\hat{w} - \tilde{w}$ *is increasing in* κ.

As confirmed in Proposition 4(ii), the extent to which the firm views its retailer as a strategic partner depends on the degree to which the entrant represents a competitive threat. That is, the greater κ, the more of a threat is the entrant and, therefore, the greater the wholesale discount provided to the retailer. We next analyze the relative importance of the wholesale-price and competitive poaching effects of entry, and how this informs the retailer's disclosure choice.

3.3. The Retailer's Disclosure Policy

As evidenced in the previous subsection, entry offers the retailer an upside of a lower wholesale price. It also has the glaring consequence of eroded market share from additional competition. The net effect of these two features underlies the retailer's preferred disclosure policy.

In particular, since withholding disclosure is an effective means of deterring entry, the retailer's expected profit under no disclosure can be written as:

$$\int_{\underline{a}_1}^{\bar{a}_1}\left[E_{a|a_1}\left\{[a-\hat{q}_R-\gamma\hat{q}_F]\hat{q}_R-\hat{w}\hat{q}_R\right\}\right]dF_1(a_1)$$

$$=\int_{\underline{a}_1}^{\bar{a}_1}\left[E_{a|a_1}\left\{\frac{4a^2[1-\gamma]^2}{[8-3\gamma^2]^2}\right\}\right]dF_1(a_1)$$

$$=\int_{\underline{a}_1}^{\bar{a}_1}\left[\frac{[(a_1+\mu_2)^2+\sigma_2^2][2(1-\gamma)]^2}{[8-3\gamma^2]^2}\right]dF_1(a_1). \tag{12}$$

On the other hand, when the firm opts to disclose its advance read of demand, such disclosure prompts entry for all $a_1 > a_1^*$. Thus, with disclosure, the retailer's expected profit can be written as:

$$\int_{\underline{a}_1}^{a_1^*}\left[E_{a|a_1}\left\{[a-\hat{q}_R-\gamma\hat{q}_F]\hat{q}_R-\hat{w}\hat{q}_R\right\}\right]dF_1(a_1)+$$
$$\int_{a_1^*}^{\bar{a}_1}\left[E_{a|a_1}\left\{[a-\tilde{q}_R-\gamma\tilde{q}_F-\kappa\tilde{q}_E]\tilde{q}_R-\tilde{w}\tilde{q}_R\right\}\right]dF_1(a_1)$$

$$=\int_{\underline{a}_1}^{a_1^*}\left[E_{a|a_1}\left\{\frac{4a^2[1-\gamma]^2}{[8-3\gamma^2]^2}\right\}\right]dF_1(a_1)+$$
$$\int_{a_1^*}^{\bar{a}_1}\left[E_{a|a_1}\left\{[a(2-\kappa)(8(1-\gamma)+\gamma\kappa^2)A]^2\right\}\right]dF_1(a_1)$$

$$=\int_{\underline{a}_1}^{a_1^*}\left[\frac{[(a_1+\mu_2)^2+\sigma_2^2][2(1-\gamma)]^2}{[8-3\gamma^2]^2}\right]dF_1(a_1)+$$
$$\int_{a_1^*}^{\bar{a}_1}\left[[(a_1+\mu_2)^2+\sigma_2^2][(2-\kappa)(8(1-\gamma)+\gamma\kappa^2)A]^2\right]dF_1(a_1). \tag{13}$$

From (12) and (13), the retailer prefers to disclose if and only if:

$$\int_{a_1^*}^{\bar{a}_1}\left[[(a_1+\mu_2)^2+\sigma_2^2][(2-\kappa)(8(1-\gamma)+\gamma\kappa^2)A]^2\right]dF_1(a_1)-$$

$$\int_{a_1^*}^{\bar{a}_1}\left[\frac{[(a_1+\mu_2)^2+\sigma_2^2][2(1-\gamma)]^2}{[8-3\gamma^2]^2}\right]dF_1(a_1)>0$$

$$\Rightarrow [2-\kappa][8(1-\gamma)+\gamma\kappa^2]A-\frac{2[1-\gamma]}{8-3\gamma^2}>0. \tag{14}$$

Proposition 5 then follows from (14).

Proposition 5.

(i) If $\kappa > \kappa^* \equiv [2/5]\left[\sqrt{14}-2\right]$, *the retailer opts to disclose its demand information.*

(ii) If $\kappa \le \kappa^*$, *the retailer opts to disclose its demand information if and only if* $\gamma > \gamma^*(\kappa)$, *where (a)* $\gamma^*(\kappa) \in [\kappa^*, 1)$ *and (b)* $\gamma^*(\kappa)$ *is decreasing in* κ.

The cutoffs in the proposition reveal a crisp comparative static: the greater κ, the more appealing is disclosure. Large values of κ suggest a greater retail cost of entry in that the entrant poaches on the consumer base of both the incumbent firms. While this suggests a greater retail downside of entry (the traditional view), from Proposition 4, it also introduces a greater wholesale upside. In effect, the more of a competitive threat the entrant is to the supplier, the tighter the coalition between the supplier and its wholesale customer becomes. From the proposition, it is this effect that becomes paramount as κ increases.

Similarly, greater values of γ too point toward entry-inducing disclosure. For large values of γ, the retailer poses an imminent threat to the supplier. Absent a competitive distraction brought by the entrant, then, the supplier decimates the retailer's market share. In this case, from the retailer's perspective, entry causes a welcome shift by redirecting the supplier's focus towards the upstart rival. These intuitive features of the proposition are presented graphically in Figure 2.

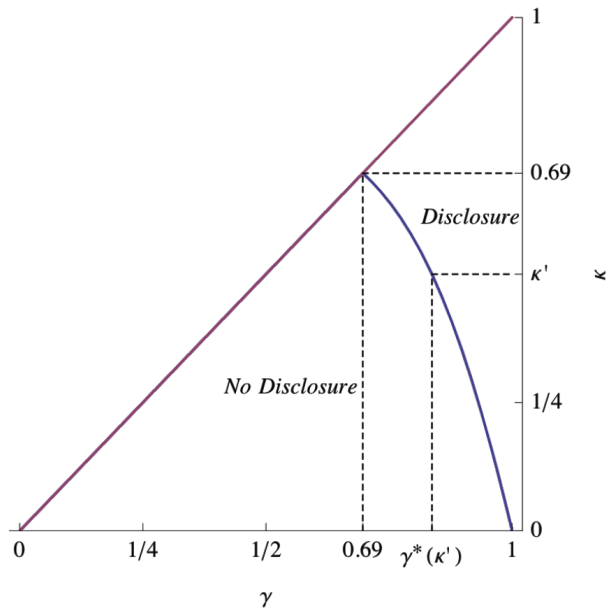


Figure 2: Preferred Disclosure Policy as a function of γ and κ.

We conclude this subsection with a brief digression on commitment. The question we ask now is whether the ex ante desire to disclose (or not disclose) from the retailer's view is an ex post viable strategy. In particular, a common theme in studies of disclosure is that disclosure policies which are ex ante desirable tend to be noncredible ex post. Most notable in this regard is the unraveling results of Grossman and Hart (1980); Grossman (1981); and Milgrom (1981). This unraveling result notes that even if a firm wishes not to disclose, observers' inferences in the event of nondisclosure are sufficiently negative that a firm whose realized values are borderline would rather disclose the mediocre information than be viewed even more negatively. The consequence of this result is that the literature on disclosure is decidedly split between papers presuming an ex ante ability to commit (as is the case in this paper) and those where a violation of the assumptions inherent in the unraveling result gives rise to realization-contingent discretionary disclosure choices (for more, see, e.g., Dye 2001;Verrecchia 2001).

As it turns out, in the present study the typical dichotomy in the disclosure literature is not present. In fact, as confirmed in the next corollary, the ex ante preferred disclosure policy is ex post sustainable regardless of the realized value of a_1. Thus, discretionary and ex ante disclosure coincide.

Corollary 1.

The retailer's optimal disclosure policy is self-enforcing in that it requires no formal commitment.

To get a feel for why the corollary holds, consider the retailer's incentive to disclose after it has observed a_1. In this case, the retailer discloses if and only if:

$$\begin{aligned} & E_{a|a_1}\left\{[a(2-\kappa)(8(1-\gamma)+\gamma\kappa^2)A]^2\right\} - E_{a|a_1}\left\{\frac{4a^2[1-\gamma]^2}{[8-3\gamma^2]^2}\right\} > 0 \\ & \Rightarrow \left([(2-\kappa)(8(1-\gamma)+\gamma\kappa^2)A]^2 - \frac{4[1-\gamma]^2}{[8-3\gamma^2]^2}\right) E_{a|a_1}\left\{a^2\right\} > 0. \end{aligned} \tag{15}$$

Notice (15) is satisfied if and only if the condition in (14) is satisfied. In other words, the realized value of a_1 affects the magnitude but not the sign of the difference in (15). As a result, the same condition that gives rise to a preference for (or against disclosure) from an ex ante standpoint also points to the same comparison ex post (i.e., for each value of a_1).

3.4. A Comparison to the Single Distribution Benchmark

A theme herein is that dual distribution can alter widely accepted views of disclosure. To highlight the role of dual distribution, we now present a comparison to the benchmark case of a traditional single distribution channel. That is, what is the retailer's disclosure policy when the supplier sells only through the retailer and not through direct-to-consumers channels? We address this question as before, first identifying equilibria under

entry and no entry, and then determining the retailer's chosen disclosure policy given such outcomes.

Suppose that E opts to enter the market. In that event, R and E choose their quantities to maximize profits, solving (16) and (17), respectively.

$$\underset{q_R}{Max}\ \ p_R q_R - w q_R \Leftrightarrow \underset{q_R}{Max}\ \ [a - q_R - \kappa q_E] q_R - w q_R; \text{ and} \tag{16}$$

$$\underset{q_E}{Max}\ \ p_E q_E - I \Leftrightarrow \underset{q_E}{Max}\ \ [a - q_E - \kappa q_R] q_E - I. \tag{17}$$

Jointly solving the first-order conditions of (16) and (17) yields equilibrium quantities as a function of the prevailing wholesale price: $q_R = [a(2-\kappa) - 2w]/[4-\kappa^2]$ and $q_E = [a(2-\kappa) + \kappa w]/[4-\kappa^2]$. The retailer's quantity, then, represents the supplier's induced demand curve. Since wholesale profit is the supplier's only source of revenue, it chooses wholesale price to maximize $wq_R = w[a(2-\kappa) - 2w]/[4-\kappa^2]$. Solving this maximization reveals the chosen wholesale price, $w = a[2-\kappa]/4$. This price, when substituted into each firm's equilibrium quantity, confirms Observation 1(i). If E opts not to enter, the equilibrium outcome is derived similarly. In particular, solving (16) with $q_E = 0$ yields $q_R = [a-w]/2$. In that case, then, the supplier's profit is $wq_R = w[a-w]/2$. Maximizing this entails $w = a/2$. Substituting this value in the retailer's quantity confirms Observation 1(ii).

Observation 1. The equilibrium single distribution outcome is:

(i) With entry: $w = a[2-\kappa]/4$; $q_R = a/[4+2\kappa]$; *and* $q_E = a[4+\kappa]/[8+4\kappa]$.

(ii) Without entry: $w = a/2$; *and* $q_R = a/4$.

Given the setting is one where the entrant will not enter the market unless it is nudged to do so by disclosure of favorable demand information, the question to consider again is how this affects the retailer's desire to disclose such information. First, consider

when the entrant actually enters upon observing a disclosure of high demand. Given disclosure of a_1, the entrant's expected profit from entry is:

$$E_{a|a_1}\left\{[a - q_E - \kappa q_R]q_E - I\right\} \equiv E_{a|a_1}\left\{\frac{a^2[4+k]^2}{16[2+k]^2} - I\right\}$$
$$\equiv \frac{[(a_1+\mu_2)^2 + \sigma_2^2][4+k]^2}{16[2+k]^2} - I. \tag{18}$$

Given (18), the entrant opts to enter upon observing disclosure of $a_1 > a_1^+ \equiv \sqrt{\frac{16[2+k]^2 I}{[4+k]^2} - \sigma_2^2} - \mu_2$. Thus, the retailer's expected profit under disclosure is:

$$\int_{\underline{a}_1}^{a_1^+}\left[E_{a|a_1}\left\{a^2/16\right\}\right]dF_1(a_1) + \int_{a_1^+}^{\bar{a}_1}\left[E_{a|a_1}\left\{a^2/[4(2+\kappa)^2]\right\}\right]dF_1(a_1). \tag{19}$$

In (19) the first term represents retailer profit in the event of no entry (i.e., (16) with Observation 1(ii) values), whereas the second represents retailer profit in the event of entry (i.e., (16) with Observation 1(i) values). In contrast, if the retailer opts not to disclose, its expected profit is simply:

$$\int_{\underline{a}_1}^{\bar{a}_1}\left[E_{a|a_1}\left\{a^2/16\right\}\right]dF_1(a_1). \tag{20}$$

Comparing (19) and (20), the expected benefit of disclosure is:

$$-\int_{a_1^+}^{\bar{a}_1}\left[E_{a|a_1}\left\{a^2\kappa[4+\kappa]/[4(2+\kappa)]^2\right\}\right]dF_1(a_1) < 0. \tag{21}$$

Inspection of (21) and its derivative with respect to κ confirm the next proposition.

Proposition 6. Under a traditional single distribution channel:

(i) The retailer strictly prefers no disclosure; and

(ii) The net benefit of withholding disclosure is increasing in κ.

In short, the proposition confirms a stark contrast to the dual distribution case: the traditional views of disclosure rule the day under traditional distribution. In particular, the

perspective that a firm will withhold information in order to limit potential entry by rivals is indeed borne out in the case of a traditional supply channel. The view that entry-inducing disclosure can be optimal is unique to dual distribution.

We conclude this subsection by examining the special case of $\gamma = \kappa = 1$ to highlight the stark difference brought by dual distribution. In the case of perfect substitutes, the usual view of entry is most pronounced in that a firm typically prefers being a monopolist than being part of an duopoly. For this reason, the retailer of a traditional distribution channel will choose not to disclose in order to preserve its monopoly position in the market.

In the case of dual distribution, the same consideration is at play – in this case the retailer would seemingly prefer to be part of a incumbent duopoly than part of a (three-member) oligopoly. However, in the case of an incumbent duopoly, since consumers view products equivalently and the supplier has wholesale pricing power, the supplier simply prices so as to foreclose the rival and secure a monopoly. If the retailer can coax entry, however, the supplier opts to keep the retailer as an oligopoly participant instead of foreclosure. In that event, the supplier prefers the oligopoly outcome since it extracts a measure of control over (and, thus, profit of) retail decisions of two of the three participants; with foreclosure, however, it only can extract half of the retail market since the entrant obtains the other half. For this reason, the retailer, when faced with dual distribution, opts to disclose as a means of encouraging entry.

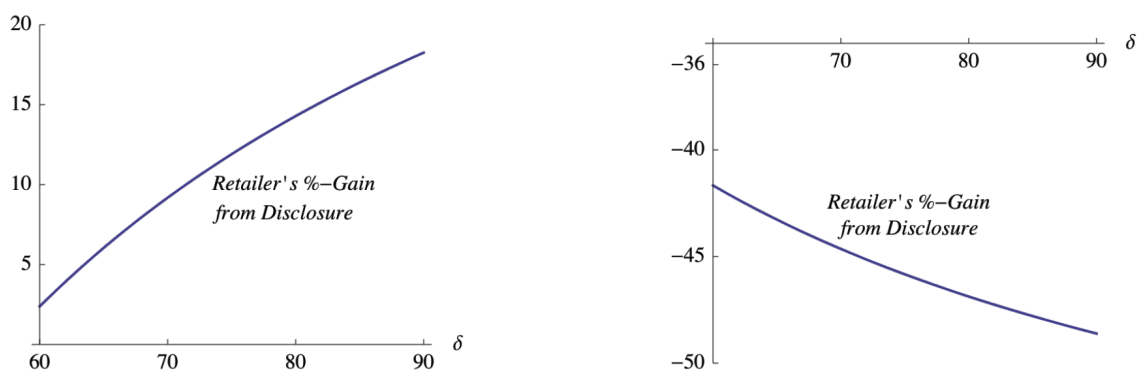
Corollary 2.

*When products are perfect substitute*s, i.e., $\gamma = \kappa = 1$,

(i) under dual distribution the retailer discloses demand information and the equilibrium probability of entry is $1 - F_1\left[\dfrac{\sqrt{I - \sigma_2^2[7/22]^2}}{7/22} - \mu_2\right]$.

(ii) under a single distribution channel, the retailer does not disclose and there is no entry.

The contrast between traditional distribution and dual distribution as it pertains to disclosure is further highlighted via the next example. Say a_1 is uniformly distributed in [100-δ,100+δ], $60 \leq \delta \leq 90$, $a_2 = 0$, and $I = 2{,}500$. In this case, the expected gains (or losses) from disclosure under dual distribution (left panel) and traditional distribution (right panel) are depicted in Figure 3. The figure depicts that (i) dual (single-channel) distribution promotes (inhibits) disclosure and (ii) the retailer's gain (loss) from disclosure under dual (single-channel) distribution is greater the more uncertain the demand environment. If one roughly views greater uncertainty as tied to greater cost of capital, the figure suggests that the empirical link between how benefits of disclosure relate to the cost of capital is also influenced by the nature of the underlying distribution channels. In other words, accounting, production, and distribution processes are intertwined.



Panel A: Dual Distribution *Panel B: Single Distribution*

Figure 3: Gains from Disclosure as a function of δ.

3.5. Robustness to a General Bargaining Framework

The results derived in Propositions 5 and 6 demonstrate that the presence of a direct-to-consumer channel for the supplier greatly alters the retailer's disclosure incentives.

This result was formalized in the common (and parsimonious) case in which the supplier unilaterally sets a unit wholesale price that governs trade. Though this characterization is the most succinct, we next demonstrate that the implied manufacturer power was not critical to the results. Consider a bargaining arrangement where the supplier and retailer negotiate over the prevailing wholesale price and can also make fixed monetary concessions. To be precise, say the wholesale pricing terms come from a process of generalized Nash bargaining over a two-part tariff arrangement. Besides allowing an axiomatic representation of bargaining outcomes, the Nash bargaining approach allows a tractable and general characterization of equilibria without an explicit representation of the precise process of bargaining. In this case, in the event of no entry, the wholesale price (w) and fixed fee transfer (T) solve the generalized Nash product of the profits of F and R as in (22):

$$\begin{aligned} \underset{w,T}{Max} \; & \left[(a-\hat{q}_F(w)-\gamma\hat{q}_R(w))\hat{q}_F(w)+w\hat{q}_R(w)+T-a^2/4\right]^{\beta} \times \\ & \left[(a-\hat{q}_R(w)-\gamma\hat{q}_F(w))\hat{q}_R(w)-w\hat{q}_R(w)-T\right]^{1-\beta}. \end{aligned} \tag{22}$$

In (22), the first term reflects F's incremental profit from an agreed-upon contract: $(a-\hat{q}_F(w)-\gamma\hat{q}_R(w))\hat{q}_F(w)+w\hat{q}_R(w)+T$ reflects the sum of retail profit, wholesale profit, and the agreed-upon fixed fee, while $a^2/4$ reflects the firm's profit in the event of no contract in which case it opts to "go it alone." Similarly, the second term reflects R's incremental profit from successful negotiation. The relative bargaining leverage of each party is reflected by β, $\beta \in (0,1)$, where greater values of β reflect greater bargaining power for F. The analogous bargaining in the event of entry entails solving the generalized Nash product in (23); in this case, note that the supplier's disagreement profit is $a^2/[2+\kappa]^2$ since it faces competition from the entrant if it chooses to go it alone.

$$\underset{w,T}{Max} \left[(a-\tilde{q}_F(w)-\gamma\tilde{q}_R(w)-\kappa\tilde{q}_E(w))\tilde{q}_F(w)+w\tilde{q}_R(w)+T-a^2/[2+\kappa]^2\right]^{\beta} \times \left[(a-\tilde{q}_R(w)-\gamma\tilde{q}_F(w)-\kappa\tilde{q}_E(w))\tilde{q}_R(w)-w\tilde{q}_R(w)-T\right]^{1-\beta}. \tag{23}$$

Solving the contractual outcomes in bargaining from (22) and (23) and using these values to determine the expected retailer profit under disclosure and no disclosure yields a result strikingly similar to that in Proposition 5. This result is presented in Proposition 7.

Proposition 7. Under generalized Nash bargaining,

(i) If $\kappa > \overline{\kappa} \approx 0.68$*, the retailer opts to disclose its demand information.*

(ii) If $\kappa \leq \overline{\kappa}$*, the retailer opts to disclose its demand information if and only if* $\gamma > \overline{\gamma}(\kappa)$*,* $\overline{\gamma}(\kappa) \in [\overline{\kappa},1)$.

Intuitively, under general bargaining, entry has a related benefit to the retailer of shifting the manufacturer's focus. Absent entry, the manufacturer views the retailer primarily as a threat and treats it accordingly in negotiating wholesale terms. The tough stance in negotiation results from the manufacturer's temptation to walk away from bargaining and go it alone as a monopolist. In contrast, with entry, the manufacturer views the retailer more as a strategic partner, which again is manifest in negotiation. In this case, the temptation to walk away from bargaining is less pronounced since that would entail the manufacturer needing to go it alone in competition with the entrant; in contrast, successful negotiation would yield a strong strategic partnership in competing with the entrant. As a result of the effect on wholesale prices, the retailer again may seek to disclose its information in the hopes of attracting entry. Further, as before, this preference for disclosure arises if and only if competition is sufficiently intense. In short, while the results are demonstrated most succinctly in the case of simple unilateral contracts, they are robust to considering more complex bargaining arrangements.

4. Conclusion

The consequences of disclosure for various market participants, be they suppliers, competitors, or capital market constituents is an undoubtedly nuanced issue. Nonetheless, some themes have permeated conventional wisdom, including the notion that a firm may withhold valuable information to deter entry by potential competitors. This long-standing traditional view of disclosure is rooted in traditional views of the competitive landscape. This paper posits, however, that the competitive landscape has undergone dramatic shifts in recent years due to the notable increase in forward integration by suppliers. As more and more suppliers find themselves in the retail arena, views of firm strategy have evolved accordingly. In this paper, we demonstrate that this trend also has significant ramifications for accounting, even among the most widely accepted views of disclosure.

In particular, we demonstrate that when a supplier both provides goods to a retailer and provides goods directly to consumers (say via an online arm), a retailer who is privy to proprietary market information may be much more willing to publicly share that information than conventional views would suggest. By disclosing its proprietary knowledge, the retailer may attract competition, but this competition also stands to shift the focus of the retailer's own supplier. Entry by independent competitors, in effect, creates a de facto partnership between the supplier and its retailer. This, in turn, translates into a lower wholesale price and thus potentially greater profit for the retailer.

The results confirm that the changing marketplace necessitates an adjustment to our views of proprietary disclosure and its consequences. This shift also suggests future areas of study. Given the expansion of dual distribution, one may wonder what consequences it has for other aspects of accounting, particularly as it pertains to cost measurement and the sharing of information among supply chain partners. Relatedly, it may be worth examining if and how accounting practices can shape the formation of dual distribution networks and alter the relative importance of bricks-and-mortar stores vs. online sales channels. After

all, if dual distribution stands to alter how we view accounting, it seems reasonable to presume that how accounting practices develop may also shape how distribution networks form and thrive.

APPENDIX

Proof of Proposition 1. The backward induction process detailed in section 3.1 derives the equilibrium solution with entry. The condition $0 < \kappa \leq \gamma \leq 1$ ensures that the wholesale and retail prices and quantities are each nonnegative. ■

Proof of Proposition 2. The paper's model assumes a nontrivial entry decision. As we demonstrate in the appendix, the necessary and sufficient condition for this is (A1) and, thus, this condition is presumed throughout the paper.

$$I \in \left([(\mu_1 + \mu_2)^2 + \sigma_1^2 + \sigma_2^2] \frac{[4+\kappa]^2}{16[2+\kappa]^2},\ [(\bar{a}_1 + \mu_2)^2 + \sigma_2^2][z(\kappa,\gamma)]^2 \right). \tag{A1}$$

Using the equilibrium outcome derived in Proposition 1, E's profit from entry equals:

$$\Pi_E = [a_1 + a_2 - \tilde{q}_E - k\tilde{q}_R - k\tilde{q}_F]\tilde{q}_E - I = [a_1 + a_2]^2 [z(\kappa,\gamma)]^2 - I. \tag{A2}$$

From (A2), in the absence of disclosure, E's expected profit equals:

$$\begin{aligned} E\{\Pi_E|\phi\} &= \int_{\underline{a}_2}^{\bar{a}_2}\int_{\underline{a}_1}^{\bar{a}_1} [a_1 + a_2]^2 [z(\kappa,\gamma)]^2 \, dF_1(a_1) dF_2(a_2) - I \\ &= [(\mu_1 + \mu_2)^2 + \sigma_1^2 + \sigma_2^2][z(\kappa,\gamma)]^2 - I. \end{aligned} \tag{A3}$$

Since $\frac{[4+\kappa]^2}{16[2+\kappa]^2} > z(\kappa,\gamma)$, the lower bound on I in (A1) yields $E\{\Pi_E|\phi\} < 0$. In contrast, when the retailer discloses a_1, the entrant's expected profit equals:

$$\begin{aligned} E\{\Pi_E|d\} &= \int_{\underline{a}_2}^{\bar{a}_2} [a_1 + a_2]^2 [z(\kappa,\gamma)]^2 \, dF_2(a_2) - I \\ &= [(a_1 + \mu_2)^2 + \sigma_2^2][z(\kappa,\gamma)]^2 - I. \end{aligned} \tag{A4}$$

The upper bound on I in (A1) ensures $E\{\Pi_E|d\} > 0$ for $a_1 = \bar{a}_1$. And, from the lower bound on I in (A1), $E\{\Pi_E|d\} < 0$ for $a_1 = \mu_1$. Given $E\{\Pi_E|d\}$ in (A4) is increasing in a_1, it follows that $E\{\Pi_E|d\} > 0$ for all $a_1 > a_1^*$ where a_1^* is the a_1-value that solves (A4) as an equality. Thus, $a_1^* = \frac{\sqrt{I - \sigma_2^2[z(\kappa,\gamma)]^2}}{z(\kappa,\gamma)} - \mu_2$. The probability of entry is therefore $1 - F_1(a_1^*)$. This completes the proof of Proposition 2. ■

Proof of Proposition 3. The backward induction process detailed in section 3.2 derives the equilibrium solution in the absence of entry. The condition $0 < \gamma \leq 1$ ensures that the wholesale and retail prices and quantities are each nonnegative. ■

Proof of Proposition 4. Using the wholesale price $\tilde{w}$ presented in Proposition 1:

$$\frac{\partial \tilde{w}}{\partial \kappa} = -4a[2-\gamma]A^2\Big[128 - 192\kappa^2 + 96\kappa^3 + 36\kappa^4(1-\kappa) + 9\kappa^6 + 2\gamma^4(6 - 4\kappa + \kappa^2) - 4\gamma^3(6 - 4\kappa + 7\kappa^2 - 4\kappa^3 + \kappa^4) - \gamma^2(80 - 80\kappa - 52\kappa^2 + 56\kappa^3 - 27\kappa^4 + 8\kappa^5 - 2\kappa^6) + \gamma(64 - 128\kappa + 96\kappa^2 - 16\kappa^3 - 54\kappa^4 + 36\kappa^5 - 9\kappa^6)\Big]. \tag{A5}$$

Some tedious algebra verifies that $\frac{\partial \tilde{w}}{\partial \kappa} < 0$ for $0 \le \kappa \le 1$ and $0 \le \gamma \le 1$. This combined with the fact that $\hat{w}$ in Proposition 3 is free of κ, and $0 < \kappa \le \gamma \le 1$, implies:

$$\hat{w} - \tilde{w} > \hat{w} - \tilde{w}\big|_{\kappa=0} = \frac{a[8 - 4\gamma^2 + \gamma^3]}{2[8 - 3\gamma^2]} - \frac{a[8 - 4\gamma^2 + \gamma^3]}{2[8 - 3\gamma^2]} = 0 \text{ and}$$

$$\frac{\partial[\hat{w} - \tilde{w}]}{\partial \kappa} = -\frac{\partial \tilde{w}}{\partial \kappa} > 0. \tag{A6}$$

The results in (A6) complete the proof of Proposition 4. ■

Proof of Proposition 5. From Proposition 1, the retailer's profit if E enters is:

$$\begin{aligned}\tilde{\Pi}_R &= [a_1 + a_2 - \tilde{q}_R - \kappa\tilde{q}_E - \gamma\tilde{q}_F]\tilde{q}_R - \tilde{w}\tilde{q}_R \\ &= \Big[(a_1 + a_2)(2-\kappa)(8(1-\gamma) + \gamma\kappa^2)A\Big]^2.\end{aligned} \tag{A7}$$

From Proposition 3, the retailer's profit if E does not enter is:

$$\begin{aligned}\hat{\Pi}_R &= [a_1 + a_2 - \hat{q}_R - \gamma\hat{q}_F]\hat{q}_R - \hat{w}\hat{q}_R \\ &= \left[\frac{2(a_1 + a_2)(1-\gamma)}{8 - 3\gamma^2}\right]^2.\end{aligned} \tag{A8}$$

Using (A7), (A8), and E's entry decision derived in Proposition 2, the retailer's expected profit under no disclosure and under disclosure, respectively, equals:

$$\begin{aligned}E\{\Pi_R|\phi\} &= \int_{\underline{a}_2}^{\bar{a}_2}\int_{\underline{a}_1}^{\bar{a}_1}\left[\frac{2(a_1 + a_2)(1-\gamma)}{8 - 3\gamma^2}\right]^2 dF_1(a_1)dF_2(a_2) \quad \text{and} \\ &= 4[(\mu_1 + \mu_2)^2 + \sigma_1^2 + \sigma_2^2][1-\gamma]^2 / [8 - 3\gamma^2]^2\end{aligned}$$

$$\begin{aligned}E\{\Pi_R|d\} &= \int_{\underline{a}_2}^{\bar{a}_2}\int_{\underline{a}_1}^{a_1^*}\left[\frac{2(a_1 + a_2)(1-\gamma)}{8 - 3\gamma^2}\right]^2 dF_1(a_1)dF_2(a_2) + \\ &\int_{\underline{a}_2}^{\bar{a}_2}\int_{a_1^*}^{\bar{a}_1}\Big[(a_1 + a_2)(2-\kappa)(8(1-\gamma) + \gamma\kappa^2)A\Big]^2 dF_1(a_1)dF_2(a_2).\end{aligned} \tag{A9}$$

The retailer adopts a policy to disclose if and only if $E\{\Pi_R|d\} > E\{\Pi_R|\phi\}$ which, from (A9), is equivalent to $\tilde{\Pi}_R > \hat{\Pi}_R$. From (A7) and (A8), $\tilde{\Pi}_R - \hat{\Pi}_R > 0$ if and only if $f(\kappa,\gamma) > 0$, where:

$$f(\kappa,\gamma) = -64 + 96\kappa - 12\kappa^3 + \gamma^3[-24 + 2\kappa + 3\kappa^2] + 8\gamma^2[3 + 5\kappa - \kappa^3] + 4\gamma[16 - 32\kappa - 2\kappa^2 + 5\kappa^3]. \tag{A10}$$

Using (A10),

$$f(\kappa,1) = 5[2-\kappa]\kappa \text{ and}$$

$$\frac{\partial f(\kappa,\gamma)}{\partial\gamma} = \gamma^2[-72 + 6\kappa + 9\kappa^2] + 16\gamma[3 + 5\kappa - \kappa^3] + 4\gamma[16 - 32\kappa - 2\kappa^2 + 5\kappa^3]. \tag{A11}$$

From (A11), $f(\kappa,1) > 0$ and $\frac{\partial f(\kappa,\gamma)}{\partial\gamma} > 0$ for $0 < \kappa \le \gamma \le 1$. This implies that $f(\kappa,\gamma) > 0$ if $f(\kappa,\kappa) > 0$. From (A10), $f(\kappa,\kappa) = [2-\kappa]^3[-8 + 8\kappa + 5\kappa^2]$. Thus, $f(\kappa,\kappa) > 0$ if and only if $\kappa > \kappa^* \equiv \left[2/5\right]\left[\sqrt{14} - 2\right]$. This yields the result in part (i).

For $\kappa \le \kappa^*$, $f(\kappa,\kappa) \le 0$. Thus, in this case, there exists a unique γ-value in $[\kappa,1)$ that solves $f(\kappa,\gamma) = 0$. This unique γ-value is denoted $\gamma^*(\kappa)$, and disclosure is preferred by the retailer for $\gamma > \gamma^*(\kappa)$.

Finally, using (A10), and taking the derivative of both sides of the equation $f(\kappa,\gamma^*(\kappa)) = 0$ with respect to κ yields:

$$\frac{d\gamma^*(\kappa)}{d\kappa} = -\frac{2[48 - 18\kappa^2 + \gamma^{*3}(1 + 3\kappa) + 4\gamma^{*2}(5 - 3\kappa^2) - \gamma^*(64 + 8\kappa - 30\kappa^2)]}{64 - 128\kappa - 8\kappa^2 + 20\kappa^3 - \gamma^{*2}[72 - 6\kappa - 9\kappa^2] + 16\gamma^*[3 + 5\kappa - \kappa^3]}. \tag{A12}$$

From (A12), and $0 < \kappa \le \gamma^* < 1$, $\frac{d\gamma^*(\kappa)}{d\kappa} < 0$. This implies the smallest value of $\gamma^*(\kappa)$ occurs at the largest value of κ. Recall, $\kappa \le \kappa^*$ and, hence, the lower bound on $\gamma^*(\kappa)$ is $\gamma^*(\kappa^*)$ which equals κ^*. This proves part (ii). ■

Proof of Corollary 1. First, consider the case wherein the retailer's ex ante policy is to not disclose, i.e., $E\{\Pi_R|\phi\} \ge E\{\Pi_R|d\}$. Recall, from (A9), this is equivalent to $\hat{\Pi}_R > \tilde{\Pi}_R$ which from (A7) and (A8) implies:

$$\frac{2[1-\gamma]}{8 - 3\gamma^2} > (2-\kappa)(8(1-\gamma) + \gamma\kappa^2)A. \tag{A13}$$

By committing to not disclose, the retailer deters entry. Thus, the non disclosure policy is self enforcing if the retailer wishes to continue to deter entry even after it has observed a_1. If $a_1 \le a_1^*$, from Proposition 2(i), E will not enter irrespective of whether a_1 is revealed, so there is no incentive for the retailer to disclose. If $a_1 > a_1^*$, disclosure leads

to entry. Using (A7), the retailer's expected profit from disclosing a_1 when $a_1 > a_1^*$ equals:

$$\begin{aligned}&\int_{\underline{a}_2}^{\bar{a}_2}\left[(a_1+a_2)(2-\kappa)(8(1-\gamma)+\gamma\kappa^2)A\right]^2 dF_2(a_2)\\&=[(a_1+\mu_2)^2+\sigma_2^2]\left[(2-\kappa)(8(1-\gamma)+\gamma\kappa^2)A\right]^2.\end{aligned} \tag{A14}$$

Using (A8), the retailer's expected profit from adhering to its no disclosure policy and, thus, dissuading entry is:

$$\begin{aligned}&\int_{\underline{a}_2}^{\bar{a}_2}\left[\frac{2(a_1+a_2)(1-\gamma)}{8-3\gamma^2}\right]^2 dF_2(a_2)\\&=[(a_1+\mu_2)^2+\sigma_2^2]\left[\frac{2(1-\gamma)}{8-3\gamma^2}\right]^2.\end{aligned} \tag{A15}$$

Comparing (A14) to (A15), and using the inequality in (A13), implies that if the retailer ex ante prefers the policy of no disclosure, it will adhere to this stance even after it observes a_1.

Next consider the case wherein the retailer's ex ante policy is to disclose, i.e., $E\{\Pi_R|d\} > E\{\Pi_R|\phi\}$. From (A9), this is equivalent to $\tilde{\Pi}_R > \hat{\Pi}_R$ which, from (A7) and (A8), implies:

$$(2-\kappa)(8(1-\gamma)+\gamma\kappa^2)A > \frac{2[1-\gamma]}{8-3\gamma^2}. \tag{A16}$$

On observing a_1, if the retailer opts to not disclose, we denote E's (off equilibrium) beliefs to be $a_1 = \mu_1$. With these beliefs, E's profit from entry equals $[(\mu_1+\mu_2)^2+\sigma_2^2][z(\kappa,\gamma)]^2 - I$ which, from (A1), is negative. Given no entry, the retailer's profit from no disclosure is as in (A15). Contrast this to the outcome if the retailer discloses a_1. If $a_1 \le a_1^*$, from Proposition 2(i), E will not enter irrespective of whether a_1 is revealed, so there is no incentive for the retailer to stop disclosing. If $a_1 > a_1^*$, disclosure leads to entry, and the retailer's profit is as in (A14). Comparing (A14) to (A15), and this time using the inequality in (A16), implies that if the retailer's ex ante prefers to disclose, it will adhere to this stance even after it observes a_1. This completes the proof of Corollary 1. ■

Proof of Proposition 6. The equilibrium solution with and without entry is derived in the text in section 3.4, and summarized in Observation 1. From Observation 1(i), E's profit from entry equals:

$$\Pi_E = [a_1+a_2-q_E-kq_R]q_E - I = \frac{[a_1+a_2]^2[4+\kappa]^2}{16[2+\kappa]^2} - I. \tag{A17}$$

From (A17), in the absence of disclosure, E's expected profit equals:

$$E\left\{\Pi_E|\phi\right\} = \int_{\underline{a}_2}^{\bar{a}_2}\int_{\underline{a}_1}^{\bar{a}_1}[a_1 + a_2]^2 \frac{[4+\kappa]^2}{16[2+\kappa]^2} dF_1(a_1)dF_2(a_2) - I$$

$$= [(\mu_1 + \mu_2)^2 + \sigma_1^2 + \sigma_2^2]\frac{[4+\kappa]^2}{16[2+\kappa]^2} - I. \tag{A18}$$

The lower bound on I in (A1) is necessary and sufficient to ensure that E does not enter the market unless it receives new demand information, i.e., $E\left\{\Pi_E|\phi\right\} < 0$. In contrast, when the retailer discloses a_1, the entrant's expected profit equals:

$$E\left\{\Pi_E|d\right\} = \int_{\underline{a}_2}^{\bar{a}_2}[a_1 + a_2]^2 \frac{[4+\kappa]^2}{16[2+\kappa]^2} dF_2(a_2) - I$$

$$= [(a_1 + \mu_2)^2 + \sigma_2^2]\frac{[4+\kappa]^2}{16[2+\kappa]^2} - I. \tag{A19}$$

Since $\frac{[4+\kappa]^2}{16[2+\kappa]^2} > z(\kappa,\gamma)$, it follows from the upper bound on (A1) that $E\left\{\Pi_E|d\right\} > 0$ for all $a_1 > a_1^+ \equiv \sqrt{\frac{16[2+\kappa]^2 I}{[4+\kappa]^2} - \sigma_2^2} - \mu_2$. That is, E does not enter if the retailer does not disclose, but enters if the retailer discloses and $a_1 > a_1^+$.

Using Observation 1, and E's entry decision derived above, the retailer's expected profit under no disclosure and under disclosure, respectively, equals:

$$E\left\{\Pi_R|\phi\right\} = \int_{\underline{a}_2}^{\bar{a}_2}\int_{\underline{a}_1}^{\bar{a}_1}\left[\frac{a_1 + a_2}{4}\right]^2 dF_1(a_1)dF_2(a_2) \quad \text{and}$$
$$= [(\mu_1 + \mu_2)^2 + \sigma_1^2 + \sigma_2^2]/16$$

$$E\left\{\Pi_R|d\right\} = \int_{\underline{a}_2}^{\bar{a}_2}\int_{\underline{a}_1}^{a_1^+}\left[\frac{a_1 + a_2}{4}\right]^2 dF_1(a_1)dF_2(a_2) + \int_{\underline{a}_2}^{\bar{a}_2}\int_{a_1^+}^{\bar{a}_1}\left[\frac{a_1 + a_2}{2(2+\kappa)}\right]^2 dF_1(a_1)dF_2(a_2). \tag{A20}$$

Notice $\frac{a_1 + a_2}{4} > \frac{a_1 + a_2}{2(2+\kappa)}$. Hence, from (A20), the retailer prefers no disclosure, i.e., $E\left\{\Pi_R|\phi\right\} > E\left\{\Pi_R|d\right\}$. Further, using (A20) and the expression derived for a_1^+,

$$\frac{d\left[E\left\{\Pi_R|d\right\} - E\left\{\Pi_R|\phi\right\}\right]}{d\kappa} = -\frac{2[(\bar{a}_1 + a_2)^3 - (a_1^+ + a_2)^3] + 3[2+\kappa][a_1^+ + a_2][da_1^+ / d\kappa]}{12[2+\kappa]^3},$$

$$\text{where } \frac{da_1^+}{d\kappa} = \frac{32[2+\kappa]I}{[4+\kappa]^3[a_1^+ + \mu_1]} > 0. \tag{A21}$$

From (A21), and $\bar{a}_1 > a_1^+$, it follows that $d\left[E\left\{\Pi_R|d\right\} - E\left\{\Pi_R|\phi\right\}\right] / d\kappa < 0$. This completes the proof of Proposition 6. ■

Proof of Corollary 2. With $\kappa = 1$, part (i) of Proposition 5 applies, so the retailer prefers to disclose demand information. From Proposition 1, $z(1,1) = 7/22$. Using this in Proposition 2(i) yields $a_1^* = \frac{\sqrt{I - \sigma_2^2[7/22]^2}}{7/22} - \mu_2$, and then Proposition 2(ii) immediately yields the probability of entry. This completes the proof of Corollary 2. ■

Proof of Proposition 7. In the absence of entry, the retail quantity decisions as a function of the wholesale price are again as in (9). Given these quantities, the two-part tariff terms are obtained using Nash bargaining. The disagreement point for such bargaining corresponds to the outcome in the event *F* and *R* parties fail to reach contractual agreement. Clearly, in the no-agreement case, the firm does not utilize the retailer and serves as the monopolist in the retail market. Thus, the status quo payoffs are 0 for the retailer and $a^2/4$ for the firm (which supplies $a/2$ units to the retail market). Given the status quo payoffs, the Nash bargaining problem is presented in (A22):

$$\begin{aligned} \underset{w,T}{Max} \; & \left[(a - \hat{q}_F(w) - \gamma\hat{q}_R(w))\hat{q}_F(w) + w\hat{q}_R(w) + T - a^2/4\right]^{\beta} \times \\ & \left[(a - \hat{q}_R(w) - \gamma\hat{q}_F(w))\hat{q}_R(w) - w\hat{q}_R(w) - T\right]^{1-\beta}. \end{aligned} \tag{A22}$$

Solving the first-order conditions of (A22) yields the optimal two-part tariff terms. These values, and the corresponding retailer profit, are noted in (A23):

$$\hat{w} = \frac{a\gamma[2-\gamma]^2}{2[4-3\gamma^2]}; \; \hat{T} = \frac{a^2[1-\gamma]^2[3\gamma^2 + \beta(4-3\gamma^2)]}{[4-3\gamma^2]^2}; \text{ and } \hat{\Pi}_R = \frac{a^2[1-\gamma]^2[1-\beta]}{4-3\gamma^2}. \tag{A23}$$

With entry, the disagreement point profit for the retailer is again 0 since it is foreclosed. However, in this case, the firm does not enjoy monopoly power since it also faces competition from the entrant. Solving for standard duopoly competition between *F* and *E* yields that the firm's retail quantity is $a/[2+\kappa]$, and its disagreement point profit is

$a^2/[2+\kappa]^2$. Using this disagreement point and retail quantities from (4), the Nash bargaining problem with entry is as follows:

$$\underset{w,T}{Max}\ \left[(a-\tilde{q}_F(w)-\gamma\tilde{q}_R(w)-\kappa\tilde{q}_E(w))\tilde{q}_F(w)+w\tilde{q}_R(w)+T-a^2/[2+\kappa]^2\right]^{\beta}\times \left[(a-\tilde{q}_R(w)-\gamma\tilde{q}_F(w)-\kappa\tilde{q}_E(w))\tilde{q}_R(w)-w\tilde{q}_R(w)-T\right]^{1-\beta}. \tag{A24}$$

Solving the first-order conditions of (A24) yields optimal two-part tariff terms under entry. These terms, and the corresponding retailer profit, are as follows:

$$\tilde{w}=\frac{a[2-\gamma]^2[2-\kappa][\gamma-\kappa^2]}{2[8(1-\kappa^2)+\kappa^4-\gamma(6-\kappa^2)(\gamma-\kappa^2)]};$$

$$\tilde{T}=\frac{a^2[8(1-\gamma)+\gamma\kappa^2]^2[\kappa^2(8-\kappa^2)+2\gamma(6-\kappa^2)(\gamma-\kappa^2)+2\beta(8(1-\kappa^2)+\kappa^4-\gamma(6-\kappa^2)(\gamma-\kappa^2))]}{16[2+\kappa]^2[8(1-\kappa^2)+\kappa^4-\gamma(6-\kappa^2)(\gamma-\kappa^2)]^2};$$

$$\text{and } \tilde{\Pi}_R=\frac{a^2[8(1-\gamma)+\gamma\kappa^2]^2[1-\beta]}{8[2+\kappa]^2[8(1-\kappa^2)+\kappa^4-\gamma(6-\kappa^2)(\gamma-\kappa^2)]}. \tag{A25}$$

Using the same arguments as in the proof of Proposition 5, the retailer adopts a policy to disclose if and only if $\tilde{\Pi}_R>\hat{\Pi}_R$. From (A23) and (A25), $\tilde{\Pi}_R-\hat{\Pi}_R>0$ if and only if $g(\kappa,\gamma)>0$, where:

$$\begin{aligned} g(\kappa,\gamma) &= -8[32-24\kappa-32\kappa^2-4\kappa^3+4\kappa^4+\kappa^5]+\gamma^4[192+64\kappa-32\kappa^2-11\kappa^3]+ \\ &8\gamma^3[-48-34\kappa-16\kappa^2+4\kappa^4+\kappa^5]+\gamma^2[-64+528\kappa+608\kappa^2+60\kappa^3-96\kappa^4-24\kappa^5]+ \\ &8\gamma[64-64\kappa-88\kappa^2-10\kappa^3+12\kappa^4+3\kappa^5]. \end{aligned} \tag{A26}$$

Using (A26),

$$g(\kappa,1)=\kappa^3>0 \text{ and } g(\kappa,\kappa)=[2-\kappa]^2[-64+112\kappa+48\kappa^2-112\kappa^3-20\kappa^4+29\kappa^5+8\kappa^6]\ .$$

As before, if $g(\kappa,\kappa)>0$, then $g(\kappa,\gamma)>0$. The unique solution of $g(\kappa,\kappa)=0$, $0\le\kappa\le1$, is $\bar{\kappa}$. Thus, for $\kappa>\bar{\kappa}$, $g(\kappa,\gamma)>0$, proving part (i). For $\kappa\le\bar{\kappa}$, $g(\kappa,\kappa)\le0$. In this case, there is a unique γ-value in $[\bar{\kappa},1)$, denoted $\bar{\gamma}(\kappa)$, that solves $g(\kappa,\bar{\gamma}(\kappa))=0$. For $\gamma>\bar{\gamma}(\kappa)$, $g(\kappa,\gamma)>0$ and, for $\gamma\le\bar{\gamma}(\kappa)$, $g(\kappa,\gamma)\le0$. This proves part (ii). ■

References

Bagnoli, M. Watts, S. 2011. Competitive Intelligence and Disclosure. Purdue University working paper.

Berger, P. 2011. Challenges and opportunities in disclosure research – a discussion of 'The financial reporting environment: review of the recent literature.' *Journal of Accounting and Economics* 51, 204-218.

Beyer, A., Cohen, D., Lys, T., Walther, B. 2010. The financial reporting environment: review of the recent literature. *Journal of Accounting and Economics* 50, 296-343.

Darrough, M. 1993. Disclosure policy and competition: Cournot vs. Bertrand. *The Accounting Review* 68, 534-561.

Dye, R. 1986. Proprietary and nonproprietary disclosures. *The Journal of Business* 59, 331-366.

Dye, R. 2001. An evaluation of 'essays on disclosure' and the disclosure literature in accounting. *Journal of Accounting and Economics* 32, 181-235.

Gallini, N., Lutz, N. 1992. Dual distribution and royalty fees in franchising. *Journal of Law, Economics, and Organization* 8, 471-501.

Graham, J., Harvey, C., Rajgopal, S. 2005. The economic implications of corporate financial reporting. *Journal of Accounting and Economics* 40, 3-73.

Grossman, S. 1981. The role of warranties and private disclosure about product quality. *Journal of Law and Economics* 24, 461–483.

Grossman, S., Hart, O. 1980. Disclosure laws and takeover bids. *Journal of Finance* 35, 323-334.

Guo, R., Lev, B., Zhou, N. 2004. Disclosure and corporate governance. *Journal of Accounting Research* 42, 319-355.

Hwang, Y., Kirby, A. 2000. Competitive effects of disclosure in a strategic entry model. *Review of Accounting Studies* 5, 57-85.

Kalnins, A. 2004. An empirical analysis of territorial encroachment within franchised and company-owned branded chains. *Marketing Science* 23, 476-489.

Karuna, C. 2010. Industry product market competition and corporate voluntary disclosure: evidence from forward-looking line items at the industrial segment level. Working paper, University of Houston.

Li, X. 2010. The impacts of product market competition on the quantity and quality of voluntary disclosures. *Review of Accounting Studies* 15, 663-711.

Milgrom, P. 1981. Good news and bad news: representation theorems and applications. *Bell Journal of Economics* 12, 380–391.

Milgrom, P., Roberts, J. 1982. Limit pricing and entry under incomplete information: an equilibrium analysis. *Econometrica* 50, 443-459.

Newman, P., Sansing, R. 1993. Disclosure policies with multiple users. *Journal of Accounting Research* 31, 92-112.

Park, J., Seo, K. 2008. Bundling, information aggregation and entry deterrence. *Economics Letters* 101, 100-102.

Raith, M. 1996. A general model of information sharing in oligopoly. *Journal of Economic Theory* 71, 260-288.

Tedeschi, B. 09/26/2005. "New level of competition: When a supplier gets into its customers' business." *New York Times*.

Verrecchia, R. 2001. Essays on disclosure. *Journal of Accounting and Economics* 32, 97-180.

Vinhas, A., Anderson, E. 2005. How potential conflict drives channel structure: concurrent (direct and indirect) channels," *Journal of Marketing Research* 42, 507-515.