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Brand Communities and New Product Adoption: The Influence and Limits of Oppositional Loyalty

Brand communities have been cited for their potential not only to enhance the loyalty of members but also to engender a sense of oppositional loyalty toward competing brands. However, the impact of brand community membership on actual new product adoption behavior has yet to be explored. This study examines the effects of brand community participation and membership duration on the adoption of new products from opposing brands as well as from the preferred brand. Longitudinal data were collected on the participation behavior, membership duration, and adoption behavior of 7506 members spanning four brand communities and two product categories. Using a hazard modeling approach, the authors find that higher levels of participation and longer-term membership in a brand community not only increase the likelihood of adopting a new product from the preferred brand but also decrease the likelihood of adopting new products from opposing brands. However, such oppositional loyalty is contingent on whether a competitor's new product is the first to market. Furthermore, in the case of overlapping memberships, higher levels of participation in a brand community may actually increase the likelihood of adopting products from rival brands. This finding is both surprising and disconcerting because marketing managers usually do not know which other memberships their brand community members possess. The authors discuss how managers can enhance the impact of their brand community on the adoption of the company's new products while limiting the impact of opposing brand communities.

Keywords: brand community, brand loyalty, oppositional loyalty, adoption, new products

Brand communities have been touted as a possible path to "the Holy Grail of brand loyalty" (McAlexander, Schouten, and Koenig 2002, p. 38). A growing list of companies, including Chrysler, Saturn, and Apple, has dedicated marketing resources to encourage customers to join and participate in such communities in the hope that this will influence adoption behavior. For example, Apple actively supports the formation of customer-run Macintosh user groups. Although these groups are founded by volunteers and enthusiasts, the company encourages customers to join and participate in them through the Apple Web site, in mailings to registered customers, and by hosting events at conferences, such as MacWorld. By encouraging customers to join this community, Apple hopes to foster greater loyalty among its customers and thus enhance its bottom line.

These investments are being made because of the belief that brand communities can influence adoption behavior in two ways. First, membership and participation in a brand community have been found to engender a sense of loyalty among members. The hope is that this loyalty will benefit the company by increasing the likelihood that members will purchase the company's products in the future. Second, membership and participation in brand communities have been found to create a sense of "oppositional loyalty" (Muniz and Hamer 2001; Muniz and O'Guinn 2001). This oppositional loyalty leads members of the community to take an adversarial view of competing brands. Such oppositional loyalty may benefit companies by reducing the likelihood that members will purchase products from competing brands.

If brand communities can deliver on their promise, the implications for the adoption and diffusion of new products are profound. Companies that succeed in getting customers to join and participate in their brand community can enjoy significant advantages over rivals. For example, the resultant increase in the likelihood of purchasing the company's new products would lead to faster rates of adoption among existing customers. Furthermore, the oppositional loyalty created by membership and participation could slow the rate of adoption of competing products and reduce the ability of competitors to gain an advantage in market share by being first to market. Finally, the presence of large numbers of customers who are reluctant to adopt competing products could serve as a deterrent to entry by potential competitors. Indeed, if brand communities reduce the likelihood of adopting competing products, the outlook for competitors is grim. However, there is little research directly linking brand community membership to actual adoption behavior. Thus, whether and how brand community membership and participation affect adoption behavior remains an open question.

This study contributes to both the product adoption and the brand community literature. First, we examine the

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ISSN: 0022-2429 (print), 1547-7185 (electronic)

Journal of Marketing
Vol. 72 (November 2008), 65–80

impact of brand community participation and membership duration on the likelihood of adopting a product from the preferred brand as well as the competing brand. Second, and more important, we identify limiting conditions on these relationships. Specifically, we show that the expected relationships between adoption and either participation or membership duration do not hold when a comparable product is unavailable from the preferred brand. Third, we examine the impact of multiple brand community memberships on the adoption of products from preferred and rival brands. As McAlexander, Schouten, and Koenig (2002, p. 40) note, "Scholars of brand community often neglect the effects of multiple community memberships. Interesting questions arise when the possibility of interlocking community ties is recognized." In this study, we directly examine how participation in multiple brand communities devoted to competing products alters the relationship between participation and adoption behavior.

Our results confirm that participation and membership duration in a brand community influence the adoption of products from both the preferred brand and the competing brands. More important, we find that that there are limits to oppositional loyalty. Indeed, under certain conditions, higher levels of participation may actually increase the likelihood of adopting products from competing brands. This surprising finding suggests that there are conditions under which efforts to foster participation in a brand community can backfire and unintentionally benefit rivals. In addition, the results suggest possible strategies that managers can employ to blunt the detrimental impact of competitors' brand communities.

We organize the remainder of this article as follows: We begin with a brief review of the brand community literature. Next, we consider how brand communities affect adoption behavior, and we develop our hypotheses. In the subsequent section, we describe the study context and data collection methods. We then discuss the hazard modeling approach used to analyze the data, and we present the results. We conclude with a discussion of these results and their managerial implications.

The Nature of Brand Community

Muniz and O'Guinn (2001, p. 412) define a brand community as "a specialized, non-geographically bound community, based on a structured set of social relationships among admirers of a brand." Brand communities are composed of people who possess a social identification with others who share their interest in a particular brand (Algesheimer, Dholakia, and Herrmann 2005; McAlexander, Schouten, and Koenig 2002). In turn, this social identification with other users leads to behavior that is consistent with the three characteristics of a community: consciousness of kind, rituals and traditions, and a sense of moral responsibility (Muniz and O'Guinn 2001). Muniz and O'Guinn define consciousness of kind as "the intrinsic connection that members feel toward one another, and the collective sense of difference from others not in the community" (p. 413). It leads to a sense that users of a particular brand are somehow different and distinct from users of a competing brand. Rituals and traditions may include sharing stories about using the product, recounting the brand's history, displaying old logos, or greeting fellow brand users in particular ways. Finally, a sense of moral responsibility leads to community-oriented actions, such as sharing information about products offered by the brand and encouraging fellow members to remain loyal to the brand and community.

Because they are nongeographic, brand communities can exist anywhere or even virtually. Brand communities may take the form of local clubs based on direct interaction (Algesheimer, Dholakia, and Herrmann 2005), or they may exist entirely on the Internet (Granitz and Ward 1996; Kozinets 1997; Muniz and Schau 2005). Furthermore, brand communities may be based on a wide array of products, including cars, motorcycles, and computers (Algesheimer, Dholakia, and Herrmann 2005; Belk and Tumbat 2002; McAlexander, Schouten, and Koenig 2002; Muniz and O'Guinn 2001; Schouten and McAlexander 1995). Brand communities have also been documented for such mundane products as television series (Kozinets 2001; Schau and Muniz 2004), movies (Brown, Kozinets, and Sherry 2003), personal digital assistants (Muniz and Schau 2005), and even soft drinks and car tires (Muniz and O'Guinn 2001).

A key characteristic of brand communities is the general absence of barriers to membership (Muniz and O'Guinn 2001). People can purchase the brand and join the community without prior approval. As a result, they may be members of multiple, overlapping communities, even within the same product category. For example, a consumer could own two car brands and actively participate in online communities dedicated to both brands, providing assistance to fellow owners and seeking information on other vehicles being released under each brand. Indeed, in many product categories, it is not uncommon for consumers to own multiple brands of the same product. However, the impact of overlapping memberships has yet to be examined (McAlexander, Schouten, and Koenig 2002).

Brand Communities, Adoption, and Oppositional Loyalty

Research has shown that brand communities clearly influence their members. Members of brand communities develop a social identification with the community, which has been shown to influence word-of-mouth behavior and purchase intentions (Algesheimer, Dholakia, and Herrmann 2005). In addition, members experience normative pressure to remain loyal to the brand and the community (Algesheimer, Dholakia, and Herrmann 2005; Muniz and O'Guinn 2001). Finally, members rely on the brand community as an important source of product information (Muniz and O'Guinn 2001). However, the impact of brand community participation on actual adoption behavior has not been directly examined.

Participation in Brand Communities and Adoption

Prior research has shown that information and word of mouth play a critical role in the adoption and diffusion of

new products (Mahajan, Muller, and Bass 1995; Rogers 2003). Specifically, research on diffusion theory suggests that social systems and communication channels influence the adoption of products by shaping the information to which people are exposed (Gatignon and Robertson 1985; Rogers 2003). From the perspective of diffusion theory, brand communities can be viewed as both social systems composed of members and communication channels through which information about new products is transmitted. As a result, brand communities have the potential to alter members' adoption behavior by selectively exposing them to information about new products offered by competing brands as well as the preferred brand.

In addition to exposure to information, the literature on brand communities has found that members develop a social identification based on the community (Algesheimer, Dholakia, and Herrmann 2005). The literature on social identity has found that people tend to define themselves according to their group memberships (Hogg and Abrams 2003). Furthermore, membership in even trivial or minimal groups has been shown to produce social identification, which in turn produces measurable in-group bias (e.g., Diehl 1990; Tajfel 1970). As a result, members tend to evaluate the in-group more favorably and the out-group more negatively (Hogg and Abrams 2003). In the case of brand communities, membership may lead people to evaluate products from the preferred brand and competing brands differently, thus altering their willingness to adopt them. As Brown (2000, p. 747) concludes,

> From Sumner's (1906) anecdotal observations to Mullen, Brown, and Smith's (1992) more formal compilation and analysis, it is by now a common-place that group members are prone to think that their own group (and its products) are superior to other groups (and theirs), and to be rather ready behaviorally to discriminate between them as well.

Therefore, the combined impact of exposure to information and social identification provides a basis for understanding how membership and participation in brand communities may alter adoption behavior when members are confronted with products from their preferred brand and competing brands. Specifically, higher levels of participation in a brand community lead to a member being exposed to more information about the merits and uses of the preferred brand. Furthermore, diffusion theory suggests that exposure to such information enhances the likelihood of adoption (Rogers 2003). As a result, diffusion theory suggests that higher levels of participation in a brand community should lead to greater knowledge about products from the preferred brand and a greater likelihood of adopting such products.

In addition, the social identification that members develop with the brand community may alter adoption behavior. Prior research on social identification has found that participation with the related social group enhances the strength of the identification through various mechanisms (Brauer and Judd 1996; Hogg and Abrams 2003). This literature has found that social identities, even weak ones, give rise to in-group bias and more favorable assessments of members' own group and its products. In the context of brand communities, this suggests that higher levels of participation will increase in-group bias toward the preferred brand and therefore increase the likelihood of adopting a new product from the preferred brand.

Information, Social Identity, and Oppositional Loyalty

Prior research on brand communities indicates that members of a brand community tend to avoid discussing the merits and use of products from rival brands in favor of products from the preferred brand (Muniz and O'Guinn 2001). Instead, members of brand communities tend to emphasize the merits of products from the preferred brand and focus on disparaging information about products from rival brands. As a result, members of a brand community are exposed to less information about the merits of new products from competing brands because of their emphasis on the merits and uses of products from the preferred brand. Diffusion theory suggests that the likelihood that people who have not purchased a new product up to a specific time will do so at that time depends on the amount and form of the information available to them about the existence, quality, and value of the new product (Horsky and Simon 1983). Thus, the lack of such information reduces the likelihood of adopting a new product from a competing brand, giving rise to oppositional loyalty in adoption behavior.

Furthermore, social identification may lead to oppositional loyalty when adopting products from rival brands. Social identity has been shown to produce out-group bias in the form of more negative evaluations of rival groups and their products (Brown 2000; Hogg and Abrams 2003). Notably, social identification produces such bias only when a relevant target for comparison is available (Hogg and Abrams 2003). In the case of new products, this process would involve comparing the new product from the preferred (or rival) brand with equivalent products from the rival (or preferred) brand. Because participation strengthens social identity, higher levels of participation enhance the negative bias toward comparable products from other brands in terms of the type of information discussed and attitudes toward the products. In turn, this negative out-group bias should increase oppositional loyalty and lead to a reduced likelihood that a member will adopt a new product from a competing brand, given the presence of a comparable product from the preferred brand.

The Role of Competing Products in Oppositional Loyalty

The preceding discussion is consistent with the conventional wisdom on how participation in brand communities influences new product adoption behavior. However, this conventional wisdom rests on an unstated but critical assumption. Specifically, the brand community literature implicitly assumes that comparable products are available from both the preferred brand and competing brands. In this case, members of brand communities are expected to show loyalty toward the product from their preferred brand and oppositional loyalty toward products from competing brands. However, when a competing brand is first to market

with a new product, the impact of participation on adoption behavior is not as clear.

On the one hand, members may rely on general perceptions of the rival brand based on oppositional loyalty to make decisions in the absence of their preferred brand. Indeed, oppositional loyalty may be intensified by the existence of products from rivals that represent a threat to the preferred brand (Muniz and O'Guinn 2001). In addition, members of a brand community may anticipate the future release of a comparable product from their preferred brand.[1] As a result, they may elect to wait for their brand's future product and thus avoid adopting the first-to-market product from the rival brand. This would reduce the likelihood of adopting the competing brand, consistent with the standard view of brand community participation and oppositional loyalty.

On the other hand, the social identity literature has found that social identities produce bias only when there is a relevant group or product with which to make comparisons (Brown 2000; Hogg and Abrams 2003). Thus, there should be no social identity–based bias against a first-to-market product, and participation should not reduce the likelihood of adopting a first-to-market product from a competing brand. As a result, counter to the standard view, the absence of a comparable product from the preferred brand should inhibit oppositional loyalty.

In the same vein, diffusion theory also argues that oppositional loyalty may be inhibited in the absence of a comparable product from the preferred brand. Specifically, when there is no comparable product available from the preferred brand, discussing the merits of the new type of product effectively requires members to share information about the use and merits of the rival product (Horsky and Simon 1983; Johnson 1986). Therefore, to the degree to which the uses and merits of the new product are discussed, it will increase members' knowledge of the uses and merits of the rival product and inhibit oppositional loyalty (Rogers 2003; Van den Bulte and Stremersch 2004).

H_1, H_2, and H_3 summarize the predicted relationship between participation in a brand community and adoption behavior based on the preceding discussion. Specifically, they state that higher levels of participation lead to a reduced likelihood of adopting new products from rivals, consistent with conventional wisdom, but only when a comparable product is available from the preferred brand. As a result, if a rival brand is first to market, the level of participation will not influence the likelihood of adoption. This represents a significant limiting condition on oppositional loyalty. However, whereas oppositional loyalty in purchase behavior is conditional on the presence of a comparable product, loyalty in purchase behavior is not. In other words, when the preferred brand is first to market, higher levels of participation will lead to an increased likelihood of adopting that new product.

H_1: When products from both the preferred and the rival brands are available, higher levels of participation in a brand community (a) increase the likelihood of adopting a new product from that brand and (b) decrease the likelihood of adopting a new product from a competing brand.

H_2: When the preferred brand is first to market with a new product, higher levels of participation in a brand community increase the likelihood of adopting the new product.

H_3: When a competing brand is first to market with a new product, higher levels of participation in a brand community do not alter the likelihood of adopting the new product.

Membership Duration, Adoption, and Oppositional Loyalty

Members of a brand community may differ not only in how often they interact with fellow members but also in how long they have been members of the community. For example, highly social people may participate frequently with fellow members, even though they have only recently joined the community. Conversely, some long-term members may prefer to listen to the discussions of other members without directly participating themselves.

Prior research has found that longer duration membership in a group strengthens the social identification of members with the group (Bhattacharya, Rao, and Glynn 1995; Mael and Ashforth 1992). Indeed, Muniz and O'Guinn (2001) find that long-term members tend to enjoy higher status within the brand community and that their claims to membership are regarded as more legitimate. Therefore, longer-term membership in a brand community should lead to a stronger social identification with that brand community. Because social identification produces in-group bias in favor of the group and its products, longer-term membership should increase the likelihood of adopting new products from the preferred brand.

Although longer-term membership should enhance the likelihood of adopting a new product from the preferred brand, it should have the opposite effect for new products from competing brands, given the presence of comparable products. Brand community members tend to avoid discussing the merits of competing products in favor of comparable products from the preferred brand. Therefore, longer-term membership in a brand community will not enhance members' knowledge of the benefits of new products from competing brands when there is a comparable product from the preferred brand.

Finally, because longer-term membership enhances social identification, these members should possess a higher degree of out-group bias against products from competing brands. As with participation, this out-group bias should lead to oppositional loyalty in the form of a reduced likelihood of adopting a new product from a competing brand, given the availability of a comparable product. Therefore, if comparable products from both the preferred brand and the rival brand exist, longer-term members of a brand community should be less likely to adopt new products from competing brands.

However, what happens when the competing brand is first to market with a new product? As we discussed previously, when a rival brand is first to market, discussing the merits of a new type of product involves members sharing information about the use and merits of the rival product.

[1]We thank the anonymous reviewers for these insights.

As a result, longer-term members will be exposed to more information about the merits of a rival's first-to-market product, which in turn should inhibit oppositional loyalty. In addition, because social identification requires a relevant comparison group or product to produce bias, longer-term members who possess stronger social identities may nonetheless fail to show bias against rival products that are first to market (Brown 2000; Hogg and Abrams 2003). In the absence of such bias, membership duration should not influence the likelihood of adopting a first-to-market product from a competing brand. As a result, longer-term membership should not lead to oppositional loyalty in purchase behavior when rival brands are first to market with a new product. This constitutes a significant limiting condition on the relationship between membership duration and oppositional loyalty.

H_4, H_5, and H_6 summarize the predicted relationships between the length of membership in a brand community and adoption behavior. As with participation, longer-term membership is hypothesized to lead to a reduced likelihood of adopting new products from rivals but only when a comparable product is available from the preferred brand. In the absence of a comparable product from the preferred brand, membership duration will not influence the likelihood of adopting a new product from a rival brand, counter to the predictions of the brand community literature. Conversely, whereas oppositional loyalty in purchase behavior is conditional on the presence of a comparable product, loyalty in purchase behavior is not. Therefore, when the preferred brand is first to market, longer-term membership will lead to an increased likelihood of adopting that new product.

H_4: When products from both the preferred and the rival brands are available, longer-term membership in a brand community (a) increases the likelihood of adopting a new product from that brand and (b) decreases the likelihood of adopting a new product from a competing brand.

H_5: When the preferred brand is first to market with a new product, longer-term membership in a brand community increases the likelihood of adopting the new product.

H_6: When a competing brand is first to market with a new product, longer-term membership in a brand community does not alter the likelihood of adopting the new product.

Overlapping Memberships and Adoption Behavior

McAlexander, Schouten, and Koenig (2002) note that people may have multiple community memberships. Indeed, in some product categories, such as automobiles, this may be common. However, the consequences of overlapping memberships in multiple brand communities have not been explored in the literature. From the perspective of diffusion theory, memberships in multiple brand communities would lead to a person being exposed to more information about a broader array of brands and related products. Thus, the probability of adopting new products should increase for new products from multiple competing brands.

In addition, the social identity literature recognizes that people possess many social identities (Brown 2000). In the case of rival or competing groups, overlapping memberships can lead to a common in-group social identity (Anastasio et al. 1997; Gaertner et al. 1993; Gaertner et al. 1989). Under these conditions, a person will regard both groups as in-groups. As a result, overlapping memberships forestall out-group biases and the negative attitudes associated with them. In the case of rival brand communities, overlapping membership would preclude out-group biases toward either community, and such a member should not evidence oppositional loyalty toward either community. Paradoxically, this suggests that in the presence of such overlap, higher levels of participation in a given brand community could actually increase the likelihood of adopting a new product from a competing brand.

H_7: In the presence of overlapping participation across brand communities within a product category, higher levels of participation in a given brand community increase the likelihood of adopting a new product from the rival brand.

Study Context

Consistent with prior studies, we examine brand communities using data collected from online forums dedicated to specific brands. We extend this literature by collecting and analyzing data on actual participation and membership behavior across and within multiple competing brand communities. In addition, we gather data on the adoption of a specific new product by members of competing brand communities. Thus, we are able to examine the relationships between community-related behavior and adoption behavior within and across competing brand communities. This unique approach enables us to address unexplored questions related to loyalty, oppositional loyalty, the role of competing products, and overlapping memberships in multiple brand communities.

Specifically, we collected data from two dominant brands in two product categories. The first product category was x86 microprocessors. This product category was dominated by two competitors, Intel and AMD, which accounted for 98.6% of the sales in this market as of the first quarter of 2005 (Krazit 2005). The second category was discrete three-dimensional (3D) video cards. This market was also dominated by two competitors, ATI and NVIDIA, which accounted for more than 98.1% of sales as of the first quarter of 2006 (Shilov 2006). In addition, we collected data from two general product category forums: a General Hardware forum and a Video Cards forum. This enabled us to compare the impact of participation in non-brand-based forums with participation in brand-specific forums.

Evidence of Community

An examination of the messages posted in each of the four brand-specific forums revealed behavior consistent with previous studies, which have identified such forums as homes to brand communities (Algesheimer, Dholakia, and Herrmann 2005; Muniz and O'Guinn 2001; Muniz and Schau 2005). There is clear evidence of a consciousness of kind among the members of the four forums. For example, members of each group frequently and publicly assert their allegiance to the brand and express their enthusiasm for the related products. One AMD member flatly stated, "I will

never ever touch Intel in my life unless it was a life and death situation."

Furthermore, members of the rival forum are viewed as outsiders and are even treated with open hostility. One Intel member posting in the Intel forum complained about the reception he received in the AMD forum: "Take a look at how sad some of these AMD users are in that some of them have to resort to personal attacks against me even to the point of new threads calling me out trying to get me to argue more all because I was providing facts and information they didn't like." This creates some curious double standards in the discussions. For example, members of the ATI forum proudly refer to themselves as "fan boys" of ATI. However, referring to someone as a "fan boy" of NVIDIA in the ATI forum is a serious insult that is often used to discredit the views of another user. This same double standard exists in the Intel and AMD forums.

Muniz and O'Guinn (2001) note that a person's need to establish his or her legitimacy and that of others as members of the community is an important aspect of consciousness of kind. In these four groups, legitimacy is a significant concern. Users frequently point out which products they own and even append lists of products to each message they post in the form of "signatures." Indeed, before criticizing any aspect of the brand's products, it is common for members first to state their loyalty to the brand and point out the various products they own to ensure that they are not mistaken for a member of the rival brand's community. In addition, the users' signatures play an important role in establishing legitimacy, with users frequently pointing to their signatures as proof of their loyalty to the brand and allegiance to the community.

Other markers of community are also evident. Specifically, members of each of the four brand forums spend a considerable amount of time assisting fellow brand owners with the installation and use of the brand's products, providing evidence of a sense of moral responsibility among the members. Furthermore, members of each forum frequently share stories about the brand. For example, AMD members enjoy sharing similar stories of how others have ridiculed them for using an AMD processor rather than the more popular Intel processors. In general, the story concludes with the incredulous other being amazed after being shown the performance of the AMD product and expressing newfound admiration for the AMD owner. Another common story is a variant of the odyssey story (Muniz and O'Guinn 2001). However, in this case, the odyssey involves a quest to fix a poorly performing and/or malfunctioning computer system. Members recount the suffering and travails they experienced until they realized that the problem was due to the use of a rival brand. Inevitably, the journey ends with the purchase of the group's preferred brand, which solves all the problems.

Members of each forum also enjoy celebrating the history of their brand by recounting stories of past products. Members frequently use engineering code names instead of "official" product names when discussing the history of the brand as well as current products. For example, Intel members refer to Intel processors using Intel engineering code names such as "Allendale" and "Prescott," AMD members use AMD code names such as "San Diego," NVIDIA members use NVIDIA code names such as "G92," and ATI members use ATI code names such as "R600." As a result, knowledge of these code names plays an important role in discussing the history of the brand, consistent with previous findings that brand communities develop rituals and tradition focused on the history of the brand.

User Signatures

The forums allow members to assign signatures to their user accounts. These signatures contain information the user enters, including product purchase information, and appear at the end of every message posted in any forum.

Figure 1 contains the signature created by one member of the NVIDIA forum from January 28, 2007, and the new

FIGURE 1
Signatures from a NVIDIA Member

January 28, 2007	February 10, 2007
Signature	**Signature**
ASUS A8N-SLI Premium A64 4000+ San Diego 2GB Corsair Value PC3200 **eVGA GeForce 7900GS KO (550/750)** SB Audigy LS WD Raptor 150GB SATA 2x WD 320GB SATA Antec Sonata II Thermaltake PurePower 600W Belkin Keyboard Microsoft Wireless Optical Mouse 5000 Platinum Sabrent 52-in-1 Internal Card Reader	ASUS A8N-SLI Premium A64 4000+ San Diego 2GB Corsair Value PC3200 **eVGA GeForce 8800GTS Superclocked** SB Audigy LS WD Raptor 150GB SATA 2x WD 320GB SATA Antec Sonata II Thermaltake PurePower 600W Belkin Keyboard Microsoft Wireless Optical Mouse 5000 Platinum Sabrent 52-in-1 Internal Card Reader

Notes: Bold text indicates the changed part of the signature.

signature the user replaced it with as of February 10, 2007. The first signature contains a wealth of information about what products the user owns. In this case, the user reports owning an ASUS brand motherboard running an AMD Athlon 4000+ processor and two gigabytes of Corsair brand memory rated at a speed of PC3200. The user also owns a video card based on NVIDIA's 7900 GS 3D accelerator and sold by eVGA. In addition, the user owns a Sound Blaster brand sound card, three Western Digital brand hard drives, an Antec brand case, a Thermaltake brand power supply, a Belkin keyboard, and a Microsoft mouse. The signature information is retroactively changed on all previous posts each time the user updates his or her signature. As a result, updating a signature alters every message the user has ever posted on any of the forums. Thus, changing a signature is a highly visible way for a person to announce his or her purchase behavior across all the forums. The new signature shows that the user replaced the NVIDIA 7900 GS 3D accelerator with the newer NVIDIA 8800 3D accelerator.

Using signature data collected from a panel, we examined the adoption of the most recently released product within each of the two product categories. In the case of AMD and Intel, the new product was from Intel and was equivalent to existing AMD products, but it claimed superior performance. However, in the case of ATI and NVIDIA, the new NVIDIA product was not comparable to existing ATI products. Specifically, the new NVIDIA product supported the latest 3D graphics functions introduced by Microsoft's new operating system, Windows Vista. At the time of the study, no ATI product had the ability to perform these operations. Thus, NVIDIA's new product was the first to market to implement Windows Vista's 3D functions. As a result, any user who wanted to adopt a product that supported Windows Vista's 3D capabilities had only one product to choose from, NVIDIA's new product. Thus, this study context enabled us to examine the impact of both brand community participation and membership duration on a first-to-market product.

Data

The data collection phase involved a continuous process of downloading, analyzing, and recording forum information on 27,777 user accounts over a three-month period. This continuous data collection strategy was necessary because signature data are retroactively changed each time users update their signature. As a result, there is no record of previous signatures. Therefore, to detect changes, it was necessary first to identify all members of each forum, form a panel, and then collect signature data over time at regular intervals. To construct the panel, we wrote custom programs that enabled us to extract and analyze all the messages across each of the six forums. In all, 990,818 messages were extracted and recorded in a data set. These messages spanned a three-year period from when the forums were launched in January 2004 to January 2007. Next, we located and recorded the user ID within each of the messages to identify all the users who posted at least one message in any of the forums since they were opened. We used these 27,777 user accounts to form a panel and extracted and recorded all the signature data for each account. Over the following eight weeks, we re-collected and recorded the signature data for each of the accounts on a weekly basis. After the data collection period, we examined the signatures to identify those that contained product information. Of the 27,777 unique user accounts tracked, 11,333 users (representing 40.8% of all users) created signatures. Because each signature was collected eight times, the resultant data set contained 90,664 signatures. We then compared each signature and coded it according to whether it contained product information. Of the 11,333 users with signatures, 7506 users (representing 66.2% of the users with signatures) created signatures that contained lists of the computer components they currently owned, including the exact x86 processor and discrete 3D video card. Therefore, the resultant data series tracked the adoption behavior on a weekly basis of 7506 users for eight weeks spanning four brand communities and two non-brand-specific forums.

Finally, we examined the signatures to identify users who adopted products from AMD, Intel, NVIDIA, and ATI before the study as well as over the course of the study. To identify users who had adopted products during the eight-week period, we compared the signature for each week for each user. Each time a user changed his or her signature, we compared the signatures for that user and coded the type of product and week of adoption. Although this approach was difficult and time consuming, it resulted in a rich and unique data set containing detailed information on which products were adopted, when they were adopted, and by whom they were adopted. For example, the user in Figure 1 updated the signature during Week 3 of the series (February 10–February 17, 2007) to announce that he or she had adopted NVIDIA's 8800 3D accelerator.

For the analysis, we focused on the most recently released new product in each of the two product categories. In the case of AMD and Intel, this was Intel's Core2Duo processor. This product was released July 27, 2006, and had been on the market for 26 weeks at the start of the data collection. Before the start of the data series, 804 of the 7506 users had adopted the product. During the eight weeks, an additional 120 users adopted the product, for a total of 924 adopters, or 12.31% of the 7506 users.

For ATI and NVIDIA, the most recently released new product was NVIDIA's 8800 series video card. This product was released on November 8, 2006, and had been available for 11 weeks at the start of the data collection. At the start of the panel, 423 users had already adopted the product. Over the eight-week course of the panel, an additional 136 users adopted the product, for a total of 559 users of a possible 7506. This reflects a 7.45% adoption rate since launch.

Data Validation

We performed several analyses to validate our data and to determine whether the user signatures constituted accurate measures of adoption behavior. First, we considered that people might create duplicate user accounts. In this study context, the terms of service of the Web site prohibit users from registering more than one account under penalty of being banned from the forums. In addition, users are

required to provide a valid e-mail address to receive an account, and only one account is granted per address.

Nonetheless, these steps do not prevent a determined user who is willing to risk being banned from getting multiple accounts under false pretense. If the user accounts did not list any signatures, the results of the study would not be influenced by this factor. However, if the accounts had the same signature for both accounts, the results could be biased if one account was used exclusively in one forum and the other was used in the opposing forum. To determine the extent to which this might be a problem, we compared the signatures for all 27,777 accounts. We identified 24 users who had matching signatures with another user. Of these, 15 were signatures that simply contained a "smiley face" icon. Of the remaining 9, all were short and generic, and none contained product information. Overall, after we compared 27,777 accounts, there was not a single example of a duplicate signature that contained product information or that was included in our analysis. This suggests that duplicate user accounts did not bias the results of the analysis.

A second concern was that users might adopt a product but announce it in a message post rather than update his or her signature. To assess the extent of such behavior, we examined all the messages posted in any of the six forums by users who did not indicate adoption in their signatures. In the case of the Core2Duo processor, we found 53 instances of the 6529 users (.8%) coded as nonadopters from their signatures and 7 instances in which users were slow to update their signatures. In the case of the NV8800 video card, we found 35 instances of the 6912 users (.5%) coded as nonadopters from their signatures and 10 instances in which users were slow to update their signatures. These are extremely low error rates on the part of forum members and reflect the degree to which members feel obligated to acknowledge the products they purchase to fellow members.[2]

Finally, more frequent participants might update their signatures more rapidly. As a result, the relationship between participation and adoption might be overstated. If such a relationship existed, the results of the analysis could be biased. To determine whether there is a relationship between participation and the speed with which members updated their signatures, we examined the message posts of all users who adopted either product during the observed period. We analyzed all messages posted in any of the six forums for any indication that a user adopted a product in a period before when their signature was updated. Of the 120 users who adopted the Core2Duo processor during the eight-week period, 7 were late in updating their signatures according to the contents of their message posts. Similarly, of the 136 users who adopted the NV8800 video card during the eight-week period, 10 were late in updating their signatures according to the contents of their message posts. We also performed a t-test on the number of posts made in the related brand forums by those who updated their signatures in a timely way versus those who did not. For the Core2Duo processor, the difference in participation in the AMD forum was statistically insignificant ($t(124) = .08$, $p = .936$), as was the difference in participation in the Intel forum ($t(124) = –.646$, $p = .519$). For the NV8800 graphics card, the difference in participation in the ATI forum was statistically insignificant ($t(146) = –.014$, $p = .989$), as was the difference in participation in the NVIDIA forum ($t(146) = –.365$, $p = .716$). These results suggest that the failure of some users to update their signatures in a timely manner did not bias the estimates of the relationship between participation and adoption behavior. Thus, from the nature of the forums and the results of these three separate analyses, we are confident that these signatures represent accurate measures of product adoption.

Measures

Next, we describe the variables and their operationalization. The summary statistics for each variable appear in Table 1.

Time to adoption. For each of the eight weeks, we observed each user to determine whether he or she adopted one of the two products. The time to adoption for each user is the number of weeks that have elapsed since each product was released. Time to adoption, measured in weeks, is the observed dependent variable.

Forum post variables. The forum post variables reflect the number of posts the user has made in each of the six observed forums in the prior six months in units of 100. These variables serve as measures of the level of participation in each forum.

Forum duration variables. The duration variables for each forum indicate the amount of time that has elapsed since the user made his or her first post in the respective

TABLE 1
Summary Statistics

Variable	M	SD
Time to adoption for Core2Duo	33.08	2.51
Time to adoption for NV8800	18.48	1.92
AMD posts	1.55	10.83
Intel posts	1.80	15.51
ATI posts	.91	5.84
NVIDIA posts	2.51	14.89
AMD duration	46.21	54.78
Intel duration	23.67	46.80
ATI duration	25.74	44.05
NVIDIA duration	32.11	44.18
Intel/AMD overlap	–.004	.444
NVIDIA/ATI overlap	.099	.420
Video posts	2.08	11.21
General posts	1.89	19.68
Total posts	359.24	787.40
Posts per day	.41	.78

[2]To ensure that the failure of a few users to update their signatures did not bias the results, we recoded the records of users who failed to report their purchase and reran the analyses. The results were almost identical and closely matched those for the original analysis; all the relationships were in the expected direction, and the outcome for each of the hypotheses remained exactly the same. We omit these results for the sake of brevity.

forum. These variables indicate the duration of the user's membership in each forum and are measured in years.

Forum overlap variables. These variables indicate the level of overlap in a user's participation in two competing forums. To calculate this variable, we computed the number of posts made in both forums. Next, we calculated the percentage of these posts that were made in each forum individually. Finally, we subtracted these percentages to create a variable ranging from 1 to –1. A value of 1 indicates that 100% of the user's posts were made in the first forum, and –1 indicates that 100% of the user's posts were made in the second forum. A value of 0 indicates that the user posted an equal number of messages in both forums.

General and video post variables. These variables indicate the number of posts the user has made in each of the general product category forums. They serve as a measure of participation in non-brand-related forums.

Total posts. This variable indicates the total number of posts the user has made across all 31 forums hosted by the Web site. There was a wide array of other forums available to users, including "for-sale" forums and forums dedicated to various uses of computers, such as networking. This variable is a measure of how generally active each user is in online forums.

Posts per day. We calculated this variable by dividing the total number of posts each user has made by the number of days that the account has existed. This variable reflects the general intensity with which each user participates in online forums.

Model and Estimation

We use a hazard modeling approach to examine the relationship between brand community membership and new product adoption. Because hazard models have been used extensively in the marketing literature to study adoption and diffusion in marketing (e.g., Prins and Verhoef 2007; Sinha and Chandrashekaran 1992), we provide only a cursory overview of the hazard model specifications. However, because unobserved heterogeneity has a potentially important role in our analysis, we motivate the discussion of the importance of controlling for unobserved heterogeneity with an example from our data and then provide the results of estimating the models.

The duration time for individual i can be viewed as a random variable having some probability density f(t) and a cumulative distribution function F(t). In characterizing the time to adoption, it is convenient to consider the hazard rate $h(t) \equiv f(t)/[1 - F(t)]$, which is the conditional likelihood that the event of interest occurred. A class of duration models, called "accelerated failure time (AFT) models," follows the parameterization:

$$\ln(t_j) = x_j\beta_x + \varepsilon_j. \quad (1)$$

The word "accelerated" is used to describe these models because rather than assuming a specific distribution for failure time itself, a distribution is assumed for τ_j:

$$\tau_j = \exp(-x_j\beta_x)t_j, \quad (2)$$

where $\exp(-x_j\beta_x)$ is the acceleration parameter. Thus, on the basis of the acceleration parameter, we can determine whether time passes at the normal rate, is accelerated, or is decelerated as a result of the occurrence of the event of interest. This model can be reparameterized as follows:

$$\ln(t_j) = x_j\beta_x + \ln(\tau_j), \quad (3)$$

where the distribution of $\ln(\tau_j)$ can now be specified (frequently used distributions include gamma, Weibull, lognormal, and Gompertz).

A particularly severe problem in the context of estimating hazard models is that associated with unobserved heterogeneity. To understand this in the context of our data, consider the possibility that our population consists of two subgroups of consumers: one with a distinct preference for Intel and one with a strong preference for AMD products. These preferences are unobserved and cannot be included as covariates in the hazard analysis. In this sense, the unobserved heterogeneity problem is just a special case of the omitted variables bias that is well known in the linear models literature. When faced with a new Intel product, the former group (in the jargon of hazard models, the one with a higher "risk of failing"; i.e., adopting Intel products) will exhibit a higher failure rate than the latter. As such, the proportion of Intel loyalists relative to the AMD loyalists will decline over time, and the population will become self-selected into those who are less likely to adopt Intel products. Consequently, the estimated hazard rate based on ignoring these subgroup differences will appear to decline, even though the hazard rates for the individual groups may actually be constant or rising over time. Thus, the crux of the problem is that estimating individual hazard rates while ignoring such unobserved heterogeneity underestimates the true hazard function. However, note that if the observed hazard rate is rising over time, this cannot be due to heterogeneity across people (Heckman and Singer 1982).

The most popular method of controlling for unobserved heterogeneity is the random-effects specification based on the seminal work of Flinn and Heckman (1982a, b) and Vaupel, Manton, and Stallard (1979). In the context of the proportional hazard (PH) model, $h(t|x_{it}) = h_0(t)\exp(x_{it}\beta)$, heterogeneity is incorporated as follows:

$$h(t|x_{it}) = h_0(t)\exp(x_{it}\beta + \tau_i), \quad (4)$$

where τ_i represents the random effects that follow a particular functional form for unobserved characteristics (Lancaster 1979, 1990). If we rewrite the hazard function as

$$h(t|x_{it}) = h_0(t)\exp(x_{it}\beta)\Psi(\theta), \quad (5)$$

where $\Psi(\theta) = \exp(\tau_i)$, the unobserved heterogeneity operates in a multiplicative manner on the baseline hazard. Thus, this captures the logic that some groups are intrinsically more or less likely than others to experience adoption. The estimation of this model yields parameter estimates for the βs as well as the variance of the heterogeneity distribution. These may be used to test the null hypothesis that the latter is zero and, thus, no different from the model without unobserved heterogeneity.

Our model estimation proceeded as follows: We began by estimating the PH model using the partial likelihood pro-

cedure developed by Cox (1975).[3] Next, we estimated the parametric PH model on the basis of various parametric distributions, such as the Weibull, Gompertz, lognormal, and exponential. From our estimates, the Weibull provided the best fit, with the Akaike information criterion for the Weibull, Gompertz, and exponential being 4062, 4270, and 5462, respectively. Thus, we report the results of the Weibull model and compare them with those of the Cox PH model. The results of the Weibull model are virtually identical, suggesting that they are not sensitive to the distributional assumptions. Finally, we reestimated the Weibull model to control for unobserved heterogeneity. Because all the specification tests suggested the importance of controlling for unobserved heterogeneity in our data, the subsequent discussion relies on the results of this model.

Results

Table 2 reports the results for the Cox PH model and the Weibull hazard model with unobserved heterogeneity for the adoption of Intel's Core2Duo processor. In addition, the table reports results for the base model and a model that includes a measure of overlap. For the base model without overlap, the results across the Cox PH model and the Weibull model are remarkably consistent. Notably, the Weibull shape parameter p is always greater than 1, implying a monotonically increasing hazard.

[3]In the event that there is little or no theoretical guidance for selecting among parametric approaches, the PH model that Cox (1975) proposes provides an appealing alternative because it does not rely on parametric assumptions for the underlying hazard distribution. Thus, the recommended approach is to use it as a reference model for assessing the results for sensitivity to the distributional assumptions made in the parametric model.

In each case, both participation variables are significant. In support of H_{1a}, the results for the Intel posts variable suggest that higher levels of participation in the Intel forum increase the likelihood of adopting Intel's new processor and accelerate the time to adoption when a comparable product is available. With regard to the coefficients for Intel posts in Table 2, the hazard ratio (i.e., the impact on the hazard of adoption) estimates from the Weibull model with unobserved heterogeneity suggest that posting 100 messages (approximately eight months' worth of posts for an average member) in the Intel forum increases the likelihood of adoption by 134.7% (2.347 – 1 = 1.347). The Weibull AFT model suggests that posting 100 messages in the Intel forum reduces the expected time of adoption to exp[ln(1) – .123] = .884 years for members who are expected to adopt in Year 1. In other words, the time to adoption is accelerated by approximately 1.5 months.

In support of H_{1b}, higher levels of participation in the AMD forum reduce the likelihood of adopting Intel's new product when a comparable product is available. For example, with regard to the coefficients for AMD posts in Table 2, the hazard ratio estimates from the Weibull model suggest that posting 100 messages (approximately eight months' worth of posts for an average member) in the AMD forum reduces the likelihood of adoption by 75.67% (.243 – 1 = –.757). The Weibull AFT model estimates state that posting 100 messages in the AMD forum increases the expected time of adoption to exp[ln(1) + .204] = 1.23 years for members who are expected to adopt in Year 1. Substantively, this would result in members delaying purchase by a full financial quarter. In a market characterized by rapid technological change and frequent product releases, such a delay has the potential to materially affect quarterly financial results. Therefore, these results support H_{1a} and H_{1b},

TABLE 2
Adoption of Intel's Core2Duo Processor

	Base Model			Model with Overlap		
	Cox PH Model	Weibull Hazard Model with Unobserved Heterogeneity		Cox PH Model	Weibull Hazard Model with Unobserved Heterogeneity	
Variables	Hazard Ratios	Hazard Ratios	AFT Metric	Hazard Ratios	Hazard Ratios	AFT Metric
AMD posts	.508 (.155)*	.243 (.123)**	.204 (.073)**	1.742 (.340)**	2.431 (.667)**	–.138 (.043)**
Intel posts	1.516 (.081)**	2.347 (.211)**	–.123 (.014)**	1.066 (.094)	1.237 (.151)	–.033 (.019)
General posts	.961 (.105)	.922 (.177)	.012 (.028)	.950 (.101)	.884 (.140)	.019 (.025)
Total posts (ln)	.611 (.020)**	.398 (.025)**	.133 (.008)**	.650 (.022)**	.486 (.026)**	.112 (.008)**
Posts per day (ln)	2.086 (.065)**	3.784 (.269)**	–.192 (.009)**	1.843 (.063)**	2.702 (.168)**	–.155 (.008)**
AMD duration	.864 (.036)**	.808 (.049)**	.031 (.009)**	.954 (.040)	.928 (.047)	.012 (.008)
Intel duration	1.293 (.051)**	1.505 (.092)**	–.059 (.051)**	1.145 (.049)**	1.190 (.063)**	–.027 (.008)**
Intel/AMD overlap				4.703 (.319)**	10.428 (1.168)**	–.365 (.047)**
Shape parameter p		6.930 (.348)			6.426 (.301)	
Test of H_0: $\theta = 0$		$p \geq .000$			$p \geq .000$	
Log-likelihood	–7892.634	–1964.054		–7616.046	–1598.645	

*$p < .05$.
**$p < .01$.

Notes: For the Cox PH model, the coefficients represent exp(β), whereas for the accelerated hazard models (AFT metric), the coefficients represent exp[ln(t) + β]. In the case of the AMD forum, the PH model estimates that posting 100 messages reduces the likelihood of adoption by (.243 – 1 = –75.7%). The Weibull AFT model estimates reflect the impact on time of adoption. For example, posting 100 messages in the AMD forum increases the expected time of adoption to exp[ln(1) + .204] = 1.23 years for members who are expected to adopt in Year 1 and to exp[ln(3) + .204] = 3.68 years for those who are expected to adopt in Year 3. The other coefficients are interpreted in a similar manner.

which state that participation increases the likelihood of adopting new products from the preferred brand and reduces the likelihood of adopting new products from competing brands.

Both membership duration variables are also statistically significant, lending support to H_{4a} and H_{4b}, which address cases in which a comparable product is available. The results for the Intel duration variable indicate that longer-term membership in the Intel forum increases the likelihood of adopting Intel's new processor and accelerates the time to adoption. Conversely, longer-term membership in the AMD forum reduces the likelihood of adopting Intel's new processor and decelerates the time to adoption. For example, with regard to the coefficients for AMD posts in Table 2, the PH model suggests that being a member of the AMD forum for one year reduces the likelihood of adoption by 19.16% (.808 – 1 = –.192). The Weibull AFT model estimates state that being a member of the AMD forum for one year increases the expected time of adoption to exp[ln(1) + .031] = 1.03 years for members who are expected to adopt in Year 1. Furthermore, the impact of both participation and membership duration remains significant and in the expected direction, even when we control for participation and membership across both forums. These findings support H_{4a} and H_{4b}, which predict that when a comparable product is available, longer-term membership increases the likelihood of adopting new products from the preferred brand and reduces the likelihood of adopting new products from competing brands.

The results for the remaining variables reported in Table 2 are also noteworthy. Participation in the non-brand-specific General Hardware forum does not have a significant impact on adoption behavior. This indicates that participation in this product-related but non-brand-specific forum does not alter adoption behavior. However, the total-number-of-posts variable has a statistically significant impact on adoption behavior and timing. Specifically, higher total post counts are associated with a reduced likelihood to adopt the new product and a decelerated time to adoption. In comparison, the posts-per-day variable is a measure of participation intensity across all the forums. Consistent with diffusion theory's emphasis on the role of information, our results suggest that higher levels of participation intensity are associated with a greater likelihood to adopt and an accelerated time to adoption. In other words, an accelerated rate of participation accelerates the time to adoption.

Table 3 reports the results for each of the models for the adoption of NVIDIA's 8800 series 3D video card. In this case, NVIDIA was the first to market with a product that implemented the 3D acceleration features present in Microsoft's new Windows Vista operating system. ATI had no equivalent product during the observed period. As a result, customers who were seeking a discrete 3D video card that supported the functions in Microsoft's most recent operating system had only one choice.

H_2 predicted that when the preferred brand is first to market with a new product, higher levels of participation in a brand community will increase the likelihood of adopting the new product. The results for the NVIDIA posts variable support H_2 and indicate that higher levels of participation increase the likelihood of adopting NVIDIA's new product and accelerate the time to adoption when the preferred brand is first to market. Indeed, the hazard ratio estimates from the Weibull model with unobserved heterogeneity suggest that posting 100 messages in the NVIDIA forum increases the likelihood of adoption by 1341.2% (14.412 – 1 = 13.412). Furthermore, posting 100 messages in the NVIDIA forum decreases the expected time of adoption for the NVIDIA product to .466 years for members who are expected to adopt in Year 1. In other words, the time to adoption is reduced by more than half to 6.4 months. Whereas posting in the NVIDIA forum has a dramatic impact on adoption behavior for the new NVIDIA product,

TABLE 3
Adoption of NVIDIA's 8800 Video Card

	Base Model			Model with Overlap		
	Cox PH Model	Weibull Hazard Model with Unobserved Heterogeneity		Cox PH Model	Weibull Hazard Model with Unobserved Heterogeneity	
Variables	Hazard Ratios	Hazard Ratios	AFT Metric	Hazard Ratios	Hazard Ratios	AFT Metric
ATI posts	.460 (.265)	.360 (.298)	.292 (.235)	5.718 (2.946)**	25.412 (19.493)**	–.970 (.233)**
NVIDIA posts	3.368 (.001)**	14.412 (3.393)**	–.764 (.068)**	1.940 (.249)**	4.513 (1.011)**	–.452 (.066)**
Video posts	.450 (.126)**	.175 (.081)**	.499 (.131)**	.525 (.151)*	.199 (.093)**	.485 (.139)**
General posts	.537 (.259)	.340 (.250)	.309 (.210)	.513 (.224)	.336 (.206)	.327 (.184)
Total posts (ln)	.559 (.023)**	.385 (.031)**	.273 (.021)**	.631 (.030)**	.501 (.036)**	.208 (.020)**
Posts per day (ln)	2.231 (.093)**	3.599 (.328)**	–.367 (.024)**	1.687 (.083)**	2.219 (.175)**	–.239 (.022)**
ATI duration	.929 (.056)	.926 (.081)	.022 (.025)	1.028 (.083)	1.043 (.083)	–.013 (.024)
NVIDIA duration	1.556 (.091)**	1.887 (.167)**	–.182 (.025)**	1.323 (.088)**	1.404 (.117)**	–.102 (.025)**
NVIDIA/ATI overlap				6.447 (.638)**	12.901 (2.040)**	–.767 (.046)**
Shape parameter p		3.493 (.230)			3.335 (.202)	
Test of H_0: $\theta = 0$		$p \geq .000$			$p \geq .000$	
Log-likelihood	–4707.898	–1798.925		–4514.413	–1587.658	

*$p < .05$.
**$p < .01$.

posting in the ATI forum does not have a statistically significant effect.

Unlike NVIDIA members, ATI members did not have a comparable product available from their preferred brand that supported Windows Vista's 3D acceleration abilities. As a result, ATI members faced a situation in which the first-to-market product was from a rival brand. In this case, H_3 predicted that contrary to conventional wisdom, higher levels of participation in the brand community will not alter the likelihood of adopting the rival's new product. From the results for the ATI posts variable in Table 3, we find that higher levels of participation in the ATI forum do not have a significant impact on the likelihood of adopting NVIDIA's new product or the timing of adoption. Furthermore, this result is consistent across both models. This lends support to H_3.

In terms of membership duration, H_5 predicted that when the preferred brand is first to market with a new product, longer-term membership in a brand community will increase the likelihood of adopting the new product. In support of H_5, the NVIDIA duration variable in Table 3 is statistically significant. This result indicates that longer-term membership in the forum is associated with a higher likelihood to adopt the new NVIDIA product and an accelerated time to adoption. Specifically, being a member of the NVIDIA forum for one year increases the likelihood of adoption by 88.7% (1.887 – 1 = .887). In addition, being a member of the NVIDIA forum for one year decreases the expected time of adoption for the NVIDIA product to .834 years for members who are expected to adopt in Year 1. Therefore, H_5 is supported.

However, the results for ATI membership duration are different. Faced with a first-to-market product from the rival brand, the ATI membership duration variable fails to achieve significance in any of the models. This indicates that longer-term membership in the ATI forum does not alter the likelihood or timing of adopting NVIDIA's new video card. This result supports H_6, which predicted that longer-term membership in a brand community will not alter the likelihood of adopting the new product when a competing brand is first to market.

The results for the remaining variables are consistent with those reported for Intel and AMD. Participation in the general forum does not have an impact on adoption behavior. Furthermore, the total number of posts reduces the likelihood of adoption, and higher levels of posting intensity increase the likelihood of adoption. Notably, the level of participation in the non-brand-specific forum dedicated specifically to the video card product category has a significant impact on adoption. Specifically, higher levels of participation in this forum are associated with a decrease in the likelihood of adopting NVIDIA's first-to-market new product and an increased time to adoption.

Impact of Overlap in Participation

Finally, H_7 predicted that overlap in participation across two brand communities will negate oppositional loyalty and result in a positive relationship between participation and adoption, regardless of brand. To test this hypothesis, we computed an overlap variable for each pair of brand forums. The values range from 1 to –1, with 0 indicating an equal level of participation between the two forums. We then reestimated each model with the overlap variable included; the results appear next to the base models in Tables 2 and 3.

Table 2 reports the results for the adoption of Intel's Core2Duo processor when the effect of overlap is included alongside the base model. In this case, a value of 1 for the overlap variable indicates that 100% of posts were in the Intel forum, and a value of –1 indicates that 100% of posts were in the AMD forum. The overlap variable itself has a statistically significant impact on adoption behavior, with the positive skew in participation in favor of the Intel forum serving to increase the likelihood of adopting Intel's new processor and accelerate the time to adoption. Specifically, if all the posts were in the Intel forum, the likelihood increases by 942.8% (10.428 – 1 = 9.428). Similarly, the time to adoption decreases to .694 years for members who were expected to adopt in Year 1. In other words, if a forum member posts exclusively in the Intel forum, there is a ninefold increase in the likelihood that a member will adopt the new Intel processor compared with a member who posts with an equal frequency in both the Intel and the AMD forums.

Moreover, the introduction of the overlap variable also has a dramatic effect on the Intel and AMD forum variables in the model. In particular, participation in the AMD forum goes from having a negative impact on the likelihood of adoption of the new Intel processor to having a positive one. In other words, when participation is statistically set to be equal across both forums, higher levels of participation in the AMD forum result in an increased (rather than decreased) likelihood to adopt the new Intel processor. Furthermore, duration of membership in the AMD forum no longer has a statistically significant impact on adoption behavior. In comparison, longer-term membership in the Intel forum still increases the likelihood of adoption. However, the impact of participation in the Intel forum is no longer statistically significant, though the coefficient is positive.

Table 3 reports the results for the adoption of NVIDIA's 8800 video card when overlap in participation is accounted for alongside the results for the base model. In this case, a value of 1 for the overlap variable indicates that 100% of posts were in the NVIDIA forum, and a value of –1 indicates that 100% of posts were in the ATI forum. The overlap variable is statistically significant, with the skew toward participating in the NVIDIA forum resulting in an increased likelihood to adopt NVIDIA's new video card. The results for the NVIDIA and ATI variables are consistent with those reported for Intel and AMD in Table 2. With equal participation across the two forums, higher levels of participation in the ATI forum result in an increased likelihood to adopt NVIDIA's new product. In addition, the coefficient for membership duration becomes positive but remains statistically significant. In the case of the NVIDIA forum, higher levels of participation and longer-term membership both result in an increased likelihood to adopt and an accelerated time to adoption. Specifically, we show that if all the posts were in the NVIDIA forum, the likelihood of adoption increases by 1190.1% (12.901 – 1 = 11.901). In addition,

the time to adoption decreases by more than half to .464 years for members who were expected to adopt in Year 1. Finally, the results for the remaining variables are unaltered by the introduction of the overlap variable.

Overall, the results in Tables 2 and 3 support H_7. When there is a high degree of overlap, oppositional loyalty is reduced. In this case, participation in both communities increases the likelihood of adoption and reduces the time to adopt the new product. Indeed, when the level of participation is equal across both forums, higher levels of participation in a forum increase the likelihood of adopting a new product from a rival brand. This represents a surprising reversal of the relationship between brand community participation and the adoption of rival products. Furthermore, this positive effect on adoption of rival products remains even when the level of participation in the competing brand's forum is included in the model.

This last finding is particularly worrisome for marketing managers who hope to benefit from brand communities. Specifically, marketing actions designed to increase participation in a company's brand community may actually backfire and increase the adoption of rival's products when there is a higher degree of overlap. Furthermore, although managers can generally observe the level of participation in their brand community, they cannot readily observe the degree to which members might be participating in rival brand communities. As a result, brand communities present marketing managers with a dilemma.

Sensitivity to Participation Interval and Endogeneity

The participation variables in the analysis were based on the number of posts each user made within the previous six months. To determine whether the results are sensitive to the specification of a six-month interval, we recomputed the participation variables according to the number of posts made in the previous year. We then reestimated the models for Tables 2 and 3; the results appear in Table 4.

Comparing the results for Intel's product in Table 2 with those in Table 4, we find that all the coefficients are in the expected direction, and the same variables achieve statistical significance. The pattern of results is also the same for NVIDIA's product when we compare Tables 3 and 4. As a result, H_1–H_6 are supported. In the case of the model with overlap, comparing Tables 2 and 3 with Table 4 indicates that the specification of the interval for computing participation had no impact. The results for the adoption of Intel's

TABLE 4
Adoption with One-Year Interval

	Base Model		Model with Overlap	
	Weibull Hazard Model with Unobserved Heterogeneity		Weibull Hazard Model with Unobserved Heterogeneity	
Variables	**Hazard Ratios**	**AFT Metric**	**Hazard Ratios**	**AFT Metric**
Adoption of Intel's Core2Duo Processor				
AMD posts	.505 (.107)**	.096 (.030)**	1.412 (.231)*	–.047 (.022)*
Intel posts	1.676 (.118)**	–.073 (.010)**	1.147 (.081)	–.019 (.010)*
General posts	1.101 (.153)	–.014 (.020)	1.084 (.133)	–.011 (.017)
Total posts (ln)	.401 (.024)**	.129 (.008)**	.426 (.044)**	.116 (.008)**
Posts per day (ln)	3.834 (.264)**	–.190 (.009)**	3.579 (.521)**	–.173 (.008)**
AMD duration	.823 (.049)**	.027 (.008)**	1.030 (.058)	–.004 (.008)
Intel duration	1.541 (.092)**	–.061 (.008)**	1.153 (.071)*	–.019 (.008)*
Intel/AMD overlap			7.722 (1.700)**	–.277 (.014)**
Shape parameter p	7.090 (.337)		7.381 (.834)	
Test of H_0: $\theta = 0$	$p \geq .000$		$p \geq .000$	
Log-likelihood	–2033.880		–1765.121	
Adoption of NVIDIA's 8800 Video Card				
ATI posts	1.077 (.561)	–.021 (.149)	11.190 (5.428)**	–.690 (.139)**
NVIDIA posts	3.060 (.319)**	–.321 (.032)**	2.265 (.253)**	–.234 (.032)**
Video posts	.780 (.221)	.071 (.081)	.501 (.147)*	.197 (.084)*
General posts	.430 (.164)*	.242 (.109)*	.431 (.163)*	.240 (.109)*
Total posts (ln)	.401 (.031)**	.262 (.021)**	.458 (.036)**	.223 (.021)**
Posts per day (ln)	3.437 (.295)**	–.354 (.023)**	2.696 (.237)**	–.283 (.022)**
ATI duration	.954 (.081)	.014 (.024)	1.204 (.101)*	–.053 (.024)*
NVIDIA duration	1.836 (.157)**	–.174 (.024)**	1.264 (.112)**	–.067 (.025)**
NVIDIA/ATI overlap			6.522 (.972)**	–.535 (.040)**
Shape parameter p	3.484 (.216)		3.502 (.221)	
Test of H_0: $\theta = 0$	$p \geq .000$		$p \geq .000$	
Log-likelihood	–1908.676		–1790.651	

*$p < .05$.
**$p < .01$.

product and NVIDIA's product are consistent for both intervals. Overall, the results for the one-year participation interval support H_7.

Finally, we consider the possibility that forum participation is endogenous (i.e., product adoption may make it more likely for members to participate in forums). For example, after adopting a new product, members may become more active because they have experiences to share or problems to discuss regarding the new product. To test for potential endogeneity in the member participation regressor, we estimated a two-stage least squares model (2SLS) with instrumental variables (Hayashi 2000) and performed both a Hausman test (Hausman 1983) and a test based on the generalized method of moments (GMM) estimator (Hansen 1982). The idea was to test the null hypothesis that the specified endogenous regressors (participation in Intel and AMD forums) can instead be treated as exogenous. The test statistic is distributed as chi-square with degrees of freedom equal to the number of regressors being tested as endogenous. Both tests failed to reject member participation as being exogenous in the adoption regression. The Hausman test, which tests whether the differences between the 2SLS estimates and the ordinary least squares (OLS) estimates are large enough to suggest that the OLS estimates are inconsistent, is 3.93 (p = .14) and fails to reject the hypothesis that the OLS estimates are inconsistent. The GMM estimator yields a test statistic of .046 (p = .83) and also fails to reject the exogeneity of forum participation. Thus, we conclude that our results do not suffer from the endogeneity bias.

Discussion and Implications

In this study, we examined the effects of brand community participation and membership duration on adoption behavior and identified important limiting conditions. In doing so, we contribute to the literature on new product adoption by exploring how and when brand communities may alter adoption behavior. This study is the first to link brand community participation and membership duration to actual adoption behavior. Furthermore, we extend prior research by examining the effects of participation and membership duration both within and across rival brand communities. This enabled us to detect simultaneously the presence of both loyalty and oppositional loyalty and to identify critical limiting conditions on their influence. Specifically, we find that oppositional loyalty is conditional on the presence of a comparable product. Finally, we contribute to the brand community literature by addressing the issue of overlapping community memberships. In doing so, we integrate the social identity and diffusion theory literature to predict how and when overlapping memberships will affect adoption behavior.

Our results show that higher levels of participation in a brand community lead to both loyalty and oppositional loyalty in adoption behavior. Higher levels of participation increase the likelihood that a person will adopt a new product from the preferred brand and accelerates the time to adoption. At the same time, participation reduces the likelihood that a person will adopt a product from a competing brand and decelerates the time to adoption. Membership duration in a brand community has a similar effect; it increases the likelihood that longer-term members will adopt a new product from the preferred brand and accelerates the time to adoption while reducing the likelihood that members will adopt a competing brand and decelerating the time to adoption.

However, these results are contingent on the presence of a comparable product from the preferred brand. Although in general prior literature on brand communities has assumed the presence of comparable products, this assumption does not hold when a company beats a competitor to market with a new product. We consider a case in which this assumption does not hold and find that the absence of an equivalent product from the preferred brand blunts the impact of participation on the likelihood of adopting products from rival brands. In markets with large brand communities, these results suggest that first movers realize significant advantages in the form of higher adoption rates and shorter times to adoption among members of rival communities as well as among members of their own communities.

Finally, we contribute to the brand community literature by examining the role of overlapping community memberships. Consistent with research on social identity but counter to the conventional view on brand community participation, our results indicate that overlapping memberships across rival brand communities can actually reverse the relationship between participation and the adoption of rival products. Specifically, when there is a high degree of overlap, higher levels of participation in one brand's community may actually increase the likelihood of adopting a new product from a rival brand. These results suggest that relative participation in rival forums and overlap in membership play a key role in how members react to new products.

Managerial Implications

The brand community literature indicates that brand communities are common and potentially valuable to marketers. This study offers some important insights into how marketers can tap into this potential value. By encouraging customers to join and participate in their brand community, companies can increase the willingness of customers to adopt their new products. Furthermore, encouraging customers to join and participate in the company's brand community can insulate the company from competitive pressure by reducing the likelihood that customers will adopt competing products. Finally, brand communities can be particularly valuable for companies that are the first to market with a new product. In this case, the company benefits from loyal adoption behavior from members of its community but is not penalized by oppositional loyalty from members of rival brand communities.

However, brand communities are not a magic bullet. Membership duration plays an important role in adoption behavior beyond participation rates. Therefore, companies should attempt to recruit potential members early and often. If a competitor has a larger brand community or builds one sooner, a company may find itself at a disadvantage. Yet even if a company succeeds in building a large brand com-

munity, the advantages are not guaranteed. To benefit from oppositional loyalty, a company must still offer a comparable product. Otherwise, members of its community will consider adopting new products from competing brands if a competitor manages to beat the company to market.

In addition, companies must convince their members to join and participate frequently in their community while avoiding joining and participating in rival brand communities. If a company's customers join multiple brand communities, the advantages offered by oppositional loyalty may be lost. In the presence of overlap, efforts to increase participation in the brand's community may actually backfire and benefit rivals. Given this prospect, marketing managers should first assess the degree to which members of their own community also participate in rival communities before seeking to promote it. Armed with this preliminary research, managers can then decide whether investments are warranted. Furthermore, such research might allow managers to selectively promote participation only among members who do not possess overlapping memberships.

Finally, these results may sound discouraging for companies that face rivals that enjoy large brand communities, such as Apple and Harley-Davidson. However, the findings suggest strategies that could even the playing field. A company can negate some of the advantages of a competitor's brand community by encouraging opposing members also to participate in the company's own brand community, thus increasing overlap in participation. In addition, a company can limit the impact of oppositional loyalty among opposing members by beating its competitors to market with new products. Finally, a company can extract more value from a smaller brand community by encouraging its members to focus their participation in the company's community and avoid competing brand communities.

Limitations and Further Research

The results should be viewed with the limitations of the study in mind. In turn, these limitations suggest future research opportunities. First, this study examined the adoption of two products from two product categories whose products typically range in price from $100 to $500. As such, these products are priced similarly to or are less expensive than products associated with previously studied brand communities, such as automobiles, Macintosh computers, and electronic personal digital assistants. Therefore, we expect that the results of this study will generalize to contexts that involve the adoption of products within a similar price range and above. However, further research should examine the degree to which these findings extend to inexpensive consumer goods that are purchased regularly, such as soda or detergent. The low price and frequent purchase intervals typical of such products could lead to a greater willingness on the part of brand community members to engage in trial behavior. Conversely, such trial purchases could be made for the purpose of reconfirming the superiority of the community's products and therefore might not result in repurchase behavior. Given the lack of research on frequently purchased low-cost products within the existing brand community literature, this is a promising area for future work.

Second, the products examined in this study are less visible than other products, such as cars, motorcycles, or sodas. In this regard, they are similar to products such as shampoo, DVD players, or audio speakers. Thus, the degree to which a product is consumed publicly or in a visible way might influence the behavior of brand community members. Indeed, many computer enthusiasts place stickers or "badges" on their computers to indicate which video cards and processors they own. Some owners even purchase transparent acrylic computer cases with internal lighting so that their products are clearly visible. This behavior suggests that visibility can play an important role in brand communities. Further research could explore the ways the visibility of a product influences the behavior of brand community members.

Finally, this study explored the relationship among membership duration, participation, and adoption behavior. Prior ethnographic research suggests that brand communities have the potential to influence adoption behavior through social identification and by exposing members to product information. Further research should explore the relative role of social identification versus product information in influencing member behavior. For example, exposure to product information might play a larger role in generating loyalty, whereas social identification might play a greater role in producing oppositional loyalty. The degree to which each of these mechanisms influences behavior has important theoretical and managerial implications. Specifically, a lack of product information among community members might be overcome with targeted advertising. However, such advertising might be less effective at overcoming oppositional loyalty if social identification is the primary driver of such behavior. These possibilities raise the prospect that marketing actions, such as advertising, are effective only in influencing the behavior of brand community members under certain conditions. Further research should explore the roles of identification and information in shaping the attitudes and behaviors of brand community members as well as possible interactions. Further research should also address the effectiveness of different marketing actions in influencing brand community members and the conditions under which they are most appropriate.

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