To Platform-Sell or Resell?
Channel Structures in Electronic Retailing
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Vibhanshu Abhishek, Kinshuk Jerath, Z. John Zhang
vibs@cmu.edu, kinshuk@cmu.edu, zjzhang@wharton.upenn.edu

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Abstract

Recent innovations in e-commerce have led to the emergence of online retail platforms, where online retailers (e-tailers) allow manufacturers direct access to their customers while charging a fee for providing this access. In this paper, we answer a key question that e-tailers are facing: When should they use a platform-selling format instead of using the more conventional reselling format? Using a theoretical model, we focus on the effects of two main factors on the resulting selling format in electronic retailing: competition among e-tailers, and reaction by the manufacturer due to the impact of the electronic channel on sales in the traditional channel (brick-and-mortar retailing). Our results suggest that whenever sales in the electronic channel lead to a negative effect on demand in the traditional channel, e-tailers prefer to set up platforms, whereas when sales in the electronic channel lead to substantial stimulation of demand in the traditional channel, e-tailers prefer reselling contracts with manufacturers. This preference is moderated by competition among e-tailers—as competition between them increases, e-tailers prefer to set up platforms. Interestingly, under certain conditions, all market participants are better off when platforms are used. We also analyze the effect that a new entrant has on the existing selling format in electronic retailing. We show that market entry can disrupt the existing format, and find the surprising result that, under certain conditions, consumers might face higher prices in the e-channel when there are competing e-tailers as opposed to when there is a monopolistic e-tailer.

Keywords: multi-channel retailing, electronic commerce, distribution channel, cross-channel spillovers, retail competition, game theory.
1 Introduction

Online retailing has witnessed strong growth in the last decade, resulting in online retail sales totaling US$ 176 billion in 2010 and accounting for 8% of total retail sales (Malpuru, 2011). Online retailers (also called “e-tailers”) have primarily been resellers (i.e., e-tailers purchase from manufacturers and resell to consumers online). More recently, however, retailing platforms such as Amazon Marketplace have emerged. Under this selling format, e-tailers allow manufacturers (or, more generally, upstream agents) direct access to customers through the retailing website for a fee, and the manufacturers make the decisions regarding key marketing variables such as retail prices.

Sellers of digital goods, especially sellers of e-books (Kindle, iPad), were the early adopters of retail platforms. However, online platforms are now widespread in industries as varied as consumer packaged goods (Alice), travel (Expedia, Travelocity) and vintage goods and arts (Etsy), while online “marketplaces” such as Amazon Marketplace and Marketplace at Sears.com use platform selling for hundreds of categories. Many manufacturers and content producers have also enthusiastically adopted the platform-selling format: book publishers such as Macmillan and Random House, and magazines such as The New Yorker, have started using platforms such as Kindle and iPad extensively for distribution of their content, and app and game developers use the Android and the iPhone platforms to reach out to their consumers. Platforms have become so commonplace for digital distribution that Eric Schmidt, the ex-CEO of Google, suggested that a platform war is brewing between companies such as Apple, Amazon, Google and Facebook (Wall Street Journal, 2011).

Online retailing is still in flux, and as it grows over time and increasingly influences traditional retailing, it is important to understand which selling formats will be adopted by competing e-tailers. Even though online platforms have become a pervasive phenomenon, the understanding of this phenomenon is limited. An important question that has been raised by practitioners is: What factors lead to the proliferation of e-commerce platforms and how are various market participants affected by the use of platforms? Our aim in this paper is to develop a deeper understanding of platform retailing, which can guide e-tailers in making the choice between using the historically dominant reselling format, and the novel platform-selling format.

In the reselling format, the e-tailer buys goods from the manufacturer for a fixed wholesale price and sets the retail price in the market (as practiced by Amazon for many of its products, iTunes and
Soap.com, among others). In the platform-selling format, the manufacturer sells directly to consumers on the retailer’s platform and sets the retail price, but needs to share a certain fraction of the revenues with the e-tailer for providing the selling platform (as practiced by Amazon Marketplace, Kindle, iBook Store and Alice, among others). An important distinction between these two formats is who sets the retail prices—in platform selling the retail prices are decided by the manufacturer, whereas in reselling they are decided by the e-tailer—and we focus on this distinction in this paper. Due to historical inertia and logistical constraints, the predominant format in online retailing has been reselling, but recent advances in e-commerce and logistics technologies have increased the feasibility and ease of platform selling. Nevertheless, although platform selling is becoming more popular, we observe that reselling continues to prevail as the dominant selling format in some mature digital industries such as music. In this research, we study different factors that affect the selling format in the e-channel across different industries.

The selling format used in electronic retailing has also been evolving as a consequence of the entry of new online retailers. For example, Amazon started by using a reselling agreement for e-books sold on the Kindle, an extension of its strategy for print books. With the introduction of the iPad and the iBook Store there was a disruption in the e-book market. Apple started using a platform-selling model for sales through the iPad, where the publishers could decide the prices of e-books but had to pay a certain fee (30%) to Apple for the use of its platform. There was an enormous amount of debate in the publishing industry addressing the advantages and disadvantages of both the reselling and the platform selling models. The publishers were largely unhappy with Amazon because they had no control over the prices of the e-books on Kindle, which they thought affected the sales of print books. This rift became so severe that it led to Amazon withdrawing not only Macmillan’s e-books but also, temporarily, its print books from Amazon.com (Stone and Rich, 2010). Eventually, after some negotiations, Amazon also instituted a platform-selling format for its e-books. In light of this controversy, two questions become important: First, given that manufacturers’ profits in previously-existing traditional channels are affected by the selling format that emerges in electronic retailing, how do manufacturers’ reactions influence the selling formats chosen by e-tailers? Second, how does the selling format of the e-channel evolve over time as new competitors enter the market, and what factors drive this evolution?

A key factor that plays a role in determining the selling format in online retailing is the degree of competition among e-tailers. Furthermore, in a multi-channel retailing environment, sales in one
channel may have an impact on sales in another channel. Several empirical studies suggest that sales in the electronic channel have a negative effect on sales in the traditional brick-and-mortar channel (Brynjolfsson et al. (2009) and Goolsbee (2001) show this for apparel and computers, respectively). Other studies suggest that the e-channel not only gives access to new consumers, but also has a strong stimulation effect on demand in the traditional channel (Smith and Telang (2010) show this for media, such as movies and music). Yet other studies suggest that effect of e-channel sales on traditional channel can be positive but small (Hilton and Wiley (2010) sho this for books). Such cross-channel effects impact the manufacturer’s aggregate profit from the two channels. In the presence of spillovers between channels, different selling formats in online retailing will induce different reactions from the manufacturer, because they will lead to different levels of sales in the e-channel which will impact the manufacturer’s sales in the traditional channel to different degrees. Therefore, when the e-tailers decide their selling formats, they will consider the reactions from the manufacturer under different kinds of spillovers. Essentially, different selling formats lead to different degrees of channel efficiency and pricing power for various players, the impact of which on players’ profits varies with the type of spillover. The equilibrium market structure is a result of the complex interactions among these factors. We build a parsimonious game theory model that captures these drivers and answers the questions posed earlier.

Our results show that if the e-channel has a negative cross-effect on demand in the traditional channel, it is optimal for the e-tailers to adopt the platform-selling agreement. On the other hand, if the e-channel has a strong positive cross-effect on demand in the traditional channel, the e-tailers prefer to adopt the reselling agreement. These results are directionally consistent with the retailing agreements we observe in different industries, as we discuss later. We also find that as the intensity of competition among e-tailers increases, they prefer platform selling over reselling.

Furthermore, an e-tailer might change the existing selling format when a competitor enters the market. We find that if the competition between the incumbent and the new entrant is intense, an incumbent reseller transitions to setting up a platform. However, under conditions of moderate competition, an incumbent platform seller becomes a reseller. A surprising result we find is that online consumers might face higher prices in the presence of competing e-tailers than in the presence of a monopolistic e-tailer.

Our research is closely related to three streams of literature: (i) interactions between the Internet and traditional channels, (ii) retail competition within a channel, and (iii) platforms and two-sided markets. We now describe how our research relates to the literature in the these areas.
A growing stream of literature looks at the interactions between traditional and electronic channels. Balasubramanian (1998) models a horizontally-differentiated traditional channel and analyzes how this channel changes in the presence of an Internet retailer. He shows that the e-tailer acts as a wedge between the competing retailers and the retailers compete with the e-tailer instead of competing with each other. Yoo and Lee (2011) extend the Balasubramanian model to account for heterogeneous customer preferences for the e-channel, and show that introduction of the e-channel does not necessarily intensify competition, a result contrary to common intuition. Chiang et al. (2003) and Zettelmeyer (2000) suggest that a manufacturer can directly sell through the e-channel to improve its bargaining position versus a traditional retailer. These papers focus on the impact on the traditional market due to the introduction of the electronic channel. Our research differs in two distinct ways. First, we focus on the equilibrium selling formats in electronic retailing in the presence of interactions with the traditional channel, as opposed to focusing on the effect of e-channel introduction on traditional retail. Second, most research in this area assumes that the e-channel cannibalizes sales from the traditional channel. Noting that several studies show that sales in the e-channel can also stimulate demand in the traditional channel, we extend the analytical literature in this area by analyzing the impact on selling formats in the e-channel under both positive and negative spillovers from the e-channel into the traditional channel.

Our work is also related to the rich stream of literature on the determinants of vertical channel structure. McGuire and Staelin (1983), Bernheim and Whinston (1985), Bonanno and Vickers (1988), Coughlan (1985), Coughlan and Wernerfelt (1989) and Moorthy (1988) focus on the equilibrium channel structure when the manufacturers are the architects of the channel. Recent work in channels has been motivated by the observation that retailers are increasingly gaining greater power in the channel (Iyer and Villas-Boas, 2003, Raju and Zhang, 2005, Geylani et al., 2006). Jerath and Zhang (2010) study the equilibrium channel structure when a monopolistic retailer is the architect of the channel. Specifically, they study when a traditional retailer allows manufacturers to set up stores within a store (which can be considered as the brick-and-mortar analogue to online platforms). Our research, however, focuses on competing retailers and inter-channel spillovers, which is important in a multi-channel setting. Various other papers analyze contracts in channels assuming the channel structure to be exogenous (Cachon and Kok, 2010, Choi, 1991, Desai et al., 2004, Jeuland and Shugan, 1983, Iyer, 1998).

A key question that we address in this paper is: When should an e-tailer set up a platform? This is related to the nascent literature on platform retailing (Jiang et al., 2011) and the literature on two-
sided markets (Parker and Alstyne, 2005, Rochet and Tirole, 2003). Jiang et al. (2011) consider the phenomenon of strategic underselling by agents selling on platforms under the threat of being replaced by the platform owner, while we study a completely different problem—when will a platform structure be adopted in an electronic market. In relation to two-sided markets, we model consumers using a reduced-form (passive) demand function, i.e., we do not explicitly model the two-sided market aspect. This is because we want to identify the effect of online competition and spillover effects on the resulting selling formats, and isolate these phenomena from the phenomena that are typically invoked in a two-sided market setting. Moreover, the dynamics of two-sided markets are equally important in both the reselling and platform-selling formats (as in both these cases the e-tailers would want to attract more manufacturers on one side to increase variety and more consumers on the other side to drive up volume on the e-channel). We leave the incorporation of two-sided networks into our problem setting for future research.

The rest of the paper is organized as follows. In the next section, we describe our model. In Section 3, we analyze the different selling formats that are possible, and derive the equilibrium formats that emerge in the e-channel under different conditions. In Section 4, we discuss the evolution of the selling format when the market transitions from a monopoly to a competitive regime. In Section 5, we present some extensions to our basic model. In Section 5, we conclude and discuss some shortcomings of our research along with directions for future work.

2 Model

We consider a manufacturer (M) who sells a product on the electronic channel (E) through two symmetric “pure play” electronic retailers (e-tailer A and e-tailer B). Pure play implies that retailers only have an electronic/online presence. In the rest if the paper, we refer to the manufacturer as “him” and to the e-tailers as “her.”

2.1 Channel Structures

Different market configurations are possible in this setting based on the contractual agreements between the manufacturer and the e-tailers. An e-tailer can enter into a reselling agreement (denoted by R) with the manufacturer, in which case the e-tailer buys the product from the manufacturer at a fixed wholesale
price and decides the retail price for the consumer. This is similar to the selling format that is commonly
used in brick-and-mortar retailing. Alternately, the e-tailer can enter into a platform-selling agreement
(denoted by \( P \)) and allow the manufacturer to use the retail platform to sell its products directly to
consumers. In this arrangement, the manufacturer determines the retail price but has to pay the e-tailer
a fraction \( \alpha, 0 \leq \alpha \leq 1 \), of its revenues as fee for use of the platform. Such a fee structure is used by
most online platforms, e.g., Amazon Marketplace, Travelocity, Alice, iPhone App Store, iBook Store
and Kindle.\(^1\) Note that, the key distinction between the two arrangements that we focus on is whether
the manufacturer or the retailer has the ability to decide price.\(^2\)

The e-tailers independently and simultaneously choose either the reselling or the platform-selling
format. We endow the e-tailers with the power to make this decision because online retailers have
large customer bases and extensive reach which offers them substantial power in determining the selling
format that they want to use. Note, however, that in making these decisions the e-tailers will consider
the subsequent reactions they expect from the manufacturer. The e-tailers’ decisions lead to three
possible configurations in the market:

1. **RR** — Both e-tailers are resellers; we name this the *wholesale* configuration.

2. **RP** — E-tailer A chooses to sell the product as a reseller and e-tailer B enters into a platform-
selling arrangement with the manufacturer; we name this the *hybrid* configuration. Note that the
\( RP \) and \( PR \) arrangements are the same as the e-tailers are indistinguishable.

3. **PP** — Both e-tailers enter into platform-selling agreements with the manufacturer; we name this
the *platform* configuration.

\(^1\)In addition to the percentage fee, platform providers sometimes charge the sellers a small fixed fee as well. For instance,
Amazon Marketplace charges a small fee of $39 per month to sellers who want to sell regularly over a long time horizon
on its platform. This fee gives the sellers access to certain infrastructure services such as easy interfaces for uploading and
displaying product information. Note that, because even small professional sellers have monthly sales much higher than
many thousands of dollars, this small fee is, in all probability, *not* levied as part of a two-part tariff with the intent of
coordinating the channel.

\(^2\)There are other distinctions that we do not consider in this paper. For instance, who provides service and how much,
and whether the service provided is observable, is an important issue (Jerath and Zhang, 2010, Jiang et al., 2011). Another
important distinction, related to logistical issues, is that under reselling the e-tailer owns the inventory and is responsible
for order fulfillment, whereas under platform selling the manufacturer owns the inventory and is responsible for order
fulfillment. While this may not be important in the case of information goods because delivery is virtually costless, it
may be important in the case of physical goods because delivery entails a cost. We do not model this distinction between
the two contractual agreements in our model and assume that fulfillment entails a costless transfer to the consumer, an
assumption invoked in most previous studies on channels.
2.2 Demand Specification

Electronic Channel

We assume the two e-tailers to be symmetric and differentiated, and model the demand in the e-channel using the following linear demand system:

\[
q_A = \frac{1}{1 + \beta} - \frac{1}{1 - \beta^2} p_A + \frac{\beta}{1 - \beta^2} p_B, \\
q_B = \frac{1}{1 + \beta} - \frac{1}{1 - \beta^2} p_B + \frac{\beta}{1 - \beta^2} p_A, 
\]

(1)

where \( q_i \) is the quantity of the product sold at e-tailer \( i \) and \( p_i \) is the retail price charged by e-tailer \( i, i \in \{A, B\} \). Linear demand models have been used in the marketing and economics literatures previously to model differentiated duopolies (Jerath and Zhang, 2010, McGuire and Staelin, 1983, Singh and Vives, 1984). The demand system above gives us a model of partial competition where \( \beta \in [0, 1) \) is the parameter that captures the degree of differentiation between the two e-tailers. If \( \beta = 0 \), then both retailers act as monopolies in their respective markets. If \( \beta = 1 \), the market is perfectly competitive and we observe Bertrand competition. Intermediate values of \( \beta \) represent different degrees of differentiation.

The degree of competition is specific for a particular industry.\(^3\) We also assume that the manufacturer can reach the consumers in this electronic market only through these e-tailers. The total demand faced by the manufacturer through the electronic channel is given by \( q_E = q_A + q_B \).

Traditional Channel

There is an existing (traditional) retail channel where the manufacturer sells goods at a per-unit price normalized to $1, and faces a base demand \( \bar{Q} \) in the absence of the electronic channel. It is important to note that we do not assume that the manufacturer necessarily sells identical products through the two channels.\(^4\) Although the manufacturer sells the same product through the e-tailers, these goods can still be differentiated from the perspective of a consumer. For example, the experience of reading an e-book on the iPad is very different from the experience of reading the same e-book on the Kindle, and this can affect consumer’s preference for Apple or Amazon. More broadly, differentiation between e-tailers could arise due to membership programs, website layout, other products offered by the e-tailers, etc. Based on how salient these differences are from the consumers’ perspective, the e-tailers might compete very aggressively or not so aggressively.

\(^4\)The demand system we use has the desirable characteristics that as the differentiation increases (i.e., value of \( \beta \) decreases), the sensitivity to price, \( 1/(1 - \beta^2) \), decreases (consistent with the intuition that customers are less price sensitive for more differentiated products), and the size of the total potential market, \( 2/(1 + \beta) \), increases (consistent with the intuition that more differentiated products reach a wider customer base). We have also tried other popular demand systems, e.g., \( q_i = 1 - p_i + \beta p_j, i, j \in \{A, B\}, \beta \in [0, 1) \), and we obtain the same results.
channels; he may sell the same product or different products through the two channels. For example, a publisher of books may sell e-books through the online channel and print books (same and different titles) through the traditional channel. Similarly, a music producer or artist may sell individual mp3 tracks online, and sell album CDs, concert tickets and airplay rights offline.

The sales of the product in the traditional channel are affected by the sales in the new electronic channel. We model this by assuming that sales in the traditional channel are now \( \bar{Q} + q_E \), where \( q_E \) denotes the total sales in the e-channel, and the parameter \( \tau \) captures the cross-channel effect that the e-channel imposes on sales through the existing channel. In our analysis, we consider \( \tau \in [-1, 1]. \)\(^5\) This formulation models, in a reduced-form way, an increase (\( \tau > 0 \)), or decrease (\( \tau < 0 \)), or no effect (\( \tau = 0 \)) in traditional sales due to every unit sold through the e-channel.

\( \tau > 0 \) implies a positive cross-effect, i.e., every sale in the e-channel leads to \( \tau \) units of increased sales in the traditional channel. One factor driving this increase could be word-of-mouth, e.g., when a consumer purchases an e-book on the Kindle and discusses it with his friends, they might buy the print version of the book from a bookstore. Hilton and Wiley (2010) find that availability of e-books leads to a moderate increase in the sales of print books, indicating that \( \tau \) might be positive and small/moderate for books. For media products, such as movies and music, we see strong evidence of positive externalities (Smith and Telang, 2010). For example, positive cross-effects are present in the music industry in which several independent artists and, more recently, popular bands such as Coldplay, even give away their music online for free to promote concert attendance and generate demand for airplay. The e-channel

\(^5\)For \( \tau < -1 \), in our model, the negative externality imposed is so strong that the manufacturer would not want to sell through the electronic channel at all.
might also complement the traditional channel by providing information to consumers and driving sales through traditional channels. A recent study suggests that around 87% of consumers research for products online before they make in-store purchases, implying that online channels might complement traditional retail (Sterling, 2010). On the other hand, various studies also find that, in certain cases, the online channel has a negative cross-effect on sales through the traditional channel, i.e., $\tau < 0$. This might be attributed to cannibalization, i.e., consumers who buy online are less likely to go into stores to buy the product, which could happen for consumer packaged goods sold at online stores like Soap.com and Alice (Brynjolfsson et al., 2009, Goolsbee, 2001). Given that studies show that cross-effects can be negative or positive (or absent) in different cases, our model is flexible enough to capture all of these cross-effects and understand their implications on the selling formats that will result in the e-channel. Note that many different factors may be at play simultaneously in determining the aggregate effect of how demand in different channels interacts in a multi-channel scenario.\(^6\) Our reduced-form way of modeling cross-effects is meant to capture the aggregate cross-channel effect. Future research can look into the impact of different factors in isolation by micro-modeling them.\(^7\)

In our basic model, we also assume for simplicity that the impact on demand in the traditional channel from sales on the e-channel does not influence prices in the traditional channel. This can be due to several reasons. One reason is that the baseline demand, $\bar{Q}$, is sufficiently high compared to the magnitude of the spillover, and therefore prices are not influenced much (in support of this, note that online sales only account for about 8% of total retail sales). Other reasons can be high menu costs, established reference prices and operational reasons. For example, the prices of print books have remained largely unaffected by e-book pricing. One could argue that this is due to a combination of historically-established reference prices in the minds of consumers as well as operational difficulties (e.g., prices are printed on books and can’t be changed with frequent changes in e-book prices). Nevertheless, in Section ??, we relax this assumption and show that the qualitative nature of the findings do not change when the prices in the traditional channel are chosen endogenously.

Given the above, the profit of the manufacturer depends on the profit from the e-channel, sales on

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\(^6\)The different factors at play simultaneously may include demand expansion after a new channel is introduced, a segment of consumers switching between channels due to price differences, and different products being offered on different channels (e.g., e-books through the e-channel and collector’s editions through the traditional channel; music singles through the e-channel and album CDs, concert tickets and airplay rights through the other channel).

\(^7\)On incorporating one such important factor into our model, specifically, introducing a segment of consumers who choose between the e-channel and the traditional channel by comparing prices, both of which are endogenous, our basic insights continue to hold. This indicates the robustness of our results.
<table>
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| Table 1: Notation |

the traditional channel and the spillover effects of the e-channel on the traditional channel, and is given by

$$\pi_M = 1 \cdot (\bar{Q} + \tau q_E) + \pi_E,$$

where $q_E$ is the total demand in the electronic channel and $\pi_E$ is the profit from the electronic channel which depends on the e-channel structure—$RR$, $RP$, or $PP$. Therefore, the manufacturer will react to the selling format in the e-channel, and the e-tailers have to consider this reaction while making their selling format decisions. A summary of notation used is presented in Table 1.

### 3 Analysis

In this section, we characterize the equilibrium outcomes under the three configurations of the e-channel—$RR$, $RP$ and $PP$. Following this, we derive which of these configurations will be observed in equilibrium for different combinations of values of market competition ($\beta$) and cross-channel effect ($\tau$), and the impact on different market players of the resulting arrangement. We also derive insights on platform management by e-tailers.
3.1 Analysis of Different Configurations in the E-Channel

3.1.1 Electronic Channel with Two Resellers (RR)

In this configuration, both e-tailers purchase the product at a fixed wholesale price from the manufacturer and then set retail prices. First, the manufacturer decides the wholesale price it will charge to both e-tailers. The e-tailers then individually decide if they wish to accept this wholesale price or choose an outside option (which we normalize to zero). If the e-tailers accept, they set the retail prices. This arrangement is illustrated in Figure 2(a). The profits of the manufacturer and the two e-tailers can be written as

\[ \pi^{RR}_M = 1 \cdot (\bar{Q} + \tau q_E) + w(q_A + q_B), \quad \pi^{RR}_i = q_i(p_i - w), \quad i \in \{A, B\} \]  

(2)

where \( w \) is the wholesale price, \( p_i \) is the price charged by e-tailer \( i \) and \( q_i \) is the quantity sold by e-tailer \( i \). We solve this subgame using backward induction. The equilibrium prices and quantities under this configuration are as follow:

\[ w^{RR} = \frac{1 - \tau}{2}, \quad p^{RR}_A = p^{RR}_B = \frac{3 - 2\beta - \tau}{2(2 - \beta)}, \quad q^{RR}_A = q^{RR}_B = \frac{1 + \tau}{2(2 - \beta)(1 + \beta)}. \]

Note that the wholesale price decreases linearly with the spillover effect. This is because, if \( \tau \) is negative, then more sales in the e-channel will decrease sales in the traditional channel, and the manufacturer
keeps wholesale price high to induce high retail prices and sell less in the e-channel. As \( \tau \) increases and becomes positive, the effects are reversed and the manufacturer wants to increase sales in the e-channel by charging a low wholesale price to induce low retail prices. The equilibrium payoffs are as follow:

\[
\begin{align*}
\pi_{RR}^M &= \frac{(1 + \tau)^2}{2(2 - \beta)(1 + \beta)}, \\
\pi_{RR}^{ME} &= \frac{1 - \tau^2}{2(2 - \beta)(1 + \beta)}, \\
\pi_{i}^{RR} &= \frac{(1 - \beta)(1 + \tau)^2}{4(2 - \beta)^2(1 + \beta)} \quad \forall i \in A, B.
\end{align*}
\]

It is easy to see that both \( \pi_{RR}^M \) and \( \pi_{i}^{RR} \) are convex and increasing in \( \tau \) whereas \( \pi_{RR}^{ME} \) is concave in \( \tau \) and achieves a maximum when \( \tau = 0 \).

### 3.1.2 Electronic Channel with One Platform and One Reseller (RP)

In this configuration, one of the e-tailers uses platform selling and the other e-tailer sells as a reseller. The timing of this subgame is as follows. First, the e-tailer willing to enter into a platform-selling agreement announces the platform fee, \( \alpha \), which is the fraction of the revenue she will keep for each item sold on the platform. Without loss of generality we assume that B sets up the platform in this configuration. Next, after observing the platform fee, the manufacturer decides whether he wants to sell through the platform or only through the reseller (we find that M always sells through the reseller). He simultaneously announces the wholesale price \( w \) for the reseller (A). Following this, A decides the retail price \( p_A \) that it will charge, and the manufacturer decides the retail price \( p_B \) on the platform provided by B. This arrangement is illustrated in Figure 2(b). If M decides to sell through both e-tailers his profit is:

\[
\pi_{M}^{RP} = 1.(\bar{Q} + \tau q_E) + q_A w + (1 - \alpha)q_B p_B.
\]

If he decides to sell only through the reseller, we assume that the price on the platform is such that there are no sales through the platform.\(^8\) In this case, the manufacturer’s and the e-tailers’ payoffs are given by:

\[
\pi_{M}^{RP} = 1.(\bar{Q} + \tau q_A) + wq_A, \quad \pi_{A}^{RP} = q_A(p_A - w), \quad \pi_{B}^{RP} = \begin{cases} 
\alpha q_B p_B & \text{if } M \text{ sells through E2} \\
0 & \text{otherwise}
\end{cases}.
\]

\(^8\)We model zero sales on platform \( j(\neq i) \) by setting \( q_j = 0 \), or \( \frac{1}{1 + \beta} - \frac{1}{1 - \beta^2} p_j + \frac{\beta}{1 - \beta^2} p_i = 0 \Rightarrow p_j = 1 - \beta + \beta p_i. \)
If the manufacturer chooses to sell through both the e-tailers, we observe the following prices in the electronic channel:

\[ p_{RP}^A = \frac{w(2(1 - \alpha) + \beta^2) + (1 - \beta)(1 - \alpha)(2 + \beta) - \beta \tau}{(1 - \alpha)(4 - \beta^2)}, \quad p_{RP}^B = \frac{w(3 - \alpha)\beta + (1 - \beta)(1 - \alpha)(2 + \beta) - 2\tau}{(1 - \alpha)(4 - \beta^2)}. \]

The optimal wholesale price for e-tailer A in this case, conditional on \( \alpha \), is given by:

\[ w_{RP}^A = \frac{(1 - \beta)\{(1 - \alpha)(2 + \beta)(4 + \beta(2(1 - 2\alpha) - \beta(1 - \beta))) + (\alpha(8 + 2(2 - \beta)\beta) - (1 + \beta)(8 + (2 - \beta)\beta^2))\tau\}}{2(\beta^4 + (1 - \alpha)((7 - \alpha)\beta^2 - 8))}, \]

which is linearly increasing in \( \tau \) (as in the wholesale case).

If the manufacturer chooses to sell only through the reseller, we observe the following wholesale and retail prices in the electronic channel:

\[ w_{RP} = \frac{1 - \tau}{2}, \quad p_{RP}^A = \frac{3 - \tau}{4}. \]

Note that the optimal wholesale price above is the same as in the wholesale (RR) case.

We find that, in equilibrium, the manufacturer sells through both e-tailers. We compute the optimal fee \( \alpha_{RP}^* \) numerically over the entire parameter space, as solving for it analytically is challenging. We observe that the wholesale price in this case is weakly lower than the wholesale prices offered in the wholesale (RR) case, i.e., \( w_{RP}^* \leq w_{RR}^* \), and the retail prices at both the e-tailers are lower than the retail prices in the wholesale case, i.e., \( p_{RP}^{RR} \leq p_{RR}^{RP} \).

### 3.1.3 Electronic Channel with Two Platforms (PP)

In this configuration, both e-tailers are platform sellers. First, the e-tailers announce the platform fees \( \alpha_A \) and \( \alpha_B \). The manufacturer then decides whether he wants to sell through A or B or both. Once he decides which platforms he wants to sell through, he decides the retail prices. This arrangement is illustrated in Figure 2(c). If the manufacturer chooses both platforms, his profit can be written as follows:

\[ \pi_{PM}^{PP} = 1.(\bar{Q} + \tau q_E) + (1 - \alpha_A)q_{AP} + (1 - \alpha_B)q_{BP}. \]

If the fee charged by an e-tailer is too high, the manufacturer might decide not to use the e-tailer’s platform for selling his products. Under this condition, when he chooses to sell only through one e-tailer
(say $i$), his profits and the e-tailer’s profits are:

$$\pi_M^{PP} = 1.\overline{(Q + \tau q_i)} + (1 - \alpha_i)q_i p_i, \quad \pi_i^{PP} = \begin{cases} \alpha_i q_i p_i & \text{if M sells through } i, \\ 0 & \text{otherwise} \end{cases}$$

If the manufacturer chooses to sell through both e-tailers, we observe the following retail prices in the electronic channel

$$p_i^{PP} = \frac{(1 - \beta) \left( (1 - \alpha_i)^2 \beta - (1 - \alpha_j^P) \beta \tau + (1 - \alpha_j^P)(2 + \beta)(1 - \alpha_j^P + \tau) \right)}{4(1 - \alpha_i^P)(1 - \alpha_j^P) - (2 - \alpha_i^P - \alpha_j^P)^2 \beta^2}, \quad i, j \in \{A, B\}, i \neq j.$$  

In case the manufacturer wishes to sell only on platform $i$, we set the quantity sold on the other platform to be zero, i.e., $q_j = 0$, by using a similar treatment as in the hybrid case. The retail price on platform $i$ is then given by

$$p_i = \frac{1}{2} \left( 1 - \frac{\tau}{1 - \alpha_i} \right).$$

We find that, in equilibrium, the platform fees are such that the manufacturer sells through both e-tailers. There is a unique and symmetric equilibrium in the fees charged by the e-tailers, given by $\alpha_A = \alpha_B = \alpha_{PP}^*$, where

$$\alpha_{PP}^* = 1 - \frac{1}{3} \left( \beta(\beta - 2\tau) + K^{1/3} + \frac{\beta^4 + 6\beta \tau - 4\beta^3 \tau - 3\tau^2 + 4\beta^2 \tau^2}{K^{1/3}} \right)$$

and $K = 3\sqrt{3} \sqrt{(1 - \beta^2) \tau^2 (\beta^6 + 2\beta^3 (5 - 3\beta^2) \tau + 3 (9 - 11\beta^2 + 4\beta^4) \tau^2 + 4\beta (3 - 2\beta^2) \tau^3 + \tau^4) + \beta^6 + 9\beta^5 \tau - 6\beta^5 \tau + 3 (3 - 2\beta^2)^2 \tau^2 + \beta (9 - 8\beta^2) \tau^3}.$

The equilibrium prices and quantities as a function of platform fee are as follow:

$$p_i^P = \frac{1 - \alpha_{PP}^* - \tau}{2(1 - \alpha_{PP}^*)}, \quad q_i^P = \frac{1 - \alpha_{PP}^* + \tau}{2(1 + \beta)(1 - \alpha_{PP}^*)}, \quad \forall i \in \{A, B\}. \quad (4)$$

Note that, after conditioning on the platform fees, the prices above do not depend directly on the level of market competition ($\beta$). This is because the prices for both e-tailers are jointly set by the manufacturer.

We can see from (4) above that $\tau$ has two effects on the retail prices—a direct effect, and an
indirect effect through \( \alpha^*_{pp} \). The direct effect leads to the reduction of prices as \( \tau \) increases, because the manufacturer wants to sell more in the e-channel to advantage of the spillover into the traditional channel. The indirect effect of \( \tau \) manifests itself through \( \alpha^*_{pp} \), which increases or decreases in \( \tau \) under different conditions. When \( \alpha^*_{pp} \) increases in \( \tau \), the indirect effect leads to a further reduction in prices (beyond the direct effect). This is because a larger fee means that the manufacturer can keep lesser revenue per unit, so has the incentive to reduce the price. On the other hand, when \( \alpha^*_{pp} \) decreases in \( \tau \), the indirect effect leads to an increase in prices. This is because a smaller fee means that the manufacturer can keep more revenue per unit, so has the incentive to increase the price. In this case, while the overall effect of \( \tau \) on the prices is a combination of these two effects, the direct effect dominates the indirect effect and prices always decrease with \( \tau \). The equilibrium payoffs for the manufacturer and the retailers are as follow:

\[
\begin{align*}
\pi^M_{PP} &= Q + \frac{(1 - \alpha^*_{pp} + \tau)^2}{2(1 - \alpha^*_{pp})(1 + \beta)}, \\
\pi^E_{PP} &= \frac{(1 - \alpha^*_{pp})(1 - \alpha^*_{pp})^2 - \tau^2}{2(1 - \alpha^*_{pp})(1 + \beta)}, \\
\pi^i_{PP} &= \frac{a^*_{pp}[(1 - \alpha^*_{pp})^2 - \tau^2]}{4(1 - \alpha^*_{pp})^2(1 + \beta)} \quad \forall i \in \{A, B\}.
\end{align*}
\]

\( \tau \) has both a direct and an indirect effect (through \( \alpha^*_{pp} \)) on the manufacturer’s total profits also. The direct effect leads to an increase in profits as \( \tau \) increases. However, when \( \alpha^*_{pp} \) increases in \( \tau \), the manufacturer’s profits might actually decrease because he keeps a smaller fraction of the e-channel revenue. In this case, we observe that the profits are non-monotonic in the spillover.

A summary of the relationships between the different equilibrium quantities under the three different e-channel structures is presented in Table 2.
3.2 Equilibrium Selling Formats

Using the solutions of the different sub-games studied in the previous section, we now solve the first stage of the game in which the competing e-tailers determine the selling formats they will adopt. The following matrix represents the game between the e-tailers in strategic form.

<table>
<thead>
<tr>
<th>E-tailer A</th>
<th>P</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>$\pi_{P}^{PP}$, $\pi_{B}^{PP}$</td>
<td>$\pi_{B}^{RP}$, $\pi_{A}^{RP}$</td>
</tr>
<tr>
<td>R</td>
<td>$\pi_{A}^{RP}$, $\pi_{B}^{RP}$</td>
<td>$\pi_{A}^{RR}$, $\pi_{B}^{RR}$</td>
</tr>
</tbody>
</table>

Note that we have only two exogenous parameters—$\beta$ and $\tau$. We solve the preceding $2 \times 2$ game for every tuple $(\beta, \tau)$ to derive the selling formats adopted by the e-tailers in equilibrium. From the e-tailers' perspectives, different formats offer them varying levels of channel efficiency and pricing power. The resulting equilibrium configuration depends on the degree of competition and the cross-channel spillover. The equilibrium selling formats for all allowable values of $\beta$ and $\tau$ are described in the following proposition and illustrated in Figure 3.

**Proposition 1** For any given $\beta$, both e-tailers prefer platform-selling for negative or low positive spillovers, both e-tailers prefer reselling for high positive spillovers, and one e-tailer prefers platform-selling with the other preferring reselling for medium positive spillovers.
We now discuss the insights behind this pattern. First, different selling formats lead to different channel efficiency. In reselling, the manufacturer sets the wholesale price, followed by each e-tailer setting her retail price, which leads to the problem of double marginalization. In platform selling, where a percentage fee structure is used, if the manufacturer sets a higher retail price, he also has to pay a larger amount as fee to the e-tailer, which leads to a downward pressure on prices. In other words, the problem of double marginalization is reduced in the case of platform selling, and the channel is more efficient as compared to the reselling agreement. Furthermore, the e-tailer have more control of the channel in the platform format because they are Stackelberg leaders in the fee-and-pricing game (after the selling format decision stage of the game). If there were no spillover effects, the e-tailers would always prefer the platform-selling format.

The source of mis-alignment between the manufacturer and the e-tailer above is that the transfer price has opposite effects on the profits of the manufacturer and the e-tailer (e.g., a smaller wholesale price in reselling helps the e-tailer but hurts the manufacturer, and vice versa, while a smaller platform fee in platform selling helps the manufacturer but hurts the e-tailer, and vice versa). When faced with spillovers, the incentives of the manufacturer and the e-tailers are further mis-aligned due to another reason. This is because the manufacturer wants to maximize profits keeping both channels (electronic and traditional) in mind, whereas the pure-play e-tailers want to maximize the profits they derive from the electronic channel alone. In the case of a negative cross-effect of e-channel sales on traditional channel sales, the manufacturer has the incentive to limit e-channel sales. Therefore, if a reselling agreement is chosen, the manufacturer will set a high wholesale price for the e-tailer which, in turn, will lead to higher retail prices and limit the negative spillover into the traditional channel. However, this implies that the double marginalization problem will worsen in the e-channel. Therefore, the e-tailers have the incentive to choose platform selling which increases channel efficiency, as discussed above. In addition, the e-tailers can also charge lower fees on their platforms, which gives the manufacturer greater incentive to sell through the e-channel. Therefore, if e-channel sales have a negative cross-effect on traditional channel sales, the e-tailers will prefer platform selling.

When e-channel sales lead to a positive cross-effect on traditional sales, the manufacturer has the incentive to increase e-channel sales through lower e-channel prices. In the platform arrangement, the manufacturer has control over the retail price, and will charge a retail price lower than the efficient retail price of the e-channel. This reduces the e-tailers’ realized fees as well, and hurts their profits.
On the other hand, in reselling, not only do the e-tailers control the final retail price, the manufacturer is willing to charge lower wholesale prices to the e-tailers to keep retail prices low. Therefore, if the spillover effect is positive and large, the e-tailers prefer the reselling agreement.

Finally, when the spillover effect is positive and medium, the channel structure is mixed, which is surprising because ex-ante symmetric e-tailers use asymmetric channel structures. In the mixed structure, the platform format maintains efficiency, while reselling format prevents retail prices from going too low in the e-channel.

To summarize, depending on the degree of competition in a particular market, and the effect of the spillover into the traditional market (which determines how the manufacturer will respond in prices), the e-tailers either prefer to have a more efficient vertical channel by using platforms, or have increased pricing power by using reselling.

The results in Proposition 1 are consistent with observed selling formats in certain industries. Specifically, we find that platform selling should be preferred under a negative or small positive cross-effect. In the airline industry, where we can expect a negative effect on traditional sales (e.g., sales through travel agents) as online sales increase, we see that most online travel sites such as Expedia and Travelocity have platform-selling agreements with airlines and hotels, which set retail prices. In the case of books, where the cross-effect is small positive (Hilton and Wiley, 2010), our model again predicts that we should observe platforms, which is indeed the format used by competing e-book stores run by Amazon and Apple. On the other hand, we find that reselling should be preferred under a positive cross-effect. In industries such as music, where there are strong stimulation effects (e.g., more song and album sales lead to more revenues to artists from other channels, such as more airplay and concert collections), we observe that most online music stores, e.g., iTunes and Spotify, have a reselling agreement with artists and record labels.

We now discuss how the selling formats in the e-channel vary with the intensity of competition in the market. In the presence of competing e-tailers, an advantage of platform selling is that retail prices are jointly set for both retailers by the manufacturer, which cushions competition at the retail level. In addition, the e-tailers are Stackelberg leaders in the market, which gives them more control over the channel. Thus, we expect to see that as competition increases, platform selling will be preferred more by both e-tailers. In Figure 3, when $\tau$ takes medium and large positive values, we see that as the value of the competition parameter $\beta$ increases, the e-tailers prefer to adopt the platform arrangement. (For
negative and small positive values of \( \tau \), the e-tailers are already in the platform arrangement for all values of \( \beta \).) We state this result in the proposition below.

**Proposition 2** As competition in the market increases, the e-tailers’ preferences shift from reselling to platform selling. If the spillover is sufficiently positive, as competition increases, the e-tailers switch from the RR arrangement to the RP and the PP arrangements.

This result complements the findings of McGuire and Staelin (1983). In their case, as competition increases, the manufacturers choose reselling (or, in their terminology, vertical separation), whereas in our case, as competition increases, there is a shift away from reselling and towards platform selling. The difference arises because in their setting manufacturers decide the channel structure, while in our setting e-tailers decide the channel structure.

Interestingly, under conditions of moderate spillover, we see a hybrid channel structure even though the e-tailers are ex-ante indistinguishable. Choosing two different retail formats also helps reduce the competition between the e-tailers,\(^9\) and they make more profits than they could have if they had both chosen the same retail format. Not only does the reseller (e-tailer A) face a lower wholesale fee, but the platform seller (e-tailer B) can also charge higher platform fee. (This explains why the manufacturer never prefers the hybrid arrangement, a fact we use in the next section.) Therefore, when the spillover is moderate, we see an asymmetric configuration in the e-channel.

### 3.3 Beneficiaries Under the Platform-Selling Format

The platform-selling format confers different powers to the manufacturer and the e-tailers under different conditions, and its adoption might lead to gains or losses for the players in comparison to the reselling structure. Given that the retailers decide the equilibrium selling formats, is the manufacturer always worse off under the equilibrium selling formats in the e-channel?

The manufacturer is the Stackelberg leader in the reselling arrangement as it decides the wholesale prices first, while it is a Stackelberg follower in the platform arrangement as the e-tailers decide the platform fees first. Therefore, generally speaking, the manufacturer prefers the reselling arrangement. However, in the presence of spillovers, the manufacturer wants to control the final retail price in the

\(^9\)Note that the hybrid channel structure is not seen when there is no market competition, i.e., \( \beta = 0 \), and it gains more prominence as the market competition increases. This points to the fact that the emergence of this arrangement in equilibrium is driven by competitive forces.
e-channel, which implies that it has a preference for the platform arrangement. Specifically, when the spillover is positive, the manufacturer gains more by having pricing power in the e-channel so that he can keep the price low to stimulate demand in the traditional channel and, therefore, he prefers platform selling to reselling. For a fraction of this region, the e-tailers also prefer platform selling to reselling because the gains from channel efficiency are enough to compensate for the loss of pricing power. In this situation, marked by Region I in Figure 4, the manufacturer and the e-tailers receive the highest payoff in the platform (PP) configuration as compared to any other configuration. Furthermore, consumer welfare is greater when higher quantities are sold in the market, which happens under the platform agreement. Hence, all market participants are better off with the platform arrangement under the conditions marked by Region I.

In the other regions in Figure 4, the equilibrium channel outcome is not what the manufacturer prefers. In Region II, the manufacturer prefers the platform (PP) structure but a hybrid structure is observed in equilibrium. (As discussed in the previous section, the manufacturer never prefers the hybrid channel arrangement.) Incidentally, if conditions in the e-book market resemble the market conditions in this region, this might provide an explanation for publishers’ insistence for Amazon to adopt a platform-selling format when Apple introduced platform selling in the iBook Store. In Region III, both e-tailers choose reselling but the manufacturer prefers platforms. In Region IV, both e-tailers choose platforms but the manufacturer prefers reselling.
3.4 Platform Management

Online platform selling is a new retailing innovation, which is only partially understood by the industry. In this section, we provide some guidelines on platform management. (Note that, in this section, we study platform management strategies for all combinations of values of $\beta$ and $\tau$, irrespective of whether or not platform selling will be practiced in equilibrium, i.e., according to the the results in Section 3.2.) Specifically, we address how various factors such as spillovers and competition affect the platform fee that the e-tailer should charge.

**Proposition 3** In the $PP$ configuration, the platform fees charged by the e-tailers are non-monotonic in $\tau$. As $\tau$ increases from its lowest possible value of -1, platform fees increase up to the value of $\tau$ at which $(1 + \alpha_{PP}^* - \beta^2)\tau = (1 - \alpha_{PP}^*)\alpha_{PP}^*\beta$ holds. Beyond this value of $\tau$, the platform fees decrease in $\tau$.

The plot of $\alpha_{PP}^*$ is shown in Figure 5. When the e-channel has a negative cross-effect on the traditional channel, the manufacturer is cautious of selling too much in the e-channel. With a strong negative cross-effect, the e-tailers need to offer incentives to the manufacturer to sell through the platform instead of selling through the traditional channel. They achieve this by setting a low platform fee so that the manufacturer makes a higher profit per item sold through the platform in comparison to the loss incurred in the traditional channel due to this sale (i.e., due to $\tau$ lower sales). As $\tau$ increases and the negative cross-effect reduces, the e-tailers need to offer smaller incentive to the manufacturer to sell through the platform, hence the platform fee increases in $\tau$. As $\tau$ increases further and becomes sufficiently positive, the manufacturer now cares more about the stimulation of demand in the traditional channel than the revenues from the e-channel. In this case, the manufacturer can reduce prices on the
platform to stimulate demand through the traditional channel which would result in a loss of revenue for the e-tailer offering the platform. Therefore, the e-tailer decreases the platform fee so that the manufacturer gets a bigger share of the revenues, and does not decrease retail prices on the platform as much.

To summarize, the platform fee is low for a strong negative cross-effect because the e-tailer wants the manufacturer to sell more quantity through the platform, it is low for a strong positive cross-effect because the e-tailer wants higher prices to be charged on the platform, and for intermediate cross-effect values the platform fee is higher than at the extremes.

We now study the effect of competition on the platform fee. It is natural to assume that the e-tailers would reduce the fee with increase in competition. However, we see that under some conditions the platform fee might actually increase with the degree of competition.

**Proposition 4** In case of negative cross-effect ($\tau < 0$), the fees charged by the platforms always decrease in $\beta$. In case of positive cross-effect ($\tau > 0$), the fees charged by the platforms first increase and then decrease in $\beta$.

The above proposition shows that the relation between the fees charged by the e-tailers and the competitive intensity in the market ($\beta$) is mediated by the cross-channel spillover effect ($\tau$). The first part of the proposition states that if $\beta$ increases, competition in the market increases. The platforms compete for the manufacturer’s business and they need to decrease the platform fee to incent the manufacturer to use their platform. This is the effect for $\tau < 0$. 

Figure 6: Changes in $\alpha^*_{PP}$ with market competition ($\beta$).
The second part of the proposition, which states that for $\tau > 0$ the platform fee first increases and then decreases in $\beta$, is the more interesting case. This non-monotonic nature of $\alpha_{P_P}^*$ can be explained if we consider the impact of the positive spillover from the e-channel to the traditional channel. It is clear from the demand system that, as $\beta$ increases, the sensitivity of demand to own price (given by $1/(1 - \beta^2)$) increases. This implies that all else equal, demand in the e-channel decreases as $\beta$ increases. Since $\tau > 0$, the manufacturer benefits more from the positive spillover from the e-channel to the traditional channel, than from the profits in the e-channel. The decrease in e-channel demand hurts the manufacturer’s profit and he reduces prices in the e-channel (as $\beta$ increases) to mitigate the fall in e-channel demand. The e-tailers foresee this drop in prices and respond by increasing the platform fees to get a higher share of the reduced platform revenues. This explains why in the presence of positive spillovers the e-tailers may increase the platform fee as competition between them increases. However, as $\beta$ increases further and becomes large enough, the basic effect of competition between e-tailers dominates the effect described above and leads to an overall decrease in fees in $\beta$.\(^{10}\)

Overall, the model predicts that the platform fee depends on the nature of a particular industry (specifically, competitive intensity and spillover from one channel to the other) and should, therefore, vary across industries. This is consistent with the fact that fees on Amazon Marketplace and eBay show wide variation (6%-25%) across different categories.

4 Effect of Sequential Entry

In the preceeding analysis, we assumed that both e-tailers are present in the market; interpreted differently, they enter the market simultaneously. In reality, however, e-tailers might enter the market sequentially, and entry of a competitor can lead to a change in the pre-existing contractual agreement between the incumbent e-tailer and the manufacturer. A prominent example of this situation comes from the e-book industry. After Amazon launched the Kindle in 2007, there was a long hiatus before other competitors such as Barnes & Noble and Apple caught up and introduced the Nook and the iPad, respectively. Before entry by these competitors, Amazon used the reselling agreement with publishers of e-books sold on the Kindle. In January 2010, when Apple launched the iPad, Apple also introduced iBook Store, an online e-book store for which it adopted a platform-selling agreement with the publish-

\(^{10}\) $\alpha_{P_P}$ (the platform fee in the hybrid case) changes in a manner similar to $\alpha_{P_P}^*$. 

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ers (Stone, 2010). Soon after this, Amazon also switched to a platform-selling arrangement for e-books, and has continued with the platform format since then.

Interestingly, as indicated by the above example, and as also pointed out in Jiang et al. (2011), contracting parties do not seem to face major hurdles in changing contractual agreements in an online setting. (By contrast, in a traditional brick-and-mortar setting, changing existing contracts is typically quite difficult.) It is easy to see how e-tailers and manufacturers can easily switch between platform selling and reselling for digital goods, but with the availability of reliable third-party providers of logistics services, such as FedEx and UPS for shipping, this transition is relatively simple even for physical goods. Given that e-tailers can easily change pre-existing contractual agreements, under what circumstances will they have the incentive to effect such changes? We provide insights into the factors that can induce a monopolistic e-tailer to change its contract with a manufacturer when a competing e-tailer enters the market.

We begin our analysis by deriving the contractual preference for a monopolistic e-tailer. To model a monopolistic e-tailer, we adapt the model in Section 2 by setting the quantity sold at one e-tailer, namely e-tailer B, equal to zero (as in Section 3.1.2), which gives \( q_A = 1 - p_A \) as the demand at e-tailer A. Note that the demand at e-tailer A is unaffected by the value of \( \beta \) as she is the only retailer in the electronic market. E-tailer A can choose the reselling (\( R \)) or the platform-selling (\( P \)) format and her choice is specified in the following lemma.

**Lemma 1** When the electronic channel has one e-tailer, she prefers the platform-selling format when the spillover is negative or sufficiently small \( (\tau < 0.245) \) and the reselling format otherwise.

We now examine how the preferred selling format of the incumbent (e-tailer A) changes when a competitor (e-tailer B) enters the market. When both e-tailers are in the market, the situation is exactly what we have already modeled in the preceding analysis with two e-tailers. (We continue to assume that A sets up a platform only if B sets up a platform.) Figure 7 shows the change in the optimal format for A in different regions of the parameter space after there is a competing e-tailer in the market. The following proposition summarizes the changes in the pre-existing agreement due to the entry of a competitor.

**Proposition 5** When a competing e-tailer enters the electronic channel, an erstwhile monopolistic e-tailer may change it pre-existing selling format, depending on the value of the spillover and the degree
Figure 7: Changes in the preferred agreement for e-tailer A with the entry of a competitor. The shaded regions represent the regions in which A is forced to change the agreement as a result of the entry. All labels denote the contract that e-tailer A uses in that region after the competitor’s entry. We show only a subset of the parameter space to focus on the relevant regions.

of competition in the market after the second e-tailer’s entry. Specifically, (i) for moderate positive spillover and moderate retail competition (region marked R in Figure 7), the incumbent switches from platform selling to reselling, and (ii) for moderate positive spillover and high retail competition (region marked P in Figure 7), the incumbent switches from reselling to platform selling.

In the shaded region marked R in Figure 7, the incumbent e-tailer (A) has a platform-selling arrangement as a monopolist. When the competing e-tailer (B) enters the market and sets up a platform, this introduces competition for e-tailer A. In this region, competition is moderate, and A can mitigate this competition to some extent by changing to a reselling format (see Section 3 for details), so that the resulting equilibrium configuration is RP. Therefore, we see that A switches to reselling from platform selling. In the shaded region marked P in Figure 7, the incumbent e-tailer (A) has a reselling arrangement as a monopolist. In this region, competition is high, and after e-tailer B enters, the equilibrium configuration in the e-channel is for both retailers to set up platforms (PP) to assume dominance in the fee-and-pricing game as Stackelberg leaders and to cushion retail competition (see Section 3 for details). Note that Figure 7 also shows that there are conditions under which the incumbent e-tailer continues to use the same agreement that she used before the entry of a competitor.

Proposition 5 may also help to explain why Amazon switched from reselling to platform selling in the case referred to earlier. Amazon used the reselling agreement before the launch of the iBook Store when there was no (or little other) competition. However, after heightened competition due to Apple’s entry in the e-book market as a platform seller, Amazon also switched to platform selling, and both
retailers have continued since then as platform sellers in a stable way.

Our model also predicts that, surprisingly, retail prices in the e-channel can increase after competitive entry. This happens if the spillover is positive ($\tau > 0$) and competition is high when both retailers are present (high $\beta$). When the e-channel has a monopolistic retailer who uses the platform-selling arrangement, the platform fee charged to the manufacturer is high. This induces the manufacturer to charge a low retail price on the platform (because the e-tailer appropriates a large percentage of this revenue), while making up for this loss through the stimulated demand in the traditional channel. With the entry of the second e-tailer, and in the case when both e-tailers use platform selling, the platform fees decrease significantly due to high competition. Since the manufacturer no longer faces high fees, he can keep most of the revenue generated by the e-channel, which induces him to charge higher prices on the online platforms. This result, that competition can hurt consumers through higher prices, not only runs contrary to intuition, but also highlights the importance of cross-channel spillovers as an important force in understanding multi-channel retailing.

5 Discussion and Conclusions

In recent years, we have seen significant growth in the use of platforms in e-commerce across industries. Given the proliferation of platforms, there is a need to understand the conditions under which e-tailers should adopt them, especially keeping in mind the impact of sales in the e-channel on sales in traditional retail channels through which manufacturers also sell their products. In this paper, we identify conditions under which platforms should be used, and the implications of using them on various market participants, i.e., competing e-tailers, manufacturers and consumers.

Our analysis suggests that setting up platforms is not always a superior strategy for e-tailers. Specifically, e-tailers should set up platforms when spillovers from the electronic channel to the traditional channel are negative, absent or small positive. This result is anecdotally supported by the observation that platform selling is used by travel websites in the airline industry (such as Expedia and Travelocity), where we can expect a significant negative effect on traditional sales (e.g., sales through travel agents) as online sales increase. As another example, the spillover effect for books has been found to be small positive (Hilton and Wiley, 2010), and large e-book sellers such as Amazon and Apple indeed sell through platforms. On the other hand, setting up platforms implies giving control over retail pric-
ing to the manufacturers; when sales in the e-channel have a large stimulation effect on sales in the traditional channel, platform selling might be detrimental for e-tailers because manufacturers have the incentive to reduce e-channel prices, which will reduce the e-tailers’ revenues as well. In accordance with this prediction, we find that reselling is the dominant selling format used by online stores in the music industry (such as iTunes and Spotify), where there are strong stimulation effects on offline sales (e.g., more online sales of music singles lead to more sales of album CDs and concert tickets). These examples lend anecdotal support to our results.

Furthermore, e-tailers have greater incentive to set up platforms when there is increased competition in the market as they can control the market better by virtue of becoming Stackelberg leaders, and also partially mitigate retail competition by allowing the manufacturer to jointly set retail prices across competing e-tailers. Interestingly, we might notice a hybrid configuration in certain industries as the e-tailers adopt different selling formats to moderate intra-format competition.

We also provide directions for platform management, and find that the fee charged by a platform should depend both on the competition in the market and the spillover that the e-channel has on traditional retailing. The fee charged for the use of the platform is small when the absolute magnitude of the spillover is large. As this magnitude of the spillover becomes smaller, implying that there is a reduction in the interaction between the two channels, the fee increases. Surprisingly, our model also shows that the platform fee might not always decrease with competition. When the spillover is positive, the fee might actually increase with increasing competition between the e-tailers due to the demand-stimulation effect.

Finally, we find how the entry of a competing e-tailer into a market with a monopolistic e-tailer might alter pre-existing selling formats. The insights we obtain in Section 4 offer a possible explanation for the observation that when Apple entered into the e-book market in January 2010, Amazon switched from reselling to platform selling for e-books, and publishers such as Macmillan supported this change.

Our model also provides some broader implications for the future of e-commerce. Currently, e-commerce is small fraction of overall retail, and we can expect both a positive or a negative spillover from online sales into traditional retailing. As e-commerce continues to grow, one can expect a negative spillover effect to dominate. In this case, our model predicts that we will see increased adoption of platform selling by online retailers. Furthermore, our model also predicts that if e-commerce gets more competitive over time, platform selling will increase.
Our approach has certain limitations which provide interesting directions for future research. First, we assume that firms do not explicitly influence or choose $\tau$. It might be interesting to ascertain under what conditions manufacturers would want to promote complementarities between the two channels and under what conditions they would want sales in one channel to reduce demand in the other. On a related note, we have modeled cross-channel spillovers in a reduced-form way, as our interest is in determining the impact of the aggregate effect of different factors that can influence demand across channels. Future work can advance our research by micro-modeling these factors. Second, we find that, under some conditions e-tailers choose to not offer platforms (in spite of their efficiency) because in the presence of cross-channel spillovers they do not want to give pricing power to manufacturers. This indicates that e-tailers could benefit from using platforms along with restrictions on the retail prices that manufacturers can charge. Studying such contracts, which are similar to vertical price restraints used when manufacturers control the channel (Mathewson and Winter, 1984, 1998), could be an interesting and important area for future research. Third, we have not modeled the service aspect at platforms. As shown by Jerath and Zhang (2010) and Jiang et al. (2011), in a platform setting, whether the manufacturer or the retailer provides service, and how much, is an important concern. Future research can study how interactions between service provision and cross-channel spillovers affect equilibrium selling formats. Fourth, novel logistics-related agreements are being offered by platform providers to manufacturers (such as “Fulfillment By Amazon,” under which the manufacturer decides the retail price on the platform but the e-tailer takes over logistics activities such as warehousing and delivery). Incorporating logistics-sharing aspects into our framework might lead to interesting results.

E-commerce platforms present an exciting area of research, and we believe that this is the first paper that addresses the consequences of demand spillovers between the e-channel and the traditional channel on the selling formats that emerge in electronic retailing. We hope that the ideas presented in this paper motivate interesting future research.
References


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APPENDIX

Proofs of Propositions 1 and 2

The equilibrium channel arrangement for every pair of $\tau$ and $\beta$ is determined by solving the $2 \times 2$ game presented in Section 3.2. We observe the platform arrangement ($PP$) when $\pi_{A}^{PP} \geq \pi_{A}^{RP}$, the hybrid arrangement ($RP$) when $\pi_{A}^{RP} \geq \pi_{A}^{PP}$ and $\pi_{B}^{RP} \geq \pi_{B}^{RR}$ and the wholesale agreement ($RR$) when $\pi_{B}^{RR} \geq \pi_{B}^{RP}$.

Proof of Proposition 3

We compute the derivative of e-tailer A’s profit w.r.t. the platform fee ($d\pi_{A}^{PP}/d\alpha$), and impose the symmetry condition ($\alpha_{A} = \alpha_{B} = \alpha$), which gives

$$
\frac{d\pi_{A}^{PP}}{d\alpha} = \frac{(1-\alpha)^3 + (-2 + \beta^2)\tau^2 + (1-\alpha)\tau(2\beta + \tau) - (1-\alpha)^2\beta(\beta + 2\tau)}{4(1-\alpha)^3(-1 + \beta^2)}.
$$

Let $\xi = \frac{-(1-\alpha)^3 + (2-\beta^2)\tau^2 - (1-\alpha)\tau(2\beta + \tau) + (1-\alpha)^2\beta(\beta + 2\tau)}{4(1-\alpha)^3(-1 + \beta^2)} = 0$ at the optimal alpha ($\alpha_{PP}^*$). Using the implicit function theorem, we get

$$
\frac{d\alpha_{PP}^*}{d\tau} = \frac{-\partial \xi / \partial \alpha}{\partial \xi / \partial \tau} = \frac{-2(1-\alpha)(\alpha^2\beta + \tau - \beta^2\tau - \alpha(\beta - \tau))}{2(1-\alpha^2)\beta\tau - 2(2 + \alpha)\tau^2 + \beta^2 ((1-\alpha)^2 + 3\tau^2)}\bigg|_{\alpha = \alpha_{PP}^*}.
$$

Since the denominator is always greater than 0 for the domain of the parameters, $\frac{d\alpha_{PP}^*}{d\tau} \geq 0$ if $\tau \leq \frac{\beta_{PP}(1-\alpha_{PP}^*)}{1 + \alpha_{PP}^* - \beta^2}$, and $\frac{d\alpha_{PP}^*}{d\tau} < 0$ otherwise.

Proof of Proposition 4

Implicitly differentiating $\alpha_{PP}^*$ w.r.t. $\beta$ gives

$$
\frac{d\alpha_{PP}^*}{d\beta} = \frac{2(1-\alpha)(\tau(1 - \beta^2 + \alpha) - \alpha\beta(1 - \alpha))}{(4 + 2\alpha - 3\beta)\tau^2 + \beta^2(1-\alpha)^2 - 2(1-\alpha^2)\beta\tau}\bigg|_{\alpha = \alpha_{PP}^*}.
$$

Since the denominator is always positive, the sign of $d\alpha_{PP}^*/d\beta$ depends on the sign of the numerator. When $\tau \leq 0$, the numerator is always negative implying that $\alpha_{PP}^*$ is monotonically decreasing in $\beta$. For $\tau > 0$, $d\alpha_{PP}^*/d\beta > 0$ when $\beta \leq \left\{ \sqrt{(1-\alpha_{PP}^*)^2\alpha_{PP}^* - 4(1 + \alpha_{PP}^*)\tau^2} - (1-\alpha_{PP}^*)\alpha_{PP}^* \right\}/2\tau$, and
Proof of Lemma 2

In order to compute which agreement is preferred by the monopolistic e-tailer A, we first compute her payoffs under the reselling and platform-selling agreements.

**Reselling Agreement** \((R)\): The payoff functions of the manufacturer and e-tailer A are 
\[ \pi^R_M = \bar{Q} + (\tau + w)q_A \]
and 
\[ \pi^R_A = q_A(p_A - w). \]
The timing of the game is similar to the one outlined in Section 2. The equilibrium wholesale price is given by 
\[ w^*_R = \frac{1-\tau}{2} \]
and the retail price is given by 
\[ p^R = \frac{3-\tau}{4}. \]
The equilibrium profits are given by 
\[ \pi^R_M = \bar{Q} + \frac{(1+\tau)^2}{8} \]
and 
\[ \pi^R_A = \frac{1}{16}(1 + \tau)^2. \]
We can see that both the manufacturer’s and the e-tailer’s profits are convex and increasing in \( \tau \).

**Platform-Selling Agreement** \((P)\): The payoff functions of the manufacturer and e-tailer A under this agreement are 
\[ \pi^P_M = \bar{Q} + (1 - \alpha)q_A p_A \]
and 
\[ \pi^P_A = \alpha q_A p_A. \]
The equilibrium platform fee, \( \alpha^*_P \), is the same as the monopolist’s fee derived in Equation (22). The retail price is given by 
\[ p^P = \frac{1 - \alpha^*_P - \tau}{2\alpha^*_P}. \]
The equilibrium profits are 
\[ \pi^P_M = \bar{Q} + \frac{(1+\tau - \alpha^*_P)^2}{4(1-\alpha^*_P)} \]
and 
\[ \pi^P_A = \frac{\alpha^*_P((1-\alpha^*_P)^2 - \tau^2)}{4(1-\alpha^*_P)^2}. \]
In this case, the payoff to A is non-monotonic in \( \tau \).

**Channel Choice**: The monopolistic e-tailer prefers to sell using a platform-selling agreement when 
\[ 4\alpha^*_P ((1 - \alpha^*_P)^2 - \tau^2) \geq \frac{1}{4}(1 + \tau)^2 (1 - \alpha^*_P)^2 \] which holds for \( \tau \leq 0.245 \).