Celebrity Endorsements

C. Robert Clark* Ignatius J. Horstmann†

June 2005

Abstract

It is estimated that companies in the U.S. spent $800 million in 1998 to "acquire talent – entertainers, athletes and other high profile personalities – to spotlight in advertising, promotion and PR campaigns" (IEG Endorsement Insider). Approximately 20% of all television commercials feature famous people. Why do ads for some products feature celebrity endorsements while ads for others do not? To answer this question, we develop a coordination model of advertising in which firms choose both advertising levels and advertising format – ads with celebrity endorsements or ads without. We show that the equilibrium formats are either ones that reach large audiences at low cost or that coordinate well. The former provides a cost-based explanation for celebrity endorsements that is consistent with experimental evidence showing that celebrities enhance product recall. The latter provides an explanation for celebrity endorsements consitent with evidence that they enhance consumer perception of product value. For this latter case, we show that celebrity endorsements are chosen for products that i) have large potential customer pools, ii) provide large coordination returns to consumers or iii) require coordination across diverse sets of customers. Our analysis also provides an explanation for the use of "fictional" celebrities like Joe Camel.

*HEC Montréal, Université de Montréal, 3000 Côte-Sainte-Catherine, Montréal, QC, CANADA H3T 2A7 and CIRANO; Robert.Clark@hec.ca

†Rotman School of Management and Institute for Policy Analysis, University of Toronto, Toronto, ON, CANADA M5S 3E6; ihorstmann@rotman.utoronto.ca

American Express has "a long and proud history of communicating the values of our brand by using heroes and personalities who hold a significant place in the hearts and spirits of people around the world. In Tiger Woods we have a representative who captures the imagination of many different types of consumers. His participation helps us communicate messages that our Do More campaign supports: American Express has a family of products that is relevant to a wide variety of consumers." (Kenneth I. Chenault, President and COO American Express)

1 Introduction

Since 1870 when the Reverend Henry Ward Beecher appeared in an advertisement in *Harper's Weekly* endorsing Waltham watches, companies have used characters of note to help market products to consumers.[1] Entertainment personalities were first employed by the cigarette industry in 1905 when Murad Cigarettes used comedians Fatty Arbuckle and Harry Bulger in its ads. Since then, celebrities such as Fred Astaire, Ethel Barrymore, Jack Benny, Henry Fonda, Lou Gehrig and Mrs. John W. Rockefeller Jr., to name but a few, have appeared in cigarette ads. In 1934, Lou Gehrig became the first athlete to appear on a Wheaties box; he has since been followed by the likes of Babe Ruth, Johnny Bench, Michael Jordan and Tiger Woods. The Victor Talking Machine Company acquired the American rights in 1901 to the painting of Nipper the dog listening to "His Master's Voice". Nipper has since become one of a long list of famous but fictional celebrity promoters that includes the Green Giant, the Marlboro Man, Joe Camel, Tony the Tiger and the Pillsbury Dough Boy.

To give some idea of the current scope of the celebrity endorsement business, IEG Endorsement Insider estimated that companies in the U.S. spent $800 million in 1998 to "acquire talent – entertainers, athletes and other high profile personalities – to spotlight in advertising, promotion and PR campaigns". Agrawal and Kamakura (1995) cite industry sources who estimate that approximately 20% of all television commercials feature famous people. Available evidence also suggests that both now and in

[1] The Reverend Beecher was a famous orator, preacher and pamphleteer of the time. He was the brother of Harriet Beecher Stowe. Testimonials by the Reverend Beecher were also used to market Dr. M. M. Townsend's Remedy for Hay Fever, Asthma and Catarrh.

the past, certain sets of products more often feature celebrity endorsements. Agrawal and Kamakura study all endorsement contracts over the period 1980-1992. In their sample, 60% of the endorsement deals involve soft-drink companies and athletic shoe manufacturers. In the Sandra and Gary Baden Collection of Celebrity Endorsements in Advertising (The Smithsonian National Museum of American History), a collection containing over 1000 celebrity advertising endorsements culled from magazines and largely from the period 1920-1970, cigarettes, beauty products, beverages and audio equipment ads predominate. The returns to celebrity endorsements also show considerable variation. Agrawal and Kamakura provide an event study that examines the abnormal stock returns on the day that a company announces the signing of a celebrity for product endorsement purposes. Returns ranged from a low of -3.75% to a high of 6.75%. Average abnormal returns were positive and about .54%.

In this paper, we try to shed some light on the determinants of a firm's decision to employ (or not) a celebrity endorsement for a particular product. To do so, we develop an advertising model in which firms choose both a level of advertising and an advertising format – ads with a celebrity endorsement or ads without a celebrity endorsement. We take as data for our analysis results from the marketing and social psychology literature that suggest two potential dimensions in which a celebrity format can differ from a non-celebrity format. Specifically, experiments suggest that a celebrity endorsement can enhance consumer recall of the product/brand and that a celebrity has credibility or expertise that enhances consumer perception of product value. We incorporate these effects into statements about both the relative costs and the demand effects of the different formats and then examine the situations in which a celebrity endorsement arises as the equilibirum format. We develop predictions on the market conditions that are more likely to result in firms using celebrity endorsements and look at why we might observe significant profit variability with celebrity endorsements.

To proceed with our analysis, we first need to take some stand on why firms

advertise at all. A standard approach is to model advertising as a signaling device à la Nelson. In this framework, celebrity endorsements act as credible means of "money burning". This is the approach taken by Hertzendorf (1996). For certain products, this approach seems reasonable. For instance, the Baden Collection indicates that, early on, radios and airlines employed celebrity endorsement ads; such ads do not seem important for these products today. One might reasonably argue that, initially, quality uncertainty was important for both of these products, but was not so later on, and so the signaling explanation is convincing.

A signaling explanation is less convincing for other products that often have celebrity endorsements: running shoes, beauty products, soft drinks and other beverages, credit cards, and the like. These are products that are well established, that have little apparent quality variation, and on which their manufacturers spend large amounts for advertising on an on-going basis.[2] An alternative model of advertising, and the one adopted in this paper, focuses on advertising's role as a mechanism for coordinating consumer purchase decisions (see Bagwell and Ramey (1994a,b), Pastine and Pastine (2002, 1999) and Clark and Horstmann (2005)). This is a world of products for which the value a consumer obtains from purchasing any given variety depends on how many others also purchase that variety. This could be for reasons of social standing – people want to wear the "right" clothes, drink the "right" beverages and use the "right" fragrances (Chwe (1998a,b), (1999)) – for compatibility/network externality reasons – people want a credit card that is widely accepted – or for reasons of complementary products – local customer service requires a large customer base. The existence of consumption externalities, whatever the reason, means that it is important that consumers coordinate on specific products; advertising can be a mechanism for achieving coordination.

The model of firm advertising that we employ is based on that in Clark and Horstmann (2005). In this model, consumers "observe" advertising messages only

[2]For a more detailed discussion of this issue, including data on advertising expenditures for these and similar products, see Clark and Horstmann (2005).

probabilistically and they never observe how many other consumers have seen advertisements.[3] The former assumption is meant to capture two features of advertising: i) a consumer may not access the media in which a given product is advertised and so may not physically observe the ad; ii) even if a consumer accesses the appropriate media and "sees" the ad, the individual may not remember the ad at the time of purchase and so makes decisions as if the ad were not observed. The latter assumption seems realistic – very few consumers know what a firm spends on advertising, let alone the number of people that see and remember the ads – and means that consumers must form expectations about how many others have observed advertising messages for a given variety. Given these expectations and beliefs about how advertising coordinates purchases, a consumer decides which variety to buy.

We model celebrity endorsements as one type of advertising message the firm can employ; that is, the firm can choose either to use advertising messages having a celebrity endorser or ones without a celebrity. These two types of messages may be distinguished in either of two possible ways. First, experimental evidence (Misra and Beatty (1990), Petty *et al.* (1983) and Menon *et al.* (2001)) indicating that celebrity endorsements enhance brand recall means that some volume of messages incorporating celebrity endorsements should generate more observed messages than the same volume of messages but having no celebrity. In simple economic terms, an ad campaign featuring a celebrity is likely to have a higher fixed cost than one without a celebrity – the celebrity endorsement payment is likely large – but is also likely to have a lower variable cost – an ad without a celebrity must be run more times to reach (be remembered by) the same fraction of customers as an ad with a celebrity. This effect is a pure cost effect of celebrity endorsements.

[3] Our approach to this coordination role for advertising differs from that of Bagwell and Ramey and of Pastine and Pastine in an important way. These authors effectively assume that consumers perfectly observe the *level* of (total dollar expenditure on) advertising for every firm. As an example, Bagwell/Ramey and Pastine/Pastime would assume that consumers know that in 1999 American Express Co. spent $2.6 million less on advertising the American Express card than Visa International spent on advertising the Visa card. We assume that consumers only observe ads and not total expenditures.

Experimental evidence also indicates that consumers value more highly a product endorsed by a celebrity than one without a celebrity endorsement. For instance, Petty *et al.* find that "subjects tended to like the product more when it was endorsed by the famous athlete than by the average citizens of Bakersfield, California". Misra and Beatty found that subjects tended to rate the product as better or of higher quality if it was endorsed by a "congruent" celebrity. These observations suggest a second potential effect of celebrity endorsements: a direct demand effect. In our framework, this effect works through a consumer's belief about the coordinating role of different types of advertising messages. Specifically, a consumer that observes messages for two different firms' products, one product's message containing a celebrity endorsement and the other not, believes that the celebrity endorsed product will have more purchases and so be of higher value.

When either of these two effects are operative for a given set of products, we show that celebrity endorsements can occur as the equilibrium message choice by producers. Our analysis reveals that, in the case of the former effect, celebrity endorsements arise when the celebrity message is a low average cost means of communicating to consumers. When the direct demand effect is important, celebrity endorsements will be observed for those products for which coordination is important to consumers and there is a large customer base. Products for which coordination gains are small or having a small customer base should use ads without celebrities. In short, celebrity endorsements are more typical for nationally marketed products than for local or niche market products and for products such as running shoes, soft drinks and the like for which peer effects are apparently large. We also show that celebrity endorsements that arise due to cost effects (the better recall effect) yield higher expected profits than those that arise for demand reasons (the perceived value effect). This outcome potentially explains the heterogeneity in returns to celebrity endorsements that Agrawal and Kamakura find. Based on our analysis, successful ad campaigns are ones in which the celebrity endorsement cheaply reaches a large audience. Campaigns

in which the celebrity endorsement is expensive but the celebrity gives credibility to the product relative to a non-celebrity are less successful.

Our model also provides an explanation for the success of Joe Camel and other "fictional" celebrity endorsers. Specifically, we find that, if there are two celebrities that achieve the same audience reach at the same variable cost, the firm prefers the celebrity with the lower fixed cost: the firm achieves the same outcome but at a lower cost. In this sense, cultural icons such as Joe Camel, Tony the Tiger, Ronald McDonald and the Marlboro man are the ideal celebrities: they are memorable and so have a low cost of audience reach but are fictional so do not have large endorsement fees.[4] This result contrasts with the signaling story for celebrities in which it is important that the celebrity is expensive so that the "burning of money" required for signaling is credible. In a signaling world, fictional endorsers are not effective celebrities precisely because they are low cost.

Finally, our analysis identifies a role for celebrity endorsements not previously recognized in the literature. It exists for products that require coordination over multiple customer groups – different age, income, education groups or groups in different locations. The American Express card is an example. Card holders want to know when they go from one city to another or from one type of store to another that their card will be accepted. This is more likely if many individuals living in different cities or frequenting different types of stores use the card. For such products, a common set of advertising messages communicated to all customers is a more effective coordination mechanism than messages targeted at separate customer groups: with common messages, a customer in one group receiving a message knows that customers in other groups are also receiving the message. The challenge with common messages is to achieve significant audience reach in every customer group at low cost. The celebrity endorsement arises as the solution. Because the celebrity is recognizable globally, it is a low cost way to achieve cross-group coordination. Tiger Woods "captures the

[4]With the exception of Joe Camel, all of the characters in this list are in Advertising Age's Top 10 Advertising Icons of the Century.

imagination of many different types of consumers" and communicates that American Express products are "relevant to a wide variety of consumers".

The paper proceeds as follows. In the next section we present a reduced form analysis of the role of celebrity endorsements. Section 3 presents the coordination model of advertising while Section 4 examines the role of the celebrity advertiser and characterizes general features of an equilibrium. Section 5 examines the cross-market coordination. Section 6 concludes. Proofs are provided in the Appendix.

2 The Demand and Cost Sides of Endorsements

Imagine a market for a differentiated product, X, in which there are two firms, $i = 1, 2$, each producing a different variety of the product. Firms produce at constant unit cost, normalized to zero. They sell their products (and compete) in two distinct submarkets, $j = 1, 2$. Submarkets are distinguished by some observable, demand relevant characteristic of the consumer population for X. This characteristic may be some demographic feature such as age, education, sex or income or possibly a geographic/location feature. As an example, Nike might distinguish between the 12 - 17 year old market for its basketball shoes and the 18 - 30 year old market. Callaway Golf might distinguish between the men's market and the women's market for golf equipment. The quantity demanded of variety i in market j, x_{ij} is given by the function $x_{ij} = d_{ij}(p_1, p_2; \mathbf{a})$, where p_i is the price of variety i and we have imposed the restriction that the firms are not able to price discriminate across submarkets. The variable $\mathbf{a}$ is an advertising vector.

A firm advertises by sending a set of messages to consumers. A firm may send a common set of messages to all consumers or it may choose to send two distinct sets of messages, each one targeted at consumers in a given submarket. For any set of messages, either all messages have a celebrity endorsement or none do. In the case of targeted sets of messages, one set may have a celebrity endorsement and the other not or the two sets may use different celebrities. The combined choice of targeted or

common message sets and celebrity or no celebrity messages defines an advertising format, w, for the firm. For a given format, each firm chooses a level of advertising, its advertising reach, denoted by a and normalized such that $a \in [0, 1]$. An advertising strategy for the firm is a choice of advertising format and advertising level. The vector $\mathbf{a}$ contains the advertising strategy choices for the two firms. A typical element of $\mathbf{a}$ is a value a_{ij}^{w} giving the format – common message set with celebrity endorsements, perhaps – and level of advertising by firm i in market j.[5]

To give an example of an advertising strategy, Nike might choose to target the 12 -17 market by running one full page ad that highlights an Xtreme Sports angle for its basketball shoes in Thrasher, a magazine targeted at teens, each month for one year. At the same time, it might run a full page ad in Sports Illustrated once each month for a year that targets the 18 - 30 year old market, portraying youthful, fit twenty-somethings wearing Nikes. Perhaps neither ad campaign uses celebrities. The value of a_{ij}^{w} in this case is given by the fraction of the relevant customer population each ad campaign is expected to reach. Here, reach means not just that the potential customers see the ad but that they remember it, and Nike basketball shoes, when deciding on a shoe purchase.

As an alternative strategy, Nike might run three, 30 second spots featuring Michael Jordan on national, NBA basketball telecasts each week during the regular season in an attempt to reach both markets with a single ad campaign. This campaign would have a different value for reach, $a_{ij}^{w'}$.[6]

In practice, the cost of any given ad campaign depends on a multitude of factors: the specific medium through which the message is transmitted, specific elements of the ad design and production, the specific celebrity employed, audience reach and so on. To keep the analysis simple, we assume that the cost of any given advertising strategy depends on only its format, w, and advertising levels a_{ij}^{w}. Costs have a w-dependent

[5] If firm i does not advertise in market j, then this outcome is denoted by $a_{ij} = 0$.

[6] In practice, Nike may utilize both sorts of ad campaigns. Foir simplicity, we assume here that firms use only one sort or the other.

fixed component, capturing costs of designing and creating the set of messages, and a variable component based on format and audience reach. The former is given by $F^w > 0$ and is such that, if advertising formats w and w' differ only in that w involves a celebrity endorsement and w' does not, then $F^w > F^{w'}$. This ranking captures the idea that celebrity endorsements involve additional costs due to endorsement fees. The variable cost component is given by $c^w(a^w_{i1}, a^w_{i2})$, with $c^w(0,0) = 0$ and $c^w(\cdot,\cdot)$ increasing in both arguments and strictly convex.[7]

Stripped to these bare essentials, one can see that an ad featuring a celebrity can influence firm profitability in any of three possible ways: i) directly through costs, ii) directly through demand in the market in which the ad appears and iii) indirectly through demand in the other market. To see the pure cost effect imagine that $d_{ij}(p_1, p_2; \mathbf{a})$ depends on how many consumers in j are reached by i's ad but not on whether or not the ad features a celebrity or whether or not the ad is targeted at market j. In this situation, i's choice of advertising format is driven by cost considerations: if i wishes to achieve a customer reach of a_i, it will choose the format that achieves this reach at least cost. Experimental evidence (Misra and Beatty, Petty *et al.* and Menon *et al.*) that a celebrity endorsement enhances product recall suggests that celebrity ads may be a low-cost means of achieving significant audience reach.

A direct demand effect arises if, in the above, we allow d_{ij} to depend not only on the volume of advertising in market j but also on features of the advertising format. A celebrity ad by firm i has a direct demand effect if, all else equal, demand for firm i's product is larger with a celebrity endorsement than without it. Experiments indicating that consumers value a product more (Petty *et al.* and Misra and Beatty) when it is endorsed by a celebrity are evidence of a direct demand effect. In the presence of such an effect, an ad with a celebrity endorsement may be the profitable

[7]The reader should note that, under our specification, there are no firm specific or submarket specific advertising costs. Thus, even if the firm uses different celebrities in its two sets of messages, the cost of the celebrities is assumed the same. This assumption is purely for simplicity.

choice for a firm even though the ad is more costly.

Finally, an indirect demand effect arises if d_{ij} depends on features of advertising choices in market $j' \neq j$. This feature may be either the reach of the ads in j' or the advertising format in j' (or both). When demand has this feature, then a common advertising campaign may convey information to consumers in j about advertising in j' that a targeted campaign may not. We can illustrate this latter point with the example of the Nike ads above. In this hypothetical case, the 18 - 30 year old readers of Sports Illustrated may not be readers of Thrasher and so may not be aware of Nike advertising status in the 12 - 17 year old market. If this latter information is relevant to purchase decisions of some customers in the 18 - 30 year old market, perhaps because they wish to appear young and hip, ads on the NBA telecast – the common messages – may be a more attractive option than targeted messages: with common messages customers in the 18 - 30 market know that the ads are also seen by those in the 12 -17 market. If common messages are to be used, a celebrity endorsement may be the low cost means of achieving significant reach in both submarkets.

Whether or not ads featuring a celebrity arise in equilibrium depends on which, if any, of these three effects are present and how strong any of them are. To get at this issue, we need to model how advertising format and level affect demand for a firm's product and the conditions under which each effect is operative. As an example, a signaling model of celebrity advertising (Hertzendorf (1996), for instance) has the pure cost effect not operative – the celebrity ad is more costly – and the direct demand effect operative – the consumers conclude that the product endorsed by a celebrity is high quality.[8] For reasons discussed above, we consider an alternative model of advertising that focuses on advertising's role as a coordination mechanism. The model is based on the one in Clark and Horstmann (2005).

[8]There is no indirect demand effect in this model.

3 A Coordination Model of Advertising

The market for X is populated by a continuum of risk neutral consumers of mass $M > 1$. As above, consumers are divided into two disjoint sets or submarkets. The mass of consumers in submarket 1, m_1, is normalized to 1 while that in submarket 2 is $m_2 \equiv M - 1$. Each consumer purchases at most one unit of one of the varieties produced by the firms, labelled $i = 1, 2$. For ease of exposition we describe consumer preferences in each submarket with a Hotelling type structure, assuming that firm 1's variety is located at the point 0 and firm 2's variety at the point 1 of the unit interval. Consumers in each submarket are uniformly distributed over the interval, with consumer locations in submarket j indexed by k_j. The utility that a consumer, k_j, obtains from purchasing firm i's variety (hereafter variety i) is given by v_i. The cost of purchasing from firm i is $td + p_i$ where p_i is the price of variety i and td is the travel cost for a consumer located distance d from firm i. We assume that the price of variety i is the same in each submarket, implying that firms are unable to price discriminate. The net utility that consumer k_j obtains from purchasing firm 1's variety is

$$U_1 = v_1 - p_1 - tk_j$$

and the net utility from purchasing firm 2's variety is

$$U_2 = v_2 - p_2 - t(1 - k_j)$$

We assume that the value that any consumer obtains from purchasing a unit of a given variety depends on the fraction of the total population also purchasing that variety. For simplicity, we assume that this dependence takes a simple "threshold" structure given by

$$v_i = \begin{cases} \underline{V} & \text{if } \mathbf{m}_i \geq \overline{\mathbf{M}} \\ \overline{V} & \text{otherwise} \end{cases}$$

Here $\mathbf{m}_i = (m_{ij}, m_{ij'})$ gives the mass of consumers in submarkets j and $j' \neq j$ that purchase variety i and $\overline{\mathbf{M}} = (\overline{M}_j, \overline{M}_{j'})$ gives the threshold level of purchases

in submarkets j and j'.[9] We assume that the values $\overline{V}$ and $\underline{V}$ are the same in each submarket and that $\overline{V} > \underline{V}$. This latter assumption means that a consumer's utility from purchasing variety i is higher if more than the threshold fractions also purchase i. This assumption captures the coordination aspect of consumer purchases.

In the analysis that follows we examine both the case in which the utility of a consumer in j purchasing variety i depends only on the mass of others in j that also purchase i ($\overline{M}_{j'} = 0$) and the case in which $\overline{M}_j, \overline{M}_{j'} > 0$. We refer to the former as the case of local coordination and the latter as global coordination. In both cases we assume that the threshold, $\overline{\mathbf{M}}$, is the same for all consumers in j and both varieties and that $\overline{M}_j, \overline{M}_{j'} > 1/2$ whenever these values are strictly positive. This latter assumption implies that both firms cannot simultaneously exceed the threshold and is meant to capture the intuitive idea (particularly intuitive for the case where coordination is for reasons of social standing) that both brands cannot represent the "right" choice.

This specification describes markets for goods in which the value that a consumer attaches to a particular variety depends on how many others purchase this variety. This may be for fashion reasons, because of network externalities or because complementary products are provided if sales are large enough. Evidence suggests that a number of the products for which celebrity endorsements prove successful fit this description. For instance, Friedman and Friedman (1979) found that celebrity endorsements were effective for costume jewelry – a fashion item – while Misra and Beatty found celebrity endorsements effective for a board game and for jeans. Nike products, endorsed by Michael Jordan, and American Express products, endorsed by Tiger Woods, also fit our specification as do soft drinks, cigarettes and beer (the products having the most celebrity endorsements in the Baden collection).

Depending on the nature of the good and the specifications of the submarkets, a

[9] The assumption here is that a network must be of some minimum size in order to be of any use at all. For a discussion of this assumption see Clark and Horstmann (2005, page 397). Bental and Spiegal (1995) also make this assumption.

given consumer may care only about the number of others who purchase in that consumer's own submarket. For other goods, it may be important that many individuals in both submarkets purchase a particular variety. In this latter case, the notion of submarkets may seem superfluous. However, as long as the demographics that define the submarket imply that the two consumer groups access different media through which the firm might advertise, then the choice of targeted or common ads and the use (or not) of a celebrity endorser remains relevant.

The advertising process is as above: The firm can choose either a common set of messages sent to all consumers or two sets of messages, each targeted at a separate submarket; for a given set of messages, either all have a celebrity endorsement or none do.The reach of a particular set of messages from firm i in submarket j, a_{ij}^w, is defined as the fraction of the population of consumers in submarket j that receive (and recall) i's message. The message-sending technology is such that each consumer in j receives at most one message and a_{ij}^w gives the probability that a consumer in j receives firm i's message, including its format. If messages are targeted, no consumer in j receives a message targeted at j'; with a common set of messages, a consumer in j that receives a message knows that some consumers in j' also receive the message. No consumer observes the reach of a set of messages (i.e., no consumer observes a_{ij}^w).

These assumptions are meant to capture several aspects of actual advertising. Specifically, some individuals will access media in which ads for a particular product appear and will remember the ads when purchase decisions are made. This group is given by a_{ij}^w. Others will either not access the appropriate media or will not remember the ads subsequently, the group $1 - a_{ij}^w$. Different groups of individuals also access different media so that ads targeted at one group may well not be seen (or not remembered) by another group. Finally, while we all observe ads, none of us know either how many others see/recall the same ads or how much the firm is advertising: no one observes a_{ij}^w.

The timing of moves is as follows: The firms simultaneously choose a price and

an advertising strategy. For simplicity, we denote the choice for firm i by the pair, $(p_i, \mathbf{a}_i)$, where $p_i \in [0, \overline{p}]$ for some $\overline{p}$ large. All consumers observe the price choices. A fraction a_{ij}^w of consumers in submarket j see a message from firm i and discover the advertising format; however none observe the advertising reach of either firm. Based on observed prices and messages seen, each consumer forms beliefs about the probability that a given variety will exceed the threshold. Based on these beliefs, each consumer purchases the variety that yields the higher expected utility.

The cost of any advertising strategy is as in the previous section, with the addition in the case of targeted sets of messages that the firm incurs a separate fixed cost for each message set and that $c^w(\cdot, \cdot)$ is additively separable. Firms are risk neutral and each chooses a price and advertising strategy to maximize expected profits. The equilibrium notion is Perfect Bayesian Equilibrium.

4 Local Coordination and Celebrity Endorsements

To develop the basic analytic framework, we begin with the case of local coordination. To focus attention on the firm's choice between using or not using a celebrity endorsement, we restrict the advertising technology to allow only for targeted sets of messages. Because a consumer in j only cares about how many others in j purchase the same variety, this latter assumption, while simplifying the presentation of results, proves to be without loss of generality in this case. Subsequently, we examine an additional role for celebrity endorsements when consumers care about purchases in both submarkets and firms can choose between targeted and common message sets.[10]

4.1 Advertising and Demand

With local coordination an individual consumer's purchase decision depends on that individual's beliefs about which, if either, variety will have sufficient purchases within the submarket to exceed the threshold purchase level. These beliefs are conditioned

[10] In what follows we omit the subscript j whenever the context is obvious.

by three elements: i) the individual's assessment of how advertising strategies affect aggregate purchases – the coordination role of advertising, ii) what messages, if any, the individual received and message format – celebrity endorsement (e) or no celebrity endorsement (n); iii) observed price. Because no consumer observes either firm's advertising reach, each consumer forms expectations about both firms' reach based on observed prices and messages received. Using this information and an assessment of how joint advertising reach and message format affect which variety exceeds the threshold purchase level (item i)), each consumer makes a purchase decision.

To make this process precise, we define for each consumer a *joint assessment* (J). Essentially, the joint assessment specifies two elements: i) the consumer's expectation about each firms' choice of advertising strategies; ii) for each realization under the expected strategies, the consumer's assessment about which, if either, variety exceeds threshold purchase levels.[11] We define three possible *threshold outcomes* for each submarket: (1) purchases of variety 1 are above the threshold but those of variety 2 are not, (2) purchases of variety 2 are above the threshold but those of variety 1 are not and (0) purchases of neither variety are above the threshold. A joint assessment then might specify that, if the firms set prices (p_1, p_2), the pair $[\widetilde{a}_1^e(p_1), \widetilde{a}_2^n(p_2)]$ is a possible advertising reach outcome in j with firm 1 using a celebrity endorsement and firm 2 not, and that, under this outcome, threshold outcome 1 occurs. A formal definition of the joint assessment is provided in the Appendix. For simplicity, we assume that all consumers share a common joint assessment.

Each consumer either receives a message from firm i of a particular format or does not, yielding a message outcome for the consumer. Given message format choices by firm 1 of w and by firm 2 of w', there are four possible message outcomes for any consumer, k. They are: saw a message from neither firm, $\alpha_k = (0, 0)$; saw a w-message from firm 1 but no message from firm 2, $\alpha_k = (w, 0)$; saw a w'-message from firm 2

[11] Because a consumer in j cares only about the decisions of others in j, we restrict the joint assessment to being defined only over outcomes in j. This is without loss of generality since consumers in j do not observe messages in j' and their utility is unaffected by decisions in j'.

but no message from firm 1, $\alpha_k = (0, w')$; saw a w-message from firm 1 a w'-message from firm 2, $\alpha_k = (w, w')$.

Beliefs for consumer k are a pair, giving the probabilities that threshold outcome 1 occurs and that threshold outcome 2 occurs.[12] These beliefs depend on k's realization α_k, the observed price pair, $p = (p_1, p_2)$, and the joint assessment, J. Formally, beliefs for consumer k are given by $B_k[\alpha_k, p; J] = \{\psi_{k1}[\alpha_k, p; J], \psi_{k2}[\alpha_k, p; J]\}$, where ψ_{ki} gives the probability that threshold outcome i occurs.

Given beliefs, consumer k compares the expected surplus from consuming variety 1 to the expected surplus from consuming variety 2 and purchases the variety yielding greater surplus. Thus, demand for variety 1 from consumers with message outcome α_k, $x_1[J, \alpha_k, p]$, is given by the set of all persons k for whom:

$$\psi_{k1}[\alpha_k, p; J]\overline{V} + (1 - \psi_{k1}[\alpha_k, p; J])\underline{V} - p_1 - tk \geq$$
$$\psi_{k2}[\alpha_k, p; J]\overline{V} + (1 - \psi_{k2}[\alpha_k, p; J])\underline{V} - p_2 - t(1 - k).$$

The fraction of consumers with message outcome α_k and that purchase variety 2, $x_2[J, \alpha_k, p]$, is given by the complement of this set.[13] Note that, if $\psi_{k1} = \psi_{k2}$ and $p_1 = p_2$, then $x_1[J, \alpha_k, p_1, p_2] = x_2[J, \alpha_k, p_1, p_2] = \frac{1}{2}$.[14] The fraction of the total population that purchases variety i is the weighted sum of the $x_i[J, \alpha_k, p]$ over the four possible α_k, with the weights given by the probabilities of each of the respective α_k.

How does demand here compare to our reduced form demand specification in Section 2? Clearly, the fraction of consumers having any given message outcome, α_k, depends on the advertising reach of both firms, a_1, a_2. By itself, however, this fact does not imply that advertising has demand effects. The existence, or not, of demand effects depends on the structure of the joint assessment. Suppose, for instance, that

[12] The complementary probability is the probability that neither variety exceeds threshold purchases (threshold outcome 0).

[13] We assume here that all consumers purchase one of the two varieties.

[14] Since we assume that all consumers purchase one unit, submarket demand is m_j and so $x_1[J, \alpha_k, p_1, p_2] = x_2[J, \alpha_k, p_1, p_2] = .5m_j$.

consumers' assessment of which variety exceeds threshold purchases is independent of advertising reach. Then there are no demand effects nor is there any advertising. By similar logic, the impact on demand of advertising format also depends on J. What we show below is that there are equilibrium assessments in which advertising arises and in which both advertising reach and advertising format have demand effects. In these cases, our demand specification is supported as an equilibrium outcome and so we can explore how celebrity endorsements might work.

4.2 The Firm Advertising Decision

Consider, first, the firm's decision on advertising reach for any given message format choice. Note that the demand expressions $x_i[J, \alpha_k, p]$ depend, through J, on consumer expectations about advertising reach but do not depend on actual firm choices of reach (recall that advertising reach is unobservable). As a result, firm i's revenue depends on advertising reach only through the probabilities of the given message outcomes occurring. This means that i's revenue is a linear function of its advertising reach. Marginal revenue from advertising is constant as a result (see the Appendix). As long as this constant value of marginal revenue is strictly positive, firm i's expected profit is a strictly concave function of advertising reach. Furthermore, the profit function has a discontinuity at $a_i^w = 0$ since the fixed cost is only incurred if $a_i^w > 0$. Together, these observations imply that, if firm i advertises at all, there is a unique advertising reach a_i^{w*} that maximizes profits. In addition, profits may be higher or lower (or the same) at this reach than if the firm does not advertise.

The above result has immediate consequences for the structure of any equilibrium with advertising. In particular, since firm i's equilibrium advertising reach must maximize expected profit given its rival's choices, i's equilibrium advertising strategy can contain at most two advertising reach values: $a_i^w = 0$ and $a_i^w = a_i^{w*}$. The following result shows that there is no equilibrium in which a_i^{w*} is chosen with probability 1.

Lemma 1 *There is no equilibrium in which a_i^w is a singleton, $\widehat{a}_i^w$, with $\widehat{a}_i^w > 0$.*

What happens here is the following: Because a consumer does not observe either firm's advertising reach and may or may not receive a message when the firm is advertising, failure to receive a message cannot disconfirm any belief that the firm's reach is positive. As a consequence, if the firm is surely advertising to some fraction $\widehat{a}_i^w$, no message outcome can disconfirm a belief consistent with this behavior. Since advertising is costly, the firm can reduce it's advertising reach, induce no alteration in consumer behavior and so increase profits.

The above results mean that, in any equilibrium, the firm either chooses not to advertise at all, $a_i^w = 0$, or it randomizes between not advertising and advertising with a reach whose value is unique and positive: the firm randomizes between $a_i^w = 0$ and $a_i^w = a_i^{w*}$. This latter case, described as pulse advertising in the marketing literature, is common in coordination models and is the outcome of interest in what follows.[15]

Proposition 1 *In any equilibrium, a firm selects at most two values for advertising reach:* $a_i = 0$ *and* $a_i^w = a_i^{w*} > 0$*, with* a_i^{w*} *being the unique (positive) maximizer of firm* i*'s expected profits. If a firm advertises, then it must randomize between* 0 *and* a_i^{w*}*. In this case, the equilibrium price choice,* p_i^{w*}*, must be independent of the advertising reach choice.*

4.3 The Advertising Equilibrium

For fixed, common advertising format choice w by both firms, Clark and Horstmann (2005) shows that there exists a symmetric equilibrium in which both firm advertise with positive probability using the mixed strategy given in Proposition 1. This equilibrium outcome is supported by a joint assessment, J_S, of the following form:

$$\text{If} \quad \begin{array}{l} \text{i. } a_1 = a^{w*} \text{ and } a_2 = 0 \\ \text{ii. } a_1 = 0 \text{ and } a_2 = a^{w*} \\ \text{iii. } a_1 = a^{w*} \text{ and } a_2 = a^{w*} \\ \text{iv. } a_1 = 0 \text{ and } a_2 = 0 \end{array} \quad \text{, then} \begin{cases} \text{threshold outcome 1} \\ \text{threshold outcome 2} \\ \text{threshold outcome 0} \\ \text{threshold outcome 0} \end{cases}$$

[15] For other instances of mixed strategy equilibria in coordination models see Bagwell and Ramey and Pastine and Pastine. For a discussion of mixed strategy equilibria and pulsing, see Clark and Horstmann (2005).

where $a^{w*} > 0$ is the symmetric equilibrium advertising reach. With this assessment, a consumer who receives a message for variety 1, say, believes that variety to be a "better value" overall (the outcome is defined by either i. or iii. in J_S) than a consumer who does (in which case, the outcome can be any of i-iv above but is more likely ii or iv). These beliefs that the advertised variety is a better value supports advertising by the firms. This advertising choice, in turn, confirms the beliefs.

We examine an advertising equilibrium of this sort here. This equilibrium involves a common choice by the two firms of an advertising format, w^*, a price, p^{w*}, and a randomization between not advertising and advertising with probability q^{w*} at advertising reach, a^{w*}. The equilibrium is supported by a symmetric joint assessment, J_S, of the form above. A formal definition of a symmetric advertising equilibrium is provided in the Appendix, as are the conditions defining a^{w*}, q^{w*} for any common w (see equations (2) - (4)). The value of p^{w*} is not uniquely determined in equilibrium without some restriction on consumer beliefs. In what follows, we impose the restriction that, in the neighborhood of equilibrium, consumer beliefs are independent of price. This restriction implies that p^{w*} is given by the value of p_i^w that maximizes i's expected profit given (q^{w*}, a^{w*}) and price $p_j^w = p^{w*}$ for firm j. This value is defined uniquely as $p^{w*} = t$.

In this world celebrity endorsements can arise for two reasons: 1) The cost of celebrity messages is lower than that of a non-celebrity messages – the pure cost effect; 2) the joint assessment rewards celebrity messages or penalizes non-celebrity messages – the direct demand effect. As is often the case in models of this sort, this latter effect can arise in almost any environment because the equilibrium conditions impose no restrictions on consumer beliefs for off-equilibrium choices $w' \neq w^*$. So, for instance, a celebrity endorsement can arise because the belief is that variety i never exceeds threshold purchases when firm i's advertising strategy involves non-celebrity messages. With such consumer beliefs, both firms choosing celebrity messages is an equilibrium in any environment as long as the cost of the celebrity message is not so

high that a firm would prefer not to advertise at all.

To provide some structure on our analysis of the environments in which celebrity endorsements are used, our equilibrium definition imposes two additional restrictions on consumer beliefs off the equilibrium path. The purpose of these restrictions is to rule out advertising equilibria in which a particular format is chosen (like celebrity endorsements) purely because of exogenously imposed asymmetries in the joint assessment. The first restriction requires that, whatever message format a consumer observes, the consumer believes that the advertising reach of the message is consistent with profit maximizing behavior by the firm. From Proposition 1, this restriction implies that the joint assessment for any off-equilibrium path message contains at most one positive advertising reach and it is the one that equates marginal revenue, as defined by the analogue of (1), to marginal cost. This requirement essentially restricts consumers to believe that firms choose best replies, even off the equilibrium path, when making advertising reach decisions. Formally, the restriction is:

Condition 1 *Suppose that the message outcome for consumer k, α_k, contains a message format for firm i that occurs with zero probability under i's equilibrium strategy. Then, whenever possible, k's joint assessment should be consistent with firm i choosing the profit maximizing advertising reach given the selected technology and price and that firm j is following equilibrium play.*

The second restriction limits the extent to which consumers view one message format as intrinsically more effective at coordinating than another. The restriction specifically rules out assessments in which the consumer expects that non-celebrity messages never result in above threshold purchases. Essentially the requirement is that, for elements of the joint assessment in which the consumer expects only firm i to be advertising, the expectation regarding threshold outcome depends only on the advertising reach and not on the message format. Formally, we require

Condition 2 *If, for some (p_1, p_2), J, assigns threshold outcome 1 to the pair $[\widetilde{a}_1^w(p_1), 0]$,*

then J must also assign threshold outcome 1 to any pair $[\widetilde{a}_1^{w'}(p_1'), 0]$, $w' \neq w$, $\widetilde{a}_1^{w'} \geq \widetilde{a}_1^{w}$ and for any (p_1', p_2) with $p_1' \leq p_1$. If, for some (p_1, p_2), J assigns threshold outcome 2 to the pair $[0, \widetilde{a}_2^{w}(p_2)]$, then J must assign threshold outcome 2 to any pair $[0, \widetilde{a}_2^{w'}(p_2')]$, $w' \neq w$, $\widetilde{a}_2^{w'} \geq \widetilde{a}_2^{w}$ and for any (p_1, p_2') with $p_2' \leq p_2$.

This condition implies that if consumers believe that firm 1 obtains above threshold purchases when it is advertising with message format w and reach $\widetilde{a}_1^{w}(p_1)$ and firm 2 is not advertising, then, prices constant, consumers must believe the same for any other format w' used by 1 that also reaches at least as large an audience (and when 2 is not advertising). Basically, if only the message format changes, consumers cannot arbitrarily decide that purchases of the firm's product no longer exceed the threshold. With this restriction, celebrity advertising cannot be the result of consumers believing it to be the only effective coordination technology.

With these two restrictions and a restriction that, if neither firm advertises, then neither variety achieves above threshold purchases, we can now explore the circumstances in which celebrity endorsements arise in equilibrium. To provide a benchmark, we first confirm that if celebrity messages have a higher marginal cost than non-celebrity messages (recall that celebrity messages have a higher fixed cost) and no demand effects – the joint assessment assigns threshold outcome 0 to the case of firm 1 advertising with celebrity messages and firm 2 advertising with non-celebrity messages – they cannot arise as part of a symmetric advertising equilibrium outcome. The reason essentially is that, if celebrity messages have higher costs and provide no more favorable beliefs by consumers, they are dominated by non-celebrity messages. This result is formalized below:

Proposition 2 *Suppose that i) consumers who observe the advertising outcome (n, e) $((e, n))$ and prices $p_1 = p_2$ believe that threshold outcome 0 occurs; ii) $c'^{n}(a_i^n) < c'^{e}(a_i^e)$ $\forall a_i > 0$. Then, in any symmetric advertising equilibrium, non-celebrity is the unique message choice.*

This proposition confirms that celebrity endorsements are not ubiquitous in our model. If they are to arise, they either must have a lower variable cost (the pure cost effect) or, when in competition with non-celebrity ads, generate beliefs that the variety with the celebrity endorsement has above threshold purchases (the direct demand effect). To investigate the former, suppose that celebrity endorsements have no direct demand effect.[16] Let $a_i^e(a_{i'}^w, p, q)$ be the unique profit-maximizing level of advertising reach for firm i when it uses a celebrity message and firm i' advertises with probability q at advertising reach $a_{i'}^w$ and firms set a common price p; let $AC(a_i^e(a_{i'}^w, p, q)$ be the associated average cost. Consider a proposed equilibrium in which both firms use non-celebrity messages, set price p^{n*} and have advertising reach $a^{n*}$with probability q^{n*}. If $AC(a_i^e(a^{n*}, p^{n*}, q^{n*})) < AC(a^{n*})$, then either firm can increase its profits by leaving price unchanged but employing celebrity messages instead. In this case celebrity messages are the unique equilibrium outcome.

Proposition 3 *Suppose that i) consumers who observe the advertising outcome* (n, e) $((e, n))$ *and prices* $p_1 = p_2$ *believe that threshold outcome 0 occurs; ii)* $AC(a_i^e(a^{n*}, p^{n*}, q^{n*}))$ $< AC(a^{n*})$*. Then, in any symmetric advertising equilibrium, celebrity is the unique message choice.*

When is the above cost condition likely to be satisfied? A necessary requirement is that the value of minimum average advertising cost for the celebrity message is lower than that for the non-celebrity message. This will also be sufficient if the difference in marginal advertising cost between the non-celebrity and celebrity messages is increasing in a.[17] In this case, the value of a that minimizes average advertising cost with celebrity messages will be larger than a^{n*} and so the cost condition of the proposition must be satisfied. This condition on marginal cost has a natural interpretation in terms of what makes a celebrity: The celebrity's advantage is not the ability

[16] Specifically, the restriction is that J does not assign threshold outcome 1 to the pair $[a^{n*}, a_2^e(a^{n*}, p^{n*}, q^{n*})]$.

[17] An example would be the case in which $c^e(a) = bc^n(a)$, $b < 1$.

to communicate to small audiences much more cheaply than a non-celebrity; rather, it is the ability to communicate to large audiences cheaply that defines the celebrity.

A similar analysis applies for the case of celebrity demand effects. Suppose, now that the cost condition is not satisfied but that a celebrity ad in competition with a non-celebrity ad generates expectations of above threshold purchases for the celebrity endorsed variety. Then, at a proposed equilibrium with non-celebrity messages, a deviation to celebrity messages will be profitable if the gain in customers due to this demand effect more than offsets the increased costs of the celebrity message. From equation (4) in the Appendix, this occurs when the customer base, m, is large and when the utility gain from coordination, $\overline{V} - \underline{V}$, is large. This prediction squares with casual empiricism: celebrity endorsements are typically for nationally marketed products and products such as running shoes for which there are apparently large peer effects.

The fact that a celebrity message can arise either because it is a low cost form of communication (the cost reason) or because, in spite of being a high cost form of communication, it has valuable coordination effects (the demand reason) means that not all types of celebrity endorsements will be equally "successful". What does our analysis suggest about which type of celebrity, a low cost communicator or an expensive but effective coordinator, is more profitable? To get a handle on this question, note, in the latter case, that the demand effect is operative only off the equilibrium path; that is, it is operative when one firm employs celebrity messages and the other non-celebrity messages. Along the equilibrium path both firms employ celebrity messages and so the joint assessment in the demand effect case and in the cost effect case are essentially the same and given by J_S above. This means that demand behavior in the two cases is essentially the same also and that equilibrium outcomes in each case are given by equations (2) - (4). The difference between the two cases is purely in terms of how costly the celebrity message is relative to the non-celebrity message. If the celebrity message arises for pure cost reasons then the

variable cost savings from the celebrity message are sufficiently large relative to the increased fixed cost associated with it that the celebrity message has a lower average advertising cost than does the non-celebrity message. When the celebrity message arises for pure demand reasons, the variable cost savings from the celebrity message are small relative to the increased fixed cost associated with it and so the celebrity message has a higher average advertising cost than does the non-celebrity message.

How do expected profits differ between the two cases? From (2) - (4), equilibrium expected profits are given by the expression $.5p^{w*}m - q^{w*}[F^w + c^w(a^{w*})]$, with the equilibrium advertising reach, a^{w*}, being the value of a that minimizes average advertising cost, $[F^w + c^w(a^{w*})]/a^{w*}$. Which type of celebrity message is more profitable, then, depends on which has a lower *expected total cost* of advertising in equilibrium. Suppose that, from an initial situation in which the fixed cost of a celebrity message is sufficiently low that it has a lower average cost than a non-celebrity message, we consider an increase in the fixed cost such that the celebrity message now has a higher average cost than the non-celebrity message. Suppose also that the values of m and $\overline{V} - \underline{V}$ are sufficiently large that the celebrity message is the equilibrium in this latter case. Then we have that the celebrity message arises for pure cost reasons initially but for pure demand reasons subsequently. The larger value of F^w in the demand effects case means that the advertising reach, a^{w*}, is larger and so $[F^w + c^w(a^{w*})]$ is larger: the celebrity message arising for demand reasons has a higher total cost of advertising. We show in the Appendix that, for large values of m and $\overline{V} - \underline{V}$, expected advertising costs, $q^{w*}[F^w + c^w(a^{w*})]$, are also larger and so expected profits are lower. From this perspective, a celebrity endorsement strategy that relies on demand effects is less "successful" than one that is based on low costs of communicating.

Note finally that, even in the case of pure cost effects, if two different celebrities were to achieve the same advertising reach at the same variable cost, the equilibrium outcome will be that the celebrity with the lower fixed cost arises: the firm can achieve the same outcome but at a lower cost. This result is in contrast to the signaling story

for celebrities in which it is important that the celebrity is expensive so that the "burning of money" required for signaling is credible. In a signaling world, cultural icons such as Joe Camel, Tony the Tiger, the Energizer Bunny and the Marlboro man are not effective celebrities because they are low cost.[18] In our framework, these are the celebrities of choice: the fact that they are memorable means that they have a low cost of advertising reach and the fact that they are fictional means that they do not have endorsement fees.

5 Global Coordination and Celebrity Endorsements

When the utility of a consumer in submarket j purchasing variety i depends on the number of others both in j and in j' that purchase i ($\overline{M}_j, \overline{M}_{j'} > 0$), celebrity endorsements can play an additional role (i.e., in addition to the ones discussed above) of coordinating across submarkets. We can analyze this additional function of endorsements by using a modified version of the analysis in the last section. The modifications are to the joint assessment – J is now defined over pairs of advertising levels/message formats both for submarket 1 and for submarket 2 – and to consumer beliefs – a belief for a consumer in submarket j maps from an advertising outcome, price pair in submarket j to threshold outcomes in submarkets j and j'. Firms now also make choices both between celebrity or non-celebrity messages and between targeted or common message sets.

In this modified setup, advertising now has an indirect demand effect. It occurs because the firm's advertising decision in submarket j' can affect purchases in j' which in turn affect utility levels and so purchases in j. Because of the indirect demand effect, the firm's choice of targeted or common message sets becomes non-trivial. An additional role for celebrity endorsements arises out of this choice. To see how, we need to examine the choice of message sets.

[18] With the exception of Joe Camel, all of the characters in this list are in Advertising Age's Top 10 Advertising Icons of the Century.

The firm's choice of common versus targeted message sets turns on two issues: i) how cheaply the common set of messages can reach large audiences in both submarkets and ii) the extent to which ads can coordinate across submarkets when they are targeted at specific markets. Regarding the former, a potential benefit of targeted message sets is that the messages in each set can be designed for each submarket to effectively communicate to the consumers in that submarket: targeting allows large advertising reach in each submarket at relatively low variable cost. Alternatively, a potential problem with a common set of messages is that it may cheaply achieve large advertising reach in one submarket but does so only at great cost in the other.

As to the latter, because consumers in submarket j care about how many consumers in submarket j' purchase a given product, the firm would like to adopt an advertising strategy that can coordinate consumer decisions across the two submarkets. Specifically, the firm would like to adopt a strategy that allowed a consumer receiving an ad in submarket j to know with certainty that consumers in submarket j' are also receiving ads (recall that consumers in a given market do not see ads for the other market). Such a strategy would have the firm using perfectly correlated randomizations for the two submarkets, so that either the firm advertises in both or advertises in neither. A common set of messages has this feature by construction. It turns out that targeted sets of messages cannot have this feature in equilibrium.

To see this last point, consider the advertising equilibrium if the firm targets messages. As before, the firm's marginal revenue from advertising in a given submarket is independent of the level of advertising. Therefore, there is a unique positive level of advertising in a given submarket, a_{ij}^{w*}, that maximizes the firm's profit from advertising in that submarket. Also as before, advertising can only occur in equilibrium if the firm randomizes between advertising and not.

Now suppose that the randomization is perfectly correlated across submarkets. Call the common advertising probability q. For this randomization to be an equilibrium, the firm's profits from not advertising in either submarket must be equal to its

combined profits from advertising in both. This is the usual condition for a mixed strategy equilibrium. It must also be that the firm's profit from advertising in a given submarket is equal to its profit from not advertising in that submarket. To see why, suppose that the profit from advertising in j is lower than the profit from not advertising in j. In this case, profits from advertising in j' must be higher than profits from not advertising in j'. This follows from the fact that profits from advertising both in j and j' are equal to profits from advertising in neither. In this case, the firm can increase its profit by advertising more frequently in j' and less frequently in j. Essentially, an equilibrium cannot have the profit from advertising in one submarket cross-subsidizing advertising in the other.

Except for the situation in which costs are identical across submarkets, the advertising probability that equates profit from advertising and not in submarket 1 will be different from the probability that equates profits from advertising and not in submarket 2. As a result, cross-subsidization will occur if the firm adopts a common advertising strategy. Thus, if the firm targets messages for the two submarkets, it must choose different advertising probabilities for the two. We have then:

Proposition 4 *Suppose that a firm chooses targeted sets of messages. Then in any advertising equilibrium, the firm cannot perfectly correlate the advertising and no advertising decisions across the two submarkets.*

An implication of this result is that, when a firm chooses targeted sets of messages, a consumer observing an ad in submarket 1 cannot be sure that consumers in submarket 2 are also observing ads. By contrast, if the firm uses a common set of messages, then a consumer who sees an ad in submarket 1 knows that advertising is occurring in submarket 2. In this sense, a common set of messages allows the firm to more effectively exploit the indirect demand effect from advertising than do targeted messages. The operational consequence of this fact is that, as long as the common set of messages is not too costly relative to targeted sets of messages, the firm prefers (earn higher profits from) the common messages.

Proposition 5 *Suppose that advertising formats w and w' differ in that w has targeted message sets and w' a common message set. Suppose also that i) consumers who observe the advertising outcome (w, w') and prices $p_1 = p_2$ believe that threshold outcome 0 occurs; ii) $c^{w'}(a_{i,1}^{w'}, a_{i,2}^{w'}) \equiv c^w(a_{i,1}^w) + c^w(a_{i,2}^w)$ $\forall$ $a_{i,1}^{w'} = a_{i,1}^w$, $a_{i,2}^{w'} = a_{i,2}^w$ and $F^w = F^{w'}$. Then w cannot be a symmetric advertising equilibrium outcome.*

One might imagine that, because targeted messages allow the firm to customize ads for each distinct market, they have total costs that are lower than the total cost of a common set of messages. Here is where celebrity endorsements come in to play play. The celebrity endorsement is valuable because, for reasons discussed previously, it is a relatively low cost way to communicate effectively to large groups of disparate individuals. Basically, a common set of messages with a celebrity endorsement arises in equilibrium because the celebrity allows the firm to achieve large advertising reach in both markets and do so at sufficiently low cost as to make the returns from common messages still valuable. Put simply, because Tiger Woods "captures the imaginations of many different types of consumers", ads for American Express that feature him and run on national media are an equilibrium way for Amex to "communicate messages ... that (it) has a family of products that is relevant to a wide variety of consumers".

6 Conclusion

In this paper, we have explored the conditions under which firms choose to advertise using celebrity endorsements. Taking as data experimental results that find that celebrity endorsement enhance consumer recall and/or valuation of the product, we show that celebrity endorsements arise either because they are a low (average) cost means of communicating or because a celebrity message coordinates well when in competition with a non-celebrity message. Our analysis reveals that, in this latter case, celebrity endorsements will be observed for those products for which coordination is important to consumers and there is a large customer base. Endorsements

that enhance recall tend to generate higher firm profit, and so are more successful, than those that enhance valuation. Our analysis also provides a basis for the use of fictional endorsers. Finally, we find that celebrity endorsements can also be valuable in situations in which coordination across different consumer groups is valuable. Here, the celebrity endorsement is a cost effective way for the firm to achieve large advertising reach in many markets while still using a common advertising campaign.

7 Appendix

Definition of a Joint Assessment for local coordination:

Let the set $\widetilde{a}_i^w(p_i) = \{\widetilde{a}_{i0}^w(p_i), ..., \widetilde{a}_{iL}^w(p_i)\}$ represent the set of advertising levels that a given consumer believes occur with positive probability for firm i if i uses advertising format w and sets price p_i. Similarly, let $\widetilde{q}_i^w(p_i) = \{\widetilde{q}_{i0}^w(p_i), ..., \widetilde{q}_{iL}^w(p_i)\}$ be the set of probabilities associated with each of the advertising levels in $\widetilde{a}_i^w(p_i)$. We assume that the sets $\widetilde{a}_i^w(p_i), \widetilde{q}_i^w(p_i)$ are the same for all consumers. Define $\widetilde{A}_1(p_1)$ as the set containing all of the elements of $\widetilde{a}_1^w(p_1)$ for all w and all $p_1 \in [0, \overline{p}]$; define $\widetilde{A}_2(p_2)$ similarly. Let an *advertising reach outcome* be any pair $(\widetilde{a}_{1,l}^w(p_1), \widetilde{a}_{2,h}^{w'}(p_2))$ with $\widetilde{a}_{1,l}^w(p_1) \in \widetilde{A}_1(p_1)$ and $\widetilde{a}_{2,h}^{w'}(p_2) \in \widetilde{A}_2(p_2)$.

Definition 1 *A joint assessment, J, is a map from $\widetilde{A}_1(p_1) \times \widetilde{A}_2(p_2) \times [0, \overline{p}]^2 \rightarrow \{0, 1, 2\}$. For every $(p_1, p_2) \in [0, \overline{p}]^2$ and for each pair $(\widetilde{a}_{1,l}^w(p_1), \widetilde{a}_{2,h}^{w'}(p_2)) \in \widetilde{A}_1(p_1) \times \widetilde{A}_2(p_2)$, J assigns one of the threshold outcomes: neither over (0), 1 over and 2 not (1), 2 over and 1 not (2).*

Proof that firm i's marginal revenue from advertising is constant:

Suppose that firm i chooses advertising format w and firm j chooses format w'. Given J, and for advertising reach choices $a_j^{w'} = \{a_{j0}^{w'}, ..., a_{jH}^{w'}\}$ with probabilities $q_j^{w'} = \{q_{j0}^{w'}, ..., q_{jH}^{w'}\}$ and price choice p_j by firm j, firm i's expected profits from price choice p_i and audience reach a_{il}^w are:

$$\begin{aligned} E\pi_i(p_i, a_{il}^w; J, a_j^w, q_j^w, p_j) = p_i m_j \{ & q_{j0}^{w'}[a_{il}^w(a_{j0}^{w'} x_i[J, (w, w'); p] \\ & + (1 - a_{j0}^{w'}) x_i[J, (w, 0); p]) + (1 - a_{il}^w)(a_{j0}^{w'} x_i[J, (0, w); p] \\ & + (1 - a_{j0}^{w'}) x_i[J, (0, 0); p])] + ... \\ & + q_{jH}^{w'}[a_{il}^w(a_{jH}^{w'} x_i[J, (w, w'); p] + (1 - a_{jH}^{w'}) x_i[J, (w, 0); p]) \\ & + (1 - a_{il}^w)(a_{jH}^{w'} x_i[J, (0, w'); p] + (1 - a_{jH}^{w'}) x_i[J, (0, 0); p])]\} - F^w - c^w(a_{il}^w) \end{aligned}$$

Because the demands have consumer beliefs about advertising reach, through J, but not the actual advertising reach choice (recall that advertising reach is unobservable),

firm i's revenue is a linear function of a_{il}^w. Marginal revenue with respect to a_{il}^w is:

$$\begin{aligned} MR_{a_{il}^w} &= p_i m_j \{ \sum_{a_{jm}^{w'} \in a_j^{w'}} q_{jl}^{w'} a_{jl}^{w'} (x_i[J,(w,w');p] - x_i[J,(0,w');p]) \\ &+ \sum_{a_{jl}^{w'} \in a_j^{w'}} q_{jl}^{w'} (1 - a_{jl}^{w'}) (x_i[J,(w,0);p] - x_i[J,(0,0);p]\} \end{aligned} \tag{1}$$

which is independent of a_{il}^w.

Proof of Lemma 1:

Consider a proposed equilibrium in which firm i's advertising strategy involves a choice $\widehat{a}_{il}^w > 0$ with probability 1. For J to be consistent with the equilibrium it must be that any variation in a consumer's assessment of which threshold outcome will arise is due to variation in firm j's audience size. Bayesian updating based on the message outcome then implies that a consumer's beliefs, B, about the threshold outcome are independent of whether or not that consumer heard a message from firm i. The reason is that equilibrium consistent updating requires that the consumer believe that i is reaching a fraction $\widehat{a}_{im}^w$ with probability 1 regardless of the message outcome. As a consequence, $x_i[J,(w,w');p] = x_i[J,(0,w');p] = x_i[J,w;p]$ and $x_i[J,(w,0);p] = x_i[J,(0,0);p] = x_i[J,0;p]$. Firm i's expected profits are then $E\pi_i(a_{il}^w; T, A_j^*, J) = p_i\{x_i[J,T_j^{w'};p] \sum_{a_{jh} \in A_j^*} q_j(a_{jh}^{w'}) a_{jh}^{w'} + x_i[J,0;p] \sum_{a_{jh} \in A_j^*} q_j(a_{jh}^{w'})(1 - a_{jh}^{w'})\} - F^w - c^w(a_{il}^w)$, which is decreasing in a_{il}^w. As a result, firm i can deviate to some $a_{il}^w < \widehat{a}_{il}^w$ and increase profit. □

Definition of a Symmetric Advertising Equilibrium:

A symmetric advertising equilibrium is defined by a symmetric joint assessment, J_S, that satisfies Conditions 1 and 2 and, for equilibrium outcomes, is given as:

$$\text{If } \begin{array}{l} \text{i. } a_1 = a^{w*} \text{ and } a_2 = 0 \\ \text{ii. } a_1 = 0 \text{ and } a_2 = a^{w*} \\ \text{iii. } a_1 = a^{w*} \text{ and } a_2 = a^{w*} \\ \text{iv. } a_1 = 0 \text{ and } a_2 = 0 \end{array} \text{, then} \begin{cases} \text{threshold outcome 1} \\ \text{threshold outcome 2} \\ \text{threshold outcome 0} \\ \text{threshold outcome 0} \end{cases}$$

and by a set $(p^{w*}, a^{w*}, q^{w*}, w^*, J_S, B_S^*)$ such that, for $i = 1, 2$:

1. $E\pi_i(p^{w*}, a = 0; J_S, w^*, a^{w*}, q^{w*}, p^{w*}) = E\pi_i(p^{w*}, a = a^{w*}; J_S, w^*, a^{w*}, q^{w*}, p^{w*})$

2. $a^{w*} = \arg\max_{a>0} E\pi_i(a, p^{w*}; J_S, w^*, a^{w*}, q^{w*}, p^{w*})$

3. $E\pi_i(p^{w*}, a = a^{w*}; J_S, w^*, a^{w*}, q^{w*}, p^{w*}) \geq \pi^0 = \max_p \pi_i(p, p^{w*}, w^*, a^{w*}, q^{w*})$, where π^0 are maximal profits given firm j's strategy and consumer beliefs that firm i never gets over the threshold.

4. If consumer k chose variety i, then $ES_{k,i}[J_S, \alpha_k, p^{w*}] \geq ES_{k,j}[J_S, \alpha_k, p^{w*}]$

5. Beliefs, B_S^*, are given by:

$i.\ B[J_S, (0,0), p^{w*}; a^{w*}, q^{w*}] = \{(\frac{(1-a^{w*})q^{w*}}{1-a^{w*}q^{w*}})(\frac{(1-q^{w*})}{1-a^{w*}q^{w*}}), (\frac{(1-a^{w*})q^{w*}}{1-a^{w*}q^{w*}})(\frac{(1-q^{w*})}{1-a^{w*}q^{w*}})\}$

$ii.\ B[J_S, (1,0), p^{w*}; a^*, q^*] = \{(\frac{(1-q^{w*})}{1-a^{w*}q^{w*}}), 0\}$

$iii.\ B[J_S, (0,1), p^{w*}; a^*, q^*] = \{0, (\frac{(1-q^{w*})}{1-a^{w*}q^{w*}})\}$

$iv.\ B[J_S, (1,1), p^{w*}; a^*, q^*] = \{0, 0\}$

6. Purchase outcomes are consistent with J_S; that is,

$$x_1(J_S, p^{w*}, a_1 = a^{w*}, a_2 = 0) \geq \overline{M} \geq x_2(J_S, p^{w*}, a_1 = a^{w*}, a_2 = 0);$$

$$x_2(J_S, p^{w*}, a_1 = 0, a_2 = a^{w*}) \geq \overline{M} \geq x_1(J_S, p^{w*}, a_1 = 0, a_2 = a^{w*});$$

$$x_1(J_S, p^{w*}, a) = x_2(J_S, p^{w*}, a) < \overline{M},\ a = (0,0), (a^{w*}, a^{w*}).$$

7. $E\pi_i(p^{w*}, a^{w*}, q^{w*}; J_S, w^*, a^{w*}, q^{w*}, p^{w*}) \geq E\pi_i(p^w a^w, q^w, w; J_S, w^*, a^{w*}, q^{w*}, p^{w*})$, $\forall w \neq w^*, a^w, p^w, q^w$

Conditions defining (a^{w*}, q^{w*}) for any given format w:

We assume that the values $\overline{V}, \underline{V}$ are sufficiently large that all consumers buy one of the two varieties given equilibrium price p^*. Under this assumption, demand for variety i in a symmetric equilibrium has the property that $x_i[J_S, (w,w), p^{w*}] = x_i[J_S, (0,0), p^{w*}] = .5 < x_1[J_S, (w,0), p^{w*}]$ and $x_i[J_S, (w,0), p^{w*}] + x_i[J_S, (0,w), p^{w*}] = 1$. Exploiting these facts in the definition of expected profits, we have that, for firm i to be indifferent between advertising and not in equilibrium (item 1 for a symmetric advertising equilibrium), it must be that:

$$p^{w*} m_j a^{w*}(x_i[J_S, (w,0), p^{w*}] - .5) - F^w - c^w(a^{w*}) = 0. \tag{2}$$

We also have that the marginal condition defining the profit maximizing advertising rate (item 2 for an equilibrium) is given by:

$$p^{w*} m_j (x_i[J_S, (w,0), p^{w*}] - .5) - c'^w(a^{w*}) = 0. \tag{3}$$

Finally, from items 4) and 6) for equilibrium, demand $x_i[J_S, (w, 0), p^{w*}]$ is given by the fraction of consumers receiving message outcome $\alpha_k = [w, 0]$ for whom

$$\frac{1 - q^{w*}}{1 - a^{w*}q^{w*}}\overline{V} + \frac{(1 - a^{w*})q^{w*}}{1 - a^{w*}q^{w*}}\underline{V} - \underline{V} \geq 2tk - t. \tag{4}$$

Proof of Proposition 2:

We first show that the outcome $w = e$ for both firms cannot be part of a symmetric advertising equilibrium. To see this, consider a proposed equilibrium in which $w^* = e$, price is p^{e*} and advertising reach is a^{e*}. Now consider a deviation by firm 1 to $w' = n$ and $p_1^n = p^{e*}$. If consumers who receive the advertising outcome (n, e) and prices $p_1 = p_2 = p^{e*}$ believe that threshold outcome 0 occurs, then $x_1[J, (n, e); p^{e*}] = x_1[J, (e, e); p^{e*}]$. Further, since $c'^n(a_i^n) < c'^e(a_i^e) \quad \forall a_i > 0$, equation (1) implies that the profit maximizing choice of a for firm 1 under the deviation, $a_1^n(a^{e*}, p^{e*}, q^{e*}) > a^{e*}$. Conditions 1 and 2 then guarantee that a consumer who obtain outcome $(n, 0)$ must believe that threshold outcome 1 occurs. This means that $x_1[J, (n, 0); p^{w*}] = x_1[J, (e, 0); p^{w*}]$. Consumers who don't receive a message from firm 1 continue to maintain their equilibrium beliefs so that demand from this group is also unchanged. As a result, firm 1 obtains the same total revenue under the deviation if it sets $a_1^n = a^{e*}$ but has lower costs at this point and so higher profits. If firm 1 chooses $a_1^n(a^{e*}, p^{e*}, q^{e*}) > a^{e*}$ its profits must be higher still and so, in either case, the deviation pays.

To see that there is a symmetric advertising equilibrium with $w^* = n$, note that a deviation by either firm to $w = e$ can result in beliefs by the consumers that the deviating firm never obtains above threshold purchases (i.e., these beliefs do not violate Conditions 1 and 2). Item 3 for an equilibrium guarantees that, in this case, the deviation reduces the firm's profit. □

Proof of Proposition 3:

The proof here is essentially identical to that for Proposition 2. The only point to note is that, since marginal revenue from advertising is constant, so is average revenue.

This and the facts that $a_i^e(a^{n*}, p^{n*}, q^{n*}) > a^{n*}$ and $AC(a_i^e(a^{n*}, p^{n*}, q^{n*})) < AC(a^{n*})$ imply that the deviation increases profit. □

Impact of changes in F on expected advertising costs:

In what follows we provide a comparative static result on the impact of a change in F on expected total advertising costs, $q^*[F + c(a^*)]$, where q^*, a^* are defined in (2) - (4) above and $p^* = t$. Note from (2) - (4) that a^* is given by the condition

$$F + c(a^*) = a^* c'(a^*)$$

while q^* is defined as

$$q^* = \frac{m(\overline{V} - \underline{V}) - 2c'(a^*)}{m(\overline{V} - \underline{V}) - 2c'(a^*)a^*}.$$

We have then that

$$\frac{dq^*[F + c(a^*)]}{dF} = \frac{dq^*}{dF}[F + c(a^*)] + q^*[1 + c'(a^*)\frac{da^*}{dF}].$$

Substituting for $\frac{dq^*}{dF}$ and $F + c(a^*)$ from above, we have that

$$\frac{dq^*[F + c(a^*)]}{dF} = \frac{da^*}{dF}[\frac{-2c''}{m(\overline{V} - \underline{V}) - 2c'a^*} + \frac{2q^*(c' + a^*c'')}{m(\overline{V} - \underline{V}) - 2c'a^*}]a^*c'(a^*) + q^* + q^*c'\frac{da^*}{dF};$$

or

$$\frac{dq^*[F + c(a^*)]}{dF} = q^* + \frac{da^*}{dF}\frac{1}{m(\overline{V} - \underline{V}) - 2c'a^*}[q^*c'm(\overline{V} - \underline{V}) - 2c'c''a^*(1 - q^*a^*)].$$

Finally, we have that the above expression is positive as longs as $q^*c'm(\overline{V} - \underline{V}) - 2c'c''a^*(1 - q^*a^*) > 0$, which it will be for sufficiently large values of $m(\overline{V} - \underline{V})$.

For the proofs of Propositions 4 and 5, recall that costs with targeted sets of messages are such that $c^w(\cdot, \cdot) = c_1^w(a_{i1}^w) + c_2^w(a_{i2}^w)$ and $F^w = F_1^w + F_2^w$. A symmetric

advertising equilibrium is now described by symmetric advertising reaches for the two submarkets, (a_1^{w*}, a_2^{w*}) with probabilities (q_1^{w*}, q_2^{w*}) and common price p^{w*} (recall that there is no price discrimination across submarkets).

Proof of Proposition 4:

For a common q to be an equilibrium, the following must hold:

$$\begin{aligned}\pi_{i,1}(a_1 &= a_1^{w*}; J_S, w^*, a_1^{w*}, q, p^{w*}) + \pi_{i,2}(a_2 = a_2^{w*}; J_S, w^*, a_2^{w*}, q, p^{w*}) = \\ \pi_{i,1}(a_1 &= 0; J_S, w^*, a_1^{w*}, q, p^{w*}) + \pi_{i,2}(a_2 = 0; J_S, w^*, a_2^{w*}, q, p^{w*})\end{aligned}$$

and

$$\pi_{i,j}(a_j = a^{w*}; J_S, w^*, a_j^{w*}, q, p^{w*}) = \pi_{i,j}(a_j = 0; J_S, w^*, a_j^{w*}, q, p^{w*}) \tag{5}$$

To see the reason for this latter condition, suppose instead that:

$$\pi_{i,1}(a_1 = a^{w*}; J_S, w^*, a_1^{w*}, q, p^{w*}) < \pi_{i,1}(a_1 = 0; J_S, w^*, a_1^{w*}, q, p^{w*})$$

Equation (5) then implies that:

$$\pi_{i,2}(a_2 = a^{w*}; J_S, w^*, a_2^{w*}, q, p^{w*}) > \pi_{i,2}(a_2 = 0; J_S, w^*, a_2^{w*}, q, p^{w*})$$

and the firm should choose a higher q for market 2 and a smaller q for market 1. The only way the firm would not deviate to a different randomization in one of the markets is if $\pi_{i,j}(a_j = a^{w*}; J_S, w^*, a_j^{w*}, q, p^{w*}) = \pi_{i,j}(a_j = 0; J_S, w^*, a_j^{w*}, q, p^{w*})$ in both markets given a common q. This condition cannot hold generically, however, since equilibrium requires that:

$$p^{w*} m_j a^{w*}(x_{ij}[J_S, (1,0), p^{w*}] - .5) - F_j^w - c_j^w(a^{w*}) = 0 \tag{6}$$

for $j = 1, 2$ and with a_j^{w*} and $x_{ij}[J_S, (1,0), p^{w*}]$ given by equations (2) - (4). Since technologies are characterized by different variable (and possibly fixed) costs, (6) cannot hold generically for each market. □

Proof of Proposition 5:

Consider a proposed advertising equilibrium with format w that has targeted sets of messages, price p^{w*}, and advertising reach a_1^{w*}, a_2^{w*} and symmetric joint assessment:

$$\text{If} \quad \begin{array}{l} \text{i. } a_{11} = a_1^{w*} \text{ and } a_{21} = 0 \text{ and } a_{12} = a_2^{w*} \text{ and } a_{22} = 0 \\ \text{ii. } a_{11} = 0 \text{ and } a_{21} = a_1^{w*} \text{ and } a_{12} = 0 \text{ and } a_{22} = a_2^{w*} \\ \text{iii. otherwise} \end{array} \quad \text{, then} \begin{cases} 1 \\ 2 \\ 0 \end{cases}$$

Now consider a deviation by firm 1 to common format $w = w'$ and $p_1^{w'} = p^{w*}$. Since consumers who receive message outcome (w', w) still believe that threshold outcome 0 occurs, their purchase decisions do not change. Consumers who have outcomes $(0, w), (0, 0)$ are not aware of the deviation and so their purchase decisions do not change either. As a result, demand from all of these groups under the deviation is the same as in the proposed equilibrium.

Under the proposed equilibrium, a consumer in submarket j with the outcome $(w, 0)$ cannot be certain if firm 1 is advertising in j' (from Proposition 4). This same consumer with the outcome $(w', 0)$ knows that consumers in submarket j are also receiving messages from firm 1. From Condition 2, if this consumer believes that firm 1's advertising reach in the two submarkets is at least a_1^{w*}, a_2^{w*} respectively, then the joint assessment for a consumer with the outcome $(w', 0)$ must be as above. In this case, we have that a consumer with outcome $(w', 0)$ attaches positive probability to i. or iii. in the joint assessment and, because of the perfect correlation across submarkets of a common message set, attaches higher probability to i. and lower probability to iii. in the joint assessment than does the same consumer with outcome $(w, 0)$. This fact implies that demand for firm 1's product is higher when the outcome is $(w', 0)$.

Under the deviation, and assuming that consumers with the outcome $(w', 0)$ have a joint assessment given by i.-iii above, we have then that demand is no lower for any advertising outcome group and strictly higher for the group having $(w', 0)$. In this case, the assumption of identical costs yields (see equation (1)) that the profit maximizing advertising levels for firm 1, should it advertise, are at least a_1^{w*}, a_2^{w*} and so, by Condition 1, the assumption on the joint assessment is confirmed. This then yields that firm 1's profit increase under the deviation. □

References

[1] Agrawal, Jagdish and Kamakura, Wagner A. 1995. "The economic worth of celebrity endorsers: An event study analysis". *Journal of Marketing*. Vol. 53. 56-63.

[2] Bagwell, Kyle and Ramey, Garey. 1994a. "Advertising and Coordination". *The Review of Economic Studies*. Vol. 61. 153-172.

[3] _____. 1994b. "Coordination Economies, Advertising, and Search Behavior in Retail Markets". *The American Economic Review*. Vol. 84. 498-517.

[4] Bental, Benjamin and Spiegal, Menahem. 1995. "Network Competition, Product Quality, and Market Coverage in the Presence of Network Externalities". *Journal of Industrial Economics*. Vol. 43. 197-208.

[5] Chwe, Michael Suk-Young. 1998a. "Culture, Circles, and Commercials: Publicity, Common Knowledge, and Social Coordination." *Rationality and Society*. Vol. 10. 47-75.

[6] _____. 1998b. "Believe the Hype: Solving Coordination Problems with Television Advertising." Unpublished Manuscript, Department of Economics, University of Chicago.

[7] _____. 1999. *Culture, Coordination and Common Knowledge*. Unpublished manuscript.

[8] Clark, C. Robert and Horstmann, Ignatius. 2005. "Advertising and Coordination in Markets with Consumption Scale Effects", *ournal of Economics and Management Strategy*, Vol.14. 377-401.

[9] Friedman, Hershey H. and Friedman, Linda. 1979. "Endorser Effectiveness by Product Type." *Journal of Advertising Research*. Vol. 19. 63-71.

[10] Hertzendorf, Mark. 1993. "I'm not a High-Quality Firm – But I Play One on TV". *RAND Journal of Economics* 24, 236-47.

[11] _____. 1996. "A Game Theory Model of Celebrity Endorsements". Federal Trade Commission, Working Paper #211.

[12] Kaikati, Jack G. 1987. "Celebrity Advertising: A Review and Synthesis." *International Journal of Advertising.* Vol.6. 93-105.

[13] McCracken, Grant. 1989. "Who is the Celebrity Endorser? Cultural Foundations of the endorsement Process." *Journal of Consumer Research.* Vol. 16. 310-321.

[14] Menon, M., L. Boone and H. Rogers. 2001. "Celebrity Advertising: An Assessment of Relative Effectiveness", mimeo.

[15] Misra, S. and S. Beatty. 1990. "Celebrity Spokesperson and Brand Congruence". *Journal of Business Research.* Vol. 21. 159-73.

[16] Pastine, Ivan and Pastine, Tuvana. 2002 "Consumption Externalities, Coordination and Advertising". *International Economic Review,* Vol. 43. 919-943.

[17] _____. 1999. "Coordination in Markets with Consumption Externalities: The Role of Advertising and Product Quality". Mimeo, 1999.

[18] Petty, R., J. Cacioppo and D. Schumann. 1983. "Central and Peripheral Routes to Advertising Effectiveness: The Moderating Role of Involvement". *Journal of Consumer Research.* Vol. 10. 135-46.

[19] Sahuguet, Nicolas. 2003. "Repeat Advertising." mimeo. Université Libre de Bruxelles.

[20] Sherman, Stratford P. 1985. "When You Wish Upon a Star." *Fortune.* Vol. 112. No4.

[21] Sutherland, Max. 1993. *Advertising and the Mind of the Consumer*. St. Leonards: Allen & Unwin.