

ABSTRACT

Title of Dissertation: Marketing of Digital Products

 Nevena Taneva Koukova, Doctor of Philosophy, 2005

Dissertation directed by: Professor Brian T. Ratchford and Professor P. K. Kannan

 Department of Marketing

My dissertation comprises of three essays that theoretically and empirically investigate the marketing of digital products, which are information products such as newspapers and books sold in both physical and electronic form.

In the first essay, we study product form bundling, defined as marketing two or more forms of the same product as a package. We show experimentally that, regarding information products, the usage situations communicated to consumers moderate the effect of the availability of bundle discount on the purchase likelihood for the product form bundle. We also compare the effect of different pricing strategies for information products. When no bundle discount is offered, the likelihood of buying both forms of an information product, holding the sum of their prices constant, can be increased by pricing the electronic form lower than the print form rather than pricing both at the same level.

In the second essay we compare two product strategies that can be used in marketing digital products. Under standard mixed bundling companies offer full content in print and electronic form and the bundle of the two, while under content unbundled

mixed bundling companies offer full content in print form, unbundled content in electronic form, and the bundle of the two. Which strategy is more attractive for a company to pursue? We model the profits under these two strategies and outline conditions in which one or the other leads to higher profit. We apply our analytical framework to data from a field experiment implemented on the website of a book publisher.

The third essay investigates the attractiveness of complete product lines of items such as books and newspapers. We employ a choice experiment in which a sample of consumers is presented with hypothetical product scenarios asked to make a choice. The data is used to develop a profit-maximizing configuration of products and prices. Similar approaches to the product line pricing problem have been employed for conventional products, but not when bundling of different forms of a product is an option, and not when the different products may be complements rather than substitutes.

MARKETING OF DIGITAL PRODUCTS

by

Nevena Taneva Koukova

Dissertation submitted to the Faculty of the Graduate School of the
University of Maryland, College Park in partial fulfillment
Of the requirements for the degree of
Doctor of Philosophy
2005

Advisory Committee:

Professor Brian T. Ratchford, Chair
Professor P. K. Kannan, Chair
Professor Roger R. Betancourt
Professor Rebecca W. Hamilton
Professor Joydeep Srivastava

©Copyright by

Nevena Taneva Koukova

2005

ACKNOWLEDGEMENT

I would like to thank my advisors, Dr. Brian Ratchford and Dr. P. Kannan, for their excellent guidance and help on my dissertation and my other research projects. I would also like to thank the other dissertation committee members, Dr. Rebecca Hamilton, Dr. Joydeep Srivastava and Dr. Roger Betancourt, for their helpful comments and suggestions at various stages of my dissertation.

TABLE OF CONTENTS

List of Tables	v
List of Figures	vii
Chapter I: Dissertation Overview	1
Chapter II: Essay One. Product Form Bundling - Implications for Marketing Digital Products.....	4
Abstract.....	4
Introduction.....	5
Research Background	9
Study Objectives	13
Theoretical Framework and Hypotheses	14
Study 1	25
Study 2	29
Discussion.....	38
Managerial Implications	40
Conclusion	42
Chapter III: Essay Two. Bundling and Pricing Strategies for Digital Products	44
Abstract.....	44
Introduction.....	45
Research Background	47
Bundling Model	49
Data and Estimation Procedure.....	59
Results.....	64

Discussion	69
Managerial Implications	72
Conclusion	73
Chapter IV: Essay Three. Bundling and Unbundling of Electronic Content.....	75
Abstract	75
Introduction.....	76
Research Background	78
Theoretical Background.....	82
Methodology	86
Study Design and Data Collection.....	87
Results.....	90
Discussion.....	102
Managerial Implications	106
Conclusion	107
References.....	131

LIST OF TABLES

Table 1: Purchase Probabilities for Bundle: Product, Discount and Usage Conditions .	109
Table 2: Perceived Appropriateness of Generated Usage Situations.....	110
Table 3: Study 2 - Mean Percentage of Points Allocated to Bundle	111
Table 4: Study 2 ANOVA Results.....	112
Table 5: Profit Comparison under CUMB and TMB Strategies.....	113
Table 6: Actual Purchase Rates under the Two Mixed Bundling Strategies	114
Table 7: Estimation Results - Content Unbundled Mixed Bundling	115
Table 8: Estimation Results - Traditional Mixed Bundling.....	116
Table 9: Simulation Results – Profit under the Two Mixed Bundling Strategies.	117
Table 10: Conjoint Design and Price Levels	118
Table 11: Random Parameters Logit Model Results (conjoint choice experiment).....	119
Table 12: Book Category – Market Simulation Results	120
Table 13: Newspaper Category – Market Simulation Results.....	121
Table 14: Book Category – Market Simulation Results (Incomplete Product Line).....	122
Table 15: Newspaper Category – Market Simulation Results (Incomplete Product Line)	123
Table 16: Book Category – Market Simulation Results (Incomplete Product Line, No Bundle Discount)	124

Table 17: Newspaper Category – Market Simulation Results (Incomplete Product Line, No Bundle Discount)	125
Table 18: Book Category - Forms' Attribute Perceptions.....	126
Table 19: Newspaper Category - Forms' Attribute Perceptions.....	127

LIST OF FIGURES

Figure 1: Study 2 Results.....	128
Figure 2: Optimal Price and Total and Marginal Revenue from Electronic Chapters....	129
Figure 3: Optimal Price and Total and Marginal Revenue from Full Electronic Book..	130

CHAPTER I: DISSERTATION OVERVIEW

Marketing digital products is appealing because of several reasons: 1) the marginal cost of reproducing and distributing them is almost zero (Bakos and Brynjolfsson, 1999), 2) they can be easily organized, searched and stored, and 3) the whole buying experience through Internet can be more interactive and tailored to the specific needs and preferences of the customer (Peterson et al., 1997). Although many publishers make available content online, others (e.g. marketers of full length books, reference materials, music and video) are still cautious in distributing content in digital form over the Internet (Kannan and Jain, 2003). There are good reasons for this cautious approach, such as piracy of content and bandwidth constraints. However, less valid reasons also prevent managers from offering digital content, such as uncertainty about what product and pricing strategies to utilize.

How should companies market digital products? What product, pricing and communication strategies should they employ? My dissertation attempts to tackle these interesting and practically relevant questions. It comprises of three essays organized as follows.

In Essay 1 we focus on consumer reactions to bundling of information products, and contrast these with consumer reactions to bundling of conventional products. In particular, we concentrate on communication and pricing strategies that might enhance the viability of selling the information goods as a bundle. We show experimentally that communicating different possible usages for the product forms may increase the likelihood of buying the items as a bundle. We also investigate consumer reactions to

alternative pricing plans for product forms. Our respondents readily accept bundle discounts on conventional items that can be inventoried, but are generally unresponsive to bundle discounts on different forms of information goods that have the same content. However, emphasizing different uses for the forms does increase their responsiveness to bundle discounts. We conclude that communicating the appropriateness of different forms for different usage situations can be a key to a successful bundling strategy for information goods; further, it is more beneficial for companies to price the electronic form lower than the print form instead of offering bundle discounts.

In Essay 2 we model the profits under two strategies a content provider may employ: traditional mixed bundling, in which the product line consists of print book, PDF book and the bundle of the two, and content unbundled mixed bundling, which is selling print book, PDF chapters and the combination of the two. While appealing because of low marginal costs and the likely catering to emerging consumer needs, offering electronic products may lead to additional revenue generation but can also result in product cannibalization. Our results suggest that offering unbundled PDF chapters is more profitable than offering only the full PDF books under certain conditions. We empirically support our predictions with actual data gathered in an online experiment executed on the website of a publisher of academic books. We present interesting insights on how customers from different subject domains react to electronic products and how they are likely to behave when different product and pricing schemes are employed.

In Essay 3 we further extend the previous essays and investigate the attractiveness of complete product lines of information good. For example, the publisher of Wall Street Journal can offer the following product line of subscription options: print WSJ, WSJ

online, separate sections of WSJ online (e.g. Money & Investment, Technology), print WSJ and online WSJ bundle, and print WSJ and online section bundle. We employ a choice experiment in which a sample of consumers is presented with hypothetical product offerings at various prices and asked to make a choice. The data is used to develop a profit-maximizing configuration of products and prices. Similar approaches to the product line pricing problem have been employed for conventional products, but not when bundling of different forms of a product is an option, and not when the different products may be complements rather than substitutes.

CHAPTER II: ESSAY ONE. PRODUCT FORM BUNDLING - IMPLICATIONS FOR MARKETING DIGITAL PRODUCTS

Abstract

In this paper we study product form bundling, defined as marketing two or more forms of the same product as a package. Although we are primarily interested in information products (e.g. Wall Street Journal: print and online forms), we contrast consumer reactions to bundling these products with reactions to bundling conventional products (e.g. margarine: stick and tub forms). We show experimentally that the usage situations communicated to the consumers moderate the effect of the availability of bundle discount on the purchase likelihood for the product form bundle. Our subjects readily accept bundle discounts on conventional items that can be inventoried, but are generally unresponsive to bundle discounts on bundles of information products that have the same content. However, emphasizing different uses for the information product forms does increase the responsiveness to bundle discounts. Also, we examine the impact of different relative prices for the forms within the information bundle on the bundle purchase likelihood, and compare this to offering discounts. Our study provides useful insights into the conditions under which the marketer is better off pricing the forms differentially than pricing them equally and offering bundle discounts.

Introduction

It is a common practice in consumer packaged goods categories to market products in different forms, for example, margarine (stick and tub forms) and soap (bar and liquid forms). In marketing different forms of the same product the focus has been on offering forms appropriate for various usage situations. For example, margarine is sold in both stick and tub form and customers can choose the form that better suits their needs and usage situations. Recently, marketers of information products have been applying similar strategies as well by making the information products available in electronic form in addition to the print/traditional form. Specifically, newspapers (e.g., Wall Street Journal) market print and electronic forms of their content, publishers (e.g., US Government Printing Office) offer print books and reports as well as the corresponding electronic versions, and recording companies (e.g., EMI Recorded Music) have started offering online music in addition to music in traditional forms (CDs, tapes, etc.) all catering to the diverse needs of customers.

While bundling different forms of the same product is occasionally seen in the consumer packaged goods market (e.g. bundling Eucerin body cream and lotion; Dial liquid soap and Dial soap bars), one would generally not expect similar bundling strategies in the information goods market as the content being sold in the different forms is generally the same. However, newspapers such the Wall Street Journal not only offer the print and electronic forms separately as single products, but also as a bundle of different forms. Likewise, publishers of scholarly content such as National Academies Press have started to offer bundles of print and PDF forms in addition to offering them separately. Many scholarly journals also market subscriptions of both print and electronic

forms. New formats introduced by dualdisc.com provide the capability to sell music content in CD format as well as DVD-Audio or surround sound as a bundle on the same disk (Business Week, 2004).

While different forms of products such as margarine and soap may have roughly the same production costs, information products are unique in that the marginal cost of reproducing and distributing the electronic form is often much lower than the one of the print form. Consequently, it is not surprising that marketers are interested in selling bundles of electronic and print forms, as it implies significant additional revenue. As broadband service penetration increases, similar opportunities in selling bundles of streaming videos and DVDs, and music bundles (mp3 form, CD, mobile tunes) become possible. In order to realize this additional revenue potential, however, companies need a clear understanding of how to market, communicate and price product form bundles. It is in this context that we present our research.

In this paper, we first focus on consumers' reactions to alternative forms of information products, and examine conditions under which they are more likely to purchase the product form bundle. In particular, we concentrate on communication and pricing strategies that might enhance the viability of selling the information goods as a product form bundle. We replicate our study in the consumer packaged goods category to establish a comparative baseline. It is well known that there are different types of utility a good may provide – elementary (or basic), place, form, time, and possession (Macklin 1922). In our study we distinguish between content utility (similar to elementary or basic) – utility provided by the product itself – and form utility – utility provided by the specific form in terms of convenience, ease of use and the like – of the product forms that

play a critical role in how the bundle is viewed. Content utility tends to be duplicated across different forms of an information product, making it less attractive to buy them as a bundle. From this viewpoint, the content utility of either of the information forms or the bundle is the same in magnitude. However, in the conventional packaged goods categories, the content utility of the bundle is generally more than that of either of the individual forms.

While content utility remains the same in the case of an information product bundle making it less attractive to purchase, extant research would suggest that suitability of different forms of an information product for use in different situations will decrease the perceived similarity between them (Ratneshwar and Shocker 1991) and that bundles composed of complements have a higher purchase intent versus bundles of similar products (Estelami 1999), thus making the information bundle appealing. However, we find experimentally that communicating different possible usage situations for the forms, in and of itself, is not sufficient to increase the probability of selling the bundle of information product forms. Yet, for conventional packaged goods categories, such communication strategies are effective in increasing the bundle purchase probabilities. In investigating consumer reactions to alternative pricing plans for different forms of information products and different forms of conventional products, we find that our experimental subjects readily accept bundle discounts on conventional items that can be inventoried, but are generally unresponsive to bundle discounts on different forms of information products that have the same content. It is only when different uses for the forms are emphasized along with bundle discount that respondents' bundle purchase probabilities of information product forms increase significantly. This suggests that

emphasizing the appropriateness of the forms for different usage situations is as important as bundle discounts in successfully marketing bundles of information products.

Finally, we examine the impact of different relative prices for the forms within the information bundle on the purchase of information bundle, and compare this to offering discounts. Our study provides useful insights into the conditions under which the marketer is better off pricing the different forms differentially than pricing them the same and offering bundle discounts.

The contribution of the paper is three-fold. First, our study offers a useful approach in terms of examining product forms and the attractiveness of information product bundles under bundle discounts, differential pricing of the forms, and usage situation communication from the perspective of content and form utilities. We are not focusing on the effect of the above factors per se but on their interaction effect in influencing consumer choice. Second, our study complements the findings in extant literature on bundling by providing insights into conditions under which those findings are directly applicable to product forms and instances where those results may not hold. Specifically, our study extends the findings to situations where items of bundles (forms) can be perceived as substitutes as well as complements across different consumers. Third, our paper provides substantive insights in an area of emerging importance – bundling of information products – by providing guidelines for communication and pricing strategies for increasing the attractiveness of information bundles and expanding revenue opportunities for marketers. This is managerially very relevant given that the consumer spending for online content in the US grew to \$853 million in 2004, an increase of 14 percent over the same period last year (Online Publishers Association Report, 2004).

The paper is structured as follows. First, we define and discuss product form bundling in the context of extant literature and position our study. Second, we present a theoretical framework and derive hypotheses. Third, we discuss two experiments that were designed to empirically test our hypotheses. Finally, we highlight the implications of our study and suggest areas for future research.

Research Background

Product Form Bundling

Extant literature defines bundling as selling goods in packages (Adams and Yellen 1976), marketing products as a package at a special price (Guiltinan 1987), and selling products at a single price (Yadav and Monroe 1993). Distinction is also made between price bundling, defined as the sale of two or more separate products in a package at a discount without any integration of the products, and product bundling, which is the integration and sale of two or more separate products or services at any price (Stremersch and Tellis 2002). We define product form bundling as marketing two or more forms of the same product as a package.

In the context of product categories, we make a distinction between information product form bundles in which the same information is presented in different forms and the forms are bundled together (e.g. electronic book and print book), and conventional product form bundles consisting of different physical forms of the same product (e.g. stick of margarine and margarine tub). Information bundles have some unique characteristics: the marginal cost of producing the electronic form after producing the print is negligible, consumers have reasonable knowledge of this cost structure, and, in

some cases, the individual products are perishable (e.g. after reading the news online consumers do not benefit from the print version of the newspaper to read the same news). With respect to conventional bundles, the cost structure is different - the marginal costs associated with the forms are positive - and the products usually are not immediately perishable and can be stockpiled.

From a conceptual point of view, product form bundling seems similar to other types of bundling discussed in extant literature. On one hand, it could be viewed as a special case of product bundling – that is, the integration and sale of two or more separate products, the separate products being different forms of the same product; on the other hand, it is a type of price bundling - the sale of two or more separate products in a package at a discount. However, there are two important distinctions in the case of product form bundling. First, the product forms can range from being perceived as substitutes to being perceived as complements to each other and degree of heterogeneity across consumers on this dimension is much higher than what is encountered in other bundling situations. As an illustration, consider the bundling of print and electronic forms of newspaper subscriptions. The Wall Street Journal has been recently promoting the two forms of the newspaper as a bundle. The ads suggest that people might use the two forms for different purposes and/or situations (e.g. keeping up with the daily news versus doing research). If customers perceive WSJ Online as a substitute to WSJ, they will subscribe to one of them; if they view the two form of the journal as complementing each other, they may be willing to subscribe to both. Second, in the case of information product bundles, the marginal cost of producing one form after producing the other form is close to zero, which is quite different from the scenarios encountered in the extant bundling literature.

Offering different forms of a product is also similar to having more than one package of the same item available. Packaging of items explicitly sold at retail into a small and a large package, for example, can be viewed as commodity bundling and thus as a mechanism for price discrimination, or it can be viewed as a mechanism for providing different levels of distribution services through the shifting of distribution costs across market boundaries (Betancourt 2004). The small package provides a high level of the distribution service assurance of product delivery in the desired form bundled with the items explicitly sold that are contained in the small package (Betancourt 2004). Offering a print and an electronic form of a product can be considered as two different levels of the distribution service assurance of product delivery in the desired form, and each level is bundled with the content of the product. The difference between offering different product forms and offering different product packages is in the cost structure associated with the two offers. While the marginal costs of producing the different packages are positive and similar to each other, this is not necessarily true with respect to the different product forms - the marginal cost of the electronic form, for example, is close to zero. Consequently, the implications of offering different product forms can be different from the implications of offering different types of packaging both from buyers' and sellers' point of view. Because of the cost structure the buyers are likely to expect a relatively lower electronic form price as compared to the print form price, and it may be profitable for the sellers to charge relatively lower price for the electronic form. In sum, offering different forms of a conventional product is the same as offering different packaging types, while offering different forms of an information product is not necessarily the same as offering different packaging types because of the associated cost

structure. Thus, we use the term product forms as it is more general. Also, our focus is on bundling product forms (or types of packaging in the case of conventional products), and not on bundling an item with the specific service level it provides.

While there is extensive literature focusing on conditions favorable for bundling – negative correlations in consumer reservation prices (Stigler 1963; Schmalensee 1984), complementarity in consumption (Telser 1979), uncertainty in the valuations of the quality of the goods (Kenney and Klein 1983) – contingent valuation of interrelated products in the bundle is very relevant for product form bundling. Contingent valuations have been examined at both conceptual (e.g. Guiltinan 1987) and analytical (e.g. Venkatesh and Kamakura 2003 (VK) levels. Under assumptions of homogeneous degree of contingency or complementarity, VK find that moderate to strong substitutes should be offered as separate products; the same is applicable for complements if the marginal costs are moderate relative to the market's maximum willing to pay. They also find mixed bundling to be optimal for weak substitutes/complements if the marginal costs are not too high (Venkatesh and Kamakura 2003). It is not clear to what extent these results will hold given the heterogeneity in customer perceptions of the product forms as being substitutes or complements (contingency) or under the case of very low marginal costs. Thus, our study on bundling product forms might complement the above findings. In addition, the heterogeneity in consumer contingency/ complementarity perceptions may also suggest that consumers may be amenable to suggestions from marketers in manipulating such perceptions.

Extant research based on mental accounting and related framing effects have provided interesting insights into consumer reaction to bundling (Thaler 1985; Johnson

1999). The findings relevant for relative pricing of the product forms and its impact on bundle choice suggest that (1) in terms of evaluation process, there is evidence that buyers use anchoring and adjustment (Yadav 1994), (2) the evaluation of a bundle depends on the price leader as well (Yadav 1995), and (3) savings offered on the bundle have a greater relative impact than savings offered on the individual items (Yadav and Monroe 1993). In the context of information products, the price of the form that consumers are more familiar with – print – could form an anchor against which other forms are evaluated. Also, given the marginal cost of one form (say, an e-book) is close to zero, the relative pricing of the forms may have to account for consumers' expectations regarding the relative prices of product forms.

Study Objectives

Our study objectives are as follows. First, we examine the concept of product form bundling from the viewpoint of content utility and form utility with the objective of answering the questions faced by a manager marketing information product form bundles – how can he/she increase consumers' choice of bundles through appropriate communication to impact consumers' perception of complementarity? And how should he/she price the individual product forms and the bundle? We contrast information product form bundles with conventional product form bundles to gain better insights into consumers' reactions to bundling. Our second objective is to explain our findings in the light of extant literature in bundling and highlight the similarities and variances that help us better understand product form bundling. Given that most of the behavioral studies so far focus on bundles composed of complements (e.g. computer and printer), on investigating how consumers evaluate such bundles, and on the optimal strategies for

price and discount information presentation, the fact that we study bundle items for which marketers can influence the degree of contingency/complementarity should provide results that complement extant findings. Thus, our overall focus is not only on understanding how the bundling of interrelated products influences consumers' purchase decisions but also on how these decisions can be affected through marketing communication and differential pricing.

Theoretical Framework and Hypotheses

Perceived Complementarity

From the firm's point of view, complementarity is traditionally defined by referring to the sign of the cross-product elasticity of demand - if the sign is positive, products are substitutes; in the opposite case they are complements (Sarvary and Parker 1997). If different forms are substitutes, the purchase of one item lowers the value of alternative forms (contingent valuation), and therefore makes bundling the items less attractive. If different forms are complements, bundling becomes more attractive because the consumer is in effect purchasing a system of products that enable and enhance the functionality of each other (Estelami 1999). Consumers may perceive a high degree of complementarity based on economies of time and effort in purchasing the bundled items together (search economies), improved satisfaction because of the bundle, and/or improved total image of the bundle (Guiltinan 1987; Simonin and Ruth 1995). With regard to the attractiveness of bundling to firms, complementarity between products can cause bundling to be profitable (Telser 1979) and bundles composed of complements have higher purchase intent versus bundles of similar or unrelated products (Harlam et al. 1995). There is evidence that complementarity positively affects bundle reservation

prices as well (Gaeth et. al 1990).

Applied to product form bundling, we would expect a positive relationship between the degree of perceived complementarity between the bundle components and the purchase likelihood for the bundle. On one hand, if consumers believe that the individual product forms can be used interchangeably, they would buy only one of the forms and not the product form bundle. On the other hand, if consumers think that there is additional utility in having both product forms versus just one of them, they would choose the product form bundle, *ceteris paribus*.

Hypothesis 1: There is a positive relationship between the degree of perceived complementarity between the product forms in a bundle and the purchase likelihood for the product form bundle.

We use the above hypothesis as a baseline and build on it to explain how exactly communicating different usage situations influences consumers' complementarity perceptions and thus consumer choice. We elaborate more on this in the discussion section of Study 1.

Usage Situation

Usage situations correspond to activities and conditions for which products are created and marketed (Fennell 1978). In order to analyze the effect of usage situations on the acceptance of product form bundles, we draw upon extant literature (Macklin 1922) to make a distinction between V_C , the utility of the content (material in a book, the margarine or soap itself), and V_F , the utility that the specific form adds to the content

(print or electronic form of a book, stick or tub form of margarine)¹.

A consumer's utility of a product form of an information product is not independent of whether the consumer also buys another form. This is because the consumer obtains the same content when buying the two product forms and she does not get extra utility from having the same content twice. For example, if a consumer buys a reference book bundle, she gets the same content twice, but receives content utility only once. However, the consumer can read the print edition while traveling by metro/train, and search the electronic edition if looking for some specific information. Consequently, she can derive two separate form utilities from the bundle – that is, the incremental utility from acquiring the second form together with the first is positive. How great this incremental utility is depends on whether the alternative forms are viewed as complements.

In our framework, the consumer's purchase decision for an information product that comes in two formats can be represented as follows: choose the maximum of

$$\text{Value of Product Form i: } V_C + V_{Fi} - P_i$$

$$\text{Value of Product Form j: } V_C + V_{Fj} - P_j$$

$$\text{Value of Bundle: } V_C + V_{Fi} + V_{Fj|Fi} - (1 - d)*(P_i + P_j),$$

where d is the bundle discount, and $V_{Fj|Fi}$ is incremental form utility of Form j given that Form i is purchased.² Note that V_C is counted only once in valuing the bundle because the same content is shared by both forms. Let Form i be the form that provides the highest value to the consumer (e.g., $V_{Fi} - P_i > V_{Fj} - P_j$). Then the bundle will be chosen if $V_C + V_{Fi} + V_{Fj|Fi} - (1 - d)*(P_i + P_j) > V_C + V_{Fi} - P_i$, or if $V_{Fj|Fi} + d(P_i + P_j) > P_j$. If there are two

¹ We assume that V_C and V_F are independent and additive for expositional purposes, without any loss in generality.

² Specifically $V_{Fj|Fi} = V_{Fi+Fj} - V_{Fi}$, where V_{Fi+Fj} is form utility from buying both items.

items in the bundle, and at least one of them has a positive valuation, we can state a general condition under which a consumer would buy both items if there were no discount:

$$(1a) \quad \text{Prob}_{\text{INFO}} = \text{Prob} (V_{F_j|F_i} > P_j),$$

where j is the item that provides less value, i is the item that provides more value, and Prob refers to probability that a consumer will buy both items. The incremental form utility of the second item must exceed its price if it is to be purchased along with the first. If there is a bundle that is offered at a discount, the condition for buying the bundle becomes:

$$(2a) \quad \text{Prob}_{\text{INFO}} = \text{Prob} (V_{F_j|F_i} + d (P_i + P_j) > P_j) = \text{Prob} (d > (P_j - V_{F_j|F_i}) / (P_i + P_j)).$$

The consumer will buy the bundle only if the discount is large enough to overcome the fact that she only receives form utility for the less preferred item. If $V_{F_j|F_i} > P_j$ she would buy this item without a discount, as shown in Equation 1a.

While information bundles suffer a redundancy of content, this is ordinarily not the case for conventional bundles. In the case of conventional bundles, consumers normally derive content utility from both product forms because they can first use Form i and then Form j .³ For example, if a consumer buys a bundle consisting of a pack of four sticks of margarine and a margarine tub, she can first use the sticks, store the tub, and then use the tub. Consequently, she derives two content values. In terms of form value, the consumer can use the margarine stick for baking purposes, while the tub for spreading margarine on bread or bakery, thus deriving form utility from both product forms

³ We assume here that conventional products do not deteriorate in quality as they are stocked. For example, rapidly perishable items can be an exception to this. As one example, large containers of soft drinks can be thought of as a bundle (they are a multiple of smaller sizes). A consumer might not value these highly because most of the contents may become flat before the consumer has a chance to consume a high proportion of the contents of the container.

(positive marginal utility from acquiring the second product form together with the first).

For conventional bundles, the value of the bundle becomes $2V_C + V_{F_i} + V_{F_j|F_i} - (1 - d)(P_i + P_j)$, while the values of individual items remain as above⁴. Using the notation defined above, the probability of buying both forms if there were no discount becomes:

$$(1b) \quad \text{Prob}_{\text{CONV}} = \text{Prob}(V_C + V_{F_j|F_i} > P_j).$$

By comparing to 1b to 1a, the probability of buying the conventional product form bundle even when there is no discount will tend to be higher than for the information product form bundle. Similarly, as shown in Equation 2b below, the discount needed to induce consumers of the conventional products to buy a bundle will tend to be smaller because of the opportunity to obtain more content.

$$(2b) \quad \text{Prob}_{\text{CONV}} = \text{Prob}(V_C + V_{F_j|F_i} + d(P_j + P_i) > P_j) = \text{Prob}(d > (P_j - V_C - V_{F_j|F_i}) / (P_i + P_j))$$

Hypothesis 1a: Because both forms of a conventional product form bundle provide content utility, consumers are more likely to select a conventional bundle than an information bundle at a given discount level.

By directly comparing consumers' reactions to the two types of product form bundles at specific discount levels we intend to show that the conventional and information bundles are valued differently by consumers because of the different content utility they provide (single or double).

Usage Situation and Bundle Discount

When consumers are suggested usage situations in which the two product forms are differentially appropriate (one form is more appropriate for some situations, and the

⁴ For sake of exposition, we assume that the different forms of the conventional product have equivalent content and each provide the same content value V_C . Also, we assume that the content utility of the bundle is the sum of the content utilities of the individual forms, with marginal utility remaining the same whatever be the stage of consumption. These simplifying assumptions do not affect our general results.

other form is more appropriate for other situations), consumers are more likely to view them as complements. Consequently, by manipulating different possible usages for the two forms in the bundle, the form utility of one or both product forms can be changed. Specifically, if communications succeed in convincing consumers that different forms are appropriate for different uses of the product, and therefore more complementary, the value of $V_{Fj|Fi}$ can be increased to, say, $V^*_{Fj|Fi}$. As can be seen from equations 1 and 2 this increases the value of the bundle in all cases.

Numerous brand management teams apply usage-oriented advertising campaigns to expand the use of their products, for example “Eat Campbell’s Soup with formal family dinners or for breakfast” (Wansink and Ray, 1996). In our study we go beyond this conceptually and consider not the number (we keep it constant) but the nature of the usage situations presented to the consumers. We elaborate on this in the stimuli development section.

<< Insert Table 1 about here >>

The probabilities of buying the information and conventional product form bundles subject to usage situations and level of discount are presented in Table 1. With respect to information bundles, we expect the usage situations considered when making a purchase decision to moderate the effect of bundle discount on purchase likelihood. Specifically, when consumers regard the two product forms as equally appropriate for the same usage situations, the forms will be substitutes and $V_{Fj|Fi} \rightarrow 0$. The bundle will be relatively unattractive and there will be no significant difference in their purchase

likelihood for the bundle whether a bundle discount is offered or not.⁵ The discount itself does not motivate consumers to buy the bundle because they are paying for the same content twice and the marginal utility they receive from the second form together with the first is very low or even zero.

On the other hand, when consumers are considering different possible usages for the product forms, the likelihood of buying the bundle should be significantly higher in the discount as compared to the no discount case. Specifically, when consumers regard the two product forms as appropriate for different usage situations, the forms will be perceived as more complementary than in the previous case and $V_{F_j|F_i} \rightarrow V_{F_j}$. The bundle discount can motivate consumers to buy the bundle in this case – not only the marginal utility they get from the second form together with the first is positive but also the money outlay is lower. In the absence of a discount consumers are likely to find the bundle unattractive because it does not increase content utility (see Equation 1a). The bundle discount can compensate for this (see Equation 2a).

Hypothesis 2 (information product form bundles): a) When consumers are suggested different usage situations for the product forms, the purchase likelihood for the bundle when bundle discount is offered is significantly higher than when bundle discount is not offered.⁶ b) There is no effect of availability of bundle discount when consumers are suggested same usage situations for the two product forms.

With respect to conventional product form bundles the predictions on the effect of

⁵ In our experiments we have chosen to test a 25% level of bundle discount because this level is commonly used in practice (e.g., Buy a pair of shoes and get the second pair at 50% off). As shown in Equations 2a and 2b, the choice of a bundle is sensitive to the size of the discount, and this conclusion may not hold for very deep discounts.

⁶ As can be seen from Equation 2a, the appropriateness of this hypothesis is conditional on the discount being large enough to compensate for the bundle not offering an increase in content utility.

usage situation and bundle discount on purchase likelihood for the bundle are different – we expect a main effect of both usage situation and bundle discount but no interaction. Because consumers receive more content utility when acquiring the bundle, their willingness to pay for the bundle is higher than that for each individual item. If a bundle discount were offered, consumers would perceive the bundling of product forms as a quantity discount, and thus be more likely to buy the product form bundle. If they are suggested to use the two forms in different usage situations (versus same usage situations) $V_{F_j|F_i}$ may still increase because the items could be viewed as more complementary. Thus, consumers may perceive positive marginal utility from owning Form j together with Form i, and consequently, be more likely to buy the product form bundle.

Hypothesis 3 (conventional product form bundles): a) Consumers are more likely to buy the product form bundle when they are suggested different usage situations for the two product forms as compared to when they are suggested the same usage situations for the two product forms. b) Consumers are more likely to buy the product form bundle when they are offered bundle discount as compared to when they are not offered bundle discount.

Relative Price of Print vs. Electronic Forms

Another factor that might influence the purchase likelihood for the product form bundle is the relative price of the two product forms. The more interesting case is the one of the information product form bundle. In this case, because consumers receive just one content utility from the two different forms, the marginal utility having Form j together

with Form i is relatively low and sometimes close to zero. Second, electronic information products are unique in that the marginal cost of reproducing and distributing them is often much lower than the cost of the print form, even close to zero (e.g. Bakos and Brynjolfsson 2000). In our empirical work we examine the purchase likelihoods for the bundle when the information product forms are priced differentially and compare the following cases: Case 1 - price of the two forms is equal, and Case 2 - price of the print form is higher than price of the electronic form. Note that the bundle prices are kept constant.

To establish a benchmark, assume that the prices of the two forms are equal: $P_i = P_j = P_A$, so the price of the bundle is $(1-d)*(2 P_A)$, where d is the discount. Then the bundle will be chosen if $V_C + V_{F_i+F_j} - (1-d)*(2 P_A) > \text{Max} (V_C + V_{F_i} - P_A, V_C + V_{F_j} - P_A)$, where $V_{F_i+F_j} = V_{F_i} + V_{F_j|F_i}$ is form utility from buying both items (see footnote 1). If $V_{F_i} > V_{F_j}$ it follows that the bundle is chosen if $V_{F_j|F_i} > (1-2d)P_A$, or if the incremental value of j exceeds its incremental cost. A similar condition can be worked out for the case in which $V_{F_j} > V_{F_i}$. Adding the conditional probabilities of these two cases gives the probabilities of bundle choice expressed in conditions 5 and 6 in Table 1, panel B (condition 5 expresses the special case of $d = 0$).

Let the price of item i increase by kP_A , and the price of item j decrease by an equal amount, so that the sum of the prices of the two items is still $2P_A$. Now, because of the shift in relative price, i is more attractive only if $V_C + V_{F_i} - (1+k)P_A > V_C + V_{F_j} - (1-k)P_A$, or if $V_{F_i} - 2kP_A > V_{F_j}$. If this condition holds, the bundle will be chosen if $V_C + V_{F_i+F_j} - (1-d)*(2P_A) > V_C + V_{F_i} - (1+k)P_A$, which reduces to: $V_{F_j|F_i} > (1-k-2d)P_A$. A similar expression can be worked out for the case in which j is more attractive ($V_{F_i} -$

$2kP_A < V_{F_j}$). Adding conditional probabilities of these two cases gives the probabilities of bundle choice expressed in conditions 7 and 8 in Table 1, panel B (condition 7 expresses the special case of $d = 0$).

Comparison of the conditions in panel B of Table 1 leads to predictions about the effects of discounts and relative prices on the acceptance of the bundle. First, because it lowers the incremental cost of the less preferred item, the discount makes condition 6 $>$ 5 and 8 $>$ 7, and there should be a main effect of discount.⁷ Whether a change in relative prices will lead to increased purchases of the bundle depends on how the relative valuation of the two items varies across consumers. As shown in conditions 7 and 8, when $V_{F_i} - 2kP_A > V_{F_j}$ the probability of buying both items increases because the less valued item becomes cheaper, and it can also be shown that the probability of buying the bundle will increase as long as $V_{F_i} - kP_A > V_{F_j}$.⁸ If this condition does not hold, the bundle becomes less attractive when there are different relative prices, and the net effect of changes in relative price on bundle choice depends on the distribution of consumer valuations.⁹ Given that most consumers employ the print versions of books and newspapers, it seems reasonable to assume as a maintained hypothesis that most consumers place a relatively high valuation on the print version.

⁷ To compare conditions 6 and 5, let $F_{j_i}(V')$ represent the density of consumer valuations $V_{F_i|F_i}$ between 0 and V' , and $F_{i_j}(V')$ be a similar density for $V_{F_j|F_j}$. Then the share of consumers who would buy the bundle with a discount, but not otherwise, is $(F_{j_i}(P_A) - F_{j_i}((1-2d)P_A))(S) + (F_{i_j}(P_A) - F_{i_j}((1-2d)P_A))(1-S)$, where S is the share of consumers for whom $V_{F_i} > V_{F_j}$. A similar condition can be worked out for comparison of 8 & 7.

⁸ Let $0 < V_{F_i} - V_{F_j} < 2kP_A$, in which case the bundle is chosen if $V_{F_i|F_j} = V_{F_i+F_j} - V_{F_j} > (1+k-2d)P_A$. Let $V_{F_i} - V_{F_j} = \varepsilon$, so $V_{F_i+F_j} - V_{F_j} + \varepsilon > (1+k-2d)P_A$, or $V_{F_i|F_j} = (1+k-2d)P_A - \varepsilon$. If $\varepsilon > kP_A$, the incremental value of i exceeds its cost, and the bundle becomes more attractive relative to the case of equal prices. If $\varepsilon < kP_A$, the incremental value of i is not sufficient to cover its cost.

⁹ To compare conditions 7 and 5, use the same notation for the density of consumer valuations as in footnote 5, let S' be the share of consumers with valuations $V_{F_i} - V_{F_j} > kP_A$, S^* be the share of consumers with valuations $0 < V_{F_i} - V_{F_j} < kP_A$, and $1 - S' - S^*$ be the share with valuations $V_{F_j} > V_{F_i}$. Then the share of consumers who would buy the bundle compared to the case of equal relative prices is $(F_{j_i}(P_A) - F_{j_i}((1-k)P_A))(S') - (F_{j_i}((1+k)P_A) - F_{j_i}(P_A))S^* - (F_{i_j}((1+k)P_A) - F_{i_j}(P_A))(1-S' - S^*)$. A similar comparison between 8 and 6 could be obtained from subtracting $2dP_A$ from the price terms. Since 8 vs. 6 involves different parts of the price distribution compared to 7 vs. 5, the two comparisons need not give the same results.

Hypothesis 4 (information product form bundles): a.) Across both discount conditions, if the preference for the traditional (print) version (i) over the electronic version (j) is sufficiently large ($V_{Fi} - V_{Fj} > kP_A$), consumers are more likely to buy the product form bundle when the traditional print product is priced at a premium and the electronic product is priced at a discount as compared to when the products are priced at the same level. b.) Consumers are more likely to buy the bundle when a discount is offered.

The intuition behind Hypothesis 4a is straightforward. The more item prices match consumer valuations, the easier it is to induce consumers to buy both items. If V_{Fi} is very high relative to V_{Fj} , setting equal prices will make j unattractive, but leave the consumer a surplus on i. It becomes difficult to induce the consumer to buy both items. Conversely if V_{Fi} is only slightly higher than V_{Fj} , setting a high price on i will make it unattractive, but will leave the consumer with a surplus on j. If V_{Fi} is very high relative to V_{Fj} , offering different relative prices can have the same effect as offering a bundle discount (compare conditions 6 and 7 in Table 1). However, as they extract more surplus, different relative prices will bring more revenue.

We can also present an alternative intuition for Hypotheses 4 from the perspective of consumers' evaluation process. Recall that under the no discount case, the price of the bundle is the same across the same price (case 1) and differential price (case 2) conditions. Given that consumers have higher preference for the print version, it becomes the anchor for evaluating the bundle (see Yadav 1993). Under the same price condition, consumers have a "gain" on the anchor form (print) in the bundle, while they have a "loss" on the less preferred form (electronic), as the individual prices of the different forms could act as reference points in evaluating the bundle. Since perceived loss has a

greater impact than the perceived gain (Kahneman and Tversky 1979), the bundle is still evaluated negatively overall. In the differential price case, the prices are more in line with consumers' expectations (driven by their valuation) and there is no significant gain/loss on the anchor form and the other form. Thus, the bundle is evaluated more favorably. We argue that the price level of the less preferred form relative to consumer valuation in case 1 (same prices) heightens the poor evaluation of the form and the bundle, while the lower price in case 2 does not have such an effect on the bundle evaluation. Giving a price discount for the bundle can help overcome the negative evaluations and improve the evaluation and purchase of the bundle.

In the following sections we present the results of two studies designed to test the hypotheses outlined above.

Study 1

The main objective of this study is to test Hypothesis 1. Additionally, we introduce a bundle discount variable and investigate whether the level of bundle discount affects the purchase likelihood for the product form bundle. Specifically, we are interested in whether the bundle discount per se motivates consumers to buy the bundle.

Method

Subjects. Subjects were 80 undergraduate students enrolled in an introductory marketing course. They were awarded extra course credit for their participation.

Product categories and materials. We used two information product categories and two conventional product categories, specifically books (print and electronic) and journal subscriptions (print and electronic), and margarine (stick and tub) and soap (bar

and liquid). Advertisements for fictitious brands were developed to describe these products.

Design and procedure. We employed a 2 (level of discount: 0%, 25%) by 2 (category type: information, conventional) between subjects design with 2 product replicates. The order of presentation of the product categories was counterbalanced within each category type. The prices were presented in absolute values (price of form 1, price of form 2, bundle price).

Every subject evaluated two product advertisements for either book and newspaper, or margarine and soap. Subjects reviewed each ad and stated their likelihood of purchasing the three options (the bundle and the two individual product forms). Purchase likelihood was measured in two different ways: by allocating 100 points between the three options¹⁰, and by indicating how likely they would be to buy the three options (1 = “very unlikely,” 9 = “very likely”). Next the subjects were asked to rate the perceived complementarity of the two product forms using a 3-item Likert scale¹¹ (1 = “strongly disagree,” 7 = “strongly agree”). Finally, several control measures were taken including attitude towards the ad (bad/good, unpleasant/pleasant, worthless/valuable, and unfavorable/ favorable; MacKenzie and Lutz 1989; Mick 1992) and demographics (e.g. gender and computer usage).

Results

¹⁰ We do not include the “buy nothing” option in the 100-point allocation among the different product forms because we are interested in which form(s) our subjects are going to choose after they have decided to buy the product. Thus we try to control for other factors that may influence the product purchase decision and are not of specific interest in this study.

¹¹ “It would be more useful to have both the paperback book and the electronic book than just the paperback book”, “There is additional value in having both the paperback book and the electronic book as compared to having only one of them” and “It would be more useful to have both the paperback book and the electronic book than just the electronic book.”

The reliabilities of the perceived complementarity scales are between 0.81 and 0.92 in the four categories (N = 40 per category). The mean levels of perceived complementarity (after averaging the three items of the scale) between the product forms are as follows: $X_{\text{BOOK}} = 3.21$ (St. Dev. =1.67), $X_{\text{NEWS}} = 3.17$ (1.62), $X_{\text{MARG}} = 3.56$ (1.81) and $X_{\text{SOAP}} = 4.19$ (2.10).

To test Hypothesis 1 we use linear regression in which the independent variable is the perceived complementarity between the product forms in the bundle, and the dependent variables are the points allocated to the bundle and the likelihood of buying the bundle (separate model for each product category and each dependent variable). Our regression results indicate that in the book, margarine and soap categories there is a positive relationship between the degree of perceived complementarity and the purchase likelihood for the bundle (Likelihood of buying the bundle: $b_{\text{BOOK}} = 0.535$, $b_{\text{MARG}} = 0.746$, $b_{\text{SOAP}} = 0.731$, all p 's < 0.01; Points allocated the bundle: $b_{\text{BOOK}} = 0.466$, $b_{\text{MARG}} = 0.675$, $b_{\text{SOAP}} = 0.626$, all p 's < 0.01), thus providing support for H1. In the newspaper category the relationship between perceived complementarity and the likelihood of buying the bundle is also positive ($b_{\text{NEWS}} = 0.297$, $p = 0.063$), and the relationship between perceived complementarity and points allocated to the bundle is positive but not significant ($b_{\text{NEWS}} = 0.178$, $p > 0.1$). In sum, our results generally provide support for Hypothesis 1.

We use one-way ANOVA to investigate the effect of bundle discount on the purchase likelihood for the product form bundle. In the book and newspaper categories, there is no significant difference between the points allocated to the bundle and the likelihood of buying the bundle in the discount and no discount conditions (all p 's > 0.44).

A discount of 25% does not make consumers more likely to buy information bundles. The perceived incremental value of the second form must therefore be less than 50% of the value of the first form. This is to be expected since both forms have the same content with its utility derived in one form or the other, but not in both. In the margarine and soap categories the situation is different – in both categories respondents are more likely to buy the bundle and allocate more points to the bundle in the discount versus the no discount conditions (Likelihood of buying the bundle: $X_{\text{MARG/HIGH}} = 4.90$ versus $X_{\text{MARG/LOW}} = 2.74$, $F_{1,38} = 6.20$, $p < 0.05$; $X_{\text{SOAP/HIGH}} = 6.62$ versus $X_{\text{SOAP/LOW}} = 3.42$, $F_{1,38} = 13.39$, $p < 0.01$; Points allocated the bundle: $X_{\text{MARG/HIGH}} = 32.33$ versus $X_{\text{MARG/LOW}} = 14.47$, $F_{1,38} = 4.14$, $p < 0.05$; $X_{\text{SOAP/HIGH}} = 43.75$ versus $X_{\text{SOAP/LOW}} = 23.42$, $F_{1,38} = 4.58$, $p < 0.05$). This indicates that, because consuming one form does not reduce the value of the other, consumers perceive the bundling of conventional product forms as a quantity discount and are more willing to buy the bundle if a discount is offered. In general, consumers were significantly more willing to buy both forms of the conventional products than the information products, supporting Hypothesis 1a.

Discussion

On the basis of these results, it appears that the purchase behavior of the consumers is related to the level of perceived complementarity between the different forms in the bundle, and can be positively affected by offering a nominal discount of 25% in the conventional but not in the information product cases. In Study 1 we do not communicate any usage situations to the consumers. We only present them with a short product description and with the item and bundle prices. We use these results as a

baseline and design a second study that investigates what happens when we communicate various usage situations to the consumers. Our goal is to show that although the bundle discount itself does not motivate consumers to buy information bundles, it can be effective when different usage situations for the forms are presented.

Study 2

Study 2 tests hypotheses 1a, 2, 3 and 4. In the usage situation manipulation we present consumers with possible usages for the two product forms in the following way: in the same usage situation condition we advertise situations for which the two forms are equally appropriate, while in the different usage situation condition we suggest usage situations for which the two forms are differentially appropriate. Below we describe how the stimuli were developed.

Stimuli Development

Product categories. As in Study 1, we use two information and two conventional product categories - book and newspaper, and margarine and coffee, respectively.

Usage situations. We employed extant substitution-in-use (SIU) methods to generate usage situations appropriate for each product form (see Srivastava et al. 1984). The SIU approach (Stefflre 1971) is an iterative procedure for constructing product specific usage-situational taxonomies. Using the SIU approach, the perceived similarity between the different alternatives for the usage situations of interest and the resulting product-market structures can be investigated (Ratneshwar and Shocker 1991; Srivastava, Leone and Shocker 1981).

In our study, first, a sample of consumers (N = 15) generated a set of usage

situations for the two forms in each product category. Then, a second sample (N = 10) evaluated the appropriateness of each product to each usage situation on a yes/no/don't know scale. Finally, a structured questionnaire with product forms and usages was developed and administered (N = 67). The subjects judged the appropriateness of each product form for each usage situation on a 5-point Likert scale (not appropriate to very appropriate) including a "don't know" option.

<< Insert Table 2 about here >>

The perceived appropriateness of the generated usage situations for each product form is presented in Table 2. For book, newspaper, and coffee product categories, one of the two forms is perceived as more appropriate for some usage situations and the other product form is perceived as more appropriate for other usage situations. For example, in the book product category, a print book is perceived as more appropriate than an electronic book for giving as a present ($X_{\text{PRINT}} - X_{\text{ELECT}} = 2.24, p < 0.05$), reading for pleasure (MD = 1.76, $p < 0.05$), reading while traveling (MD = 1.74, $p < 0.05$) and reading it to other people (MD = 1.45, $p < 0.05$). On the other hand, an electronic book is perceived as more appropriate than a print book for e-mailing pages/chapters (MD = -2.43, $p < 0.05$), searching (MD = -0.95, $p < 0.05$) and copying citations/paragraphs (MD = -0.60, $p < 0.05$). Both product forms of the above three categories are perceived as equally appropriate for several usage situations. For example, in the book product category, the perceived appropriateness of getting them on a short notice and using them for archival purposes are not significantly different across product forms.

Materials. Advertisements for fictitious brands were used to describe these products and manipulate the usage situations. We selected the usage situations in which

one product form is perceived as significantly more appropriate than the other for designing the different usage situation manipulation, and the situations in which the product forms are equally appropriate for designing the same usage situation manipulation. The number of usage situations is balanced across conditions and everything else in the advertisements is kept constant. Thus, we presented four usage situations in total in each advertisement: in the same usage situation condition we listed four situations in which the two forms are equally appropriate, while in the different usage situation condition Form 1 is more appropriate for two of the usage situations and Form 2 is more appropriate for the other two usage situations.

With respect to the margarine product category, there was no significant difference in how the two product forms were perceived for most of the situations. Therefore, we used the same four usage situations to manipulate the same/different conditions, just changing the wording – stating that form 1 is more appropriate for two of the usage situations and form 2 is more appropriate for the other two usage situations in the different usage situation condition, while stating that the forms are appropriate for all four situations in the same usage situation condition. We consider this a more conservative manipulation and elaborate on this in the results section.

Pretest 1

We pretested the two advertisements for each of the four categories using a between-subjects design in which each subject saw only one advertisement (N=160). Based on MacKenzie and Lutz (1989) and Mick (1992), we use eight semantic differential scales to measure attitude towards the ad (bad/good, unpleasant/pleasant,

worthless/valuable, and unfavorable/favorable) and ad credibility (unconvincing/convincing, biased/unbiased, unbelievable/believable and non-informative/informative). Across the categories, the alphas varied between 0.85 and 0.93 for attitude towards the ad, and between 0.74 and 0.85 for ad credibility. The results showed that the attitudes towards the ads and the ad credibility were not significantly different across the manipulated same/different usage situation conditions. Therefore, differences in responses to the advertisements across conditions cannot be attributed to differences in attitudes towards the ad/ad credibility.

Pretest 2

We performed a second pretest of our stimuli (N=75) to assess the extent to which the product forms were perceived as complements using the same complementarity scale as in Study 1. The results indicated that our subjects viewed the product forms as more complementary in the different usage situation condition (vs. the same usage situation condition) in the book, newspaper, coffee and margarine product categories ($X_{\text{BOOK/DIFF}} = 4.32$ versus $X_{\text{BOOK/SAME}} = 3.00$, $F_{1,35} = 5.21$, $p < 0.05$; $X_{\text{NEWS/DIFF}} = 4.25$ versus $X_{\text{NEWS/SAME}} = 2.96$, $F_{1,35} = 5.33$, $p < 0.05$; $X_{\text{MARG/DIFF}} = 4.77$ versus $X_{\text{MARG/SAME}} = 3.48$, $F_{1,36} = 4.33$, $p < 0.05$; $X_{\text{COFF/DIFF}} = 5.46$ versus $X_{\text{COFF/SAME}} = 4.25$, $F_{1,36} = 5.31$, $p < 0.05$). Consequently, we decided to proceed with the study.

Method

Subjects. 406 undergraduate students enrolled in several marketing courses participated in the experiment (N = 240 in the information bundle categories, and N=166

in the conventional categories)¹². They were awarded extra course credit for their participation.

Design and procedure. We employed a 2 (usage situations: same, different) by 2 (level of discount: 0%, 25%) by 2 (category type: information, conventional) between subjects design with 2 product replicates within each category type (book and newspaper, and margarine and coffee). Additionally, for the information category type, we introduce another between subjects factor, relative price, which was varied so that the print form price was either equal to the electronic form price or higher than the electronic form price. The prices were presented in dollar amounts. We used the same experimental procedure and measures as in Study 1.

Summary of Study 2 Results

As in study 1, respondents allocated 100 points between the individual items and the bundle to indicate their likelihood of purchasing each alternative. Table 3 presents the average share of the points that were allocated to the bundle in each of the experimental conditions; these shares can be interpreted as average probabilities of choosing the bundle. In accord with Hypothesis 1a, the table shows that the average probability of choosing conventional bundles is considerably higher than the average probability of choosing information bundles in all conditions. Consistent with Hypothesis 2, the discount and different usage conditions only have a major effect on the probability of choosing information product bundles when they are combined. On the other hand, consistent with Hypothesis 3, the discount and different usage conditions are both associated with higher choice probabilities for conventional bundles across all conditions.

¹² Our use of the additional relative price manipulation necessitated a larger sample for the information products.

Finally, the high price for print and low price for electronic items is associated with a higher incidence of preference for the bundle, as predicted by Hypothesis 4, only in the no discount case. We present a more complete analysis of these results, including formal hypothesis tests, in the following section.

<< Insert Table 3 about here >>

Detailed Results

We first discuss the manipulation check, and then present results of hypothesis tests for conventional products, followed by information products.

Manipulation check. The reliabilities of the perceived complementarity scales were between 0.82 and 0.92. We ran one-way ANOVAs for each product category with USAGE as the between-subjects factor and perceived complementarity as the dependent variable. In all four categories the perceived complementarity in the different usage situations condition was significantly higher than the perceived complementarity in the same usage situations condition (USAGE: $X_{\text{BOOK/DIFF}} = 3.84$ versus $X_{\text{BOOK/SAME}} = 3.32$, $F_{1,239} = 4.33$, $p < 0.05$; $X_{\text{NEWS/DIFF}} = 3.99$ versus $X_{\text{NEWS/SAME}} = 3.46$, $F_{1,238} = 4.46$, $p < 0.05$; $X_{\text{MARG/DIFF}} = 4.65$ versus $X_{\text{MARG/SAME}} = 3.86$, $F_{1,78} = 4.27$, $p < 0.05$; $X_{\text{COFF/DIFF}} = 4.56$ versus $X_{\text{COFF/SAME}} = 3.81$, $F_{1,84} = 5.16$, $p < 0.05$). Thus, we successfully manipulated the same/different usage situations variable and could proceed with the analyses.

The results of the analyses employed in testing Study 2 hypotheses are presented in Table 4 (GLM procedure results) and Figure 1 (the interactions in a graphical form). Since it is bounded at zero and 100, the measure of points allocated to the bundle employed as our dependent variable may not be normally distributed. Accordingly we

applied a logit transform in which the dependent measure is defined as $\ln((\text{points} + .5)/(100 - \text{points} + .5))$ in conducting hypothesis tests.¹³

<< Insert Table 4 and Figure 1 about here >>

Conventional products. According to Hypothesis 3 we expect a main effect of both usage situation and bundle discount on likelihood of buying the bundle. As anticipated, two significant main effects were found in the analysis of the margarine and coffee data - USAGE (margarine: $F_{1,76} = 6.01$, $p < 0.05$; coffee: $F_{1,82} = 4.09$, $p < 0.05$) and DISCOUNT (margarine: $F_{1,76} = 9.24$, $p < 0.01$; coffee: $F_{1,82} = 23.65$, $p < 0.05$). The two-way interaction between USAGE and DISCOUNT is not significant in both product categories ($p > 0.1$). Consequently, our results in the margarine and coffee categories provide support for Hypotheses 3a: consumers are more likely to buy the product form bundle when they are suggested different usage situations for the two product forms as compared to when they are suggested the same usage situations for the two product forms, and for Hypothesis 3b: consumers are more likely to buy the product form bundle when they are offered a bundle discount as compared to when they are not offered a discount.

In the margarine case just stating that one form was more appropriate than the other for a given situation was sufficient to produce the desired manipulation. In the sense that it is not reinforced by a general perception that the different forms are more appropriate for different usage situations, this manipulation can be regarded as conservative. Evidently it is possible to create a perception of appropriateness for a given usage situation by simply presenting information that this is the case.

¹³ The addition of .5 makes it permissible to take logs in cases where points = 0 or 100. While we employed the logit transform, models using the raw points variables gave very similar results.

While not shown in Table 4, we also tested the hypothesis of equal choice probabilities for electronic and information products. As one might expect from the large differences in average choice probabilities between conventional and information products in Table 3, this hypothesis was rejected ($F_{1,669} = 76.69$, $p < 0.001$).

Information products. According to Hypothesis 2 we expect the usage situations considered when making a purchase decision to moderate the effect of bundle discount on purchase likelihood. To test this hypothesis, we use the GLM procedure in SAS in which the dependent measure is the points allocated to the bundle, and USAGE, DISCOUNT and RELATIVE PRICE are the between subjects factors.

As anticipated, a significant USAGE by DISCOUNT interaction was found in both categories ($F_{1,232} = 6.03$, $p < 0.05$ for book, and $F_{1,232} = 3.91$, $p < 0.05$ for newspaper). The first planned contrast revealed that when the consumers are presented with different usage situations, they are significantly more likely to buy the bundle in the discount versus no discount condition ($F_{\text{contrast1},232} = 13.28$, $p < 0.01$ for book, and $F_{\text{contrast1},232} = 13.64$, $p < 0.01$ for newspaper), and the second planned contrast revealed that when consumers are suggested the same usage situations there is no significant difference in their purchase likelihood in the discount as compared to the no discount condition (p 's > 0.37).

Consequently, our results provide support for Hypotheses 2a and 2b.

Finally, the last planned contrast (testing Hypothesis 4) showed that there is no significant difference between the likelihood of buying the bundle when the traditional print form is priced at a premium and the electronic form is priced at a discount, and the likelihood of buying the bundle when the traditional and the electronic forms are priced at the same level (p 's > 0.42). This is consistent with the data in Table 3, which show similar

choice probabilities for both conditions. A post hoc contrast comparison revealed that our prediction is valid in the case of no bundle discount in the book category ($F_{\text{contrast1,232}} = 3.78, p=0.05$): as shown in Table 3, the average probability of buying both print and electronic books is .1195 when the electronic form has a lower price, but only .0610 when prices are equal. However a similar comparison was insignificant in the other cases.

The results for Hypothesis 4 can be explained as follows. Recall that our test of Hypothesis 4 was based on the assumption that the print form is valued significantly more than the electronic version. Specifically we assumed $V_{Fi} - V_{Fj} > kP_A$, where k is increase in price of the print version (decrease on price of the electronic) as a proportion of price. In our study $k = .25$, so the print version must be worth at least 25 percent more than the electronic form as a proportion of the average price to make the bundle more attractive. However, a substantial proportion of our respondents would likely choose the electronic version at equal prices for print and electronic: at equal prices the average number of points allocated to the electronic book was 37 of 100; the average for the electronic newspaper was 40 of 100 (these averages did not differ much between discount conditions). In the no discount condition, the corresponding averages for print were 56 and 53 respectively.¹⁴ These results suggest that V_{Fi} and V_{Fj} (the utilities derived from the form per se) are not very different for many consumers. If so, since content utility can be obtained from any of the alternate forms, these consumers are likely to be better off buying just the electronic version when it has a low price rather than buying the bundle, which is what happened in our study. At a low price for the electronic version, the proportion buying only electronic form increased by about 10 percent for books, and 13 percent for newspaper. These consumers likely did not choose the bundle because the

¹⁴ In the discount condition, about ten percent more respondents chose the bundle rather than print only.

print version became too expensive relative to its incremental value. Thus our test of Hypothesis 4 appears to fail because the electronic form is valued more than we anticipated. Additionally, an interaction between the content and form utility may explain the results associated with Hypothesis 4.

Discussion

The results of our study provide useful insights into how consumers react to product form bundles. In the context of information products, since consumers obtain content utility only once in buying the bundle (content utility is fixed going from either of the form to the bundle), the product forms tend to be considered overall more as substitutes. Even with differing degrees of perceived complementarity/contingency across our subjects, the purchase probabilities of the bundle do not increase with just price discounts on the bundle. The bundle purchase probabilities increase only when price discounts are accompanied by communication about different usage situations to impact the consumers' perceived complementarities between the two forms in the bundle. These results may be more specific to the valuations of our student respondents, who we observed not to value form utilities very much in comparison to content utility, but they also point to the fact that different usages/usage situations of the forms (and form utilities) have to be emphasized clearly in order to highlight the value of the information product bundle, no matter which consumer group we market the bundle to. The important take-away is that such communication strategies help significantly in the case of information product bundles and, thus, marketers have a viable strategy to harvest the potential extra revenues in selling bundles.

In the case of conventional product form bundles on the other hand, the absolute probabilities of purchasing bundles are much higher as compared to information product bundles, even though the forms are perceived as strong substitutes. This is not surprising as consumers obtain content utilities from both forms in the bundle (content utility increases in going from either of the form to the bundle), and hence, in some sense, it is not a proper comparison. Price discounts for conventional product bundles increase the purchase probabilities of the bundles as they work as quantity discounts, and communication about different usages also seem have to a positive impact.

An interesting observation from our study is that, although the product forms seem to be moderate/strong substitutes, bundle purchase probabilities are significantly high enough to make mixed bundling a viable and profitable strategy in both categories, albeit for different reasons. While in the case of conventional product form bundles, mixed strategies could be arguably optimal in the presence of quantity discounts, in the case of information product form bundles, mixed strategies can be very profitable given the very low marginal cost of the additional form. In both categories we observe that the communication strategies play an important role in supporting mixed bundling strategies. In this regard, our results are somewhat different from the traditional bundling results, which suggest a pure component strategy in the presence of strong substitutes and low marginal costs (Venkatesh and Kamakura 2003), and provide additional insights for the case of product form bundles.

Our results also show some support for differentially pricing the information product forms. While we show that this is better than pricing the forms equally if consumers have a relatively high preference for one item as compared to the other, in our

experiment we could not enforce this condition. Nevertheless, the hypothesis was supported in the case of books under the no discount case. An interesting interpretation of the result is that the prices of the individual product forms could play an important role in bundle evaluation. If the price of the less preferred form is more than the consumers' valuation for the form, there could be a magnified negative effect on the bundle evaluation. This implies that price information can have similar effects as non-price information studied in extant literature (e.g., Yadav and Monroe 1993). While this notion needs to be tested more formally, it does highlight the importance of pricing the individual product forms appropriately in a mixed bundling strategy.

Managerial Implications

How should companies market information bundles? In practice, online publishers use various product and pricing strategies. For example, Wall Street Journal offers its online edition at 40% of the price of the print edition, and the discount for choosing the bundle is 17%. Business Week and Fortune offer free online content for their print subscribers only, and Newsweek and Washington Post offer their online editions for free to any interested readers. Finally, National Academies Press, a publisher selling books online, offers electronic copies for most of its books at about 75% of the print book price, and an average bundle discount of 40%. In general, the prevailing marketing practice in the case of information products has been to price differentially the various forms and to offer bundle discounts. With the exception of WSJ, none of these organizations stresses different usage situations for the print and electronic forms.

However, our results indicate that information providers should try to

communicate different usages for their product forms to make them to be perceived as more complementary forms rather than just substitutes. We provide evidence that discounts commonly used in practice work only when different usage situations for the product forms are communicated. The message that we would like to convey is that stressing different usages for the product forms may be needed to motivate consumers to buy the bundle even when a discount is present. We find that communication of different usage situations, or other attempts to enhance the value of alternative forms of information products can increase the salience of the form utilities and may be needed because of the inherent duplication of content that is provided by the different forms of information products.

If consumers do not perceive the form utilities to be very significant, then the content utilities can render the forms to be very strong substitutes. Something has to be done to induce buyers to purchase a second form in the face of this perception of substitutes due to content. One strategy is to make the functionalities of the forms very different and educate the consumers of the relative usage situations of the different forms. This will make the form utilities much more significant. The other option is to change the content of the two forms – for example, online newspapers are updated often during the day and thus the content is more dynamic as compared to the static content of the print form. Similarly, electronic versions of books can be updated and distributed to consumers for free. Electronic versions can also provide links to other relevant content that print versions cannot provide. However, this will increase the cost of the electronic form, and the cost side should be taken into account before considering such a strategy.

Our results also suggest that if one form is significantly preferred much more than

the other, charging a high price for the more preferred form, and a low price for the less preferred form may be an effective strategy. This might well be as effective as giving discounts while providing higher revenues to the marketer. These results have particular relevance in the bundling of online content such streaming video and DVDs, online music, CDs, and DVD-Audio, where it is not clear how consumers' valuation for the different forms are distributed. They also suggest as the online channel matures and quality of digital content improves, differential pricing strategies and discounting strategies should change significantly.

Conclusion

The study contributes to the marketing literature in several ways. To our knowledge, this is the first attempt to study the effects of product form bundling on consumer preferences and consumption behavior. We provide a useful approach using the perspective of content utility and form utility, and we model the effect of both price and non-price information in bundle evaluation process and draw conclusions about their impact. We also introduce a usage situational perspective in studying bundling issues. The SIU approach has been proven successful in investigating the influence of usage situational variables on consumers' behavior and is helpful in the present setting as well. Our study complements the findings in extant literature on bundling by providing insights into conditions under which those findings are directly applicable to product forms and instances where those results may not hold. We show that the perceived complementarity among the bundle components is extremely important and suggest how product form bundles might be marketed. Finally, we provide evidence that the conventional and

information product form bundles are different from a conceptual point of view and discuss a mechanism that can explain this difference.

Several possible ways for extending the present study are worth mentioning. First, explaining the distinction between conventional and information product form bundles is worth future effort. Consumers may see bundling of conventional product forms as a quantity discount, while bundling of information product forms as bundling of complementary items. Second, it will be interesting to see how exactly the consumers evaluate product form bundles. Some authors suggest an anchoring and adjustment model for bundle evaluation (i.e. Yadav 1994), while others argue for an averaging model whereby component ratings are balanced into an overall evaluation (i.e. Gaeth et al. 1990). This issue is especially important in designing and pricing of electronic products and bundling them with traditional products. Different pricing and price presentation strategies should be employed in the above cases of bundle evaluation. A third interesting research issue comes from the fact that the digital form offers the potential of an augmented version of the traditional form. Consequently, companies may be able to increase the level of complementarity of the forms in information bundles by somehow changing or improving the electronic form, and thus positively influence bundle sales. Finally, it is also important to support/verify our findings using empirical data from online content providers. Future research should address and clarify such strategies.

CHAPTER III: ESSAY TWO. BUNDLING AND PRICING STRATEGIES FOR DIGITAL PRODUCTS

Abstract

Content providers such as publishers of books, newspapers and magazines have started to offer products in electronic form, and even individual sections, in addition to their print products. For example, some book publishers offer print and PDF books, while others offer print books and individual PDF chapters. Which strategy is more attractive for a company to pursue? We model the profit under these two strategies and outline conditions in which one or the other leads to higher profit. We apply our analytical framework to data from a field experiment implemented on the website of a book publisher.

Introduction

“U.S. consumer spending for online content grew 14% in 2004 reaching an all-time annual high of \$1.8 billion... While there is no doubt that the market remains strong, with only 11.6% of the Internet population purchasing content online in Q4 2004, there is still significant room for growth .”

(Michael Zimbalist, President, Online Publishers Association¹⁵)

The emerging technological solutions and the Internet channel unequivocally change the marketing of information. In the music category, for example, tapes and CDs give way to music downloads and online subscription services, and new formats as those introduced by dualdisc.com allow content providers to sell music in CD format plus DVD-Audio or surround sound as a bundle on the same disk. A similar trend is observed in the publishing industry where print products such as newspapers and magazines are offered in electronic form too, and consumers are even encouraged to buy both forms (e.g., Wall Street Journal). The electronic products can be unbundled at no extra cost into separate sections to be sold individually or re-bundled with the traditional print products. Although not yet common, publishers do offer full and unbundled electronic content in addition to print content, allowing customers to buy, for example, individual PDF chapters or entire PDF books and reports separately or together with the print editions (e.g., US Government Printing Office). While appealing because of low marginal costs and the likely catering to emerging consumer needs, selling electronic products may lead to additional revenue generation but can also result in product cannibalization.

The National Academies Press (NAP), for instance, publishes over 200 books a year on a wide range of topics in science, engineering, education and health, including full length books, reports and reference materials. In 1996 NAP started posting most of

¹⁵ Online Paid Content U.S. Market Spending Report 2004, Online Publishers Association, March 2005, www.online-publishers.org

its titles online as low (fax) quality content free for anyone to browse, search and sample. Although majority of the consumers continued buying print books, many website visitors began utilizing the online capability to download chapters, some even demanding higher quality electronic content at a price. Thus, NAP decided to consider two alternative product line strategies – on one hand, introducing books in PDF form in addition to the current print books; on the other hand, marketing individual PDF chapters with the print books. It is in this context that we execute our study.

In this paper, we attempt to model the profits under two feasible strategies a content provider may employ: traditional mixed bundling, in which the product line consists of print book, PDF book and the bundle of the two, and content unbundled mixed bundling, which is selling print book, PDF chapters and the combination of the two. Although traditional mixed bundling is a special case of content unbundled mixed bundling in which consumers are constrained to buy all the chapters (instead of one or more chapters), we model them separately in order to provide better insights on what determines the optimal prices and profits. Our goal is to provide insights on which strategy is more beneficial for a company to pursue and how the electronic content should be priced to extract optimal profit. Further, we empirically test our analytical predictions with data from an online experiment executed on the website of NAP.

Our study contributes to the marketing theory and practice in the following manner. While there is an extensive body of research suggesting that mixed bundling is the optimal strategy when there is asymmetry in the reservation prices for the bundle components (e.g. Adams and Yallen 1976; Schmalensee 1984; McAfee, McMillan and Whinston 1989), few studies focus on cases in which different mixed bundling strategies

are feasible and evaluate their attractiveness. Also, we look at form bundling and content unbundling simultaneously, which makes our approach unique and adds to the extant literature. Finally, while previous studies often treat bundle components as either complements or substitutes or unrelated products, we allow heterogeneous contingent valuations of one component given the other in the population. From a substantive point of view, we show empirically that the content unbundled mixed bundling strategy is more profitable than the traditional mixed bundling strategy under certain conditions. Our findings have significant practical implications, recommending how to profitably design and price electronic content.

The paper is structured as follows. First, we review related research and position our study. Second, we model the profits under traditional and content unbundled mixed bundling strategies, and derive which one is better under various conditions. Third, we report the empirical results and conclude with the implications of the study to the extant literature and practice.

Research Background

Bundling is marketing two or more products and/or services as a package at a special price (Gultinan 1987). Demand side incentives favoring bundling include negative correlations in reservation prices (Stigler 1963; Schmalensee 1984), complementarity in consumption (Telser 1979), and uncertainty in the valuations of the quality of the goods (Kenney and Klein 1983). With respect to supply side incentives, large scale bundling of information goods, for example, can be profitable because it creates economies of aggregation when their marginal costs are low (Bakos and

Brynjolfsson 1999; 2000).

Companies can employ a pure bundling strategy whereby only the bundle is offered, or a mixed bundling strategy, in which the bundled items are also sold separately. Extant research has looked at product and pricing strategies for bundles, including optimal bundle price and composition (Hanson and Martin 1990; Venkatesh and Mahajan 1993), how the degree of heterogeneity in the reservation prices affects optimal bundle pricing (Jedidi et al. 2003) and conditions favoring bundling/unbundling of industrial systems (Wilson, Weiss and John 1990).

In terms of contingent valuations in bundling decisions, studies have compared interrelated with independently valued products in a bundle. For example, Venkatesh and Kamakura (2003) model the optimal bundling strategies for interrelated products under monopoly and suggest that moderate or strong substitutes should be offered separately; the same is applicable for complements if the marginal costs are moderate relative to the market's maximum willingness to pay. A seller would gain by mixed bundling for weak substitutes/complements if the variable costs are not too high. Regarding information goods (e.g., music, weather forecasts, websites), large scale bundling is approximately optimal if consumers' values of subsequent goods do not decrease too quickly; otherwise pure bundling is optimal even when there are strong negative or positive correlations of values across goods (Geng et al. 2005).

To summarize, the literature on bundling identifies the conditions for profitable bundling and specifies optimal bundling strategies in various situations. What is missing in this stream of research is how to handle situations in which different mixed bundling strategies are feasible. With respect to information products, companies can implement

both traditional and content unbundled mixed bundling strategies, and which one is more profitable does not have a straight-forward answer. Different consumers may have different contingent valuations for the form bundles, and different contingent valuations for the unbundled electronic units (e.g., chapters within a book). Consequently, the existing premises on optimal bundling strategy and pricing can not be applied directly. Our predictions and empirical findings are relevant and insightful from both theoretical and managerial point of view.

Bundling Model

In our model the seller is a monopolist who offers a wide selection of book titles as hardcover or paperback books. Subject areas are very diverse, ranging from agriculture and education to medicine and engineering. The product and pricing strategy the publisher is employing at the moment is segment-based and reflects the needs, buying power and quality expectations of the consumers in the different subject domains. The publisher is currently choosing between two possible product line strategies: 1) Content Unbundled Mixed Bundling - selling PDF book chapters individually and together with the print books, and 2) Traditional Mixed Bundling - selling full PDF books individually and together with the print books. Next, we express optimal pricing of electronic content and profit under each strategy, and then compare the two profits.

Content Unbundled Mixed Bundling

Model basics

We assume that a book has J chapters and P_C is the price per chapter ($P_1 = \dots = P_J = P_C$). V_{ji} is the valuation of chapter j ($j = 1 \dots J$) by consumer i ($i = 1 \dots I$). The chapters are rank-ordered in terms of their valuation starting from the highest, e.g. $V_{1i} \geq V_{2i} \geq \dots \geq V_{ji}$. The number of chapters a consumer buys depends on the valuation of the chapters, namely consumer i buys chapter j if $V_{ji} \geq P_C$ and $V_{j+1,i} < P_C$. Thus, consumer i will buy exactly Q_C rank-ordered chapters if $V_{Q_C i} \geq P_C$ and $V_{Q_C+1,i} < P_C$.

Revenue from selling electronic chapters

In this section we first express the revenue from selling electronic chapters at individual level and then aggregate the electronic chapters revenues across consumers. At this point we only consider offering electronic chapters to consumers; the print book sales and the associated revenue and costs are introduced in the next section. The optimal price per chapter and the total and marginal revenues from chapters at individual level are graphically displayed in Figure 2.

<< Insert Figure 2 about here >>

We assume that the demand for chapters is linear. The valuation for the chapters, V_C , is presented on the y-axis, and the cumulative number of chapters at every valuation point, Q_C , is presented on the x-axis. N_C is the number of chapters with positive valuation (e.g., the consumer will buy N_C chapters if the price is zero). The optimal price per chapter P_C is equal to the valuation of the marginal chapter by the consumer. Let V_{Hi} be the valuation of the chapter with the highest valuation for a consumer. The quantity of chapters bought and the marginal revenue from chapters can be expressed as follows:

$$(1) \quad Q_C = N_C - P_C \frac{N_C}{V_{Hi}}$$

$$(2) \quad MR_C = \frac{\delta(Q_C P_C)}{\delta P_C} = \frac{\delta \left[\left(N_C - P_C \frac{N_C}{V_{Hi}} \right) P_C \right]}{\delta P_C} = N_C - 2P_C \frac{N_C}{V_{Hi}} = 0$$

Solving equation 2 for P_C , the optimal price per chapter is $P_C^* = \frac{1}{2} V_{Hi}$ and the optimal

revenue is $R_C^* = \frac{1}{4} V_{Hi} N_C$. Thus, the optimal price depends on the valuation of the highly

valued chapter, while the optimal revenue depends on both the valuation of the highly valued chapter and the number of chapters with positive valuation for the consumer.

Aggregated across consumers, the number of chapters bought and the marginal revenue from chapters are expressed below:

$$(3) \quad \sum_{i=1}^I Q_{Ci} = \sum_{i=1}^I \left(N_{Ci} - P_C \frac{N_{Ci}}{V_{Hi}} \right) = \sum_{i=1}^I N_{Ci} - P_C \sum_{i=1}^I \frac{N_{Ci}}{V_{Hi}}$$

$$(4) \quad MR_{Ci} = \frac{\delta \left[\left(\sum_{i=1}^I Q_{Ci} \right) P_C \right]}{\delta P_C} = \frac{\delta \left[\left(\sum_{i=1}^I N_{Ci} - P_C \sum_{i=1}^I \frac{N_{Ci}}{V_{Hi}} \right) P_C \right]}{\delta P_C} = \sum_{i=1}^I N_{Ci} - 2P_C \sum_{i=1}^I \frac{N_{Ci}}{V_{Hi}} = 0$$

Let $\bar{N} = \sum_{i=1}^I N_{Ci} / k F$ and $\bar{S} = \sum_{i=1}^I \frac{N_{Ci}}{V_{Hi}} / k F$, where k is the number of potential

consumers on the market and F is the fraction of consumers for which $V_{Hi} \geq P_C$. Then

\bar{N} is the average demand for chapters at zero price for the customers who buy at least one

chapter, and \bar{S} is the average slope of the demand for the customers who buy at least one

chapter. Thus, the optimal price per chapter is $P_C^* = \frac{1}{2} \bar{N} / \bar{S}$ and the optimal revenue

is $R_c^* = \frac{1}{4}(\bar{N})^2 / \bar{S}$. Thus, the higher the average demand for chapters at zero price for the customers who buy at least one chapter, and the lower the average slope of the demand for the customers who buy at least one chapter, the higher the optimal price and revenue. This means that companies can charge a relatively higher price per chapter when consumers value positively relatively more chapters, and when the decrease in valuation from the most preferred to the least preferred chapter is relatively slow.

Revenue from selling electronic chapters and the print book

Here we add the revenue from selling the print book and the associated costs. The price of the print book is assumed exogenous to the model as it was set when the book was initially introduced to the market. At present the company is deciding on whether to offer the electronic chapters in addition to the print book and at what price. Consumers do not receive an extra discount for buying the print book plus electronic chapters bundle and the bundle price is simply the sum of the two individual prices, P_p and $Q_c P_c$ respectively. Consumers can buy the print book, one or more electronic chapters, or the print book plus one or more chapters. The profit function under content unbundled mixed bundling can be expressed as follows:

$$(5) \quad \Pi_{CUMB} = P_p Q_p^{CUMB} + \left[\left(\sum_{i=1}^I N_{Ci} - P_c \sum_{i=1}^I \frac{N_{Ci}}{V_{Hi}} \right) P_c \right] - c Q_p^{CUMB} - FC ,$$

where Q_p^{CUMB} is the number of print books sold under CUMB, c is the print book variable cost and FC is the fixed cost. We assume that the variable cost of electronic chapters is equal to zero. Differentiating the profit with respect to the chapter price, the optimal chapter price and profit are as follows:

$$(6) \quad \frac{\delta \Pi_{CUMB}}{\delta P_C} = (P_p - c) \frac{\delta Q_p^{CUMB}}{\delta P_C} + \sum_{i=1}^I N_{Ci} - 2P_C \sum_{i=1}^I \frac{N_{Ci}}{V_{Hi}} = 0$$

$$(7) \quad P_C^* = \frac{1}{2kF\bar{S}} \left[kF\bar{N} + (P_p - c) \frac{\delta Q_p^{CUMB}}{\delta P_C} \right]$$

$$(8) \quad \Pi_{CUMB}^* = \frac{1}{4} \left[\left\{ \sum_{i=1}^I N_{Ci} \right\}^2 - \left\{ (P_p - c) \frac{\delta Q_p^{CUMB}}{\delta P_C} \right\}^2 \right] / \sum_{i=1}^I \frac{N_{Ci}}{V_{Hi}} + (P_p - c) Q_p^{CUMB} - FC$$

$$= \frac{1}{4kF\bar{S}} \left[(kF\bar{N})^2 - \left\{ (P_p - c) \frac{\delta Q_p^{CUMB}}{\delta P_C} \right\}^2 \right] + (P_p - c) Q_p^{CUMB} - FC$$

The optimal price per chapter and profit under content unbundled mixed bundling is affected by several parameters. First, the higher (lower) the average demand for chapters at zero price for the consumers who buy and the smaller (bigger) the average slope of demand for the consumers who buy, the higher (lower) the optimal price and profit. From the consumers who enter the market for chapters, if more consumers have positive valuation for the chapters in a book and if the decrease in valuation from the most preferred to the less preferred chapter is relatively small across these consumers, publishers can charge higher price per chapter and achieve higher profit level. Second, the optimal price per chapter and the optimal profit also depend on how much the demand for print books is affected by a change in the price of the electronic chapters. If an increase in the chapter price leads to an increase (decrease) in the print book sales, the optimal chapter price is higher (lower) as compared to the case when a change in the chapter price does not affect print book sales. In terms of optimal profit, it is the magnitude of the rate of change of the print book demand function given a change in the chapter price that is important, not the direction – the more a change in the chapter price

affects the print book sales, the lower the profit as compared to the case when a change in the chapter price does not affect print book sales.

Traditional Mixed Bundling Strategy

Model basics

If the electronic chapters in a book are bundled and only the full electronic book is offered, consumer i will buy the full electronic book only if the valuation of the electronic book V_i exceeds its price P_{EB} ($V_i = \sum_{j=1}^J V_{ji} \geq P_{EB}$). The aggregate electronic book revenue is equal to $P_{EB} k [1 - F(P_{EB})]$, where $F(P_{EB})$ is the fraction of consumers for whom the valuation for the electronic book is smaller than the price of the electronic book ($V_i < P_{EB}$) and k is the number of potential customers on the market.

Revenue from selling the full electronic book

In this section we express the revenue from selling the full electronic book. Selling the print book is not yet considered in the model. The optimal price for the electronic book and the total and marginal revenues are graphically presented in Figure 3.

<< Insert Figure 3 about here >>

The valuation of the electronic book by the different potential consumers, V_{EB} , is presented on the y-axis, and the number of potential consumers, k , is presented on the x-axis. The optimal price, P_{EB} , is equal to the valuation of the electronic book by the marginal consumer. The quantity of electronic books bought and the marginal revenue from electronic books can be expressed as follows:

$$(9) \quad Q_{EB} = k F(V_{EB} \geq P_{EB})$$

$$(10) \quad MR_{EB} = \frac{\delta[k F(V_{EB} \geq P_{EB}) P_{EB}]}{\delta P_{EB}} = k[1 - F(V_{EB} \leq P_{EB})] + k P_{EB} \frac{\delta[1 - F(V_{EB} < P_{EB})]}{\delta P_{EB}} = 0$$

Without loss of generality, we assume that the valuations of the consumers for the full electronic book are uniformly distributed between V_L and V_H , and that $V_L = 0$.

Consequently, $1 - F(V_{EB} \leq P_{EB}) = 1 - F(P_{EB}) = 1 - \frac{P_{EB}}{V_H} = \frac{V_H - P_{EB}}{V_H}$ and

$\frac{\delta[1 - F(P_{EB})]}{\delta P_{EB}} = -\frac{1}{V_H}$. Solving equation 10, the optimal price of the full electronic book

is $P_{EB}^* = \frac{1}{2} V_H$ and the optimal revenue is $R_{EB}^* = \frac{k V_H}{4}$. Thus, the higher the upper bound

of the electronic book valuation in the population, the higher the optimal price and revenue. The revenue also depends on the number of potential consumers.

Revenue from selling the full electronic book and the print book

Again the price of the print book is assumed exogenous to the model as it was set when the book was initially introduced to the market. At present the company is considering whether to offer the electronic book in addition to the print book and at what price. Consumers do not receive extra discount for buying the print book plus electronic book bundle and the bundle price is just the sum of the two individual prices, P_p and P_{EB} respectively. Consumers can buy the print book, the electronic book or the bundle of the two books. The profit function under traditional mixed bundling can be expressed as follows:

$$(11) \quad \Pi_{TMB} = P_p Q_p^{TMB} + k[1 - F(P_{EB})] P_{EB} - c Q_p^{TMB} - FC ,$$

where Q_P^{TMB} is the number of print books sold under TMB, c is the print book variable cost and FC is the fixed cost. We assume that the variable cost of the electronic book is equal to zero. Differentiating the profit with respect to the electronic book price, the optimal electronic book price and profit are as follows:

$$(12) \quad \frac{\delta \Pi_{TMB}}{\delta P_{EB}} = (P_P - c) \frac{\delta Q_P^{TMB}}{\delta P_{EB}} + k[1 - F(P_{EB})] + k P_{EB} \frac{\delta [1 - F(P_{EB})]}{\delta P_{EB}} = 0$$

$$(13) \quad P_{EB}^* = \frac{V_H}{2k} \left[k + (P_P - c) \frac{\delta Q_P^{TMB}}{\delta P_{EB}} \right] = \frac{V_H}{2} + \frac{V_H}{2k} (P_P - c) \frac{\delta Q_P^{TMB}}{\delta P_{EB}}$$

$$(14) \quad \begin{aligned} \Pi_{TMB}^* &= \frac{V_H}{4k} \left[k^2 - \left\{ (P_P - c) \frac{\delta Q_P^{TMB}}{\delta P_{EB}} \right\}^2 \right] + (P_P - c) Q_P^{TMB} - FC = \\ &= \frac{kV_H}{4} - \frac{V_H}{4k} \left[(P_P - c) \frac{\delta Q_P^{TMB}}{\delta P_{EB}} \right]^2 + (P_P - c) Q_P^{TMB} - FC \end{aligned}$$

Similar to the content unbundled mixed bundling case, the optimal electronic book price and profit under traditional mixed bundling is affected by several parameters. First, the higher (lower) the upper bound of the electronic book valuations distribution, the higher (lower) the optimal price and profit. If consumers have relatively high valuation for the electronic book, publishers may charge higher electronic book price, resulting in higher profit. Second, the optimal electronic book price and the optimal profit also depend on how much the demand for print books is affected by a change in the electronic book price. If an increase in the electronic book price leads to an increase (decrease) in the print book sales, the optimal electronic book price is higher (lower) as compared to the case when a change in the electronic book price does not affect print book sales. In terms of optimal profit, similar to the optimal profit under CUMB, it is the

magnitude of the rate of change of the print book demand function given a change in the electronic book price that is important, not the direction – the more a change in the electronic book price affects the print book sales, the lower the profit as compared to the case when a change in the electronic book price does not affect print book sales.

Comparing TMB with CUMB

In this section we compare the optimal profit under the two bundling strategies. The fixed costs and the variable costs per print book are assumed to be equal across the two conditions. After subtracting (12) from (8) and doing some regrouping we get:

(15)

$$\begin{aligned}
\Pi_{CUMB}^* - \Pi_{TMB}^* &= \frac{1}{4kF\bar{S}} \left[(kF\bar{N})^2 - \left\{ (P_P - c) \frac{\delta Q_P^{CUMB}}{\delta P_C} \right\}^2 \right] + (P_P - c) Q_P^{CUMB} - FC \\
&- \frac{V_H}{4k} \left[k^2 - \left\{ (P_P - c) \frac{\delta Q_P^{TMB}}{\delta P_{EB}} \right\}^2 \right] - (P_P - c) Q_P^{TMB} + FC = \\
&= (P_P - c)(Q_P^{CUMB} - Q_P^{TMB}) + \frac{1}{4kF\bar{S}} \left[(kF\bar{N})^2 - \left\{ (P_P - c) \frac{\delta Q_P^{CUMB}}{\delta P_C} \right\}^2 \right] \\
&- \frac{V_H}{4k} \left[k^2 - \left\{ (P_P - c) \frac{\delta Q_P^{TMB}}{\delta P_{EB}} \right\}^2 \right]
\end{aligned}$$

(16) $\Pi_{CUMB}^* > \Pi_{TMB}^*$ when:

$$\left(\frac{Q_P^{CUMB} - Q_P^{TMB}}{P_P - c} \right) + \frac{1}{4kF\bar{S}} \left[(kF\bar{N})^2 - \left\{ (P_P - c) \frac{\delta Q_P^{CUMB}}{\delta P_C} \right\}^2 \right] - \frac{V_H}{4k} \left[\left(\frac{k}{P_P - c} \right)^2 - \left(\frac{\delta Q_P^{TMB}}{\delta P_{EB}} \right)^2 \right] > 0$$

When CUMB is more profitable than TMB?

This section outlines the conditions in which Content Unbundled Mixed Bundling is more profitable than the Tradition Mixed Bundling strategy. We look at three expressions in order to predict whether CUMB is more profitable than TMB (17a – 17c):

$$(17a) \quad Q_P^{CUMB} - Q_P^{TMB} > 0 \text{ which is true when } Q_P^{CUMB} > Q_P^{TMB}$$

Q_P^{CUMB} and Q_P^{TMB} are the print sales under CUMB and TMB, respectively. These are purchases by customers who have a strong preference for print; that is, customers who receive a higher value from the print form as compared to the value of the electronic form (accounting for their prices).

$$(17b) \quad \left(\frac{k F \bar{N}}{P_P - c} \right)^2 - \left(\frac{\delta Q_P^{CUMB}}{\delta P_C} \right)^2 > 0 \text{ which is true when } \frac{\delta Q_P^{CUMB}}{\delta P_C} \in \left(\frac{-k F \bar{N}}{P_P - c}; \frac{k F \bar{N}}{P_P - c} \right).$$

$\frac{\delta Q_P^{CUMB}}{\delta P_C}$ is the rate of change of the print book demand given a change in the electronic chapter price. We consider whether the absolute value of the rate of change is bigger or smaller than the average demand for chapters at zero price divided by the contribution margin of the print book.

$$(17c) \quad \left(\frac{k}{P_P - c} \right)^2 - \left(\frac{\delta Q_P^{TMB}}{\delta P_{EB}} \right)^2 > 0 \text{ which is true when } \frac{\delta Q_P^{TMB}}{\delta P_{EB}} \in \left(\frac{-k}{P_P - c}; \frac{k}{P_P - c} \right)$$

$\frac{\delta Q_P^{TMB}}{\delta P_{EB}}$ is the rate of change of the print book demand given a change in the electronic book price. We look at whether the magnitude of the rate of change is bigger or smaller than the number of potential consumers on the market divided by the contribution margin of the print book.

<< Insert Table 5 about here >>

In Table 5 we present a comparison of the profits under content unbundled and traditional mixed bundling under all possible combinations of conditions 17a, 17b and 17c. For example, if print book sales under CUMB (vs. TMB) are higher, the rate of change of the print books sales given a change in the electronic chapter price is relatively small, and the rate of change of the print books sales given a change in the electronic book price is relatively high (line b, Table 5), CUMB is always more profitable. We expect the two rates of change of print book sales given changes in the PDF chapters price and electronic book price to be relatively small and equations 17b and 17c to be positive, and consequently - to fall within profit comparisons d or h (lines d and h, Table 5). Thus, CUMB will be more profitable than TMB if profit comparison equation d or profit comparison equation h in Table 5 is true.

In sum, we predict that CUMB will be more profitable than TMB when equation 16 has a positive sign. The conditions in which equation 16 has a positive sign are outlined in Table 5. Overall, which strategy is more profitable depends on the extent to which it differentially affects the print book sales, combined with the extent to which it can extract higher profit given the optimal electronic product price that minimizes print sales cannibalization to electronic sales.

If the publisher markets more than one book, or more than one item in general, the individual item profit functions can be aggregated across items and then compared on an aggregate level. This will not change the nature and the predictions of the model.

Data and Estimation Procedure

Data

To empirically test our predictions, we use data provided by NAP. These are actual purchases in an online experiment involving intercepting customers on the publisher's website. Although NAP had been offering free browsing of its books for years, customers could buy only print (paperback or hardcover) books before the experiment. During the experiment, customers who already had a print copy of a title (for which a companion PDF version was available) in their shopping carts, were intercepted as they clicked on the check-out button and assigned to one of two conditions. About 500 titles were used in both conditions.

Experimental Condition 1: Content Unbundled Mixed Bundling Strategy

Details of the PDF book including its price per chapter (in dollars) were presented to the consumers, and they had the option to check out a sample PDF before making a decision. In this condition respondents could buy one or more PDF chapters, the print book, or a combination of the two forms. Prices of PDF chapters for the participating titles were set at different levels relative to the pro-rated price of the print books (at 50%, 75%, 100% and 125%). For example, a print book containing 10 chapters priced at \$50 would have a pro-rated price per chapter equal to \$5. Then, the PDF chapter price could be set at 50%, 75%, 100% or 125% of the pro-rated price per chapter. The books were randomly assigned to the electronic price conditions; for example, all print books priced at \$50 were randomly assigned to the four electronic price conditions. The reason for assigning books and not customers to the electronic chapters price conditions was to treat all the participants equally and avoid situations in which the same book would be offered as PDF chapters at different price to different consumers. We have data on 3256 customers who participated in the experiment.

Experimental Condition 2: Traditional Mixed Bundling Strategy

Details of the PDF book including its price (in dollars) were presented to the consumers, and they had the option to check out a sample PDF as well. Participants could buy the PDF book, the print book, or the bundle of the two. The prices of the PDF books were set at different levels relative to the price of the print books (at 25%, 50%, 75%, 100%, and 110%). As in condition 1, books and not consumers were randomly assigned to the electronic book price levels. The dataset contains 950 customers.

Estimation Procedure

In this section we discuss the estimation procedure we employ to estimate the parameters of interest. We use the estimated coefficients to perform a simulation and investigate what will the probability of buying each alternative be when the PDF price as percentage of print varies. The probabilities are the predicted market shares of the various alternatives under different PDF pricing scenarios, which allows us to compute revenues and profits.

We use a discrete choice framework to empirically investigate consumer choice. Specifically, we fit Random Parameters Logit Model (RPLM) to the experimental data (separately for the two conditions) and estimate the parameters of interest. This model is appealing for several reasons. First, the logit models in general are conceptually attractive as they are grounded in economic theory and have excellent empirical performance (Guadagni and Little 1983). Second, the RPLM accounts for heterogeneity across consumers in both brand preferences and responses to marketing variables (Jain, Vilcassim and Chintagunta 1994). Finally, it is empirically tractable and can be computed

using readily available computer software (e.g. NLOGIT 3.0 version of LIMDEP).

The utility function of consumer i for alternative j in the choice set is equal to:

$$(18) \quad U_{ji} = \beta_{1ji}CAT_1 + \dots + \beta_{5ji}CAT_5 + \beta_{6ji}PRC_{PRINT} + \beta_{7ji}PCT_{PDF} + \varepsilon_{ji},$$

where CAT_1 to CAT_5 are dummy variables for the five subject categories containing more than 5% of the observations in the sample, PRC_{PRINT} is the price of the print book in dollars and PCT_{PDF} is the price of the PDF item expressed as a percentage of the price of the print book (25% to 125%).

The probability of consumer i choosing alternative j is equal to:

$$(19) \quad P(j | v_i) = \frac{\exp(\phi_j f_{ji} + \beta_{ji} x_{ji})}{\sum_{j=1}^J \exp(\phi_j f_{ji} + \beta_{ji} x_{ji})},$$

where $j = 1 \dots J$ alternatives in the choice set of consumer i ($i = 1 \dots I$),

ϕ_j is a vector of nonrandom (fixed) coefficients,

β_{ji} is a coefficient vector that is randomly distributed across individuals, v_i enters β_{ji} ,

f_{ji} is a vector of choice varying attributes of choices, multiplied by ϕ_j ,

x_{ji} is a vector of choice varying attributes of choices, multiplied by β_{ji} ,

ε_{ji} is assumed to be distributed iid extreme values, and

v_i is a random term with mean vector zero and covariance matrix I.

We use the RPL procedure in NLOGIT 3.0 (LIMDEP) to estimate the models.

The procedure works as follows: first, the mean vector and the covariance matrix of the coefficient vector β_{ji} are estimated on a sample of consumers drawn from the population using maximum simulated likelihood estimation; then the likelihood function of a

consumer's sequence of choices is approximated by simulation given the mean vector and the covariance matrix of the coefficient vector. Consequently, the expected parameters for each individual customer are computed conditional on this customer's observed choices.

We account for heterogeneity in two ways. First, under both CUMB and TMB strategies, we estimate separate alternative specific constants for print, PDF and bundle for the consumers in the five book categories containing more than 5% of the observations in the sample – agriculture, behavioral science, education, general interest and medicine. Second, under CUMB, we use random parameters for the effect of PCT_{PDF} (PDF price as percentage of print price) on print and bundle sales, assuming that they are normally distributed in the population. This allows us to get insights into the category-specific effects and control for them when estimating the price effects. We use fixed coefficients for the effect of print price on choice, and for the effect of PCT_{PDF} on PDF sales¹⁶. Under TMB, we use fixed parameters for all print price and PCT_{PDF} effects on choice¹⁷. Our smaller sample size is the likely reason for the non-significant standard deviation of the parameters distributions.

Simulation

Next, we use the RPL model parameters to perform a simulation in which we vary the price of the PDF books and chapters and compare the CUMB and TMB profits under various pricing scenarios. Separately for each strategy and pricing scenario, we compute

¹⁶ We estimate another model allowing these coefficients to vary across consumers as well. The model in which they are fixed fits the data better.

¹⁷ We estimate another model allowing these coefficients to vary across consumers. The model in which they are fixed fits the data better.

the utility and the predicted probability of the alternatives in the choice set for every consumer in our sample using equations 18 and 19. Then, using variable print book cost information provided by the publisher, the profit is computed as follows:

$$(20) \quad \Pi = (P_{PRINT} + P_{BUNDLE})(PRC_{PRINT} - VC_{PRINT}) + (P_{PDF} + P_{BUNDLE})PRC_{PDF}$$

Finally, we average the profits across the sample. We then compare the profits under CUMB and TMB at various price levels, and suggest optimal product line and pricing.

Results

Descriptive Statistics

The actual purchase rates under the two mixed bundling strategies are presented in Table 6. Overall, under content unbundling mixed bundling 59.57% of the customers held on to their print book purchases, 10.08% switched to PDF, 4.13% bought both forms, while the rest 26.22% abandoned their carts. Under traditional mixed bundling 47.37% of the customers held on to their print book purchases, 12.32% switched to PDF, 5.89% bought both forms, while the rest 34.42% abandoned their carts. The exact breakdown under the specific price conditions is presented in Table 6 as well. Note that in the second part of the table for each condition the bundle percentages are added to the print and PDF percentages in order to see the total print and PDF sales for each condition. The number of observations for each pricing level is displayed as well.

<< Insert Table 6 about here >>

Estimation Results – Content Unbundled Mixed Bundling

The results under Content Unbundled Mixed Bundling are presented in Table 7.

Consumers buying books in the behavioral science and education categories have a significantly higher preference for the print form and are more likely to buy it as compared to consumers buying books in the other categories ($\beta = 0.39$ and $\beta = 0.52$ respectively, p 's $< .05$). They are also less likely to buy PDF chapters, although the coefficients are only marginally significant ($\beta = -0.34$, $p = .09$, and $\beta = -0.31$, $p = .18$). The other investigated category specific effects are not significantly different. The print price is significantly affecting consumers' probability of buying PDF chapters ($\beta = -0.02$, $p < .05$), suggesting that consumers are less likely to buy PDF chapters from the more expensive books (books with relatively higher print price). Finally, PCT_{PDF} is affecting the choice probabilities in the following manner: when the PDF price increases, consumers are significantly more likely to buy print books ($\beta = 0.90$, $p < .05$), significantly less likely to buy PDF chapters ($\beta = -0.55$, $p < .05$), and marginally less likely to buy the bundle ($\beta = -5.80$, $p = .09$). The derived standard deviations of the PDF percentage parameters for the print and bundle choices are significant as well (1.75 and 3.89 respectively, $p < .05$), suggesting that the effects vary across consumers. The RPL model allows us to estimate individual specific PCT_{PDF} parameters and account for heterogeneity when making predictions.

<< Insert Table 7 about here >>

Estimation Results – Traditional Mixed Bundling

The estimation results under Traditional Mixed Bundling are presented in Table 8. Similar to the results under CUMB, consumers buying books in the behavioral science and education categories are more likely to choose the print book ($\beta = 0.50$, $p = .08$, and

$\beta = 0.97, p < .05$) as compared to the customers buying books in the other categories. Consumers buying books in the behavioral science category are less likely to buy the PDF book ($\beta = -2.34, p < .05$) as compared to the customers buying books in the other categories. The other investigated category specific effects are not significantly different. Additionally, the print price is significantly affecting the probability of buying print ($\beta = 0.01, p = .07$) and the bundle ($\beta = -0.04, p < .05$), suggesting that consumers are more likely to buy the print book and less likely to buy the bundle regarding the relatively more expensive print books. Finally, as the PDF book price increases, the probability of buying the PDF book decreases ($\beta = -1.25, p < .05$).

<< Insert Table 8 about here >>

In sum, the CUMB and TMB estimation results seem intuitive. The models that we use fit the data well and allow us to estimate parameters that can be further used to perform simulations and make predictions.

Simulation Results

Using the estimated coefficients from the CUMB and TMB models, we perform a simulation by choosing different PDF price levels (PDF price as percentage of print price) and computing the individual utilities, purchase probabilities and profits using equations 18, 19 and 20, and average the profit across individuals. The simulation results for the average profit per consumer under various price levels are presented in Table 9. The simulation results suggest that in the case of Traditional Mixed Bundling the PDF book should be priced the same as the print book in order to get the highest profit (\$12.74), while in the case of Content Unbundled Mixed Bundling the PDF chapters

should be priced at 125% of the price of the print book (\$15.21). Content Unbundled Mixed Bundling seems to generate a higher profit as compared to Traditional Mixed Bundling when priced at levels above 75% of the price of the print book. Under Content Unbundled Mixed Bundling consumers are more likely to buy the print book and less likely to choose the “no choice” option, which helps generate higher profit. Although more consumers buy the bundle under TMB, this extra revenue from the current print customers do not compensate for the customers who decide not to make a purchase. We explore this issue more in discussion section.

<< Insert Table 9 about here >>

CUMB/TMB vs. Print Books Only

Here we use as a baseline the case under traditional mixed bundling where the price of the print book is the same as the price of the PDF book. In this case consumers willing to buy the book will buy it in the form they prefer as the prices are the same. As the baseline strategy is in fact the optimal strategy under TMB, this implies that introducing PDF books with the same price as the print books will not change the overall profit for the company. Introducing PDF chapters priced at 125% of the price of the print books will result in higher profit as compared to offering only books in print form (19% increase). Consequently, under the conditions considered in our empirical investigation, offering individual chapters is more beneficial for the company than either offering print books only or print and full electronic books.

Relating the Empirical Results to the Predictions of the Bundling Model

Here we compare the optimal conditions under CUMB and TMB with the predictions of the model. First, which strategy is more profitable depends on which one leads to higher print sales (equation 17a). The predicted print book market share under CUMB when the PDF chapters are priced at 125% of the print book price is 71%, while the predicted print book market share under TMB when the PDF book is priced at 100% of the print book price is 48.1%. Consequently, equation 17a holds.

Second, which strategy is more profitable depends on whether the absolute value of the rate of change of the print book sales with respect to changes in the PDF chapter price is smaller than the average demand for chapters at zero price divided by the contribution margin of the print book (equation 17b). The rate of change is 0.90, the average contribution margin is about \$18, and the average demand for chapters at zero price is 3.591. Consequently, $\delta Q_P^{CUMB} / \delta P_C \in [-kF\bar{N}/(P_P - c); kF\bar{N}/(P_P - c)]$ and equation 17b holds.

Finally, which strategy is more profitable depends on whether the absolute value of the rate of change of the print book sales with respect to changes in the PDF book price is smaller than the number of potential consumers on the market divided by the contribution margin of the print book. The rate of change is equal to -0.245, and the average contribution margin is \$18. As there are 1,000 potential customers on the market according to our assumption (which is an underestimation relative to the number of respondents in our experiment), equation 17c holds and

$$\delta Q_P^{TMB} / \delta P_{EB} \in [-k/(P_P - c); k/(P_P - c)].$$

Consequently, our results suggest that we have to expect the profit under CUMB

to be higher than the profit under TMB if

$$\left(\frac{Q_P^{CUMB} - Q_P^{TMB}}{P_P - c} \right) + \frac{1}{4kF\bar{S}} \left[\left(\frac{kF\bar{N}}{P_P - c} \right)^2 - \left(\frac{\delta Q_P^{CUMB}}{\delta P_C} \right)^2 \right] > \frac{V_H}{4k} \left[\left(\frac{k}{P_P - c} \right)^2 - \left(\frac{\delta Q_P^{TMB}}{\delta P_{EB}} \right)^2 \right] \quad (\text{line$$

d in Table 1). If there are 1,000 potential customers on the market, the first term of the above equation is equal to 12.72¹⁸. The second term of the equation is equal to 62.09¹⁹ (average print book price = \$31.33). Finally, the third term is equal to 71.60²⁰. Thus, the sum of the first two terms (74.81) is bigger than the third one and the predicted profit under CUMB is bigger (vs. TMB). This is in line with our empirical results.

Discussion

Our study highlights several important issues. First, there are significant subject category effects suggesting that consumers buying books in education and behavioral sciences have a stronger preference for print as compared to consumers buying in the other subject domains, and are less likely to either switch from print to PDF or buy the bundle. On the one hand, these consumers may not have extensive experience with electronic products, or may not use computers as often as other consumers. On the other hand, the print form may be more appropriate for their specific usage situations. Thus, publishers interested in selling electronic products to this customer segment may study why these consumers are more likely to stick with the print form and less likely to buy the PDF form.

¹⁸ Term 1 = [(0.71-0.481)*1,000]/18=12.72

¹⁹ Term 2 = [1/639.89]*[(3,591/18)*(3,591/18)-(0.9*0.9)]=62.09;

S=(1/(2*31.33*1.25/14)*(3,591+18*0.9)=639.89

²⁰ Term 3 = [(62.93/4000)*[(1000/18)*(1000/18)-(-0.234)(-0.234)]=71.60;

V_H=(2*31.33*1000)/[1000+18*(-.234)]=62.93

Second, our study reveals that for relatively more expensive books consumers are more likely to stick with the print form and less likely to switch to the PDF form or buy the bundle of the two forms. Although quite unintuitive at first, there may be good reasons for such a result. On the one hand, consumers may have relatively higher valuation for the more expensive print books because they are likely to be hardcover books with pictures and graphics, and the print form may be perceived as a better choice with regard to these attributes than the PDF form; customers may even be likely to display such books in their offices or at home (e.g., coffee table books) or have other reasons to prefer the print form. On the other hand, consumers may be less willing to pay a high price for PDF books as they know that their marginal costs are negligible. For example, keeping everything else constant, if a print book costs \$25.00 and the PDF book price is set at \$18.75 (75% of the price of the print book), consumers may be more likely to buy the PDF book vs. the print book as compared to the case where the print book costs \$75 and the PDF book price is set at \$56.25 (75% of the price of the print book). Although the price of the electronic book is the same percentage of the price of the print book in both cases, consumers are likely to be aware that the marginal costs of the electronic books are negligible and they would not expect to be charged a big dollar amount even for expensive print books. Thus, owning electronic products may be unappealing to consumers in certain subject domains, and there may be an upper bound on how much consumers are willing to pay for electronic content in terms of a dollar amount. It may be unreasonable to determine the electronic form price as a percentage of the print form price, and other pricing mechanisms may be more appropriate in some cases.

Third, our simulation predicts that, under traditional mixed bundling, as the price of the PDF book approaches and exceeds the price of the print book, the share of the no-choice option increases and the share of the print option does not change. This is not the case under content unbundled mixed bundling where as the chapter price increases, the share of the no-choice option decreases while the share of the print book option increases. Recent studies in the marketing domain may provide insight into this finding. Dhar (1997) argues that consumers tend to focus more on the comparative characteristics among the alternatives provided than on their own utilities. On the one hand, expanding the choice set by adding an attractive alternative increases the preference for the no-choice option when respondents can choose only one alternative (Dhar 1997). On the other hand, respondents are less likely to defer choice when both attractive alternatives could be selected (Dhar 1997). If they have to make a choice between print and full PDF books, consumers may focus on the comparative characteristics of the two forms and evaluate which form is better on various attributes such as layout, browsing, image quality, etc. Because both forms have their advantages and disadvantages, and because price is often perceived as a signal of product quality, consumers may be more likely to find the two alternatives equally attractive and defer choice when the prices are similar as compared to when the PDF price is significantly lower than the print price. When the full PDF book price is significantly lower than the print price consumers may be more likely to buy the PDF book as it becomes relatively more attractive because of its low price, or buy the cheaper bundle and benefit from the advantages of both forms. It seems that under content unbundled mixed bundling it is easier for consumers to make a choice as they are less likely to select the no-choice option. Thus, content unbundled mixed

bundling may be more profitable than traditional mixed bundling also because it is easier for consumers to make a choice and more consumers enter the market.

Finally, there is a self-selection bias in our sample because consumers are intercepted in the experiment after they have already decided to buy the print book. Consequently, we are offering a conservative test with respect to the quantity of electronic chapters being sold at the optimal price level under CUMB, and CUMB may be even much more profitable than TMB. The reason is that consumers for whom the reservation price for the print book is lower than the price of the print book and will not buy the print book, may be attracted to buy one or several chapters. We are not able to capture these purchases in our data because we intercept consumers after they have decided to buy the print book. Our third essay accounts for the revenue from such consumers.

Managerial Implications

Our study provides valuable insights to content providers on how to successfully design and price information products in addition to their print products, assuming that the providers have reasons not to or do not want to change the price of the print products. Content unbundled mixed bundling is a viable strategy to pursue in certain market conditions as it leads to higher profit. The unbundled electronic units should be priced at a premium compared to the pro-rated price of the print book in order to achieve the optimal level of profit. The demand for electronic versions of products such as books is sizeable and it justifies the extension of the existing product lines. Although our study does not look at this issue, introducing electronic products may attract new consumers

and expand the market as well.

It may be more beneficial for the publishers to consider different pricing schemes for the different book categories. Our results highlight that consumers buying books in certain subject domains are less likely to buy electronic products, and more likely to stick with the traditional print form. Thus, in order to penetrate these segments, content providers may focus on educating the consumers on the benefits the electronic form provides, and employ strategies that encourage first trial. Publishers may find it also interesting that the more expensive print books are less likely to be substituted with electronic books. As these are likely to be high margin books that bring substantial income, introducing electronic version of such books will not necessarily hurt this revenue stream.

Conclusion

In this paper, we model the profits under two strategies a content provider may employ: traditional mixed bundling, in which the product line consists of print book, PDF book and the bundle of the two, and content unbundled mixed bundling, which is selling print book, PDF chapters and the combination of the two. Our study suggests that offering unbundled PDF chapters is more profitable than offering only the full PDF books when the print books prices do not change when PDF content is introduced. We empirically support our predictions with actual data gathered in an online experiment executed on the website of a publisher of electronic books. We offer important insights on how customers from different subject domains react to electronic products and how they are likely to behave when different product and pricing schemes are employed.

Our study contributes to the literature on bundling as it offers guidelines on the optimal strategy when different mixed bundling strategies are feasible. Further, it looks at both form bundling and content unbundling, which is different than the literature so far and provides additional insights. Last but not least, our data includes purchases of books in a wide range of subject domains, thus allowing us to generalize our findings and recommendations (while controlling for some category specific effects).

Our findings highlight important questions and unresolved issues that future research may address. It will be interesting to discover why consumers from different subject domains have distinctive preferences and inclination with regard to electronic products. Further, future studies may clarify why consumers are less likely to make a choice when they are offered print and electronic products with similar prices. Providing further insights may help companies successfully design and implement penetration strategies regarding electronic content, resulting in higher customer satisfaction and repeated purchases. Third, it will be interesting to investigate whether offering individual book chapters in print form is a viable strategy for a publisher to pursue. Although such a product strategy may be too expensive because of the costs associated with unbundling print content, it may be appealing under certain conditions.

CHAPTER IV: ESSAY THREE. BUNDLING AND UNBUNDLING OF ELECTRONIC CONTENT

Abstract

This paper investigates the attractiveness of product lines of items such as books and newspapers available in conventional and electronic media. For example, the publisher of Wall Street Journal can offer the following product line of subscription options: print WSJ, WSJ online, separate sections of WSJ online (e.g. Money & Investment, Technology), print WSJ and online WSJ bundle, and print WSJ and online section bundle. We employ a choice experiment in which a sample of consumers is presented with hypothetical product offerings at various prices and asked to make a choice. The data is used to develop a profit-maximizing configuration of products and prices. Similar approaches to the product line pricing problem have been employed for conventional products, but not when bundling of different forms of a product is an option, and not when the different products may be complements rather than substitutes.

Introduction

The Internet as an information channel has facilitated the development and dissemination of electronic forms of traditional print products such as books and newspapers. Electronic information products are unique in that the marginal cost of reproducing and distributing them is often much lower than the cost of the print products. Hence, content providers may be interested in selling the electronic form by itself or together with the print form to get higher revenue. Further, the electronic products can be unbundled at no extra cost, and the unbundled components can be re-bundled with the traditional print products. For instance, Wall Street Journal is currently offered as print WSJ, WSJ online, and the bundle of the two subscription options. Theoretically, the publisher can also sell individual sections of WSJ in electronic form, and even re-bundle the electronic units with the print WSJ (e.g., offer a subscription to the print WSJ and the financial section in electronic form as a package). Thus, if consumers switch from the traditional print products to the cheaper electronic products or units, the publisher may encounter product cannibalization and lost revenues. On the contrary, if consumers subscribe to the print products and electronic products/units bundles, the publisher may extract extra revenue.

The focus of the present study is on product lines of items available in conventional and electronic media. Specifically, we discuss a method for determining optimal product line design and pricing for an item available in print and electronic form. In addition, we examine the effect of both price and non-price attributes on consumers' preferences and choice decisions. In our study we use choice experiment and choice-based conjoint analysis to obtain estimates of customer valuations of the price and non-

price attributes of interest. We present respondents with hypothetical choice situations in which the attributes are varied to determine how choice fluctuates with changes in the levels of attributes. Then, accounting for response and preference heterogeneity, we estimate random parameters logit models and use the results to derive optimal product mix and pricing strategy. The output of the study is a general methodology for setting product lines and prices for items available in conventional and electronic media.

The contribution of the study is as follows. It extends the research on bundling by examining bundling of interrelated products in the context of product forms, which is a new and managerially relevant application. There are three unique characteristics of the above problem that make it different from what have been studied in the literature so far. First, the product forms can range from being perceived as substitutes to being perceived as complements to each other, and these contingent valuations may vary across the consumers. Second, the forms are not only interrelated but are likely to contain the same information; thus, by choosing the bundle, consumers acquire two items with the same content. Third, there are various bundles that can be offered – print newspaper and online newspaper bundle, print newspaper and online newspaper section(s) bundle, and online sections bundle. Consequently, the predictions of the literature in terms of optimal bundle composition and pricing may not be applied directly. We study how consumers perceive electronic and conventional print products, and provide insight on how demand fluctuates with changes in price and other attributes. Similar approaches to the product line pricing problem have been traditionally employed for conventional products, but not when bundling of different forms of a product is an option, and not when the different products may be complements rather than substitutes.

The third essay extends the second essay in several ways. First, we consider all feasible print and electronic options simultaneously, thus being able to investigate the market expansion when full electronic products and electronic units are offered. Second, we incorporate in our design different price levels for the print products and different levels of bundle discount in addition to the electronic products price levels, which results in more realistic and generalizable conclusions. Finally, the choice-based conjoint experiment we execute allows us to better control the data collection process and generates panel data with many observations per consumer to better model the consumer choice process.

The paper is structured as follows. First, we review the relevant marketing and economics literature and position the study. Second, we present the theoretical foundations and the methodology of our study. Third, we discuss the experimental design and data collection procedure. Fourth, we report our empirical findings and their practical implications.

Research Background

Bundling is the strategy of marketing two or more products and/or services as a package at a special price (Guiltinan 1987). Two common approaches are pure bundling whereby only the product bundle is offered, and mixed bundling, in which the bundled items are also sold separately.

Hanson and Martin (1990) provide an overview on why the sellers are motivated to bundle, discussing both demand and supply side incentives. The demand side incentives that make bundling profitable include negative correlations in reservation

prices (Stigler 1963; Schmalensee 1984), complementarity in consumption (Telser 1979), and uncertainty in the valuations of the quality of the goods (Kenney and Klein 1983). Mixed bundling is more beneficial than pure components or pure bundling, and it is the optimum bundling strategy when there is asymmetry in the reservation prices for the bundle components (Adams and Yallen 1976; Schmalensee 1984; McAfee, McMillan and Whinston 1989). In terms of supply side incentives for bundling, Bakos and Brynjolfsson (1999, 2000) demonstrate that large scale bundling of information goods can be very profitable because it creates economies of aggregation when their marginal costs are very low.

In the marketing domain, empirical studies focus on issues such as bundling and unbundling of industrial systems (Wilson, Weiss and John 1990), determining bundle prices and composition (Hanson and Martin 1990), and optimal bundle pricing (Venkatesh and Mahajan 1993). Additionally, several analytical articles discuss contingent valuations in bundling decisions, contrasting interrelated from independently valued products in a bundle (e.g. Venkatesh and Kamakura 2003).

In sum, the above-presented research identifies the conditions for profitable bundling and specifies the optimal bundling strategies in various situations. Sellers are motivated to bundle because, on the demand side, it can help them extract consumer surplus, and, on the supply side, it can increase producer surplus or lead to cost savings.

Positioning Our Study

Most of the research so far suggests that mixed bundling is the optimal solution for producers of various goods (Adams and Yallen 1976, Schmalensee 1984, McAfee,

McMillan and Whinston 1989, etc.). This policy enables the seller to reduce effective heterogeneity among those buyers with high reservation prices for both goods, while still selling at a high markup to those buyers willing to pay a high price for only one of the goods (Schmalensee 1984). With regard to bundling of information goods such as magazines and journals, recent articles argue that pure bundling is an optimal strategy for a monopolist marketing a large number of information goods given negligible marginal costs and bulk sales (Bakos and Brynjolfsson 1999, 2000). Geng et al. (2005) further refine their results and suggest that mixed bundling is approximately optimal if consumers' values to subsequent goods do not decrease too quickly, otherwise pure bundling is optimal even when there are strong negative or positive correlations of values across goods.

Our study contributes to this stream of research in the following manner. First, we investigate the attractiveness of various bundled and unbundled forms of print and electronic content, which is an important area with significant managerial implications. Second, we address the problem both from a seller's and a buyer's point of view. We not only study how consumers are likely to behave when offered bundled/unbundled content in different forms, but also use a methodology that companies may apply in designing their product lines and pricing them optimally after accounting for consumer preferences. Third, the application in the book and newspaper categories that we discuss can be easily extended to other categories such as magazines and music. Finally, our results have interesting implications in the area of personalization of product offering and customization in the digital goods domain.

There are three recent papers that focus on issues similar to the ones in our study.

Next we briefly outline these studies in order to provide comparisons with ours. First, Venkatesh and Kamakura (2003) model the optimal bundling and pricing strategies for interrelated products under monopoly. Our study is different from theirs because we investigate optimal bundling strategies in the case of different forms of the same product and various combinations of these forms, while they consider bundling of distinctive products that are interrelated (e.g. computer and printer). Moreover, we use choice-based conjoint analysis with stated choices to estimate the parameters of interest and further include them in our optimization problem while Venkatesh and Kamakura (2003) rely on simulation-based analytical solution. In the second study, in a context similar to ours, Venkatesh and Chatterjee (2003) focus on bundling of print and electronic magazines, including separate sections of these magazines. Our study complements their analytical findings by including offering more options to the consumers. While they consider print magazine, online magazine and separate modules of the online magazine and all possible combinations of these in the product line but not bundling them (for example, they do not include a bundle of print magazine with an online magazine at a price lower than the sum of the component prices), we allow bundling of the print item with the online item, and bundling of the print item with the online modules at a price lower than the sum of the prices of the bundle components. The third paper by Jedidi et al. (2003) suggests a model for capturing continuous heterogeneity in the joint distribution of reservation prices for products and bundles. Their results suggest that the product line pricing policy depends on the degree of heterogeneity in the reservation prices. Our study further extends theirs by considering non-price attributes in addition to product and bundle price. Additionally, Jedidi et al (2003) study bundles of conventional products such as the Times Magazine

and investigate the optimal price for the magazines and the bundle of the two, while we study the same information content under different product forms and include all feasible bundled, unbundled and re-bundled options in the choice set.

In sum, our paper extends the bundling research by investigating bundling of different product forms containing the same information. Additionally, we provide optimal product line design and pricing strategies while incorporating consumer preference for bundled and individual print and electronic forms of a product, and after adding different combinations of re-bundled electronic units with print products to the choice set.

Theoretical Background

Next we discuss our expectations about the attractiveness of bundling of electronic content with traditional print content, and of unbundling of electronic content and/or re-bundling it with traditional print content.

Product Form Complementarity in Choice

Complementarity has been traditionally characterized by referring to the sign of the cross-price elasticity of demand - if the sign is positive (negative), products are substitutes (complements). In marketing, complementarity is often defined relative to product-specific utilities and the corresponding consumer needs (Chernev 2005). Products are substitutes if both can satisfy the same need to the consumer, they are complements if they are consumed jointly (but not necessarily simultaneously) in order to satisfy a need (Lattin and McAlister 1985; Henderson and Quandt 1958). Previous

research suggests that complementarity between products can cause bundling to be profitable (Telser 1979). Bundles composed of complements have higher purchase intent versus bundles of similar or unrelated products (Harlam et al. 1995), and complementarity positively affects bundle reservation prices (Gaeth et. al 1990).

From consumers' point of view, if the product forms are substitutes, the purchase of one form lowers the value of the alternative form, and therefore makes bundling the items less attractive; if the forms are complements, bundling becomes more attractive. Consumers may perceive a high degree of complementarity based on search economies, improved satisfaction because of the bundle, and/or improved total image of the bundle (Guiltinan 1987; Simonin and Ruth 1995). By and large, we expect a positive relationship between the degree of perceived complementarity between the bundle components and the purchase likelihood for the bundle. On one hand, if consumers believe that the individual product forms can be used interchangeably, they will buy only one of the forms and not the product form bundle. On the other hand, if consumers perceive additional utility in having both product forms versus just one of them, they will choose the product form bundle.

Attractiveness of Bundling of Electronic Content with Traditional Print Content

Analytical results suggest that in general moderate or strong substitutes should be offered separately; the same is applicable for complements if the marginal costs are moderate relative to the market's maximum willing to pay (Venkatesh and Kamakura 2003). Also, a seller gains by mixed bundling for weak substitutes/complements if the variable costs are not too high (Venkatesh and Kamakura 2003). Finally, although the

product line pricing policy depends on the degree of heterogeneity in the reservation prices for the items, firms would benefit from using a mixed bundling strategy (Jedidi et al. 2003). Building upon these findings, we would expect mixed bundling strategy be the optimal solution. This statement is supported by both analytical solutions and related empirical results. However, there are three unique features that characterize our problem: consumers are likely to be heterogeneous in the way they see the different product forms on the substitute-complement continuum, the marginal costs of the electronic products are almost negligible, and the market's willingness to pay for some electronic products may be significantly lower than the one for conventional print products. Consequently, our results may suggest a different optimal solution. In terms of optimal prices, Jedidi et al. (2003) advocate that a uniformly high price strategy for all products and bundles is optimal when the heterogeneity in the reservation prices is high; otherwise, a hybrid strategy is optimal. Thus, it is an empirical question on how to price the same print and electronic content as individual products and as a bundle. In sum, the findings of the extant literature do not offer guidelines on to how to design and optimally price product lines consisting of different forms of the same product. Our study aims at providing insights into this question with important implications for practitioners.

Attractiveness of Unbundling of Electronic Content and Re-Bundling with Print Content

In a different context (industrial systems), Wilson, Weiss and John (1990) identify the following cases favoring unbundling: larger unit margins from unbundling, market growth from unbundling, new market segments from unbundling, and inferior but cheaper systems from unbundling. With respect to unbundling of electronic content (e.g.

offering individual sections of WSJ online), it would be an appealing strategy if the companies could attract new customers who are more price-sensitive and otherwise would not buy the full product, thus leading to market growth. If unbundling causes cannibalization of print sales to unbundled content, the unbundling strategy could result in lower profits. Consequently, attracting new market segments and market growth would favor unbundling of electronic content. In terms of pricing of unbundled units, contrary to conventional wisdom on mixed bundling, Venkatesh and Chatterjee (2003) claim that low-priced components (e.g. individual sections) should be targeted at consumers who have low value for the information content. Thus, it might be optimal to pursue such a pricing strategy: on one hand, trying to attract new customers by offering unbundled content at a low price, and on the other hand, extracting extra profits by offering full print content plus individual sections in electronic form to the consumers who see the different forms as complementing each other.

Product Form Attractiveness in Choice

Dhar (1997) argues that consumers tend to focus more on the comparative characteristics among the alternatives provided than on their own utilities. When the choice task is to choose one alternative from a choice set, consumers are more likely to defer choice when the alternatives are equally attractive. When the task allows the choice of more than one alternative from a choice set of two attractive alternatives, the preference for a no-choice option decreases. Thus, if the consumers perceive one product form better than the other on most of the attributes (e.g. form 1 is superior to form 2), we would expect them to be more likely to choose the superior form. On the other hand, if the consumers perceive form 1 better than form 2 on some of the attributes, while form 2

better than form 1 on the rest of the attributes (form 1 and form 2 are equally attractive), we would expect them to be more likely to defer choice when they have to select just one alternative. Finally, if they are given the option to choose more than one form (e.g. buy a bundle), consumers may decide to buy both form if they are equally attractive. Thus, we would expect the relative attractiveness of the product forms to influence choice in the following manner: on one hand, the more differentially attractive the two forms are, the higher the probability to defer choice; on the other hand, the higher the difference between the attractiveness of the superior product form and the bundle, the more likely consumers will be to select the bundle.

Methodology

We use a choice-based conjoint framework to study our questions of interest. Since the early 1970s, conjoint analysis has received considerable academic and industry attention (Green and Srinivasan, 1990). Conjoint analysis and the related technique of experimental choice analysis represent the most widely applied methodologies for measuring and analyzing consumer preferences (Carroll and Green 1995). The choice-based conjoint is a relatively new type of conjoint analysis and is considered to better approximate actual decision processes as compared to the traditional ratings or rankings-based conjoint analyses²¹. Consequently, more realistic aggregate level estimates are expected. In the next sections we describe in detail our experimental design, the data collection procedure and our modeling approach.

²¹ For an excellent review and empirical comparison between ratings-based and choice-based conjoint models see Elrod, Louviere and Davey (1992).

Study Design and Data Collection

We use two product categories in our study – a book (“Vault Guide – insider information on industries, careers, and employers”) and a newspaper (Wall Street Journal). We have selected these two products because they are very popular among our sample, MBA students, and our respondents are well-experienced with them.

Additionally, current MBA students are an important target audience for both publications and this increases the external validity and applicability of our results. In the conjoint experiment the respondents evaluated various scenarios for each product and made a choice.

We vary the following factors in the scenarios: print (absent, present), full electronic (absent, present), electronic unit/section (absent, present), bundle (absent, present) and price level (low, medium, high). The conjoint factors and the price levels are presented in Table 10, panels A and B. We took the actual print and electronic/PDF form prices of the Vault Guide and WSJ for the medium price level; the electronic unit price was computed by dividing the electronic/PDF price by three²² and then adding a 15% premium. The price of the print product and electronic product bundle is the sum of the two individual product prices discounted 15%, while the price of the print product and electronic section bundle is the sum of the two individual product prices discounted 7%²³. Finally, for all product offers, the low and the high price levels represent a 15% discount/premium compared to the medium price level. We chose a 15% gap between the different pricing levels to assure that the respondents are able to register such price differences while keeping the face validity of the prices of the various items.

²² There are three sections in the product.

²³ We decreased the bundle price by only 7% in this case to preserve the face validity of our prices and avoid situations in which the print product costs much more than the print product/electronic section bundle (but still employ three different price levels).

<< Insert Table 10 about here >>

For each of the two product categories the participants were presented with a choice situation (e.g. that they are considering subscribing to WSJ) and asked to consider sixteen independent choice scenarios with three options in each (e.g. Option 1: Subscribe to the Online WSJ for \$39.50; Option 2: Subscribe to the Print WSJ for \$114.50; Option 3: Will not subscribe to either of the two). The options in each scenario were randomly selected from a full factorial design in which product offer and price were varied. Participants were asked to select the option that they were most likely to pursue in such a situation. After evaluating all the scenarios for the first category, the same was repeated in the second product category. At the end the participants answered question related to the relative attractiveness of the product forms on five attributes (image quality, browsing, layout, convenience of use and archival quality) and demographics.

Eighty seven full and part time MBA students (60% part time students; 37% female) enrolled in graduate level marketing courses participated in our study. Each participant evaluated sixteen choice scenarios in the book category and sixteen choice scenarios in the newspaper category (the order was counterbalanced).

Modeling Consumer Preferences

We use a discrete choice framework to model consumer choice. Specifically, we fit Random Parameters Logit Model (RPLM) to the conjoint data and to estimate the parameters. This model is appealing for several reasons. First, the logit models in general are conceptually attractive as they are grounded in economic theory and have excellent empirical performance (Guadagni and Little 1983). Second, when desired, the RPLM can

account for heterogeneity across consumers in both brand preferences and responses to marketing variables (Jain, Vilcassim and Chintagunta 1994). Finally, it is empirically tractable and can be computed using readily available computer software (e.g. NLOGIT 3.0 version of LIMDEP).

Accounting for heterogeneity across consumers is an important consideration when analyzing consumer purchase behavior from panel data - consumers with the same demographic and socioeconomic characteristics (e.g. income, family size) when confronted with a given set of covariates (e.g. price, feature advertisements) may exhibit different choice behavior due to differences in overall brand preferences (intercept/preference heterogeneity) and/or variations in their responses to these covariates (slope/response heterogeneity; Jain, Vilcassim and Chintagunta 1994). The above argument applies to our data as well. For example, we may observe different choice behavior by consumers with the same age, education and income level because of differences in overall preference for print vs. electronic content, and because of variations in their responses to marketing mix variables such as price. Thus, the RPLM allows us to control for the unobserved heterogeneity among individual consumers when estimating various parameters and using them to make predictions.

The RPLM is a one level multinomial logit for individuals $i = 1, \dots, N$.

$$P(j | v_i) = \frac{\exp(\phi_j f_{ji} + \beta_{ji} x_{ji})}{\sum_{m=1}^J \exp(\phi_m f_{mi} + \beta_{mi} x_{mi})},$$

where $U(j, i) = \phi_j f_{ji} + \beta_{ji} x_{ji} + \varepsilon_{ji}$, $j = 1, \dots, J$ alternatives in the i 's choice set,

ϕ_j is a vector of nonrandom (fixed) coefficients,

β_{ji} is a coefficient vector that is randomly distributed across individuals, v_i enters β_{ji} ,

f_{ji} is a vector of choice varying attributes of choices, multiplied by ϕ_j ,

x_{ji} is a vector of choice varying attributes of choices, multiplied by β_{ji} ,

ε_{ji} is assumed to be distributed iid extreme values,

v_i is a random term with mean vector zero and covariance matrix I.

We use the RPL procedure in NLOGIT in LIMDEP to estimate the models. The procedure works as follows: first, the mean vector and the covariance matrix of the coefficient vector β_{ji} are estimated on a sample of consumers drawn from the population using maximum simulated likelihood estimation; then the likelihood function of a consumer's sequence of choices is approximated by simulation given the mean vector and the covariance matrix of the coefficient vector. Consequently, the expected parameters for each individual customer are computed conditional on this customer's observed choices.

Results

Conjoint Experiment

<< Insert Table 11 about here >>

The estimation results are presented in Table 11. We include as attributes dummy variables for the following conjoint factors (1-present, 0-absent): print, electronic full, electronic unit and bundle; the price variable contains the actual prices the respondents evaluated with each product offer. We estimate a Random Parameters Logit model for each product category in which the preference parameters are assumed to be normally distributed across the sample. The results are consistent across the two categories: consumers value very positively the print attribute (the part worth is 8.485 in the book

category and 11.333 in the newspaper category) and the full electronic attribute (7.306 and 6.793 respectively), while the part worth of the electronic unit attribute is relatively smaller (3.063 and 1.452 respectively). The bundle attribute part worth is negative and relatively high in both categories (-6.647 and -3.384 respectively), and the price parameter is negative (-0.261 and -0.133)²⁴. Interestingly, the derived standard deviations of the means of all five parameters are significant in both categories (varying from 0.107 and 0.025 for the means of the price parameters to 5.249 and 6.222 for the means of the print parameters). This suggests that there is significant heterogeneity in how much people value the different product forms and their combinations, and how much price changes affect their choices. In terms of the price response heterogeneity, at least 95% of the consumers have negative responses to a price increase in the book category (their price parameters fall within two standard deviations from the parameter means and are below zero) and at least 99% of the consumers have negative responses to a price increase in the newspaper category (their price parameters fall within three standard deviations from the parameter means and are below zero). The part worth of the print attribute is positive for 68% to 95% of the consumers (their print parameters fall within one to two standard deviations from the parameter mean), and the part worth of the full electronic attribute is positive for 95% to 99% of the consumers (their full electronic parameters fall within two to three standard deviations from the mean). About 68% to 95% of the consumers have positive electronic unit part worth in the book category while the same is true for less than 68% of the consumers in the newspaper category. Finally, with respect to how much consumers value the bundle factor, the situation is very

²⁴ We also estimate another model in each category in which the price coefficients are not constrained to be the same across the alternatives. The model we report fits the data better.

different across the two categories: the bundle part worth is negative for more than 99% of the respondents in the book category, while the same is true for less than 68% of the respondents in the newspaper category.

Note that we can not directly compare the preference parameters across the two product categories because of the scaling of the parameters in the estimated models. We can compute what price makes consumers indifferent between buying one product offer or the other. For example, in the book category, the average consumer will be indifferent between buying the print book and the full electronic book when the print book price is \$29.00 and the electronic book price is \$24.36 [$\exp(8.485 - 0.261 * 29.00) = \exp(7.306 - 0.261 * 24.36)$]. Also, he/she will be indifferent between buying the print book and the print book plus electronic book bundle when the print book price is \$29.00 and the bundle price is \$31.49 [$\exp(8.485 - 0.261 * 29.00) = \exp(8.485 + 7.306 - 6.647 - 0.261 * 31.49)$]. In the newspaper category, the average consumer will be indifferent between subscribing to the print WSJ and the online WSJ when the print WSJ price is \$99.50 and the online WSJ price is \$65.67 [$\exp(11.333 - 0.133 * 99.50) = \exp(6.793 - 0.133 * 65.67)$]. Also, he/she will be indifferent between subscribing to the print WSJ and the print WSJ plus online WSJ bundle when the print WSJ price is \$99.50 and the bundle price is \$125.14 [$\exp(11.333 - 0.133 * 99.50) = \exp(11.333 + 6.793 - 3.384 - 0.133 * 125.14)$].

In sum, the conjoint experiment results are very consistent across the two investigated product categories. Because there is significant attribute preference and price response heterogeneity in our sample, the random parameters logit model allows us to estimate the part worth of the conjoint factors and their distributions. Next we use the above results to evaluate all possible market scenarios (combinations of different product

offers at different price levels), compute the market share of the various product offers and compare overall profits.

Market Shares and Profits

In this section we present the market shares and profit under various market scenarios. We first look at offering a complete product line (print product, electronic product, electronic unit, print product and electronic product bundle, print product and electronic unit bundle), and then compare the results with the case where incomplete product line is offered (print product, electronic product, print product and electronic product bundle) with or without bundle discount. The goal is to empirically compare the various approaches a company may pursue and discover the most profitable product line configuration and pricing strategy.

Complete product line

If the content provider decides to go with all available product offers, we need to compare 243 (five product offers with three price levels each) market scenarios. We use the estimated individual level part worths for the five conjoint factors to compute the utility of the available profiles for every consumer under each market scenario. Then we compute the individual probability of choosing each product profile and average the results across consumers for every market scenario. Finally we calculate the total revenue, costs and profit for each of the 243 market scenarios. We assume that the variable costs for the electronic products are equal to zero, and we consider different levels of print variable costs (from print variable cost equal to 40% of the medium price

level of the print products to print variable cost equal to 90% of the medium price level of the print products). We use the medium price level as a base as this is the actual market price the publishers of WSJ and Vault Reports are charging. We do not consider fixed costs in our analysis as they just shift the profit function and do not change its slope. The most profitable market scenarios in case of complete product line under the different variable cost levels are presented in Tables 12 and 13.

<< Insert Table 12 about here >>

The book category market simulation results are displayed in Table 12. The top three market scenarios with respect to overall profit are listed within each considered cost level (print variable cost is 40%, 50%, 60%, 70%, 80% and 90% of print price). Together with the three most profitable scenarios, we also present the top two market scenarios in which the print book price is at its medium price level (which is the current price the publisher of Vault Report is charging for the book). For example, when the variable cost of the print book is assumed to be 40% of the price of the print book (first five lines in Table 4), our results show that the most profitable market scenarios is #181 (market shares is brackets): print book at high price (31.1%), electronic book at low price (23.4%), electronic unit at high price (14.1%), print book and electronic book bundle at low price (9.4%), print book and electronic unit bundle at low price (3.9%), and no choice option (18.1%); the total revenue is equal to \$20.94 (calculated if there is only one consumer on the market), cost is \$5.15, and the profit is \$15.79. From the scenarios in which the print book is at medium price, the market scenario that brings the highest profit is #100 (it is ranked number 12 within all market scenarios): print book at medium price (42.0%), electronic book at low price (20.1%), electronic unit at high price (12.5%), print

book and electronic book bundle at low price (6.5%), print book and electronic unit bundle at low price (2.5%), and no choice option (16.3%); the total revenue is equal to \$20.70 (assuming that the total market consists of one consumer), cost is \$5.93, and the profit is \$14.77.

When comparing the top three most profitable market scenarios and the top two most profitable market scenarios in which the print book is at medium price across the considered print variable cost levels, we notice that the results are quite consistent – market scenarios #181, #182 and #172 are always the top three overall, and market scenarios #100 and #91 are always the top two in which print is at medium price. Thus, in the book category, the publisher generates the highest profit when the print book and the electronic unit are offered at high price, and the electronic book and the two bundles are offered at low price. The reason is that, although the publisher is forgoing print book revenue when the print book price is high, the company is compensating this loss with the increased revenues from the electronic book and the two bundle options which are priced at a low level and attract more buyers. As the electronic products have zero variable costs, this scenario results in lower overall revenue but higher profit as compared to the scenario when the print book price is at medium. The higher electronic unit price allows the company to price discriminate against consumers who value only a portion of the print book, and get the maximum revenue from this segment.

<< Insert Table 13 about here >>

The newspaper category market simulation results are displayed in Table 13. As before, we list the top three market scenarios with respect to overall profit within each considered cost level, and the top two market scenarios in which the print newspaper

price is at its medium price level (which is the current price the publisher of Wall Street Journal is charging). For example, when the variable cost of the print newspaper is assumed to be 40% of the price of the print newspaper (first five lines of Table 13), we can see that the most profitable market scenarios is again #181 (market shares is brackets): print newspaper at high price (2.5%), electronic newspaper at low price (51.7%), electronic unit at high price (10.3%), print newspaper and electronic newspaper bundle at low price (25.9%), print newspaper and electronic unit bundle at low price (2.1%), and no choice option (7.5%); the total revenue is equal to \$51.26 (assuming that the total market consists of one consumer), cost is \$12.14, and the profit is \$39.12. Regarding the scenarios in which the print newspaper is at medium price, the market scenario that brings the highest profit is also #100 (it is ranked number 4 within all market scenarios): print newspaper at medium price (5.5%), electronic newspaper at low price (51.3%), electronic unit at high price (10.1%), print newspaper and electronic newspaper bundle at low price (24.2%), print newspaper and electronic unit bundle at low price (1.7%), and no choice option (7.1%); the total revenue is equal to \$51.21 (assuming that the total market consists of one consumer), the cost is \$12.53, and the profit is \$38.68.

Comparing the most profitable market scenarios overall and most profitable market scenarios in which the print newspaper is at medium price across the considered print variable cost levels, the results are generally consistent – market scenarios #181, #184, #187, #172, #178 and #208 are among the top overall, and market scenarios #100 and #91 are the top two in which print is at medium price. Thus, in the newspaper category, the publisher generates the highest profit when the print newspaper and the

electronic unit are offered at high price, the electronic newspaper is offered at low price, and the two bundles are offered at low, medium or high price (depending on the cost structure). As in the book category, although the publisher is forgoing print newspaper revenue because of its high price, the company is compensating this with the increased revenues from the two bundle options which are priced low and attract more buyers. Because the electronic products have zero variable cost, this scenario results in lower overall revenue but higher profit as compared to the scenario when the print newspaper price is medium. The higher electronic unit price enables the company to price discriminate against consumers who value only a portion of the print newspaper.

Incomplete product line (traditional mixed bundling with bundle discount)

In this case the publisher offers the print product, the electronic product and the bundle of the two. As each of the three product offers has three price levels, we compare 27 possible market scenarios. The results are presented in Table 14 (book category) and Table 15 (newspaper category). Again the results are consistent across the two product categories – the publisher generates the highest profit when the print product is offered at high price, the electronic product at low price, and the bundle is at low price. In most of the cases one of the top three profiles in terms of overall profit is the one in which the print product is at medium price, and the electronic product and the bundle are at low price, which is very similar to what the publisher of WSJ is pursuing currently (print at medium price, online at low price and bundle at medium price, as in market scenario #85). The publisher of Vault Reports is offering the print and electronic books at medium price each, and no discount on the bundle is given.

<< Insert Table 14 and Table 15 about here >>

Incomplete product line (traditional mixed bundling with no bundle discount)

This case is similar to the previous one with the only difference being that consumers do not get additional discount for choosing the bundle and the price they are charged for the bundle is the sum of the two individual prices. We consider nine possible market situations in total. The results are presented in tables 16 and 17 (book and newspaper categories respectively). In the book category, the market scenario in which the print book is at high price and the electronic book is at low price is consistently the most profitable scenario, followed by the scenario in which the print price is at medium level and the electronic price is at low level. With regard to the newspaper category, the electronic product should be offered at low price, while the price of the print product depends on the variable print costs as percentage of the print price – when the costs are relatively low, the print product should be offered at low price, but when the costs are relatively high, the print product should be offered at high price.

<< Insert Table 16 and Table 17 about here >>

Comparing the complete and incomplete product line profits

Looking at the overall profits of the most appealing market scenarios in the book category listed in Tables 12, 14 and 16, we can conclude that the publisher generates the highest profit when the incomplete product line with bundle discount is chosen (Table 14); this holds regardless of the print variable costs. For example, at the 70% cost level, the overall profits for market scenario #181 are as follows: \$12.12 (incomplete product

line with bundle discount, Table 14), \$11.93 (complete product line, Table 12) and \$10.82 (incomplete product line with no bundle discount, Table 16). The results are consistent for all most profitable market scenarios and cost levels.

With regard to the newspaper category, the results are very similar with one exception – the complete product line is the most profitable strategy when the print variable costs are relatively high (e.g. 80%-90% of the medium print price). For example, at the 80% cost level, the overall profits for market scenario #184 are as follows: \$27.36 (complete product line, Table 13), \$27.04 (incomplete product line with bundle discount, Table 15) and \$26.75 (incomplete product line with no bundle discount, Table 17). When the variable print costs are relatively low or medium level (e.g. 40%-50%-60%-70%), the results are as in the book category: incomplete product line with bundle discount is the best option, followed by the complete product line, and then by the incomplete product line with no bundle discount.

Thus, the incomplete product line with discount leads to the highest profit in both product categories. We further elaborate on this result in the discussion section.

Relative Form Attractiveness and Choice

Recall that the respondents evaluated the relative attractiveness of print book as compared to electronic (PDF) book and print newspaper as compared to electronic (online) newspaper on five attributes – image quality, browsing, layout, archival quality and convenience of use (7-point scale, 1-electronic better than print, 7-print better than electronic). They also provided information on the importance of each of these attributes when making a choice within the specific product category (7-point scale, 1-not at all

important, 7-very important). We mean-centered the five scales and computed four index variables for each of the two categories: print form index, electronic form index, difference index (bundle vs. superior form) and difference index (print form vs. electronic form). The example that follows is an illustration how the index variables were computed.

<i>BOOK</i>	<i>Image Quality (IQ)</i>	<i>Browsing (B)</i>	<i>Layout (L)</i>	<i>Archival Quality (AQ)</i>	<i>Convenience of Use (CU)</i>
Attribute Perception	1	2	4	4	7
Mean Centered (a)	-3	-2	0	0	3
Importance (b)	2	5	5	2	2
Print Index (PI) = IQ(a*b) + B(a*b) + L(a*b) + AQ(a*b) + CU(a*b)					
Print Index (PI) = (-3)*2 + (-2)*5 + 0*5 + 0*2 + 3*2 = - 10					
Electronic Index (EI) = - Print Index					
Electronic Index (EI) = 3*2 + 2*5 + 0*5 + 0*2 + (-3)*2 = 10					
Bundle Index (BI)= Sum of Max (Print, Electronic) for IQ, B, L, AQ, CU					
Bundle Index (BI)= 3*2 + 2*5 + 0*5 + 0*2 + 3*2 = 22					
Difference Index 1 (DI1) = Bundle Index – Max (Print Index, Electronic Index)					
Difference Index 1 (DI1) = 22 – 10 = 12					
Difference Index 2 (DI2) = Print Index – Electronic Index = 10 – (-10) = 20					

We estimate a random parameters logit model for each product category using the following utility functions:

$$\begin{aligned}
 U \text{ of Print Product (PP)} &= b_{PP} + b_{PRC} * \text{Price} + b_{PI} * PI \\
 U \text{ of Electronic Product (EP)} &= b_{EP} + b_{PRC} * \text{Price} + b_{EI_1} * EI \\
 U \text{ of Electronic Unit (EU)} &= b_{EU} + b_{PRC} * \text{Price} + b_{EI_2} * EI \\
 U \text{ of Print Product \& Electronic Product (PPEP)} &= b_{PPEP} + b_{PRC} * \text{Price} + b_{DI1_1} * DI1 \\
 U \text{ of Print Product \& Electronic Unit (PPEU)} &= b_{PPEU} + b_{PRC} * \text{Price} + b_{DI1_2} * DI1 \\
 U \text{ of No-Choice} &= b_{PRC} * \text{Price} + b_{DI2} * DI2
 \end{aligned}$$

<< Insert Table 18 and Table 19 about here >>

The results are displayed in Table 18 (book category) and Table 19 (newspaper category)²⁵. Our goal is to discover whether the relative product form attractiveness influences choice over and above the preference for the different product offers and their price. In the book category the probability of choosing the print product is significantly positively related to the Print Index ($b_{PI} = 0.029$, $p < .05$), for both categories the probability of choosing the electronic product is significantly positively related to the Electronic Index ($b_{EI_1} = 0.029$ for the book category and $b_{EI_1} = 0.011$ for the newspaper category, p 's $< .05$), and the probability of choosing the electronic unit is significantly positively related to the Electronic Index ($b_{EI_2} = 0.013$ for the book category and $b_{EI_1} = 0.007$ for the newspaper category, p 's $< .05$). With respect to the two difference indices, the results reveal that the difference in attractiveness between the bundle and the more attractive product form significantly affect the probability of buying the print product/electronic product bundle in the book category only ($b_{DI1_1} = 0.107$, $p < .05$); the difference in attractiveness of the two forms significantly affects the probability to defer choice also in the book category only ($b_{DI2} = 0.023$, $p < .05$).

For the book category we estimate individual level parameters for the intrinsic preference for the print form, the PDF form and the bundle. We then regress the differences in the constants for pairs of alternatives for each individual for differences in the indexes. Specifically, we compute the difference between the print and the PDF book alternative specific constants, and then regress the difference on the Difference Index 2; also, we compute the difference between the alternative specific constants of the bundle

²⁵ In the book category we estimate a model in which the means of the price parameter and the alternative specific constants for print book, PDF book and print book/PDF book bundle are allowed to vary and are assumed to be normally distributed, while in the newspaper category only the price parameter is allowed to vary. These are the models that provide the best fit to the data.

and the individual form, and then regress this difference on the Difference Index 1. In both cases the regression coefficients are negative but marginal or non-significant (-0.007, $p > .10$, and -0.022, $p = 0.099$). Nevertheless, these results provide weak evidence that the indexes are related to the brand specific constants: the higher the value of the indexes, the lower the difference between the brand specific constants. This suggests that the relative attractiveness of the product forms explains at least a portion of the difference in the intrinsic preference for these product forms.

In sum, controlling for the preference for the various product offers and their prices, the more consumers find the specific form attractive and superior to the other form, the more likely they are to choose it. Furthermore, the probability of buying the bundle in the book category is positively associated with the difference in the attractiveness between the bundle and the more attractive product form.

Discussion

Several issues are important from both theoretical and managerial point of view. Why is offering the incomplete product line with discount more profitable than offering the complete product line? Our book category simulation results suggest that when the electronic units are introduced, customers who would otherwise buy the print book or the full electronic book switch to the electronic units option. Further, the no choice option market share decreases only slightly as the unbundled electronic units do not attract a significant number of new customers. Consequently, there is cannibalization of print and full electronic books sales to unbundled electronic units sales, and this loss in revenue is not compensated by the revenue from the new customers who enter the market when the

electronic units are offered. In the newspaper category the results follow a similar pattern. When the electronic units are introduced, consumers who would otherwise buy the full electronic product choose a single unit instead. Again, the no-choice option share decreases only slightly. This results in loss of revenue because of the cannibalization of full electronic product sales to electronic units sales, and because of the limited market expansion from selling electronic units.

Why is the incomplete product line with no discount worse than the other two strategies? In the book category most of the consumers who buy the bundle in the incomplete with discount case buy print only when there is no bundle discount. Because of this, the company is better off charging a discounted bundle price as it brings extra revenue without incurring extra cost. Regarding the newspaper purchases, most of the consumers who buy the bundle in the incomplete product line with discount now switch to print newspaper or electronic newspaper only. As offering the electronic newspaper as a part of the bundle does not involve extra costs, it is more profitable for the company to sell the bundle.

Thus, our simulation results show that when the unbundling of electronic content does not lead to attracting a sizeable amount of new customers or getting extra revenue from the current customers, it is more profitable for the company not to pursue such an approach. The optimal solution is to offer the print products at a high price to extract more revenue from the customers who have a high valuation for this form, and to offer the electronic products and the bundle of the two forms at low price. This way the company can still persuade the more price sensitive consumers to enter the market and buy the cheaper electronic products, and extract additional revenue from those consumers

who value the bundle and buy both forms when the bundle is offered at a discount. The optimal pricing strategy is as follows: book category – print book at \$33.40, electronic book at \$25.20, and bundle at \$43.80 (33% effective bundle discount); newspaper category – print newspaper at \$114.50, electronic newspaper at \$34.50, and bundle at \$105.20 (42% effective bundle discount).

The conclusions of Essay 2 and Essay 3 are complementing each other. Recall that in Essay 2 consumers do not receive discount for buying the bundle. Therefore, it is more profitable for the company to offer unbundled electronic units (content unbundled mixed bundling) as compared to full electronic books (traditional mixed bundling). In Essay 3 we also compare these two strategies, although they are not exactly the same as in Essay 2: offering the complete product line (which is similar to CUMB but not the same, see explanation below) vs. offering the incomplete product line without bundle discount (which is TMB in Essay 2). The results in Essay 3 are similar to those in Essay 2 – the profit is higher when unbundled electronic units are offered (but lower than TMB with discount), while TMB with no discount is the least profitable.

How do our findings relate to the extant literature on bundling? Previous studies suggest that mixed bundling is more beneficial than pure bundling and pure components is the optimal bundling strategy when there is asymmetry in the reservation prices for the bundle components (Adams and Yallen 1976; Schmalensee 1984; McAfee, McMillan and Whinston 1989). Further, with respect to interrelated products and when the marginal costs are not too high, Venkatesh and Kamakura (2003) argue that while pure components strategy is optimal for moderate to strong substitutes and complements, mixed bundling is optimal for weak substitutes/complements. We extend the above

findings by further clarifying which bundling strategy is more appealing when different mixed bundling strategies are feasible. We show that, applied to product forms, mixed bundling is the optimal strategy when full print and electronic products are offered; in the case of separate electronic units companies are better off pursuing pure bundling (which is offering the full electronic product). Also, similar to Wilson et al. (1990) we show that when there is no market growth from unbundling and new market segments are not attracted by the unbundled components, product bundles should not be unbundled.

In terms of optimal pricing, Jedidi et al. (2003) argue that when the reservation prices of the bundle components are highly heterogeneous, a uniform high price for all products and bundles is optimal; otherwise a hybrid strategy may work better. In addition, Venkatesh and Chatterjee (2003) claim that low-priced components should be targeted at consumers who have low value for the information content. Our findings suggest that, in the case of mixed bundling of different forms of information products, it is preferable to charge high price for the print product but low price for the full electronic product and the bundle. As the costs associated with the electronic products are negligible, it is beneficial for the company to sell them at a relatively low price to consumers who have a low value for the information content and attract them to make a purchase. Thus, we show that it is not always optimal to charge a high price for the individual products under mixed bundling, and the cost structure may play a role as well.

In sum, we show that with respect to product forms, the mixed bundling strategy of offering the individual product forms and the bundle is the optimal product strategy for a content provider to pursue. Adding to the existing literature on bundling of interrelated products, we show that mixed bundling is optimal when the valuations of the bundle

components vary significantly across consumers, as well as the contingent valuation for the bundle. We also show that the cost structure may play an important role in bundling decisions, especially when determining the optimal pricing strategy – it may allow the seller to generate higher profit in the case of mixed bundling versus pure components (incomplete product line with discount versus incomplete product line with no discount) even when the bundle discount is sizeable. Specifically, companies are better off selling the bundle at a discounted price as compared to selling only the individual forms – from a seller’s point of view the bundle does not involve extra cost over and above the cost of the print form but can generate extra revenue over and above the print form revenue.

Managerial Implications

Our study has important managerial implications in the areas of product line design and pricing. We offer guidelines to publishers and other content providers on how to profitably market digital content together with traditional print content. Companies should implement mixed bundling regarding lines of information products, charging a high price for the print products and offering the electronic products and the bundle at a low price. Additionally, we outline a choice-based conjoint methodology that can be applied to a wide range of products including magazines, journals, music, etc.

Second, our study has implications in the area of market segmentation and targeting. Based on the estimates that can be obtained about the valuations of the different product forms, companies can segment their customers and target their product offering and pricing accordingly. For example, consumers who have low valuation for the information content may be encouraged to try and buy lower priced electronic products,

while customers with high valuation for the information content may be encouraged to buy the bundle. Further, targeting can be applied at individual level as well resulting in personalization of product offering and customization of digital goods.

Conclusion

In this essay we use choice experiments and choice-based conjoint analysis to obtain estimates of customer valuations of the price and non-price attributes of interest. We present respondents with hypothetical choice situations in which the attributes are varied to determine how choice fluctuates with attribute changes. Then, controlling for consumer heterogeneity, we estimate random effects logit models and use the results of the conjoint analysis to derive the optimal product mix and pricing. Consequently, we are able to come up with recommendations for optimal product line design and pricing strategy.

Our empirical investigation and conclusions are conditional on the content provider being a monopolist. It will be interesting to investigate what the optimal product line and pricing strategies will be when competition exists on the marketplace. In some conditions it may be optimal to offer unbundled electronic units, and complete product line may be the market equilibrium. The rationale behind such an equilibrium solution may be that offering more product options results in higher customer satisfaction and likelihood of repeat purchase. Another interesting question is how the market norms affect the expectations of the consumers on how the print content, the electronic content and the bundle are priced. Although in our study these norms are taken into account when modeling the valuations of the consumers for the different product offers and

consequently in the market simulations, it will be beneficial for the marketing theory and practice to further investigate the long term effects of offering low priced electronic products and form bundles on the valuation of information products, as well as the unbundling of electronic content.

TABLES

Table 1: Purchase Probabilities for Bundle: Product, Discount and Usage Conditions

<i>Panel A. Product, Discount and Usage Conditions</i>			
Discount	Bundle	Same Usage	Different Usage
No	INFO	(1a) $\Pr (V_{Fj Fi} > P_j)$	(3a) $\Pr (V^*_{Fj Fi} > P_j)$
Discount	CONV	(1b) $\Pr (V_C + V_{Fj Fi} > P_j)$	(3b) $\Pr (V_C + V^*_{Fj Fi} > P_j)$
d %	INFO	(2a) $\Pr (V_{Fj Fi} + d(P_i + P_j) > P_j)$	(4a) $\Pr (V^*_{Fj Fi} + d(P_i + P_j) > P_j)$
Discount	CONV	(2b) $\Pr (V_C + V_{Fj Fi} + d(P_i + P_j) > P_j)$	(4b) $\Pr (V_C + V^*_{Fj Fi} + d(P_i + P_j) > P_j)$
Predictions		INFO: $1a=3a, 1a=2a, 2a<4a, 3a<4a$ CONV > INFO, all conditions	CONV: $1b<3b, 2b<4b, 1b<2b, 3b<4b$
<i>Panel B. Discount and Relative Price Conditions – Information Products Only</i>			
		Price of each item same (P_A)	Item i higher priced: $P_i = (1+k)P_A, P_j = (1-k)P_A$
No		(5) $\Pr (V_{Fj Fi} > P_A V_{Fi} > V_{Fj}) +$	(7) $\Pr (V_{Fj Fi} > (1-k)P_A V_{Fi} - 2kP_A > V_{Fj}) +$
Discount		$\Pr (V_{Fi Fj} > P_A V_{Fj} > V_{Fi})$	$\Pr (V_{Fi Fj} > (1+k)P_A V_{Fi} - 2kP_A < V_{Fj})$
d % Discount		(6) $\Pr (V_{Fj Fi} > (1 - 2d)P_A V_{Fi} > V_{Fj}) +$	(8) $\Pr (V_{Fj Fi} > (1 - k - 2d)P_A V_{Fi} - 2kP_A > V_{Fj}) +$
		$\Pr (V_{Fi Fj} > (1 - 2d)P_A V_{Fj} > V_{Fi})$	$\Pr (V_{Fi Fj} > (1 + k - 2d)P_A V_{Fi} - 2kP_A < V_{Fj})$
Predictions		$7 > 5, 8 > 6, 6 > 5, 8 > 7$	

Table 2: Perceived Appropriateness of Generated Usage Situations

Product	Usage Situation	MD**	Rank	t stat	Rank		
Form 1: PAPER BOOK	e-mail pages/chapters	-2.425	1	-12.825	1	*	
	give as a present	2.238	2	10.408	2	*	
	read for pleasure	1.762	3	7.638	3	*	
	read while traveling	1.738	4	6.581	4	*	
	Form 2: ELECTRONIC BOOK	read to others	1.452	5	6.203	5	*
	search	-0.952	6	-4.421	6	*	
	copy citations/paragraphs	-0.600	7	-2.399	7	*	
	need on a short notice	0.167	8	0.510	8		
	archive	-0.024	9	-0.100	9		
Form 1: PAPER NEWSPAPER	read the news	-2.548	1	-11.790	1	*	
	read old articles	-1.902	2	-7.963	2	*	
	read for pleasure	-1.690	3	-7.275	3	*	
	read during lunchtime/breaks	1.476	4	6.173	4	*	
	Form 2: ONLINE NEWSPAPER	archive	-1.171	5	-4.566	5	*
	read at home	0.805	6	3.778	7	*	
	search	0.756	7	4.036	6	*	
	read to others	0.463	8	2.649	8	*	
	follow the stock market	-0.375	9	-1.684	10		
	e-mail articles	0.310	10	1.915	9		
Form 1: STICK of MARGARINE	for cooking	1.071	1	4.079	1	*	
	for baking	0.976	2	3.992	2	*	
	shortening in cakes	0.921	3	3.441	3	*	
	take on a picnic	-0.350	4	-1.236	4		
	Form 2: TUB of MARGARINE	eat with pancakes	0.262	5	1.097	5	
	spread on a tray	-0.093	6	-0.371	6		
	spread on bread for breakfast	-0.048	7	-0.184	7		
	for frying fish/meat	-0.025	8	-0.097	8		
Form 1: LIQUID SOAP	wash dishes	3.000	1	17.037	1	*	
	wash your hands in public places	2.372	2	11.715	2	*	
	wash delicate laundry	1.930	3	8.908	3	*	
	Form 2: BAR of SOAP	take on a picnic	0.767	4	2.760	4	*
	take a shower at home	-0.628	5	-2.071	6	*	
	take a shower while traveling	-0.349	6	-1.044	7		
	wash your hands at home	0.302	7	2.383	5	*	
	take a shower in the gym	0.140	8	0.374	8		
Form 1: INSTANT COFFEE	when looking for a good cup of coffee	-2.770	1	-9.222	1	*	
	offer to your guests at home	-2.580	2	-9.259	2	*	
	while traveling	1.130	3	3.191	3	*	
	Form 2: GROUND COFFEE	when in a hurry	1.040	4	2.982	4	*
	on a picnic	-0.480	5	-1.297	6		
	during a meeting	-0.420	6	-1.305	5		
	while in class	-0.190	7	-0.548	8		
	in the middle of the day	-0.170	8	-0.848	7		

*p<0.05

**The mean difference calculated as mean appropriateness of Form 1 minus mean appropriateness of Form 2.

Table 3: Study 2 - Mean Percentage of Points Allocated to Bundle

Panel A: Bundle Discount and Usage Conditions

Discount	Bundle	Product		Same Usage		Different Usage
No Discount	INFO	Book	(1a)	9.77%	(3a)	8.28%
		Newspaper	(1a)	9.17%	(3a)	6.35%
	CONV	Margarine	(1b)	15.10%	(3b)	23.75%
		Coffee	(1b)	12.30%	(3b)	17.61%
25 % Discount	INFO	Book	(2a)	9.18%	(4a)	20.08%
		Newspaper	(2a)	11.36%	(4a)	18.90%
	CONV	Margarine	(2b)	26.85%	(4b)	49.50%
		Coffee	(2b)	31.00%	(4b)	48.19%
Predictions			INFO: 1a=3a, 1a=2a, 2a<4a, 3a<4a CONV > INFO, all conditions	CONV: 1b<3b, 2b<4b, 1b<2b, 3b<4b		

Panel B: Bundle Discount and Relative Price Conditions

Discount				Equal Prices	Print High. Low	Electronic
No Discount	INFO	Book ^a	(5)	6.10%	(7)	11.95%
		Newspaper ^b	(5)	6.88%	(7)	8.63%
25 % Discount	INFO	Book ^c	(6)	15.68%	(8)	13.58%
		Newspaper ^d	(6)	16.23%	(8)	14.07%
Predictions			7>5, 8 > 6, 6>5, 8>7			

^a Prices for book in equal condition: print = electronic= \$29.99, bundle = \$59.98; in high-low condition: print = \$37.49, electronic = \$22.49, bundle = \$59.98.

^b Prices for newspaper in equal condition: print = electronic = \$38.99, bundle = \$77.97; in high-low condition: print = \$48.79, electronic = \$29.19, bundle = \$77.97.

^c Prices are same as a except bundle = \$44.99.

^d Prices are same as b except bundle = \$58.49.

Table 4: Study 2 ANOVA Results

Source	MARGARINE					COFFEE				
	SS	df	MS	F	Sig.	SS	df	MS	F	Sig.
USAGE (USE)	26.67	1	26.67	6.01	0.02	22.53	1	22.53	4.09	0.05
DISCOUNT (DISC)	40.99	1	40.99	9.24	0.00	130.31	1	130.31	23.65	0.00
REL. PRICE (RPRC)										
USE * DISC	0.72	1	0.72	0.16	0.69	9.76	1	9.76	1.77	0.19
USE * RPRC										
DISC * RPRC										
USE * DISC * RPRC										
Error	337.24	76	4.44			451.87	82	5.51		
Total	616.25	80				928.23	86			

Source	BOOK					NEWSPAPER				
	SS	df	MS	F	Sig.	SS	df	MS	F	Sig.
USAGE (USE)	16.92	1	16.92	3.77	0.05	1.49	1	1.49	0.33	0.57
DISCOUNT (DISC)	32.68	1	32.68	7.27	0.01	48.46	1	48.46	10.54	0.00
REL. PRICE (RPRC)	2.97	1	2.97	0.66	0.42	1.02	1	1.02	0.22	0.64
USE * DISC	27.11	1	27.11	6.03	0.01	17.96	1	17.96	3.91	0.05
USE * RPRC	5.24	1	5.24	1.17	0.28	2.17	1	2.17	0.47	0.49
DISC * RPRC	16.84	1	16.84	3.75	0.05	9.89	1	9.89	2.15	0.14
USE * DISC * RPRC	0.91	1	0.91	0.20	0.65	0.94	1	0.94	0.20	0.65
Error	1042.35	232	4.49			1066.50	232	4.60		
Total	1145.02	240				1148.43	240			

DV: Ln of points allocated to the bundle

Table 5: Profit Comparison under CUMB and TMB Strategies.

Print Sales	$\frac{\delta Q_P^{CUMB}}{\delta P_C} \in$	$\frac{\delta Q_P^{TMB}}{\delta P_{EB}} \in$	$\Pi_{CUMB}^* > \Pi_{TMB}^* \quad IF$
a. $Q_P^{CUMB} > Q_P^{TMB}$	$\left(-\infty; \frac{-kF\bar{N}}{P_p - c}\right] \cup \left[\frac{kF\bar{N}}{P_p - c}; +\infty\right)$	$\left(-\infty; \frac{-k}{P_p - c}\right] \cup \left[\frac{k}{P_p - c}; +\infty\right)$	$\left(\frac{Q_P^{CUMB} - Q_P^{TMB}}{P_p - c}\right) + \frac{V_H}{4k} \left[\left(\frac{\delta Q_P^{TMB}}{\delta P_{EB}}\right)^2 - \left(\frac{k}{P_p - c}\right)^2 \right] > \frac{1}{4kF\bar{S}} \left[\left(\frac{\delta Q_P^{CUMB}}{\delta P_C}\right)^2 - \left(\frac{kF\bar{N}}{P_p - c}\right)^2 \right]$
b. $Q_P^{CUMB} > Q_P^{TMB}$	$\left(\frac{-kF\bar{N}}{P_p - c}; \frac{kF\bar{N}}{P_p - c}\right)$	$\left(-\infty; \frac{-k}{P_p - c}\right] \cup \left[\frac{k}{P_p - c}; +\infty\right)$	Always $\Pi_{CUMB}^* > \Pi_{TMB}^*$
c. $Q_P^{CUMB} > Q_P^{TMB}$	$\left(-\infty; \frac{-kF\bar{N}}{P_p - c}\right] \cup \left[\frac{kF\bar{N}}{P_p - c}; +\infty\right)$	$\left(\frac{-k}{P_p - c}; \frac{k}{P_p - c}\right)$	$\left(\frac{Q_P^{CUMB} - Q_P^{TMB}}{P_p - c}\right) > \frac{1}{4kF\bar{S}} \left[\left(\frac{\delta Q_P^{CUMB}}{\delta P_C}\right)^2 - \left(\frac{kF\bar{N}}{P_p - c}\right)^2 \right] + \frac{V_H}{4k} \left[\left(\frac{k}{P_p - c}\right)^2 - \left(\frac{\delta Q_P^{TMB}}{\delta P_{EB}}\right)^2 \right]$
d. $Q_P^{CUMB} > Q_P^{TMB}$	$\left(\frac{-kF\bar{N}}{P_p - c}; \frac{kF\bar{N}}{P_p - c}\right)$	$\left(\frac{-k}{P_p - c}; \frac{k}{P_p - c}\right)$	$\left(\frac{Q_P^{CUMB} - Q_P^{TMB}}{P_p - c}\right) + \frac{1}{4kF\bar{S}} \left[\left(\frac{kF\bar{N}}{P_p - c}\right)^2 - \left(\frac{\delta Q_P^{CUMB}}{\delta P_C}\right)^2 \right] > \frac{V_H}{4k} \left[\left(\frac{k}{P_p - c}\right)^2 - \left(\frac{\delta Q_P^{TMB}}{\delta P_{EB}}\right)^2 \right]$
e. $Q_P^{CUMB} \leq Q_P^{TMB}$	$\left(-\infty; \frac{-kF\bar{N}}{P_p - c}\right] \cup \left[\frac{kF\bar{N}}{P_p - c}; +\infty\right)$	$\left(-\infty; \frac{-k}{P_p - c}\right] \cup \left[\frac{k}{P_p - c}; +\infty\right)$	$\frac{V_H}{4k} \left[\left(\frac{\delta Q_P^{TMB}}{\delta P_{EB}}\right)^2 - \left(\frac{k}{P_p - c}\right)^2 \right] > \left(\frac{Q_P^{TMB} - Q_P^{CUMB}}{P_p - c}\right) + \frac{1}{4kF\bar{S}} \left[\left(\frac{\delta Q_P^{CUMB}}{\delta P_C}\right)^2 - \left(\frac{kF\bar{N}}{P_p - c}\right)^2 \right]$
f. $Q_P^{CUMB} \leq Q_P^{TMB}$	$\left(\frac{-kF\bar{N}}{P_p - c}; \frac{kF\bar{N}}{P_p - c}\right)$	$\left(-\infty; \frac{-k}{P_p - c}\right] \cup \left[\frac{k}{P_p - c}; +\infty\right)$	$\frac{1}{4kF\bar{S}} \left[\left(\frac{kF\bar{N}}{P_p - c}\right)^2 - \left(\frac{\delta Q_P^{CUMB}}{\delta P_C}\right)^2 \right] + \frac{V_H}{4k} \left[\left(\frac{\delta Q_P^{TMB}}{\delta P_{EB}}\right)^2 - \left(\frac{k}{P_p - c}\right)^2 \right] > \left(\frac{Q_P^{TMB} - Q_P^{CUMB}}{P_p - c}\right)$
g. $Q_P^{CUMB} \leq Q_P^{TMB}$	$\left(-\infty; \frac{-kF\bar{N}}{P_p - c}\right] \cup \left[\frac{kF\bar{N}}{P_p - c}; +\infty\right)$	$\left(\frac{-k}{P_p - c}; \frac{k}{P_p - c}\right)$	Always $\Pi_{CUMB}^* < \Pi_{TMB}^*$
h. $Q_P^{CUMB} \leq Q_P^{TMB}$	$\left(\frac{-kF\bar{N}}{P_p - c}; \frac{kF\bar{N}}{P_p - c}\right)$	$\left(\frac{-k}{P_p - c}; \frac{k}{P_p - c}\right)$	$\frac{1}{4kF\bar{S}} \left[\left(\frac{kF\bar{N}}{P_p - c}\right)^2 - \left(\frac{\delta Q_P^{CUMB}}{\delta P_C}\right)^2 \right] > \left(\frac{Q_P^{TMB} - Q_P^{CUMB}}{P_p - c}\right) + \frac{V_H}{4k} \left[\left(\frac{k}{P_p - c}\right)^2 - \left(\frac{\delta Q_P^{TMB}}{\delta P_{EB}}\right)^2 \right]$

Table 6: Actual Purchase Rates under the Two Mixed Bundling Strategies

Content Unbundled Mixed Bundling

PDF Price	Print	PDF	Bundle	Nothing	Total
0.50	57.21%	11.21%	4.95%	26.64%	21.17%
0.75	54.11%	13.59%	3.93%	28.37%	25.86%
1.00	63.55%	9.47%	4.87%	22.11%	23.42%
1.25	62.88%	6.67%	3.13%	27.32%	29.55%
Total	59.57%	10.08%	4.13%	26.22%	100.00%

Traditional Mixed Bundling

PDF Price	Print	PDF	Bundle	Nothing	Total
0.25	43.57%	16.43%	7.14%	32.86%	14.74%
0.50	45.20%	17.65%	4.95%	32.20%	34.00%
0.75	51.60%	8.33%	6.73%	33.33%	32.84%
1.00	48.57%	5.00%	5.00%	41.43%	14.74%
1.10	40.00%	11.43%	5.71%	42.86%	3.68%
Total	47.37%	12.32%	5.89%	34.42%	100.00%

Table 7: Estimation Results - Content Unbundled Mixed Bundling

<i>Variable</i>	<i>Choice</i>	<i>Coefficient</i>	<i>SE</i>	<i>b/St.Er.</i>	<i>P[Z >z]</i>
<i>Agriculture</i>	Print	0.486	0.350	1.389	0.165
	PDF	0.232	0.412	0.565	0.572
	Bundle	-0.860	1.146	-0.750	0.453
<i>Behavioral Science</i>	Print	0.391	0.173	2.262	0.024
	PDF	-0.341	0.202	-1.691	0.091
	Bundle	-0.873	0.590	-1.479	0.139
<i>Education</i>	Print	0.515	0.192	2.684	0.007
	PDF	-0.311	0.229	-1.357	0.175
	Bundle	-0.672	0.569	-1.181	0.238
<i>General Interest</i>	Print	0.262	0.306	0.855	0.393
	PDF	-0.209	0.358	-0.584	0.559
	Bundle	0.739	0.907	0.814	0.416
<i>Medicine</i>	Print	0.129	0.142	0.907	0.364
	PDF	0.057	0.163	0.353	0.724
	Bundle	0.235	0.384	0.612	0.541
<i>Print Price</i>	Print	0.000	0.006	0.038	0.970
	PDF	-0.017	0.006	-2.672	0.008
	Bundle	-0.006	0.021	-0.279	0.780
<i>PDF Price</i>	Print	0.902	0.285	3.169	0.002
	PDF	-0.553	0.179	-3.092	0.002
	Bundle	-5.802	3.364	-1.725	0.085
<i>Derived SD of parameter distributions</i>					
<i>PDF Price</i>	Print	1.753	0.819	2.142	0.032
	Bundle	3.887	1.958	1.985	0.047
<i>Number of observations</i>				3245	
<i>Iterations completed</i>				43	
<i>Log likelihood function</i>				-3290.938	
<i>Restricted log likelihood</i>				-4498.525	
<i>Chi squared</i>				2415.175	
<i>Degrees of freedom</i>				23	
<i>Prob[ChiSqd > value] =</i>				0.000	

Table 8: Estimation Results - Traditional Mixed Bundling

<i>Variable</i>	<i>Choice</i>	<i>Coefficient</i>	<i>SE</i>	<i>b/St.Er.</i>	<i>P[Z >z]</i>
<i>Agriculture</i>	Print	-0.317	0.337	-0.940	0.347
	PDF	-0.732	0.551	-1.329	0.184
	Bundle	-0.487	0.812	-0.599	0.549
<i>Behavioral Science</i>	Print	0.504	0.283	1.780	0.075
	PDF	-2.339	1.036	-2.257	0.024
	Bundle	-0.235	0.542	-0.434	0.665
<i>Education</i>	Print	0.974	0.267	3.649	0.000
	PDF	-0.003	0.424	-0.007	0.995
	Bundle	0.321	0.481	0.668	0.504
<i>General Interest</i>	Print	0.252	0.290	0.869	0.385
	PDF	-0.266	0.454	-0.587	0.557
	Bundle	0.085	0.480	0.177	0.860
<i>Medicine</i>	Print	-0.099	0.187	-0.531	0.596
	PDF	-0.285	0.258	-1.102	0.270
	Bundle	-0.661	0.384	-1.723	0.085
<i>Print Price</i>	Print	0.011	0.006	1.802	0.072
	PDF	-0.001	0.008	-0.151	0.880
	Bundle	-0.035	0.012	-2.992	0.003
<i>PDF Price</i>	Print	-0.245	0.262	-0.934	0.351
	PDF	-1.252	0.397	-3.156	0.002
	Bundle	-0.815	0.508	-1.605	0.109
<i>Number of observations</i>				950	
<i>Iterations completed</i>				7	
<i>Log likelihood function</i>				-1056.12	
<i>No coefficients</i>				-1316.98	
<i>Constants only</i>				-1088.57	

Table 9: Simulation Results – Profit under the Two Mixed Bundling Strategies.

A. Content Unbundled Mixed Bundling

<i>PDF Price as % Print Price</i>	<i>Market Share</i>				<i>Profit</i>			
	<i>Print</i>	<i>PDF</i>	<i>Bundle</i>	<i>No Choice</i>	<i>Print</i>	<i>PDF</i>	<i>Bundle</i>	<i>Total</i>
0%	0.347	0.166	0.214	0.273	6.295	0.000	3.910	10.205
25%	0.477	0.161	0.061	0.301	8.655	0.833	1.435	10.923
50%	0.561	0.133	0.021	0.284	10.188	1.376	0.607	12.170
75%	0.624	0.105	0.014	0.257	11.310	1.631	0.471	13.412
100%	0.672	0.082	0.014	0.231	12.185	1.708	0.536	14.429
110%	0.689	0.075	0.014	0.222	12.477	1.709	0.581	14.767
125%	0.710	0.065	0.015	0.210	12.862	1.690	0.655	15.207
<i>Actual</i>	0.646	0.094	0.017	0.243	11.653	1.609	0.629	13.890

B. Traditional Mixed Bundling

<i>PDF Price as % Print Price</i>	<i>Market Share</i>				<i>Profit</i>			
	<i>Print</i>	<i>PDF</i>	<i>Bundle</i>	<i>No Choice</i>	<i>Print</i>	<i>PDF</i>	<i>Bundle</i>	<i>Total</i>
0%	0.441	0.203	0.079	0.277	7.921	0.000	1.231	9.152
25%	0.457	0.165	0.072	0.306	8.219	1.302	1.390	10.911
50%	0.469	0.132	0.064	0.335	8.431	2.084	1.490	12.005
75%	0.477	0.105	0.057	0.362	8.562	2.475	1.536	12.572
100%	0.481	0.082	0.050	0.387	8.618	2.588	1.537	12.743
110%	0.481	0.075	0.047	0.397	8.623	2.577	1.527	12.727
125%	0.481	0.064	0.043	0.412	8.611	2.517	1.502	12.630
<i>Actual</i>	0.472	0.120	0.059	0.349	8.455	2.141	1.492	12.088

Table 10: Conjoint Design and Price Levels

A. Conjoint Factors					
<i>Product offer</i>	<i>Print</i>	<i>Full Electronic</i>	<i>Electronic Unit</i>	<i>Bundle</i>	<i>Price Level</i>
Print Product (PP)	1	0	0	0	L, M, H
Electronic Product (EP)	0	1	0	0	L, M, H
Electronic Unit/Section (EU)	0	0	1	0	L, M, H
Print Product & Electronic Product Bundle (PPEP)	1	1	0	1	L, M, H
Print Product & Electronic Unit Bundle (PPEU)	1	0	1	1	L, M, H
B. Price Levels					
<i>WSJ Subscription (26 weeks)</i>	<i>Low</i>	<i>Medium</i>	<i>High</i>		
Print WSJ	86.50	99.50	114.50		
Electronic WSJ	34.50	39.50	45.50		
Electronic WSJ Section	13.20	15.20	17.40		
Print WSJ & Electronic WSJ	105.20	120.90	139.10		
Print WSJ & Electronic WSJ Section	94.90	109.20	126.60		
<i>Vault Guide</i>	<i>Low</i>	<i>Medium</i>	<i>High</i>		
Print Book	25.20	29.00	33.40		
Electronic Book	25.20	29.00	33.40		
Electronic Section	9.70	11.10	12.80		
Print Book & Electronic Book	43.80	50.40	58.00		
Print Book & Electronic Section	33.20	38.20	44.00		

Table 11: Random Parameters Logit Model Results (conjoint choice experiment)

Book Category				
Variable	Coefficient	SE	b/SE	P[Z >z]
<i>Random parametes in utility functions</i>				
Bundle	-6.647	0.534	-12.457	0.000
Print	8.485	0.878	9.666	0.000
Price	-0.261	0.028	-9.378	0.000
Full Electronic	7.306	0.793	9.210	0.000
Electronic Unit	3.063	0.419	7.314	0.000
<i>Derived standard deviations of prameter distributions</i>				
Bundle	2.236	0.365	6.127	0.000
Print	5.249	0.515	10.193	0.000
Price	0.107	0.013	8.494	0.000
Full Electronic	1.621	0.296	5.469	0.000
Electronic Unit	2.316	0.230	10.068	0.000
Number of observations	4176 (87 respondents x 16 choices x 3 options)			
Log likelihood function	-904.67			
Restricted log likelihood	-2486.96			
Chi squared (df=10)	3164.58 (p=0.000)			
R-sq	0.636			
Adjusted R-sq	0.635			
Newspaper Category				
Variable	Coefficient	SE	b/SE	P[Z >z]
<i>Random parametes in utility functions</i>				
Bundle	-3.384	0.572	-5.921	0.000
Print	11.333	1.376	8.235	0.000
Price	-0.133	0.014	-9.575	0.000
Full Electronic	6.793	0.619	10.968	0.000
Electronic Unit	1.452	0.380	3.819	0.000
<i>Derived standard deviations of prameter distributions</i>				
Bundle	4.005	0.565	7.083	0.000
Print	6.222	0.720	8.646	0.000
Price	0.025	0.004	6.157	0.000
Full Electronic	3.253	0.502	6.475	0.000
Electronic Unit	3.515	0.357	9.852	0.000
Number of observations	4176 (87 respondents x 16 choices x 3 options)			
Log likelihood function	-783.75			
Restricted log likelihood	-2490.55			
Chi squared (df=10)	3413.59 (p=0.000)			
R-sq	0.685			
Adjusted R-sq	0.684			

Table 12: Book Category – Market Simulation Results

Rank	Market Scenario #	Market Share						Revenue	Cost	Cost % of Print Price	Profit
		Print Book	PDF Book	PDF Unit	Print Book and PDF Book	Print Book and PDF Unit	No Choice				
1	181	0.311	0.234	0.141	0.094	0.039	0.181	20.939	5.149		15.790
2	182	0.322	0.236	0.144	0.099	0.016	0.182	20.502	5.069		15.433
3	172	0.306	0.225	0.164	0.092	0.037	0.175	20.442	5.051	40.00%	15.390
12	100	0.420	0.201	0.125	0.065	0.025	0.163	20.699	5.926		14.773
15	91	0.413	0.194	0.146	0.064	0.024	0.159	20.446	5.813		14.634
1	181	0.311	0.234	0.141	0.094	0.039	0.181	20.939	6.436		14.503
2	182	0.322	0.236	0.144	0.099	0.016	0.182	20.502	6.337		14.165
3	172	0.306	0.225	0.164	0.092	0.037	0.175	20.442	6.314	50.00%	14.127
15	100	0.420	0.201	0.125	0.065	0.025	0.163	20.699	7.408		13.292
18	91	0.413	0.194	0.146	0.064	0.024	0.159	20.446	7.266		13.181
1	181	0.311	0.234	0.141	0.094	0.039	0.181	20.939	7.723		13.216
2	182	0.322	0.236	0.144	0.099	0.016	0.182	20.502	7.604		12.898
3	172	0.306	0.225	0.164	0.092	0.037	0.175	20.442	7.577	60.00%	12.865
22	100	0.420	0.201	0.125	0.065	0.025	0.163	20.699	8.889		11.810
23	91	0.413	0.194	0.146	0.064	0.024	0.159	20.446	8.719		11.727
1	181	0.311	0.234	0.141	0.094	0.039	0.181	20.939	9.011		11.929
2	182	0.322	0.236	0.144	0.099	0.016	0.182	20.502	8.872		11.630
3	172	0.306	0.225	0.164	0.092	0.037	0.175	20.442	8.840	70.00%	11.602
30	100	0.420	0.201	0.125	0.065	0.025	0.163	20.699	10.371		10.328
33	91	0.413	0.194	0.146	0.064	0.024	0.159	20.446	10.172		10.274
1	181	0.311	0.234	0.141	0.094	0.039	0.181	20.939	10.298		10.641
2	182	0.322	0.236	0.144	0.099	0.016	0.182	20.502	10.139		10.363
3	172	0.306	0.225	0.164	0.092	0.037	0.175	20.442	10.103	80.00%	10.339
37	100	0.420	0.201	0.125	0.065	0.025	0.163	20.699	11.852		8.847
38	91	0.413	0.194	0.146	0.064	0.024	0.159	20.446	11.625		8.821
1	181	0.311	0.234	0.141	0.094	0.039	0.181	20.939	11.585		9.354
2	182	0.322	0.236	0.144	0.099	0.016	0.182	20.502	11.406		9.096
3	172	0.306	0.225	0.164	0.092	0.037	0.175	20.442	11.366	90.00%	9.076
37	91	0.413	0.194	0.146	0.064	0.024	0.159	20.446	13.078		7.368
38	100	0.420	0.201	0.125	0.065	0.025	0.163	20.699	13.334		7.365
Market Scenario #	Print Book	PDF Book	PDF Unit	Print Book and PDF Book	Print Book and PDF Unit						
91	Medium	Low	Medium	Low	Low						
100	Medium	Low	High	Low	Low						
172	High	Low	Medium	Low	Low						
181	High	Low	High	Low	Low						
182	High	Low	High	Low	Medium						

Table 13: Newspaper Category – Market Simulation Results

Rank	Market Scenario #	Market Share						Revenue	Cost	Cost % of Print Price	Profit
		Print WSJ	Online WSJ	Online Unit	Print WSJ and Online WSJ	Print WSJ and Online Unit	No Choice				
1	181	0.025	0.517	0.103	0.259	0.021	0.075	51.256	12.137		39.120
2	208	0.026	0.451	0.123	0.284	0.021	0.095	51.985	13.174		38.811
3	19	0.133	0.498	0.096	0.206	0.011	0.056	52.621	13.913	40.00%	38.708
4	100	0.055	0.513	0.101	0.242	0.017	0.071	51.213	12.534		38.679
11	91	0.055	0.504	0.115	0.241	0.017	0.069	50.834	12.442		38.392
1	181	0.025	0.517	0.103	0.259	0.021	0.075	51.256	15.171		36.086
2	100	0.055	0.513	0.101	0.242	0.017	0.071	51.213	15.667		35.546
3	208	0.026	0.451	0.123	0.284	0.021	0.095	51.985	16.468	50.00%	35.518
4	172	0.025	0.508	0.116	0.258	0.020	0.073	50.539	15.071		35.468
7	91	0.055	0.504	0.115	0.241	0.017	0.069	50.834	15.553		35.281
1	181	0.025	0.517	0.103	0.259	0.021	0.075	51.256	18.205		33.051
2	172	0.025	0.508	0.116	0.258	0.020	0.073	50.539	18.085		32.454
3	182	0.026	0.519	0.105	0.269	0.003	0.078	50.228	17.796	60.00%	32.432
4	100	0.055	0.513	0.101	0.242	0.017	0.071	51.213	18.801		32.412
8	91	0.055	0.504	0.115	0.241	0.017	0.069	50.834	18.663		32.171
1	181	0.025	0.517	0.103	0.259	0.021	0.075	51.256	21.239		30.017
2	184	0.035	0.579	0.108	0.142	0.044	0.092	44.963	15.401		29.561
3	182	0.026	0.519	0.105	0.269	0.003	0.078	50.228	20.762	70.00%	29.466
8	100	0.055	0.513	0.101	0.242	0.017	0.071	51.213	21.934		29.279
13	91	0.055	0.504	0.115	0.241	0.017	0.069	50.834	21.774		29.060
1	187	0.044	0.619	0.109	0.067	0.062	0.098	41.559	13.821		27.738
2	178	0.044	0.607	0.124	0.067	0.061	0.096	41.200	13.712		27.487
3	184	0.035	0.579	0.108	0.142	0.044	0.092	44.963	17.601	80.00%	27.361
16	100	0.055	0.513	0.101	0.242	0.017	0.071	51.213	25.068		26.145
23	101	0.058	0.515	0.103	0.249	0.003	0.073	50.571	24.609		25.961
1	187	0.044	0.619	0.109	0.067	0.062	0.098	41.559	15.548		26.010
2	178	0.044	0.607	0.124	0.067	0.061	0.096	41.200	15.426		25.773
3	184	0.035	0.579	0.108	0.142	0.044	0.092	44.963	19.801	90.00%	25.161
21	106	0.100	0.605	0.107	0.060	0.042	0.086	41.794	18.044		23.750
24	97	0.099	0.594	0.122	0.060	0.041	0.084	41.435	17.890		23.544
Market Scenario	Print WSJ	Online WSJ	Online Unit	Print WSJ Online WSJ	Print WSJ Online Unit	Market Scenario	Print WSJ	Online WSJ	Online Unit	Print WSJ Online WSJ	Print WSJ Online Unit
19	Low	Low	High	Low	Low	178	High	Low	Medium	High	Low
91	Medium	Low	Medium	Low	Low	181	High	Low	High	Low	Low
97	Medium	Low	Medium	High	Low	182	High	Low	High	Low	Medium
100	Medium	Low	High	Low	Low	184	High	Low	High	Medium	Low
101	Medium	Low	High	Low	Medium	187	High	Low	High	High	Low
106	Medium	Low	High	High	Low	208	High	Medium	High	Low	Low
172	High	Low	Medium	Low	Low						

Table 14: Book Category – Market Simulation Results (Incomplete Product Line)

Rank	Market Scenario #	Market Share				Revenue	Cost	Cost % of Print Price	Profit
		Print Book	PDF Book	Print Book and PDF Book	No Choice				
1	172/181/182	0.365	0.308	0.109	0.217	21.748	5.503		16.244
2	91/100/101	0.479	0.259	0.072	0.190	21.764	6.395		15.369
3	184	0.407	0.328	0.041	0.224	20.311	5.197	40.00%	15.113
4	208	0.400	0.228	0.122	0.250	21.153	6.055		15.099
7	85	0.514	0.269	0.025	0.192	20.818	6.252		14.566
1	172/181/182	0.365	0.308	0.109	0.217	21.748	6.879		14.868
2	184	0.407	0.328	0.041	0.224	20.311	6.497		13.814
3	91/100/101	0.479	0.259	0.072	0.190	21.764	7.994	50.00%	13.770
4	208	0.400	0.228	0.122	0.250	21.153	7.568		13.585
6	85	0.514	0.269	0.025	0.192	20.818	7.815		13.003
1	172/181/182	0.365	0.308	0.109	0.217	21.748	8.255		13.493
2	184	0.407	0.328	0.041	0.224	20.311	7.796		12.515
3	91/100/101	0.479	0.259	0.072	0.190	21.764	9.593	60.00%	12.172
4	169/187	0.426	0.337	0.011	0.226	19.707	7.606		12.101
6	85	0.514	0.269	0.025	0.192	20.818	9.378		11.440
1	172/181/182	0.365	0.308	0.109	0.217	21.748	9.631		12.117
2	184	0.407	0.328	0.041	0.224	20.311	9.095		11.215
3	169/187	0.426	0.337	0.011	0.226	19.707	8.873	70.00%	10.833
4	91/100/101	0.479	0.259	0.072	0.190	21.764	11.191		10.573
6	85	0.514	0.269	0.025	0.192	20.818	10.941		9.877
1	172/181/182	0.365	0.308	0.109	0.217	21.748	11.007		10.741
2	185	0.407	0.328	0.041	0.224	20.311	10.394		9.916
3	169/187	0.426	0.337	0.011	0.226	19.707	10.141	80.00%	9.566
5	91/100/101	0.479	0.259	0.072	0.190	21.764	12.790		8.974
6	85	0.514	0.269	0.025	0.192	20.818	12.504		8.314
1	172/181/182	0.365	0.308	0.109	0.217	21.748	12.38		9.365
2	184	0.407	0.328	0.041	0.224	20.311	11.69		8.617
3	169/187	0.426	0.337	0.011	0.226	19.707	11.41	90.00%	8.298
5	91/100/101	0.479	0.259	0.072	0.190	21.764	14.389		7.375
6	85	0.514	0.269	0.025	0.192	20.818	14.07		6.751
Market Scenario #	Print Book	PDF Book	Print Book and PDF Book						
85	Medium	Low	Medium						
91/100/101	Medium	Low	Low						
169/187	High	Low	High						
172/181/182	High	Low	Low						
184	High	Low	Medium						
208	High	Medium	Low						

Table 15: Newspaper Category – Market Simulation Results (Incomplete Product Line)

Rank	Market Scenario #	Market Share				Revenue	Cost	Cost % of Print Price	Profit
		Print WSJ	Online WSJ	Print WSJ and Online WSJ	No Choice				
1	19	0.143	0.557	0.214	0.085	54.129	14.216		39.912
2	28	0.154	0.498	0.237	0.111	55.407	15.560		39.847
3	91/100/101	0.064	0.576	0.256	0.104	52.320	12.737	40.00%	39.583
4	55	0.167	0.423	0.263	0.147	56.666	17.099		39.567
6	127	0.068	0.515	0.283	0.134	53.445	13.975		39.469
1	172/181/182	0.028	0.581	0.277	0.114	51.609	15.170		36.439
2	91/100/101	0.064	0.576	0.256	0.104	52.320	15.921		36.399
3	19	0.143	0.557	0.214	0.085	54.129	17.771	50.00%	36.358
4	208	0.028	0.521	0.306	0.145	52.633	16.646		35.987
5	127	0.068	0.515	0.283	0.134	53.445	17.469		35.976
1	172/181/182	0.028	0.581	0.277	0.114	51.609	18.204		33.405
2	91/100/101	0.064	0.576	0.256	0.104	52.320	19.105		33.215
3	19	0.143	0.557	0.214	0.085	54.129	21.325	60.00%	32.804
4	208	0.028	0.521	0.306	0.145	52.633	19.976		32.657
5	127	0.068	0.515	0.283	0.134	53.445	20.963		32.482
1	172/181/182	0.028	0.581	0.277	0.114	51.609	21.238		30.371
2	91/100/101	0.064	0.576	0.256	0.104	52.320	22.290		30.030
3	208	0.028	0.521	0.306	0.145	52.633	23.305	70.00%	29.328
4	19	0.143	0.557	0.214	0.085	54.129	24.879		29.250
6	127	0.068	0.515	0.283	0.134	53.445	24.456		28.988
1	172/181/182	0.028	0.581	0.277	0.114	51.609	24.272		27.337
2	184	0.046	0.655	0.162	0.138	43.523	16.484		27.039
3	91/100/101	0.064	0.576	0.256	0.104	52.320	25.474	80.00%	26.846
4	178	0.068	0.704	0.078	0.150	38.369	11.615		26.754
5	85	0.102	0.643	0.134	0.120	45.145	18.805		26.340
1	178	0.068	0.704	0.078	0.150	38.369	13.07		25.30
2	184	0.046	0.655	0.162	0.138	43.523	18.54		24.98
3	172/181/182	0.028	0.581	0.277	0.114	51.609	27.31	90.00%	24.30
4	97/106	0.123	0.685	0.067	0.125	41.307	17.01		24.29
5	85	0.102	0.643	0.134	0.120	45.145	21.16		23.99
Market Scenario #	Print WSJ	Online WSJ	Print WSJ and Online WSJ	Market Scenario #	Print WSJ	Online WSJ	Print WSJ and Online WSJ		
19	Low	Low	Low	127	Medium	Medium	Low		
28	Low	Medium	Low	172/181/182	High	Low	Low		
55	Low	High	Low	178	High	Low	High		
85	Medium	Low	Medium	184	High	Low	Medium		
91/100/101	Medium	Low	Low	208	High	Medium	Low		
97/106	Medium	Low	High						

Table 16: Book Category – Market Simulation Results (Incomplete Product Line, No Bundle Discount)

Rank	Market Scenario #	Market Share				Revenue	Cost	Cost % of Print Price	Profit
		Print Book	PDF Book	Print Book and PDF Book	No Choice				
1	163-189	0.427	0.337	0.010	0.226	19.686	5.066		14.620
2	82-108	0.523	0.272	0.013	0.192	20.593	6.215		14.378
3	1-27	0.600	0.218	0.015	0.167	21.281	7.138	40.00%	14.143
4	28-54	0.645	0.163	0.010	0.183	20.776	7.591		13.185
5	109-135	0.575	0.200	0.008	0.216	19.913	6.770		13.142
1	163-189	0.427	0.337	0.010	0.226	19.686	6.332		13.354
2	82-108	0.523	0.272	0.013	0.192	20.593	7.769		12.824
3	1-27	0.600	0.218	0.015	0.167	21.281	8.923	50.00%	12.359
4	190-216	0.478	0.252	0.007	0.263	18.708	7.036		11.672
5	109-135	0.575	0.200	0.008	0.216	19.913	8.463		11.450
1	163-189	0.427	0.337	0.010	0.226	19.686	7.599		12.087
2	82-108	0.523	0.272	0.013	0.192	20.593	9.323		11.270
3	1-27	0.600	0.218	0.015	0.167	21.281	10.707	60.00%	10.574
4	190-216	0.478	0.252	0.007	0.263	18.708	8.443		10.265
5	109-135	0.575	0.200	0.008	0.216	19.913	10.156		9.757
1	163-189	0.427	0.337	0.010	0.226	19.686	8.865		10.821
2	82-108	0.523	0.272	0.013	0.192	20.593	10.876		9.716
3	190-216	0.478	0.252	0.007	0.263	18.708	9.850	70.00%	8.858
4	1-27	0.600	0.218	0.015	0.167	21.281	12.492		8.790
5	109-135	0.575	0.200	0.008	0.216	19.913	11.848		8.064
1	163-189	0.427	0.337	0.010	0.226	19.686	10.132		9.554
2	82-108	0.523	0.272	0.013	0.192	20.593	12.430		8.162
3	190-216	0.478	0.252	0.007	0.263	18.708	11.257	80.00%	7.451
4	1-27	0.600	0.218	0.015	0.167	21.281	14.276		7.005
5	109-135	0.575	0.200	0.008	0.216	19.913	13.541		6.372
1	163-189	0.427	0.337	0.010	0.226	19.686	11.40		8.288
2	82-108	0.523	0.272	0.013	0.192	20.593	13.98		6.609
3	190-216	0.478	0.252	0.007	0.263	18.708	12.66	90.00%	6.044
4	1-27	0.600	0.218	0.015	0.167	21.281	16.061		5.221
5	109-135	0.575	0.200	0.008	0.216	19.913	15.23		4.679
Market Scenario #	Print Book	PDF Book	Print Book and PDF Book						
1-27	Low	Low	Sum						
28-54	Low	Medium	Sum						
82-108	Medium	Low	Sum						
109-135	Medium	Medium	Sum						
163-189	High	Low	Sum						
190-216	High	Medium	Sum						

Table 17: Newspaper Category – Market Simulation Results (Incomplete Product Line, No Bundle Discount)

Rank	Market Scenario #	Market Share				Revenue	Cost	Cost % of Print Price	Profit
		Print WSJ	Online WSJ	Print WSJ and Online WSJ	No Choice				
1	1-27	0.184	0.611	0.112	0.093	48.721	11.754		36.967
2	28-54	0.212	0.562	0.102	0.125	48.400	12.478		35.922
3	55-81	0.247	0.494	0.090	0.169	47.887	13.413	40.00%	34.475
4	82-108	0.119	0.676	0.081	0.125	42.070	7.934		34.136
5	109-135	0.134	0.627	0.076	0.164	41.150	8.330		32.820
1	1-27	0.184	0.611	0.112	0.093	48.721	14.693		34.029
2	28-54	0.212	0.562	0.102	0.125	48.400	15.598		32.802
3	82-108	0.119	0.676	0.081	0.125	42.070	9.918	50.00%	32.152
4	55-81	0.247	0.494	0.090	0.169	47.887	16.766		31.121
5	109-135	0.134	0.627	0.076	0.164	41.150	10.413		30.737
1	1-27	0.184	0.611	0.112	0.093	48.721	17.631		31.090
2	82-108	0.119	0.676	0.081	0.125	42.070	11.902		30.169
3	28-54	0.212	0.562	0.102	0.125	48.400	18.717	60.00%	29.683
4	163-189	0.074	0.719	0.056	0.151	37.078	7.750		29.328
5	109-135	0.134	0.627	0.076	0.164	41.150	12.496		28.655
1	82-108	0.119	0.676	0.081	0.125	42.070	13.885		28.185
2	1-27	0.184	0.611	0.112	0.093	48.721	20.570		28.152
3	163-189	0.074	0.719	0.056	0.151	37.078	9.042	70.00%	28.037
4	109-135	0.134	0.627	0.076	0.164	41.150	14.578		26.572
5	28-54	0.212	0.562	0.102	0.125	48.400	21.837		26.563
1	163-189	0.074	0.719	0.056	0.151	37.078	10.334		26.745
2	82-108	0.119	0.676	0.081	0.125	42.070	15.869		26.201
3	1-27	0.184	0.611	0.112	0.093	48.721	23.508	80.00%	25.213
4	190-216	0.081	0.671	0.053	0.196	35.696	10.644		25.052
5	109-135	0.134	0.627	0.076	0.164	41.150	16.661		24.490
1	163-189	0.074	0.719	0.056	0.151	37.078	11.63		25.45
2	82-108	0.119	0.676	0.081	0.125	42.070	17.85		24.22
3	190-216	0.081	0.671	0.053	0.196	35.696	11.97	90.00%	23.72
4	109-135	0.134	0.627	0.076	0.164	41.150	18.74		22.41
5	1-27	0.184	0.611	0.112	0.093	48.721	26.45		22.27
Market Scenario #	Print WSJ	Online WSJ	Print WSJ and Online WSJ	Market Scenario #	Print WSJ	Online WSJ	Print WSJ and Online WSJ		
1-27	Low	Low	Sum	109-135	Medium	Medium	Sum		
28-54	Low	Medium	Sum	163-189	High	Low	Sum		
55-81	Low	High	Sum	190-216	High	Medium	Sum		
82-108	Medium	Low	Sum						

Table 18: Book Category - Forms' Attribute Perceptions.

Variable	Coefficient	SE	b/St.Er.	P[Z >z]
<i>Random parameters in utility functions</i>				
Price	-0.058	0.017	-3.392	0.001
Print Book (PP)	4.339	0.615	7.055	0.000
Electronic Book (EP)	3.743	0.579	6.464	0.000
Print Book & Electronic Book Bundle (PPEP)	-5.861	1.775	-3.302	0.001
<i>Nonrandom parameters in utility functions</i>				
Electronic Book Unit (EU)	1.861	0.291	6.392	0.000
Print Book & Electronic Book Unit Bundle (PPEU)	1.768	0.671	2.635	0.008
Print Form Index (PI)	0.029	0.010	2.840	0.005
PDF Form Index (EI_1)	0.029	0.009	3.357	0.001
PDF Form Index (EI_2)	0.013	0.003	4.036	0.000
Difference Index 1 (DI1_1): Bundle vs. Superior	0.107	0.033	3.232	0.001
Difference Index 1 (DI1_2): Bundle vs. Superior	0.018	0.013	1.319	0.187
Difference Index 2 (DI2): Print vs. Electronic	0.023	0.006	3.612	0.000
<i>Derived st. dev. of parameter distributions</i>				
Price	0.091	0.010	9.107	0.000
Print Book (PP)	2.289	0.254	8.998	0.000
Electronic Book (EP)	2.291	0.253	9.068	0.000
Print Book & Electronic Book Bundle (PPEP)	3.461	0.852	4.063	0.000
Number of observations	4176 (87 respondents x 16 choices)			
Iterations completed	68			
Log likelihood function	-917.41			
Restricted log likelihood	-2429.63			
Chi squared	3024.44			
Degrees of freedom	16			
Prob[ChiSqd > value]	0.000			

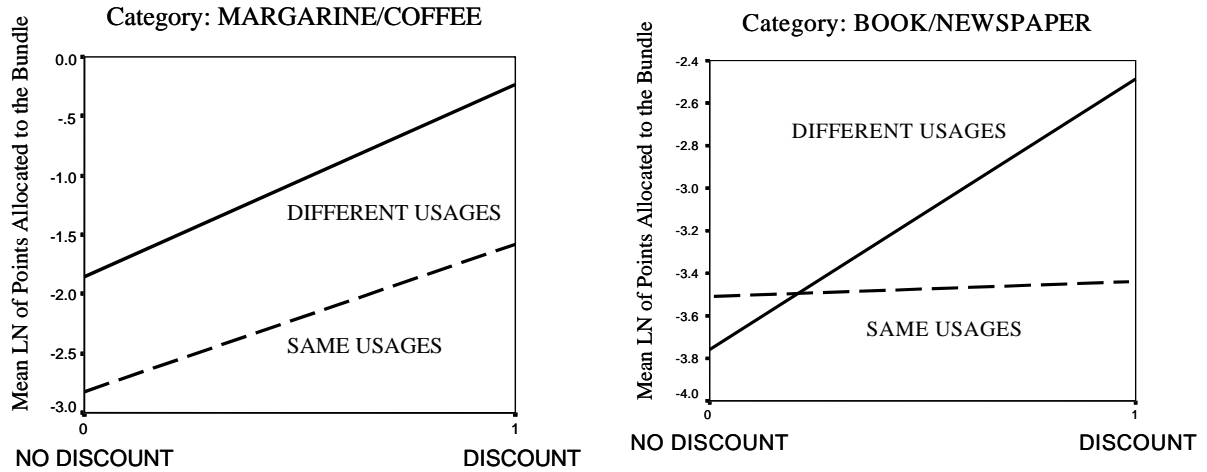
Table 19: Newspaper Category - Forms' Attribute Perceptions.

Variable	Coefficient	SE	b/St.Er.	P[Z >z]
<i>Random parameters in utility functions</i>				
Price	-0.042	0.007	-5.868	0.000
<i>Nonrandom parameters in utility functions</i>				
Print Newspaper (PP)	2.747	0.661	4.159	0.000
Electronic Newspaper (EP)	2.586	0.292	8.867	0.000
Print & Electronic Newspaper Bundle (PPEP)	3.148	0.847	3.718	0.000
Electronic Newspaper Unit (EU)	0.042	0.186	0.229	0.819
Print Newspaper & Electronic N. Unit Bundle (PPEU)	1.994	0.744	2.680	0.007
Print Form Index (PI)	0.008	0.006	1.386	0.166
PDF Form Index (EI_1)	0.011	0.003	3.645	0.000
PDF Form Index (EI_2)	0.007	0.003	2.822	0.005
Difference Index 1 (DI1_1): Bundle vs. Superior	-0.011	0.013	-0.837	0.402
Difference Index 1 (DI1_2): Bundle vs. Superior	0.003	0.014	0.183	0.855
Difference Index 2 (DI2): Print vs. Electronic	-0.001	0.004	-0.276	0.783
<i>Derived st. dev. of parameter distributions</i>				
Price	0.029	0.003	8.666	0.000
Number of observations	4176 (87 respondents x 16 choices)			
Iterations completed	18			
Log likelihood function	-1068.52			
Restricted log likelihood	-2433.21			
Chi squared	2729.37			
Degrees of freedom	13			
Prob[ChiSqd > value]	0.000			

FIGURES

Figure 1: Study 2 Results (significant effects only)

A. USAGE by DISCOUNT



B. DISCOUNT by RELATIVE PRICE

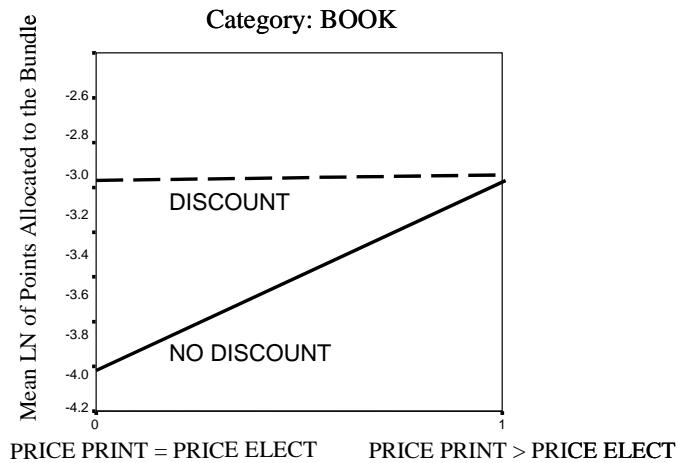


Figure 2: Optimal Price and Total and Marginal Revenue from Electronic Book Chapters.

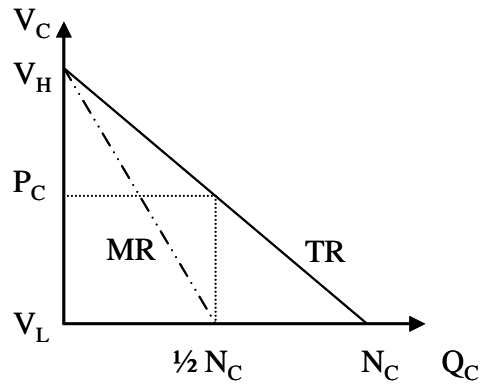
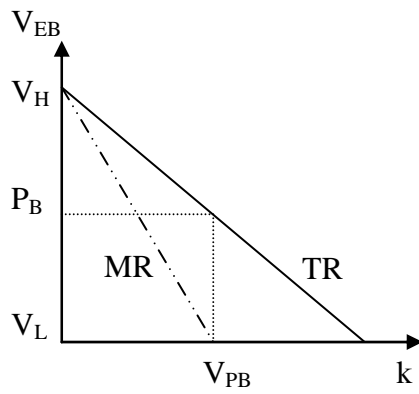


Figure 3: Optimal Price and Total and Marginal Revenue from Full Electronic Book.



REFERENCES

- March 2005 Online Paid Content U.S. Market Spending Report (2005), http://www.online-publishers.org/pdf/paid_content_report_030905.pdf.
- Aaker, David and Kevin Keller (1990), "Consumer Evaluations of Brand Extensions," *Journal of Marketing*, 54 (January): 27-41.
- Adams, William J. and Janet L. Yellen (1976), "Commodity Bundling and the Burden of Monopoly," *Quarterly Journal of Economics*, 90 (August): 475-98.
- Bakos, Yannis and Erik Brynjolfsson (2000), "Bundling and Competition on the Internet: Aggregation Strategies for Information Goods," *Marketing Science*, 19 (1): 63-82.
- Bakos, Yannis and Erik Brynjolfsson (1999), "Bundling Information Goods: Pricing, Profits and Efficiency", *Management Science*, 45 (12), 1613-1630.
- Betancourt, Roger R. (2005), *The Economics of Retailing and Distribution*, Edward Elgar Publishing, Chapter 6.
- Carroll, J. Douglas and Paul Green (1995), "Psychometric Methods in Marketing Research: Part I, Conjoint Analysis", *Journal of Marketing Research*, 32 (November), 385-391.
- Chakravarti, Dipankar, Rajan Krish, Paul Pallab and Joydeep Srivastava (2002), "Partitioned Presentation of Multi-Component Bundle Prices: Evaluation, Choice and Underlying Processing Effects," *Journal of Consumer Psychology*, 12 (3): 215 - 29.
- Chernev, Alexander (2005), "Feature Complementarity and Assortment in Choice", Working paper, Kellogg School of Management, Northwestern University, Evanston, IL.
- Dhar, Ravi (1997), "Consumer Preference for a No-Choice Option," *Journal of Consumer Research*, 24 (September), 215-231.
- Estelami, Hooman (1990), "Consumer Savings in Complementary Product Bundles," *Journal of Marketing Theory and Practice*, Summer: 107-14.
- Fennell, Geraldine G. (1978), "Consumers' Perceptions of the Product-Use Situations," *Journal of Marketing*, 42 (April): 39-47.
- Gaeth, Gary, Irwin Levin, Goutam Chakraborty and Aron M. Levin (1990), "Consumer Evaluation of Multi-Product Bundles: An Information Integration Analysis," *Marketing Letters*, 2: 47-57.
- Geng, Xianjun, Maxwell B. Stinchcombe and Andrew B. Whinston (2005), "Bundling Information Goods of Decreasing Value," ? forthcoming in *Management Science*.
- Green, Paul and V. Srinivasan (1990), "Conjoint Analysis in Marketing: New

- Developments with Implications for Research and Practice”, *Journal of Marketing*, 54 (4), 3-19.
- Guadagni, Peter M. and John D.C. Little (1983), “A Logit Model of Brand Choice Calibrated on Scanner Panel Data, *Marketing Science*, 2 (3), 203-239.
- Guiltinan, Joseph P. (1987), “The Price Bundling of Services: A Normative Framework,” *Journal of Marketing*, 51 (April): 74-85.
- Hanson, Ward and R. Kipp Martin (1990), “Optimal Price Bundling”, *Management Science*, 36 (2), 155-174.
- Harlam, Bari A., Aradna Krishna, Donald R. Lehmann and Carl Mela (1995), “Impact of Bundle Type, Price Framing and Familiarity on Purchase Intention for the Bundle”, *Journal of Business Research*, 33, 57-66.
- Henderson, James M. and Richard E. Quandt (1958), *Microeconomic Theory: A Mathematical Approach*, New York: McGraw-Hill Book Company, p. 29.
- Jain, Dipak C, Vilcassim, Naufel J, and Pradeep K. Chintagunta (1994), “A Random-Coefficients Logit Brand-Choice Model Applied to Panel Data,” *Journal of Business & Economic Statistics*, 12 (July), 317-328.
- Jedidi, Kamel, Sharan Jagpal and Puneet Manchanda (2003), “Measuring Heterogeneous Reservation Prices for Product Bundles”, *Marketing Science*, 22 (1), 107-130.
- Johnson, Michael D., Andreas Herrmann and Hans H. Bauer (1999), “The Effects of Price Bundling on Consumer Evaluations of Product Offerings,” *International Journal of Research in Marketing*, 16: 129-42.
- Kahneman, Daniel and Amos Tversky (1979), “Prospect Theory: An Analysis of Decision Under Risk,” *Econometrica*, 47: 163-91.
- Kenney, Roy W. and Benjamin Klein (1983), “The Economics of Block Booking,” *Journal of Law and Economics*, 26: 497-540.
- Lattin, James M. and Leigh McAlister (1985), “Using a Variety-Seeking Model to Identify Substitute and Complementary Relationships Among Competing Products,” *Journal of Marketing Research*, 22 (August), 330-339.
- MacKenzie, Scott B. and Richard J. Lutz (1989) “An Empirical Examination of the Structural Antecedents of Attitude Toward the Ad in an Advertising Pretesting Context,” *Journal of Marketing*, 53 (April): 48-65.
- Macklin, Theodore (1922), *Efficient Marketing for Agriculture*, The Mackmillian Co. New York: 25.

- McAfee, R. Preston, John McMillan and Michael Whinston (1989), "Multiproduct Monopoly, Commodity Bundling, and Correlations of Values," *Quarterly Journal of Economics*, 104 (2): 371-83.
- Mick, David Glen (1992), "Levels of Subjective Comprehension in Advertising Processing and their Relations to Ad Perceptions, Attitudes and Memory," *Journal of Consumer Research*, 18 (March): 411-24.
- Ratneshwar, S. and Allan D. Shocker (1991), "Substitution in Use and the Role of Usage Context in Product Category Structures," *Journal of Marketing Research*, 28 (August): 281-95.
- Sarvary, Miklos and Philip M. Parker (1997), "Marketing Information: A Competitive Analysis," *Marketing Science*, 16 (1): 24-38.
- Schmalensee, Richard (1984), "Gaussian Demand and Commodity Bundling," *Journal of Business*, 57 (1): S211-30.
- Simonin, Bernard L. and Julie A. Ruth (1995), "Bundling as a Strategy for New Product Introduction: Effects on Consumers' Reservation Prices for the Bundle, the New Product, and Its Tie-in," *Journal of Business Research*, 33: 219-230.
- Srivastava, Rajendra K., Mark I. Alpert and Allan D. Shocker (1984), "A Customer-Oriented Approach for Determining Market Structures," *Journal of Marketing*, 48 (Spring): 32-45.
- Srivastava, Rajendra K., Robert P. Leone and Allan D. Shocker (1981), "Market Structure Analysis: Hierarchical Clustering of Products Based on Substitution-in-Use," *Journal of Marketing*, 45 (Summer): 38-48.
- Stefflre, Volney R. (1971), *New Products and New Enterprises: A Report of an Experiment in Applied Social Science*, Irvine, CA: University of California.
- Stigler, George J. (1963), "United States v. Loew's, Inc: A Note on Block Booking," *Supreme Court Review*, 153 (1963): 152-57.
- Stremersch, Stefan and Gerard J. Tellis (2002), "Strategic Bundling of Products and Prices: A New Synthesis for Marketing," *Journal of Marketing*, 66 (January): 55-72.
- Telser, L. G. (1979), "A Theory of Monopoly of Complementary Goods," *Journal of Business*, 52 (2): 211-30.
- Thaler, Richard (1985), "Mental Accounting and Consumer Choice," *Marketing Science*, 4 (3): 199-214.
- Venkatesh, R. and Rabikar Chatterjee (2005), "Bundling, Unbundling and Pricing of Hybrid Products: The Case of Magazine Content," Working Paper, University of

Pittsburg, PA.

Venkatesh, R. and Vijay Mahajan (1993), "A Probabilistic Approach to Pricing a Bundle of Products or Services", *Journal of Marketing Research*, 30 (November), 494-508.

Venkatesh, R. and Wagner Kamakura (2003), "Optimal Bundling and Pricing under a Monopoly: Contrasting Complements and Substitutes from Independently Valued Products", *Journal of Business*, 76 (2), 211-231.

Wilson, Lynn O., Allen M. Weiss and George John (1990), "Unbundling of Industrial Systems", *Journal of Marketing Research*, 27 (May), 123-138.

Yadav, Manjit S. (1995), "Bundle Evaluation in Different Marketing Segments: The Effects of Discount Framing and Buyers' Preference Heterogeneity," *Journal of the Academy of Marketing Science*, 23 (3): 206-15.

Yadav, Manjit S. (1994), "How Buyers Evaluate Product Bundles: A Model of Anchoring and Adjustment," *Journal of Consumer Research*, 21 (September): 342-53.

Yadav, Manjit S. and Kent B. Monroe (1993), "How Buyers Perceive Savings in a Bundle Price: An Examination of a Bundle's Transaction Value," *Journal of Marketing Research*, 30 (August): 350-58.

Wansink, Brian and Michael L. Ray (1996), "Advertising Strategies to Increase Usage Frequency," *Journal of Marketing*, 60 (January): 31-46.

www.businesswire.com (2004), "U.S. Consumer Spending for Online Content Totals \$853 Million in the First Half of 2004, According to Online Publishers Association Report", Nov. 15.