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ORIGINAL EMPIRICAL RESEARCH

Demand-side inertia factors and their benefits for innovativeness

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Abstract Inertia reflects a firm's inability to change or innovate and may be fostered by many sources. Though researchers have focused on internal inertia factors, we examine inertia factors within a firm's customer base: switching costs, customer preference stability, and network externalities. New products at 279 firms are examined to assess the role of these demand-side inertia factors in determining innovativeness and, ultimately, financial performance. The inertia factors are hypothesized to have differential innovativeness effects for early and late entrants. Overall, demand-side factors affect innovativeness positively, contrasting with firm-based factors (e.g., routines or assets), which typically inhibit innovativeness. Consumer preference stability is the only factor negatively related to innovativeness, though only for early entrants. Network externalities and switching costs increase innovativeness (particularly for early entrants). Demand-side inertia factors are critical determinants of innovativeness and may now be placed within the previously internally focused set of factors engendering early mover advantage.

Keywords Customer-based inertia · Innovativeness · Entry order · New product development

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Inertia, "the strong persistence of existing form and function" (Rumelt 1995, p. 103), is thought to have many sources and is typically viewed as detrimental to the performance of incumbent firms (Ghemawat 1991; Leonard-Barton 1992). This "lack of plasticity" (as Rumelt refers to inertia) is often shaped by factors within the firm, such as investments in specialized assets and organizational routines that inhibit innovation (Hannan and Freeman 1984; Rothaermel and Hill 2005). However, inertia induced by a firm's customers may also impact strategic incentives to innovate. Consider a firm whose prior products have formed a base of loyal customers with stable, well-established preferences. The firm will likely prioritize serving its loyal customers, giving it little incentive to innovate in ways that are unaligned with current preferences, potentially leaving the firm vulnerable to competitors and disruptive technologies (Chandy and Tellis 1998; Christensen and Bower 1996; Fang 2008). Inertia factors—determinants of inertia in a firm's innovation or product development efforts—may therefore relate to supply-side characteristics of the firm (assets, routines, etc.) or demand-side characteristics of the customer market (switching costs, etc.).

Most prior research has investigated the role of supply-side inertia factors on firm performance and innovativeness (cf. Vlaar et al. 2005), while considerably less attention has been paid to demand-side factors (Adner and Zemsky 2006; Henderson 2006; Mueller 1997). Demand-side inertia factors are thought to fall into three categories: customer switching costs, stability and entrenchment of customer preferences, and network externalities (Lieberman and Montgomery 1998). There is some suspicion that demand-side factors may not inhibit innovation as much as supply-side inertia factors (Mueller 1997), but this has not yet been established. Demand-side inertia factors may actually lead to beneficial firm performance in certain situations. A substantial base of networked customers may help a firm effectively communicate the advantages of an innovative new product and accelerate sales (Tellis et al. 2009). A successful early incumbent may also be able to establish brand loyalty and other types of switching costs to its benefit (Wang and Wen 1998).

Despite potential benefits to a firm arising from demand-side inertia factors, it is not empirically clear whether or when such advantages may occur. Also unclear is whether demand-side inertia effects are of greater benefit to an early entrant incumbent relative to a later entrant. For example, in markets that have experienced substantial growth, the incumbent has incentive to focus on its current customer base, leaving new entrants to capitalize on the influx of new customers (e.g., Shankar and Bayus 2003). The inertia inherent to a large installed customer base may thus inhibit early entrant innovation but foster innovation by later entrants. At the same time, a firm may be able to leverage demand-side effects by developing new products that reinforce switching costs (e.g., Klemperer 1995) or improve the benefits most valued by its installed base (Basu et al. 2003). We expect substantial differences in the effects of the demand-side inertia factors between early and late entrants. Late entrants are relatively free of any "lock-in" from existing customer relationships, meaning that their innovation effects (potentially both positive and negative) from these demand-side factors should be attenuated.

Unfortunately, empirical evidence of demand-side inertia effects is relatively spare; the collective effects of demand-side factors on innovativeness are yet to be examined. Network externalities have perhaps received the most attention, but the conclusions are mixed as to whether and when a firm can benefit from strong network effects (Choi 1997; Tellis et al. 2009). Switching costs studies make inferences from purchase behavior (Chen and Hitt 2002; Dubé et al. 2009), but few direct links between switching costs and innovativeness have been considered. The role of customer preference stability on new product innovativeness also lacks direct empirical testing. Overall, empirical research to date has not fully demonstrated the conditions under which demand-side inertia factors impede or promote innovativeness. Perhaps as a consequence, many firms struggle with inertia stemming from a variety of sources. Writing for *Fortune*, Birkinshaw (2011) illustrates the managerial challenge: "Blockbuster, HMV, Nokia, and Yahoo are all current examples of companies that are … trying to adapt, but are being held back by powerful and often invisible, inertial forces". Here, we attempt make these factors more visible and understood. To place the effects of these demand-side inertia forces in theoretical context, we build upon first-mover advantage (FMA) theory, which heretofore has primarily focused on internal resources and preemption in market space to bestow advantage to early movers. To extend FMA theory to incorporate demand-side forces, we draw upon two theories that inform our perspective of potential inertia factors: the resource-based view (RBV) of the firm and economic theory of demand.

The goal of this research is to investigate the role of demand-side inertia factors in determining a firm's innovative activities and new product performance. We focus on three demand-side inertia factors: switching costs, customer preference stability, and network externalities. As will be discussed in the following section, this set of factors has been suspected (but not shown) to play a part in determining early mover (dis)advantage (Lieberman and Montgomery 1998; Mueller 1997; Suarez and Lanzolla 2007). Demand-side inertia factors encompass the forces locking in customers to an incumbent product. Customers are averse to switching costs, slow to abandon a product within a network of other users, and unlikely to discard a preferred brand (Mueller 1997).

Both the theorization of the demand-side effects presented here and the empirical testing of the three demand-side factors in concert are novel and allow this study to contribute meaningfully to first-mover advantage theory. This theorization is necessary to extend the vision of earlier scholars (Lieberman and Montgomery 1998; Mueller 1997) who speculate that these demand-side factors may be influential without fully explicating the mechanisms by which these effects occur. Drawing on RBV and economic theory of demand, we develop a theoretically informed conceptualization of the important role customers have in determining early entrant innovativeness (through the demand-side factors). Empirical testing of all three demand-side factors using a large sample of new product development organizations is necessary to confirm our conceptualization, gauge the impact of the demand-side factors, and understand the individual effects of each factor after controlling for the other factors. Taking this untrodden approach, we show that the demand-side factors are not always the drag on innovativeness they are often assumed to be. Thus, this study contributes to first-mover advantage theory by demonstrating the influence of demand-side factors in determining the advantage of early movers. Particularly, we show that switching costs and network externalities should be included among the set of resources endowing an early mover advantage. While earlier research has developed our understanding of how internal firm resources such as brands (Niedrich and Swain 2003) or location based preemption (Lieberman and Montgomery 1988) lead to advantages for early movers, FMA theory's previous focus on early entrants' internal resources that bestow advantage can no longer be considered complete. Introducing demand-side factors into the set of factors known to generate an early mover advantage marks a notable advancement with respect to first-mover advantage theory.

The remainder of this manuscript is organized as follows. First, we examine the demand-side inertia factors and their relevance to firm innovativeness. We then develop our conceptual model and hypotheses, describe our empirical study, and discuss the results.

Demand-side inertia factors and innovativeness

Inertia fundamentally relates to a firm's activities and routines to accomplish certain tasks (such as developing new products), with inert firms being slow to change relative to competitors or evolving market conditions (Hannan and Freeman 1984; Rumelt 1995). Prior research has frequently examined inertia effects on product innovativeness and new product outcomes, since innovativeness relates closely to a firm's ability to change in light of new technologies or market opportunities (Chandy et al. 2003; Chandy and Tellis 2000; Ghemawat 1991). Consistent with prior research related to inertia (e.g., Chandy et al. 2003; Marinova 2004), we take a strategic perspective by considering the firm's innovative activities (both market and technological) and, ultimately, financial new product performance. Our emphasis is on how demand-side inertia impacts what the firm does and how its new products perform (not how customers perceive new product introductions). Inertia in general would suggest a lack of innovativeness, although the demand-side factors that may inhibit a firm's ability to innovate are not yet well understood due to a paucity of research (Adner and Zemsky 2006; Henderson 2006). Before presenting our conceptual model and hypotheses, we (1) identify and define the relevant demand-side inertia factors, (2) relate the demand-side factors to relevant theoretical foundations with implications for innovativeness and incumbent performance, and (3) describe the specific dimensions of innovativeness and new product outcomes used to study inertia effects here.

Theoretical overview of demand-side inertia factors

Effects of inertia are most often studied in the context of entry order and first-mover advantage. FMA theory has primarily attempted to identify the firm-level resources allowing firms to benefit from being a first-mover, as well as methods of protecting a first-mover advantage from later imitators (Suarez and Lanzolla 2007). There have been several perspectives as to what constitutes a first-mover (see Lieberman and Montgomery 1990). In our discussion we consider the first-mover as the first firm to sell in a new product category (consistent with Golder and Tellis' (1993) notion of the market pioneer) rather than the first to merely develop a technology. Note that not all incumbents are first-movers, so incumbency (i.e., firms with prior selling experience in a given product market; Helfat and Lieberman 2002) is a broader topic.

In theorizing the effects of supply-side inertia factors, FMA theory has been closely linked with the resource-based view (RBV) of the firm (Lieberman and Montgomery 1988, 1998; Suarez and Lanzolla 2007; Varadarajan et al. 2008). The RBV posits that resources that are valuable, rare, inimitable, and non-substitutable will lead to superior performance (Barney 1986; Wernerfelt 1984); innovativeness itself has been considered a valuable resource of the firm (Menguc and Auh 2006). Innovativeness has been well established as a valuable source of competitive advantage (see Rubera and Kirca 2012; Szymanski et al. 2007). Despite its value, higher degrees of innovativeness are relatively rare compared to incrementalism (e.g., Banbury and Mitchell 1995). Innovativeness can be idiosyncratic and deeply related to organizational culture, often rendering innovativeness inimitable (Verona 1999). Intellectual property protection often ensures that a barrier accompanies innovativeness, such that competitors often cannot counter innovativeness with products that constitute perfect substitutes (Foss and Foss 2005).

Studies of first-mover advantage drawing on RBV theory have discussed customer-based resources in addition to typical supply-side factors such as specialized assets (e.g., Lieberman and Montgomery 1998), generally positing that early entrants can preempt scarce resources to its potential advantage. For the demand-side perspective, this means the firm preemptively captures or locks in a beneficial portion of the customer market, establishing a large installed base and/or creating barriers for competitors such as switching costs. Accordingly, RBV theory is a useful lens to understand the effects of demand-side factors, just as it has been earlier applied to supply-side inertia factors.

Customers do not automatically buy any one firm's products but instead purchase based on their preferences. Economic theory of demand accounts for individual consumption preferences under constraints (Bohm and Haller 1987), and it informs our perspective on how customer preferences arise and lead to purchase decisions. Indeed, economic theories of customer preferences are part of early expositions of FMA theory (e.g., Schmalensee 1982 on preference uncertainty) and RBV extensions treating customers as resources (e.g., Wernerfelt 1991 on brand loyalty).

Lieberman and Montgomery (1998) extended supply-side aspects of FMA theory to identify three categories of demand-side "resources" existing "at the level of the customer" (p. 1113): customer preference evolution, switching costs, and network externalities. Although all but network externalities were also developed earlier as part of FMA theory in Lieberman and Montgomery (1988), network externalities and switching costs are theoretically similar in that they reflect customer valuations for different forms of compatibility (Farrell and Klemperer 2007). Just as RBV and economic theory of demand are closely tied with respect to supply-side inertia factors based on resources and capabilities (Wernerfelt 1984), the demand-side factors analogously relate to economic theories of demand arising from customer preferences. Customer preference formation and uncertainty have been applied to early theoretical models of order-of-entry effects that consider an incumbent's "preemption" of differentiated perceptual space valued by customers

(Carpenter and Nakamoto 1990; Schmalensee 1982). Changes in customer preferences can critically affect whether such an initially advantageous product position can carry forward to an incumbent's sustainable advantage (Bohlmann et al. 2002). Switching costs and network externalities also are fundamental economic concepts that influence demand and hold implications for differential performance among incumbents and later entrants (Farrell and Klemperer 2007). An incumbent may be able to accrue a larger and more loyal installed base of customers, forming an entry barrier.

A few studies based on economic theory of demand and RBV consider demand-side factors more comprehensively. The theoretical exposition in Mueller (1997) explicitly notes customer switching costs, network externalities, buyer uncertainty, and habit formation; the latter factors both reflect particular facets of customer preferences and their formation over time. Suarez and Lanzolla (2007) establish the same demand-side concepts in their more general framework of FMA theory, while Varadarajan et al. (2008) draw (in part) on these demand-side factors to develop a conceptual framework pertaining to internet-enabled markets.

Our study therefore utilizes the three primary demand-side inertia factors identified by FMA theory and its foundations in RBV and economic theory of demand—switching costs, customer preference evolution, and network externalities. We next provide brief definitions of each demand-side factor as utilized in our study.

Switching costs, our first demand-side factor, "result from a customer's desire for compatibility between his current purchase and a previous investment" (Klemperer 1995, p. 517). Switching costs are defined as the costs (including effort) that customers associate with the process of switching from one provider to another (Burnham et al. 2003). Switching costs need not be monetary. There are many types of potential switching costs, including economic costs, search costs, learning costs, habit, emotional costs, and even perceived social risk and cognitive effort (Burnham et al. 2003; Fornell 1992). We take this more general view of switching costs in our study. For instance, a company adopting customer relationship management (CRM) software faces substantial costs—not only in terms of purchase price but also in terms of time and effort to train employees to use the system. If migrating to a different software package requires an additional investment in re-training, the switching costs help lock in customers to their current supplier.

Lieberman and Montgomery (1998) discuss customer preference evolution and network externalities as demand-side resources potentially benefiting first-movers. To more readily link to potential inertia effects, we utilize preference stability, or a lack of preference evolution, as the second demand-side factor we study. Customer preference stability is the extent to which customers have developed well-defined, entrenched preferences with respect to a product category. More strongly formed customer preferences would be relatively consistent, while weakly formed preferences would be more nebulous or ambiguous and therefore prone to change (West et al. 1996). Network externalities, the third demand-side factor, also relate to customer preferences. Products under network externalities provide increasing utility (preference) from consumption as the number of other users who consume the same product increases (Katz and Shapiro 1985). A social networking service gives customers greater value when more people are part of the network (direct externality) and when more devices and complementary software solutions exist to help customers connect with and manage their social network activities (indirect).

Although the three demand-side factors are well-established within the underlying foundations of RBV, FMA, and economic theory of demand, demand-side applications are lacking in two main areas: (1) assessing how the demand-side factors generate inertia in a firm's innovativeness, and (2) determining whether or not demand-side inertia is generally advantageous to the firm. Before presenting our conceptual model and specific hypotheses, we first outline potential innovativeness effects of the demand-side inertia factors based on the relevant underlying theories.

Demand-side factor effects on innovativeness

Little work has been done to ascertain or formally theorize the effects of demand-side inertia factors on firm activities and outcomes, particularly as they relate to innovation (Henderson 2006). Although a comprehensive review of inertia factors is lacking, we draw on relevant theories to describe how the three demand-side inertia factors may influence innovativeness and new product performance. Our focus is the impact that demand-side factors may have on a firm's ability to innovate. Inertia will often manifest itself in a lack of innovativeness since the firm becomes unable or unwilling to enact needed change in the form of new product opportunities. However, it is not clear whether demand-side inertia factors will have a detrimental effect on innovativeness and subsequent new product performance.

As noted by Lieberman and Montgomery (1988), switching costs may be beneficial to a firm since a competitor must invest more to steal customers away, particularly if customers have been "locked in" or become brand loyal (Wernerfelt 1991). However, this might make earlier entrant firms less innovative. If the early entrant's customers would encounter high switching costs when switching to another product, the early entrant might therefore be reluctant to innovate to avoid alienating these customers. Similarly, more stable and less ambiguous customer preferences lead customers to prefer more continuous innovations consistent with their entrenched product knowledge (Moreau et al. 2001). Firms are more likely to be compatible with these stable market expectations, as their organizational routines become attuned to meeting these preferences in familiar, less innovative product offerings (Henderson 1993). Likewise, network externalities may generate inertia in innovativeness in several ways. Customers may be shy to abandon a product with a large network of fellow users (the "penguin effect," Farrell and Saloner 1986) since customers consider the value of being part of the network in determining their demand preferences, meaning that incumbent firms may maintain current products longer. A large customer base may also lead to fear of product cannibalization (Chandy and Tellis 1998), such that a firm hesitates to introduce product innovations.

Although the demand-side inertia factors may thus appear to foster a lack of innovativeness in a firm's new products, a paucity of prior research makes this an open question. Even if demand-side factors generate inertia in a firm's product development efforts, it is unclear whether this would work to the firm's advantage or disadvantage. In particular, any discussion of innovativeness and subsequent new product performance should recognize potential differences between early and late entrant firms, since the demand-side factors develop over time and may affect some firms positively and others negatively. Just as valuable supply-side resources contributing to new product development develop over time (Verona 1999), demand-side resources also accumulate and thus impact early and late entrants differently. Consider the potential effects of demand-side inertia factors on an early entrant's performance (Table 1). An early entrant will have more time to establish switching costs and generate brand loyalty to lock in customers (Wernerfelt 1991). However, if the market is rapidly growing the incumbent firm may have difficulty taking advantage of loyalty while simultaneously acquiring new customers, decreasing overall performance (Beggs and Klemperer 1992). An early entrant may be able to shape customer preferences to its favor (Carpenter and Nakamoto 1989), but an emerging customer market with different preferences leaves the incumbent vulnerable to disruptive innovations by later entrants (Adner and Zemsky 2006; Christensen and Bower 1996). An early entrant may also be vulnerable even if it enjoys a large installed base. Strong network effects increase the customer's value derived from the product and the firm's ability to communicate product advantages to customers (Farrell and Saloner 1986; Tellis et al. 2009). However, rapid market growth can erode the initial installed base advantage, and customers may quickly abandon the early entrant if they feel stranded in an inferior product technology (Berndt et al. 2003; Choi 1997). Many of the performance implications depend on what the firm (whether early or late entrant) decides is the best approach to product innovation. For example, an early entrant need not fall victim to competitor innovativeness under strong externalities if it introduces a compatible next-generation product (Wang et al. 2010).

In total, the demand-based inertia factors may not always inhibit innovativeness. Importantly, the demand-based factors may incentivize innovation geared to new markets (e.g., if switching costs are high for current customers) or innovation through new technologies (e.g., if network effects promote product improvements). Next, we describe the relevant dimensions of innovativeness.

Innovativeness and performance

To more clearly understand the potential effects of demand-side inertia factors, we examine multiple aspects of innovativeness. Researchers have increasingly found insights from examining multiple dimensions of innovativeness (Atuahene-Gima 1995; Lee and O'Connor 2003; Song and Montoya-Weiss 2001), in particular the degrees of technological and market innovativeness (Sethi et al. 2012; Zhou et al. 2005). Technological innovativeness is the extent that product development requires new technologies or sets of engineering and design activities to develop the new product (Danneels and Kleinschmidt 2001). Market innovativeness is the extent that a developed product requires new marketing activities for the firm compared to previous product offerings (Garcia and Calantone 2002). Activities which would be considered innovative to the market include shifts in retail channel choice, adopting a novel pricing scheme, or dealing with a new set of competitors. Consistent with Henderson (1993), both dimensions of innovativeness range between incremental to the firm and radical to the firm (a common scaling in innovation research; Garcia and Calantone 2002). The market and technological innovativeness constructs concern the internal change required to offer new products and serve new markets,

Table 1 Potential effects of demand-side inertia factors on an early entrant's performance

	Potential advantages	Potential disadvantages
Switching costs	Generate brand loyalty and customer lock-in	Rapid influx of new customers may be discounted in favor of existing loyal customers
Preference stability	Preferences stabilize around the early entrant's product	A disruptive innovation aligns better with an emerging market
Network externalities	Large installed base under strong network effects increases product value	Installed base less significant under rapid market growth, or if product quality suffers

not directly the change required by customers in those markets. The firm-based view of innovativeness is aligned with the concept of inertia as we have described. Firms laden with inertia may be unable or unwilling to substantially change or innovate both their existing product offerings (Gilbert 2005) and the way they reach customers through various channel structures (Grewal and Dharwadkar 2002). Thus, a firm lacking in one or both dimensions of innovativeness can be viewed as a manifestation of inertia. The open research question is how and whether the three demand-based factors actually translate into inertia in innovativeness. In developing our conceptual framework and hypotheses, we draw upon the relevant FMA, RBV, and economic theories to relate the demand-side factors to a firm's innovativeness.

We also consider financial new product performance as an outcome of the two dimensions of innovativeness. This construct focuses on measures of profitability. Research on the effects of inertia and entry order have called for greater use of profit performance (Lieberman and Montgomery 1998). Early entrants may enjoy a sales advantage but suffer in profits due to higher costs (Boulding and Christen 2003), thus financial performance provides a more desirable, comprehensive perspective.

Conceptual model and hypotheses

Our theoretical overview summarized the three primary demand-side inertia factors and their foundations in RBV, FMA, and economic theory of demand. Links to an incumbent firm's innovativeness were discussed, along with the theoretical bases for potential differences among early and late entrants. Our resulting conceptual model is presented in Fig. 1, depicting the various relationships. Effects of the three demand-side inertia factors on both market and technological innovativeness are shown, noting the differential

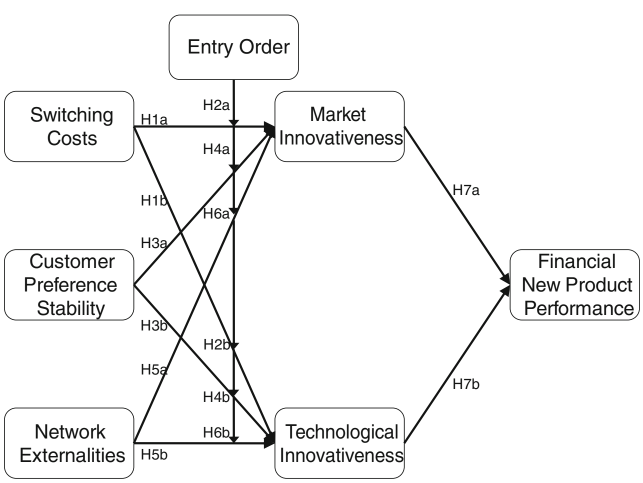

Fig. 1 Conceptual model

effects hypothesized for early and late entrants. As mentioned, we also examine how innovativeness in turn affects financial new product performance. We discuss details of these relationships in developing the specific hypotheses noted in the conceptual model. For each demand-side factor, we explicate the hypothesized effects on market and technological innovativeness, and posit moderating effects of early versus late entry.

Switching cost effects on innovativeness

Burnham et al. (2003) posit three general types of switching costs: (1) procedural, such as learning or set-up costs, (2) relational, such as psychological costs of abandoning a favored brand, and (3) financial, such as contractual fees. Financial considerations appear to be the weakest element in determining switching costs (Burnham et al. 2003), suggesting that switching costs are based on an overall evaluation that includes non-financial "costs" (see also Dubé et al. 2009). All else equal, by definition higher switching costs will be encountered when buying a more innovative product as innovation often requires the customer to modify behaviors (Garcia and Calantone 2002). However, a firm must determine—in light of potential switching costs related to its new product—how innovative the new product should be. Importantly, here switching costs concern all potential customers, rather than referring only to existing customers.

RBV and FMA theories suggest that investments in new markets will have superior returns if they lead to a sustained (i.e., locked in) and larger customer base (Lieberman and Montgomery 1988). From an economic theory perspective, high switching costs also increase incentives for firms to engage new sets of customers through innovation (Farrell and Shapiro 1988; Sheremata 2004). If successful in expanding into a new market, the value of market share gains is increased under switching costs, given that share is likely to be sustained into the future. This added incentive to increase market share under switching costs makes the pursuit of market innovation more likely. Since short-term market share will be a strong determinant of future profitability under switching costs (Farrell and Shapiro 1988), activities such as discounting and pursuit of non-conventional channels will be more common. In the situation where switching costs make it unlikely that customers will migrate to alternative technologies, competing firms are likely to focus on market innovations, such as pricing or brand, to differentiate from competitors.

The firm also considers switching costs in determining technological innovativeness. Technological innovativeness is one way that firms can pursue locked-in customers of competitors. Substantial technological innovations allow the firm to provide dramatically more benefit to customers, potentially overcoming lock-in effects from switching costs. Thus, switching costs may encourage more substantial efforts at technological innovation. Economic models suggest that incremental technological innovations will likely not be enough to attract competitors' customers unwilling to face switching costs for only a marginal improvement (Ghemawat 1991). Under switching costs, firms "must provide value that exceeds the cost of switching" (Sheremata 2004, p. 368), achievable through the benefits of an innovative product. In addition, loyalty-based switching costs encourage customers to stay with the firm and recognize the improved benefits the new product may provide (see Chen and Hitt 2002). Similarly, the loyalty-based benefits of umbrella branding, established in both the RBV and economics literatures, allows a firm to better convey the quality of product improvements (Wernerfelt 1991). The implication is that a given degree of innovativeness is likely more beneficial to the firm under higher loyalty-based switching costs. The loyalty and relationship stability often accompanying high switching costs also means the firm is better at knowing which type of technological innovativeness will best appeal to customers (Rindfleisch and Moorman 2001).

Arguments also exist supporting a negative relationship between switching costs and innovativeness. Since customers will not wish to incur switching costs, they may implicitly (or even explicitly) encourage incumbent firms to scale back innovation efforts. When customers face switching costs to migrate away from their current offerings, providers may be unlikely to launch novel offerings out of fear of alienating their existing customer bases (Krafft and Salies 2008). Despite the existence of these counter-arguments, we expect switching costs to relate to market and technological innovativeness as follows:

H1: A new product's (a) market and (b) technological innovativeness will be higher under greater customer switching costs.

FMA studies utilizing RBV and economic theory of demand suggest that an early entrant can better establish loyalty and other switching costs to its advantage (Lieberman and Montgomery 1988; Wang and Wen 1998; Wernerfelt 1991). The question is whether an early entrant has greater incentive to innovate, relative to later entrants, under higher switching costs. Switching costs foster customer loyalty, such that earlier entrants are more likely to possess stronger, longer lasting and forward-looking customer relationships; past repatronage is closely related to future repatronage (LaBarbera and Mazursky 1983). A customer's economic preference to remain loyal to an early entrant provider under switching costs is strengthened due to a longer learning period with the supplier's products as well as a more deeply based connection with the early entrant supplier's brand when compared to late entrants. Customers' greater economic preference to remain loyal to early entrants under switching costs provides added impetus for these early entrants to innovate for three reasons. First, since customers of early entrant suppliers are more likely to adapt purchase behavior due to more established loyalty to their preferred brand (Verbeke et al. 1998), early entrants have added incentive to pursue market innovation. Second, since customers' economic preference to remain loyal makes them more likely to engage with a supplier and exchange fine-grained product development preferences, this allows early entrant suppliers to innovate more successfully based on deep customer knowledge in markets with switching costs (Bonner and Walker 2004; Rindfleisch and Moorman 2001). Finally, the benefits of an innovative new product can be more easily and effectively communicated to customers tied to the firm long-term through switching costs (Chen and Hitt 2002), providing additional incentive to innovate.

The longer period of time that customers have (in general) been using an early entrant's products under switching costs should impact market innovativeness. Long-time users have a greater dependency on the product or brand and are less likely to defect to a competitive offering (e.g., Zauberman 2003). Customers' preferences evolve over time such that demand preferences favor more familiar providers (Tellis 1988), since customers are constantly becoming more familiar with, and learning more about, the product being used (Osborne 2011). Under switching costs, early entrant firms are afforded the strategic freedom to pursue non-traditional business models (i.e., market innovativeness) once customers' economic preference is firmly established through extended product specific learning and familiarity with a brand (Burnham et al. 2003). Loyal customers of early entrants are reluctant to switch from long-trusted product offerings and are more likely to overcome obstacles in adapting their purchase behaviors, such as purchasing through an alternate channel. A strong brand is also linked to greater diversification into other related markets (Chatterjee and Wernerfelt 1991).

Successful technological innovation requires knowledge about customer needs and close interactions with customers (von Hippel 2005). Strong customer relationships enable the exchange of information critical to innovativeness and creativity in new product development relationships (Rindfleisch and Moorman 2001). Customers of late entrants are less likely to contribute to product innovation efforts until trust and commitment are established (Walter 2003), making it more difficult for the later entrant to leverage customer relationships to benefit their innovation efforts. Stated differently, early entrants with stronger customer relationships are better able to recognize what constitutes successful innovation and therefore may be more willing to take on the risk innovativeness entails, versus later entrants that may lack such strong customer relationships (and accompanying foresight).

As already discussed, higher switching costs can enable the firm to better convey to customers the benefits of a new product (Chen and Hitt 2002; Wernerfelt 1991). An early entrant that has had more time to develop loyalty will thus have greater incentive to innovate product improvements (i.e., technological innovativeness) to which customers will respond favorably. Later entrants attempting to innovate will be less likely to enjoy such loyalty-based benefits. Customer relationships can be seen as important "boundary resources" to the firm, particularly where customers are tied to the firm long-term (Gouthier and Schmid 2003). Since these customers become more integrated in firm activities (such as NPD) over time, earlier entrants are more capable of harnessing these locked-in customers (i.e., deploying boundary resources) to aid innovativeness.

H2: The proposed positive effects of switching costs on (a) market and (b) technological innovativeness will be greater for early entrants than for late entrants.

Customer preference stability effects on innovativeness

Customer preferences for products tend to form over time, with early entrant products often defining customer expectations and the product features customers value most (Carpenter and Nakamoto 1989). An early entrant is thereby able to preempt valuable perceptual space (i.e., the positioning most preferred by customers) to its potential advantage, as demonstrated in numerous FMA studies drawing from RBV and economic theory of demand (Bohlmann et al. 2002; Carpenter and Nakamoto 1990; Lieberman and Montgomery 1998). As customer preferences stabilize and become less ambiguous, however, incumbent firms will have difficulty introducing new products that counter expectations or force customers to change preference valuations (Moreau et al. 2001). For example, incumbents often succumb to disruptive technologies since they focus on entrenched customer preferences rather than attributes that an emerging customer segment prefers (Adner 2002; Christensen and Bower 1996). Under preference stability, customers have (1) entrenched or relatively static preference valuations and (2) new product expectations that are incremental or more consistent with current product offerings. Under these conditions, a firm is usually better off investing in building current brands rather than new product development (Ofek and Sarvary 2003).

In general, FMA theory thus suggests that an incumbent's initial preference-based advantage is more sustainable under customer preference stability (Boulding and Christen 2003). More stable customer preferences will motivate firms to be less innovative in their product development efforts to better meet needs associated with entrenched preferences. Market innovativeness will be lower under high preference stability since preferences and shopping habits will be well-defined, and customers will have little motivation to place new products in their consideration sets (Kardes and Kalyanaram 1992). Preference stability will also inhibit technological innovativeness since customers will not be motivated to learn about new features or technologies (e.g., Wood and Lynch 2002), and firms will not want to go against customer expectations (Bridges et al. 1995). Thus,

H3: A new product's (a) market and (b) technological innovativeness will be lower under greater customer preference stability.

In assessing preference stability effects, it is important to consider the process through which preference formation occurs. Early entrants typically influence initially ambiguous customer preferences (Carpenter and Nakamoto 1989) such that as preferences stabilize, customers favor products of the early entrant over those of later entrants (the serial branding effect; Alpert and Kamins 1994). This forces later entrants to become more technologically innovative if they hope to compete or overtake such preference advantages of an early entrant (Bohlmann et al. 2002). The early entrant, on the other hand, will seek to exploit its preference-based advantage by maintaining consistency with these customer expectations and preferences. FMA theory therefore suggests that under entrenched preferences, later entrants have more incentive to technologically innovate than do early entrants hoping to sustain an initial advantage.

By not pursuing market innovativeness through new channels, the early entrant can stay consistent with its entrenched customer expectations. In markets with stable customer preferences, early entrants are strongly motivated to retain long-term customers. Thus, this tendency stifles early entrant market innovativeness. Customers will tend to avoid novel products that are inconsistent with expectations (Bridges et al. 1995), so any preference-based advantage the early entrant enjoys will be jeopardized under technological innovativeness. We therefore expect that under stable customer preferences, early entrants have less incentive to be innovative relative to later entrants:

H4: The proposed negative effects of customer preference stability on (a) market and (b) technological innovativeness will be greater for early entrants than for late entrants.

Network externality effects on innovativeness

Studies of network externalities are often grounded in economic theory of demand (Farrell and Klemperer 2007; Katz and Shapiro 1985), while RBV and FMA theories recognize how network effects and a firm's larger installed base of customers are resources that can present a barrier to competitive entry (Lieberman and Montgomery 1998; Wernerfelt 1991). Network externalities have been studied in a variety of contexts, suggesting different relationships with innovativeness. A larger installed base may lead the firm to stay committed to current technologies, reducing innovativeness (Choi 1997; Farrell and Saloner 1986). Indirect externalities through complementary products may help draw new customers, but Stremersch et al. (2007) question the pervasiveness of such benefits. Customers in a large networked market may be disinclined to be the first to switch to a new technology, making the firm reluctant to innovate for a potentially slow-growth market (Farrell and Saloner 1986).

Despite these potential inhibitors to innovativeness, other theoretical and empirical research shows clear incentives for firms to develop innovative products under network externalities. Firms can innovate via product line extensions that offer added benefits readily recognized by the installed base of customers (Basu et al. 2003; Sun et al. 2004). Firm performance may be better in networked markets under more radical innovation, especially if the innovation provides backward compatibility (Srinivasan et al. 2004; Wang et al. 2010). A large customer network may also help the firm more effectively communicate new product benefits (Tellis et al. 2009). More effective information flows among customers in a strong network can increase fears of being stranded in an inferior technology once a new innovation is introduced (Choi 1997; Farrell and Saloner 1986). In terms of economic theory of demand, network effects can provoke large-scale customer migration or “herd” behavior when additional value is demonstrated, since in making product valuations customers consider other customers’ usage (Choi 1997). In the case of products with strong network effects, the economic utility customers derive from a given product is increased when other users enlarge the network (Katz and Shapiro 1994). The potential for quick, widespread shifts in customer demand preferences when additional value is demonstrated increases the incentive for firms to innovate in networked markets.

We therefore expect that strong network effects will lead to increased levels of innovativeness by the firm. Both direct and indirect externalities will contribute to market innovativeness. A larger installed base (direct) allows the firm to more confidently enter new channels and take on competitors. An incumbent may attempt to leverage the benefits from network externalities by reaching new sets of customers through product line extensions and more complementary products as well as support (indirect; see Gupta et al. 1999; Sun et al. 2004). Firms exploit network externalities by developing their knowledge of customer ideas, needs, and preferences (Tanriverdi and Lee 2008) and thus are better able to use market knowledge to develop products based on novel technologies. Increased innovativeness has been shown to be related to both direct and indirect network effects in past studies (Basu et al. 2003; Sun et al. 2004). We therefore hypothesize network effects generally, without anticipating differential effects for direct or indirect externalities on innovativeness (Srinivasan et al. 2004).

H5: A new product’s (a) market and (b) technological innovativeness will be higher under stronger network externalities.

We expect that the externality effects will vary for early and late entrants. Consistent with our earlier applications of FMA theory, an early entrant will have more opportunity to create a larger installed base and leverage the benefits of an initial advantage (Boulding and Christen 2003; Dubé et al. 2010). This provides early entrants with greater potential reward for innovative new product offerings (Srinivasan et al. 2004; Wang et al. 2010) and the ability to better recognize product attributes and complementary products of benefit to customers (Basu et al. 2003; Gupta et al. 1999). Under network externalities a large installed base also gives the early entrant needed resources to more successfully diversify into new markets or channels, potentially with newer technology, relative to later entrants (Agarwal 1997; Bayus and Agarwal 2007). We recognize that an early entrant will not always be able to maintain network-based advantages through innovativeness, particularly under rapid market growth that diminishes the importance of the current customer base (Berndt et al. 2003; Farrell and Saloner 1986). However, such conditions may simply give the early entrant more incentive to innovate while the network benefits of its current installed base still apply. For example, the early entrant’s customer base of early adopters can communicate a new product’s benefits and influence the adoption decisions of others, particularly if customers value newer technology (Choi 1997). An early entrant’s installed base serves as an entry barrier and gives a disincentive for a later entrant to innovate too radically and go against the standard established by the early entrant’s product (Lieberman and Montgomery 1998; Wang et al. 2010).

H6: The proposed positive effects of network externalities on (a) market and (b) technological innovativeness will be greater for early entrants than for late entrants.

Innovativeness and financial new product performance

While the relationship between innovativeness and performance has been examined in prior research (see Rubera and Kirca 2012; Szymanski et al. 2007), we include it in our model to tie the demand-side factors to bottom-line outcomes. As a valuable, rare, inimitable, and not easily transferable resource, innovativeness is thought to be associated with superior returns (Menguc and Auh 2006). Since the ability to innovate accumulates idiosyncratically over time, RBV theorists have proposed that innovativeness is a primary driver of superior performance (Hult and Ketchen 2001; Verona 1999); this is as opposed to traditional tangible assets, few of which can be profitable in isolation (Grant 1991). Specifically, market innovativeness is expected to result in positive financial outcomes since the pursuit of new market segments, non-traditional promotional tactics and new channel members should generate financial returns (Cho and Pucik 2005; Kim and Mauborgne 1997). With respect to technological innovativeness, the development of novel new technologies is expected to provide value to the customer and differentiation from competitors, leading to positive financial outcomes (Kleinschmidt and Cooper 1991). More formally stated,

H7: Financial new product performance will be higher under greater (a) market and (b) technological innovativeness.

Research method

Data collection

Data were gathered by means of a cross-sectional survey of predominantly business-to-business Spanish firms. The initial sampling frame was obtained from a commercial database. Through a telephone pre-survey, 1213 firms were identified as meeting two innovativeness criteria relevant to our study. First, firms must demonstrate recent product innovation activity by having developed and launched a new product in the last three years (Lee and O'Connor 2003). Second, the new product must have been on the market for at least 12 months to ensure sufficient data on the product's resulting performance (Langerak et al. 2004). Respondents at each firm were managers responsible for product development activities. Representative titles included Product Manager and Marketing Manager. Respondents were instructed to select a new product with an independently developed launch strategy about which they were knowledgeable and to respond to the survey with respect to this product. In line with Lee and O'Connor (2003), respondents were told that the product selected should not be a product extension or packaging redesign.

Before collecting data, we conducted four in-depth interviews with managers in the industry sectors to be surveyed in order to validate measures. This feedback, as well as a pre-test with ten managers and ten academics, improved the clarity of the questionnaire and ensured effective, accurate, and unambiguous communication with the respondents. Data were collected through a web-based questionnaire. Respondents were offered a free summary of the most relevant findings of the study and a small gift for their response. Non-respondents were called after two weeks to verify that they had received the questionnaire and to remind them to respond. In all, 279 surveys were returned, yielding an effective response rate of 23.00%. The four industry sectors represented in our sample are (percentage of sample in parentheses): electronic equipment (35.13%), machinery (24.37%), chemical products (23.66%), and transportation equipment (16.85%). Respondents reported a mean of 236.8 employees and annual revenue of €33.4 m.

Armstrong and Overton's (1977) time-trend extrapolation procedure was used to assess non-response bias. In comparing early (first quartile) and late (fourth quartile) respondents, no significant differences were detected in the mean response of any of our constructs. To assess informants' suitability, respondents indicated their degree of knowledge (1 = "very limited knowledge," 10 = "very substantial knowledge") regarding the new product (Langerak et al. 2004), the new product development process, and launching activities (Atuahene-Gima et al. 2005). The mean responses were 8.43, 7.11, and 6.79, respectively, indicating adequate knowledge levels.

Measure development

Our multi-item scales (Table 2) were drawn from prior studies and are consistent with the construct definitions from our theoretical discussion. All continuous items used 10-point scales. Switching costs were measured from a managerial perspective, as in Kohli (1999) and include non-financial costs. Customer preference stability was assessed with a scale based on Jaworski and Kohli (1993), reflecting more entrenched preferences. Network externalities was operationalized as a second order factor consisting of both direct and indirect externalities using scales based on Sahay and Riley (2003). Since network externalities is composed of both direct and indirect externalities, the second order factor is first order reflective, second order formative (Jarvis et al. 2003). Note that measures of the demand-side factors concern managers' perceptions of these factors. This is appropriate given our focus on the firm's product innovativeness, based on perceptions of the customer environment.

Both market and technological innovativeness were measured using scales based on the work of Danneels and Kleinschmidt (2001). Consistent with our focus on inertia, these scales measure the change required within the firm (rather than customer change). More incremental products (to the firm) would score lower on innovativeness while more radical (again, to the firm) products would score higher. The scale for financial new product performance was adopted from Lee and O'Connor (2003). In line with Robinson and Chiang (2002), the firm's entry into the product market is assessed via a categorical variable with four categories: "late entrant" (1), "follower" (2), "one of the first" (3), and "pioneer" (4). Firm size was used as a control variable, measured using the number of employees.

Measurement model

We performed a confirmatory factor analysis (CFA) using LISREL 8.8 to determine the validity and reliability of our measures. As Table 2 indicates, the results of the measurement model demonstrate very good fit ($\chi^2(131)$ = 286.71, CFI= 0.96, RMSEA = 0.06, 90% CI: 0.05 to 0.07). The factor loadings of each individual indicator on its respective construct are significant ($p<0.001$), which along with strong fit indices establishes convergent validity. Since our research draws on multi-item reflective scales, we investigated the psychometric properties of these measures through composite reliability and average variance extracted (AVE) (Bagozzi and Yi 1988; Shook et al. 2004). Both well exceed the standard benchmarks of 0.60 and 0.50, respectively. Evidence of discriminant validity among the dimensions was provided by two procedures. Comparison of AVE with the squared correlations between constructs (see Table 3) reveals that AVE is consistently higher than the squared correlation between constructs (Fornell and Larcker 1981). Also, the 95% confidence interval of the correlation between any two latent variables never includes one (Anderson and Gerbing 1988).

Common method variance

Common method variance (CMV) has a potential biasing effect in studies using a single informant. CMV bias is less likely in our study since the data collection process relies on multiple scale anchors and both continuous and categorical scale items (Podsakoff et al. 2003; Rindfleisch et al. 2008). To assess the potential risk of CMV, we conducted several distinct tests.

First, if common method bias poses a serious threat to the analysis, a single latent factor would account for the majority of the covariance among the measures. A Harman one-factor tests shows that a single factor has a decidedly inferior fit ($\chi^2(152)$ = 2106.54, CFI=0.42, RMSEA = 0.22). This suggests that there is no common factor accounting for the covariance among our constructs.

Second, we used the marker variable technique put forward by Lindell and Whitney (2001). This technique requires (1) identifying a marker variable which is theoretically unrelated to the study's constructs (here, competitive intensity is used), (2) identifying the marker variable's smallest (absolute) correlation with predictor variables, (3) partialling out this coefficient, and (4) using the partialled results to compare to the original correlations. We find that the correlations consistently maintain their valence, size, and significance level (a series of chi-square difference tests between the adjusted and unadjusted correlations does not detect significant differences, $p>0.05$, between the adjusted and unadjusted correlations).

Third, we used the adjustment model variant of the marker variable technique (Malhotra et al. 2006). The original correlation matrix is adjusted to account for a common method–related correlation. This adjusted correlation matrix is then used to estimate a structural model. The results from this adjusted model are nearly identical to the unadjusted estimates, with no material change to any coefficients in terms of valence, size or significance. A series of chi-square difference tests confirms that the adjusted and unadjusted estimates are not statistically different ($p>0.05$).

Finally, we employed the latent methods factor approach outlined by Podsakoff et al. (2003). This involves having all items load on both their construct of interest, as well as a first-order "common" factor. This approach yields a $\chi^2(105)$ = 545.38 (compared with $\chi^2(131)$ = 286.71 for the measurement model). The failure of the common method factor to improve fit suggests that CMV is not a consequential bias here. Overall, this series of tests allows us to conclude that any potential CMV bias is not problematic.

Results

We examine the relationships in our model (Fig. 1) using structural equation modeling.

Since the entry order construct is categorical, the proposed moderations are tested via multi-group analysis. The full-sample model (Fig. 2) including all respondents will be discussed first, followed by the multi-group analysis. Estimation of the full-sample model using LISREL 8.8 resulted in a very good overall fit ($\chi^2(156)$ = 411.09, CFI = 0.94, RMSEA = 0.07, 90% CI: 0.06 to 0.08). Firm size was used as a control variable antecedent to market innovativeness, technological innovativeness and financial NPD performance. Its effect was non-significant ($p>0.10$) on all three constructs. As seen in Fig. 2, all main effects of the demand-side inertia factors on the two dimensions of innovativeness support our hypotheses. H1a and H1b are supported by switching costs' positive effects on market innovativeness (standardized coefficient = 0.18, $p<0.01$) and technological innovativeness (0.16, $p<0.01$), respectively. Customer preference stability has negative effects on both market innovativeness (−0.18, $p<0.01$) and technological innovativeness (−0.15, $p<0.05$), supporting H3a and H3b. H5a and H5b are also supported; network externalities has positive effects on market innovativeness (0.33, $p<0.05$) and technological innovativeness (0.23, $p<0.05$). With respect to effects on financial NPD performance, market innovativeness has a positive effect (0.13, $p<0.05$), supporting H7a, while technological innovativeness has a non-significant effect ($p>0.10$), not supporting H7b.

The moderating effect of early vs. late entry

The moderating effects of entry order were tested through multi-group analyses, splitting the sample into subsamples as early or late entrants. This procedure has been frequently

Table 2 Measurement model: constructs, items, loadings and reliability estimates

Construct, items	SCR	Standardized λ
Switching costs		
Customers need considerable advance planning to buy the product	0.82	0.72
Customers need substantial preparation time to make use of the product		0.84
The effort devoted by the customers to adopt the product make less probable they will change to a similar product in the future		0.79
Indirect network externalities		
The services offered by other companies relating to our product (such as training and support) have increased with the size of our installed base	0.83	0.95
The quantity of published reference material for our product has increased over the life of the product		0.76
Direct network externalities		
The increase in installed base of our product has lead directly to more benefits for the user	0.80	0.87
The number of users using the product have increased the utility of the product		0.75
Customer preference stability		
Customer preferences change very frequently*	0.80	0.79
Our clients look for new products very often*		0.80
Our customers' needs are very different to traditional customers*		0.68
Market innovativeness		
The market the product was sold in was new to the firm	0.90	0.89
The distribution channels were new to the firm		0.92
The product's competitors were new to the firm		0.76
Technological innovativeness		
The technology employed was new to the firm	0.88	0.86
The engineering and design activities were new to the firm		0.90
The new product development activities were new to the firm		0.76
Financial new product performance		
Net income	0.93	0.82
Net profit margins		0.96
Return on investment		0.92

χ^2 (131) = 286.71, RMSEA = 0.06 (90% CI: 0.05 to 0.07), CFI=0.96, IFI=0.96

SCR Scale compose reliability

* indicates items were reverse coded

Table 3 Correlation matrix with AVE (n=279)

		Mean	SD	AVE	1	2	3	4	5	6
1	Switching costs	3.92	2.17	0.61						
2	Indirect network externalities	4.95	2.39	0.62	0.21***					
3	Direct network externalities	4.69	2.80	0.66	0.24**	0.20***				
4	Customer preference stability	5.76	2.03	0.58	−0.19**	−0.37***	−0.23***			
5	Market innovativeness	4.36	2.54	0.74	0.26**	0.20***	0.33***	−0.25***		
6	Tech. innovativeness	5.55	2.41	0.71	0.23**	0.20***	0.19***	−0.21***	0.45***	
7	Financial new product performance	6.39	1.93	0.82	−0.02	0.06	0.03	−0.15**	0.08	−0.02

AVE average variance extracted, *SD* standard deviation

Significance levels: *** p<0.01, ** p<0.05, * p<0.10

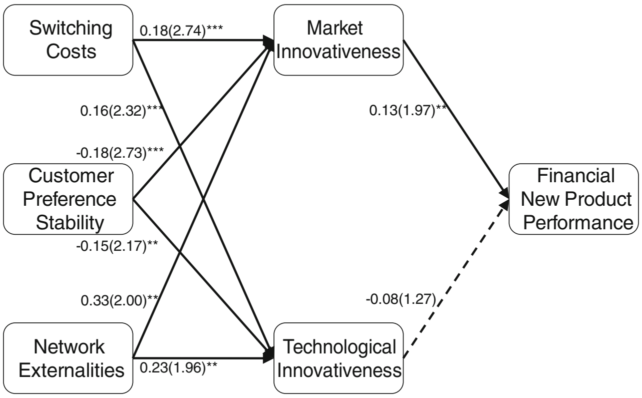

Fig. 2 Structural equation modeling results. Only main effects shown here for simplicity. $\chi^2(156) = 411.09$, RMSEA = 0.07 (90% CI: 0.06 to 0.08), CFI=0.94, IFI=0.94. Standardized coefficients shown (critical ratio in parentheses). Significance levels: ***$p<0.01$, **$p<0.05$, *$p<0.1$

used in marketing and innovation research (e.g., Calantone et al. 1996; Matsuno and Mentzer 2000), conducted as follows:

(1) The sample is split into two groups: early entrants ($n=142$) and late entrants ($n=137$).
(2) A constrained model is estimated with all structural parameters constrained to be equal across both groups.
(3) An unconstrained model is estimated in which all paths are allowed to vary across the two subsamples.
(4) A chi-square difference test is performed to determine whether the unconstrained model represents a significant improvement over the constrained model.

The chi-square difference tests, shown in Table 4, demonstrate that for early entrants, four of the six hypothesized relationships are strengthened. The demand-side inertia effects on technological innovativeness are stronger for early entrants (H2b, H4b, H6b supported), but an early entrant effect for market innovativeness only appears for network externalities (H6a supported; H2a, H4a not supported). Further, the demand-side factors better explain the innovativeness of early entrants when compared to late entrants. The demand-side factors result in an early entrant R^2 of 0.43 and 0.39 for market and technological innovativeness, respectively (compared to 0.17 and 0.11 for the late entrant analysis).

It is interesting to note the relative influence of the three demand-side factors in determining innovativeness. For early entrants, all three demand-side factors significantly influence innovativeness, but there is a wide range of effect size. Network externalities has the most substantial impact on both dimensions of innovativeness (standardized coefficients: market = 0.61, technological = 0.50). The effect of switching costs is less substantial: a one standard deviation (SD) increase in switching costs is associated with 26% of the market innovativeness gain and 66% of the technological innovativeness gain when compared to a similar one SD increase in network externalities. A one SD decline in customer preference formation is associated with 36% of the technological innovativeness gain associated with the one SD increase in network externalities.[1] Network externalities is associated with relatively dramatic change to market innovativeness; the effect of a one SD change in network externalities is more than equivalent to double the absolute sum of one SD changes for both of the other demand-side factors. With respect to technological innovativeness, the effect of network externalities is slightly smaller than the absolute total of the other two demand-side factors. For early entrants, while customer preference stability and switching costs are substantial influences on innovativeness, network externalities is the dominant demand-side inertia factor.

For completeness, though we did not hypothesize a moderating effect of entry order on the relationships between innovativeness and performance, the multi-group approach taken here allows this to be observed (see bottom of Tables 4 and 5). In line with previous conceptualizations (e.g., Bowman and Gatignon 1996), the performance benefits of market innovativeness are significantly ($p<.01$) greater for early entrants, who are able to take advantage of more established brands and better customer understanding. Technological innovativeness has a significant ($p<.01$) negative impact on new product development performance for early entrants, while for late entrants this relationship is non-significant ($p>.10$). This negative effect should not come as a complete surprise, given that though in general past researchers have found positive links between innovativeness and performance, findings of negative and non-significant relationships have been observed as well (Rubera and Kirca 2012; Szymanski et al. 2007). Technological innovativeness comes at significant expense and is certainly not without risk for early entrants (Treacy 2004).

Discussion

We have put forward empirically supported arguments demonstrating how the set of demand-side factors increases advantage for early entrants (consistent with our intention to contribute to first-mover advantage theory). These arguments are informed by the resource based view of the firm and economic theory of demand, which together help us to construct a theoretical understanding of the mechanisms by which the demand-side factors foster early entrant innovativeness. A firm's customers play a very substantial (though often unnoticed) role in determining the firm's willingness to innovate—particularly for early entrants. This study's findings contribute to our theoretical understanding of the resources residing in a firm's customers and the significant

[1] The early entrant (split sample) path from customer preference stability to market innovativeness does not reach standard levels of statistical significance to allow similar comparisons.

Table 4 Entry order's moderating effects

Path	Moderator		Standardized coefficient (t-values)	χ^2 difference
Switching costs → Market innovativeness	Entry order	Early entrants	0.16 (1.74)*	$\chi^2(1) = 0.17$
		Late entrants	0.18 (1.97)**	
Switching costs → Tech. innovativeness	Entry order	Early entrants	0.33 (3.31)***	$\chi^2(1) = 9.35$***
		Late entrants	−0.04 (0.42)	
Cust. preference → Market innovativeness	Entry order	Early entrants	−0.11 (1.29)	$\chi^2(1) = 0.52$
		Late entrants	−0.13 (1.47)	
Cust. preference → Tech. innovativeness	Entry order	Early entrants	−0.18 (2.02)**	$\chi^2(1) = 9.12$***
		Late entrants	0.03 (0.30)	
Network ext. → Market innovativeness	Entry order	Early entrants	0.61 (5.06)***	$\chi^2(1) = 9.81$***
		Late entrants	0.34 (0.01)	
Network ext. → Tech. innovativeness	Entry order	Early entrants	0.50 (4.31)***	$\chi^2(1) = 8.78$***
		Late entrants	0.26 (0.01)	
Market inno. → Fin. new product perf.	Entry order	Early entrants	0.24 (2.46)***	$\chi^2(1) = 7.96$***
		Late entrants	0.13 (1.97)**	
Tech. inno. → Fin. new product perf.	Entry order	Early entrants	−0.25 (2.52)***	$\chi^2(1) = 8.35$***
		Late entrants	−0.03 (0.70)	

Significance levels: ***$p<0.01$, ** $p<0.05$, *$p<0.1$

impact that these resources have on an early entrant's ability to innovate. Thus, we have contributed to FMA theory by extending the set of conditions known to benefit early entrants. Researchers intending to comprehensively assess first-mover (dis)advantages must account for these demand-side factors.

Overall, the results point to an early entrant advantage in leveraging switching costs and network externalities into technological innovativeness, with a market innovativeness advantage under network externalities (each of these effects are discussed more comprehensively below). Though the notion of demand-side inertia factors dates back to Lieberman and Montgomery (1998) and Mueller (1997), ours is the first study to (1) put forward specific theoretical arguments with respect to the effects of demand-side inertia factors and (2) empirically examine these factors in concert to assess their roles in fostering (or countering) inertia as it relates to innovativeness. Thus, our research confirms earlier scholars' belief that these demand-side factors play a critical role in determining early entrant innovativeness while developing a newfound understanding of the valence of these effects and the mechanisms by which these effects occur. In short, this research advances scholars' understanding of the ways early entrant firms are able to leverage customer-based resources to obtain advantage.

While earlier recognized sources of first-mover advantage have largely concerned internal firm resources such as R&D, economies of scale, and location of retail establishments (Kerin et al. 1992), here we take a needed step to place network externalities and switching costs within this set of

Table 5 Hypotheses results

	Hypothesized relationship	Result
H1	A new product's (a) market and (b) technological innovativeness will be higher under greater customer switching costs.	(a) Supported (b) Supported
H2	The positive effects of switching costs on (a) market and (b) technological innovativeness will be greater for early entrants than for late entrants.	(a) Not supported (b) Supported
H3	A new product's (a) market and (b) technological innovativeness will be lower under greater customer preference stability.	(a) Supported (b) Supported
H4	The negative effects of customer preference stability on (a) market and (b) technological innovativeness will be greater for early entrants than for late entrants.	(a) Not supported (b) Supported
H5	A new product's (a) market and (b) technological innovativeness will be higher under stronger network externalities.	(a) Supported (b) Supported
H6	The positive effects of network externalities on (a) market and (b) technological innovativeness will be greater for early entrants than for late entrants.	(a) Supported (b) Supported
H7	Financial new product performance will be higher under greater (a) market and (b) technological innovativeness.	(a) Supported (b) Not supported

advantageous resources. Importantly, the three demand-side inertia factors are shown to predict a very considerable portion of the variation in early entrant innovativeness (43% for market, 39% for technological innovativeness), bolstering our premise that these demand-side factors play a highly substantial (and overlooked) role in determining firm innovativeness. It is therefore possible that for some firms, these demand-side factors may shape firm innovativeness as much or more than supply-side factors such as internal processes, routines, assets and knowledge (Mueller 1997). First-mover advantage theory's dominant focus on internal firm resources as generators of early mover advantage can be said to be incomplete. Inclusion of demand-side factors marks a notable advancement with respect to first-mover advantage theory.

Further, though the joint effects of the three demand-side factors have not been previously empirically tested with respect to innovativeness, our results strongly challenge any notion that the demand-side factors have a dampening effect on innovativeness (Choi 1997; Farrell and Saloner 1986; Krafft and Salies 2008) and underscore the importance of examining these demand-side effects collectively (rather than piecemeal). Since customers of early entrants (in markets characterized by switching costs and network externalities) derive utility from maintaining network membership and become more deeply engrained in supplier–customer relationships over time, network externalities and switching costs provide additional impetus for early entrants to innovate. Access to product development related learning from locked-in customers and the ability to leverage the developed customer network to communicate new product benefits spurs early entrants to innovate in these markets.

Switching costs can be leveraged by an early entrant taking advantage of its close customer relationships to develop and communicate the value of innovative products to customers. Switching costs foster loyalty and long-term relationships that improve information sharing and relational embeddedness between the customer and the firm, aiding new product development (Lengnick-Hall 1996; Rindfleisch and Moorman 2001). The early entrant firm can essentially be in a better position to understand how to develop novel product benefits and communicate them to customers willing to incur some switching costs in exchange for a superior product from their preferred supplier. Markets with switching costs have long been thought to afford incumbents financial advantages (Wang and Wen 1998; Wernerfelt 1984). It is likely that financial gains (obtained through exploitation) can be used to fund additional innovative exploration (March 1991). That is, the additional returns early entrant firms garner in markets with switching costs may increase the available investment in innovation for the future, increasing long-term early mover advantage.

With respect to network externalities' innovation effects, there exist both long-held sentiment (e.g., Farrell and Saloner 1986) and more recent studies (Srinivasan et al. 2004; Tellis et al. 2009) that view network effects as potentially dampening innovativeness. On the contrary, we find that network externalities can aid innovativeness. Network externalities promote an active and engaged user network, which increasingly can be tapped to aid the innovative efforts of early entrant firms and to quickly and efficiently communicate the benefits of a new product to a networked user base, strengthening early entrants' incentive to innovate.

On the other hand, stable customer preferences have a negative influence on both dimensions of innovativeness, although this effect is muted with respect to the technological innovativeness of later entrants. This early entrant disadvantage related to preference stability reinforces the implications of Carpenter and Nakamoto (1989). Early entrants can gain from shaping preferences early, but once preferences stabilize the early entrant is less technologically innovative as it caters to the established preferences it helped formulate. FMA theorists have long contended that supply-side factors endow early movers with both advantages and disadvantages (see Lieberman and Montgomery 1988); our results indicate that this also applies to demand-side factors.

With respect to the financial implications of innovativeness, our results show a positive effect on financial new product performance from market innovativeness, but a non-significant effect from technological innovativeness. These results support past research demonstrating the positive financial implications of market innovation (e.g., Johne 1999), particularly for early entrants (e.g., Bowman and Gatignon 1996). The non-significant (overall) effect of technological innovativeness is not completely unexpected. Non-significant effects of innovativeness on financial performance have been found in prior research (Szymanski et al. 2007). In environments characterized by relatively stable technology regimes, firms have financial incentive to focus on incremental innovations or to invest in process improvements (Utterback 1996), rather than on more radical technological innovation which inherently involves financial risk (Sethi et al. 2001). Beyond this notion of risk, products may need to be examined over a longer time period to detect the financial benefits of technological innovativeness; this is discussed as a future research direction.

Managerial implications

Our results generate several insights of value to managers. Network externalities are the strongest driver of innovativeness for early entrants. By being conscious of the positive effect that a strong network of customers has on innovativeness, an early entrant has incentive to further harness the innovative value of its network. Early entrants also have stronger innovativeness effects from switching costs. Since customer relationships become more embedded over time, early entrants in markets with switching costs are better equipped to generate innovativeness. An industry example helps to clarify. Consider the case of LinkedIn, the first widely adopted online professional social network. Strong network effects impact the value customers derive from the service, since as the user base grows, more broad-based networking is possible. Users also face switching costs, since switching to an alternative professional network would necessitate redeveloping a user profile with information related to skills, education and employment history. LinkedIn has leveraged these network externalities and switching costs to generate both technological and market innovativeness. Technologically, LinkedIn has launched a well-received mobile application (Travierso 2011), allowing users to remain compatible with the network and keep their existing profiles intact, while engaging users through an alternative platform. In terms of market innovation, they have offered a set of additional tools (LinkedIn Premium) as a subscription service, targeting (among others) recruiters and salespeople (Carlozo 2012), a decidedly different target segment when compared to the entire network of users. This is one recent example of a firm leveraging network externalities and switching costs to generate innovativeness.

It is also valuable for late entrants to understand the innovativeness effects of demand-side factors on early entrant competitors in order to mitigate any advantage. Understanding the differences in how demand-side inertia factors impact incumbents may inform late entrant product strategy. In particular, later entrants should consider disrupting the network externality advantages that enhance early entrant innovativeness. This could be accomplished through radical, incompatible innovation or by attracting emerging customer segments with needs that are distinct from the current market, but which may become mainstream.

Managers should also be conscious of the strong negative effects that entrenched customer preferences have on both market and technological innovativeness (particularly for early entrants). Where higher levels of innovativeness are desired in markets with established customer preferences, innovating firms may need to seek out customers with more progressive preferences, as dictated by the lead user process (von Hippel 2005). These leading-edge users may help counter the innovativeness-dampening effect of established customer preferences.

Limitations and future research directions

There are several limitations of this research which should be acknowledged. Our results provide a good starting point by examining the effects that demand-side factors have on innovativeness, but it is important to recognize possible supply-side effects on inertia and innovativeness. Though we use a firm-specific control variable (firm size), there are likely additional supply-side effects at play, providing opportunities for future research. Exploring the integration between demand-side factors and supply-side factors (e.g., fear of cannibalization, routines, internal resource base) will likely prove fruitful. Specifically, consider a firm which has well developed routines for incremental product development under relatively entrenched customer preferences. These routines may improve financial performance since the firm will avoid wasted spending on developing products which deviate from customer preferences. Conversely, innovativeness in this scenario may suffer, since existing product development routines may tend to emphasize the focus on entrenched customer preferences, which from our results will dampen innovative efforts. The potential for supply–demand side interactions should generate future attention from researchers.

While we study the three demand-side factors, a more refined measurement of factors within a firm's customers may help further understand demand-side inertia effects. For instance, would customer willingness-to-learn have an effect beyond what we have observed from customer preference formation? Given the temporal nature of inertia, and particularly its relationship with financial performance, longitudinal exploration of how inertia is developed, along with its performance implications, appears warranted. Research examining long-term financial performance may demonstrate the financial benefits of technological innovativeness, which this study showed to have a non-significant financial effect over a relatively short time frame. Since managerial perceptions may not be completely accurate, considering objective measures (i.e., secondary data) of inertia may also prove fruitful. While measuring the demand-side factors from the perspective of managers is consistent with our focus on inertia, it is certainly possible that there are meaningful differences between management and customer perspectives of these demand-side factors, representing a further opportunity for researchers.

It is important to note that this study was conducted using respondents from a single country (Spain). Consideration of the effects of these demand-side factors in other contexts, such as emerging markets (see Nakata and Sivakumar 1997) is likely warranted. Replicating this research internationally would demonstrate broader generalizability; a possible international extension of this research is to investigate the role of cultural factors in determining the relative strength of the demand-side inertia factors.

Past researchers have explored the role that power and dependence have on the channel, and on technology adoption in particular (e.g., Lee and Qualls 2010). Given the impact of the demand-side factors on innovativeness shown here, the relative effects of supply versus demand-side factors will be of interest. The notion of power and dependence may prove helpful in providing a theoretical explanation for where this balance lies. Imbalanced power and influence structures favoring customers may dictate that the demand-side factors are more influential, whereas the situation in which customers are dependent on the supplier may strengthen the relative effect of supply-side inertia factors. While we have shown these demand-side factors to be influential determinants of firm innovativeness, firms' management of customer relationships is also likely important in enhancing these demand-side effects. It is possible that engaging customers through open innovation (Chesbrough 2003) or a structured lead user process (von Hippel 2005) may allow firms to further harness these demand-side factors for their benefit.

Our study shows that the three demand-side factors better explain the innovativeness of early entrants relative to later entrants. Presumably, early entrants also would have substantial effects from supply-side forces such as internally ingrained routines and development of specific assets. However, this does not necessarily imply that late entrants can disregard inertia entirely. On the contrary, the relatively stronger demand-side effects on early entrants observed here may indicate either (a) that supply-side inertia forces may be more substantial for later entrants or (b) that a distinct subset of inertia factors may be at play for late entrants. In either event, both of these possibilities present intriguing questions for future scholars. We hope that our results will spur researchers to examine other aspects of demand-side inertia and innovativeness.

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