Strategy by Doing and Product-Market Performance: A Contingency View

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Jung, C., Mallon, M.R , and Wilden, R. (2023). Strategy by Doing and Product-Market Performance: A Contingency View. Journal of Management.

Abstract:

The strategy-by-doing perspective argues that firms operating in highly dynamic environments can benefit from taking strategic actions in lieu of advance planning because such actions have learning effects that help the firm keep pace with changes in the environment. The implicit assumption is that strategy by doing is effective in dynamic environments but likely not in stable environments. This study challenges this notion and expands the purview of the strategy-by-doing perspective. We first argue that strategy by doing is generally an effective strategy due to the organizational learning it facilitates. We next discuss how environmental dynamism is multidimensional, encompassing both market and technological dynamism. The positive effects of strategy by doing on product-market performance are amplified in highly dynamic environments that feature high levels of both market and technological dynamism. We go on to argue that stable environments are also suitable for strategy by doing, where it can facilitate opportunity creation. However, strategy by doing may hinder performance in mixed environments where one form of dynamism is present and the other is not. Focusing on strategy by doing in the form of product changes, our analysis of 4,000 firms over a period of 20 years shows support for our arguments about environmental contingencies affecting the relationship between strategy by doing and performance. We discuss how these findings have implications for theory and practice.

Keywords: strategy by doing | product changes | performance | environmental dynamism | organizational learning | adaptation | dynamic capabilities

Article:

Introduction

Strategy by doing is an emergent perspective that emphasizes taking action to foster organizational learning as a means of informing strategic choices. For example, testing product-market combinations by introducing and withdrawing products from the market can

generate insights that optimize product-market performance (Ott, Eisenhardt, & Bingham, 2017). Strategy by doing is thought to be particularly useful in highly dynamic environments that favor actions over slower strategic planning to maintain competitiveness by capturing fleeting opportunities (e.g., Bingham, Eisenhardt, & Furr, 2007; Chen, Wang, Cui, & Li, 2021). Yet, this body of work suffers from two shortcomings. First, although the literature has recognized that environmental dynamism is multidimensional (e.g., Davis, Eisenhardt, & Bingham, 2009; Ott et al., 2017), it has rarely considered how such dimensions might have varying influences on the efficacy of strategy by doing. Indeed, "researchers need to consider different components of the environment as distinct entities that possibly pose contrasting contingencies on various firm actions" (Danneels & Sethi, 2011, p. 1027). Despite the centrality of environmental dynamism within this perspective, the critical role that different aspects of dynamism may play in affecting the relationship between strategy by doing and performance is not yet fleshed out, limiting both the normative implications of this stream of research and its contributions to our understanding of strategy (Ott et al., 2017). Second, the literature has assumed that strategy by doing is effective in highly dynamic environments, but likely much less useful in stable environments (Eisenhardt & Bingham, 2017). As a result of the focus on one kind of environmental setting, this stream's potential connections to other areas of management research are limited (Ott et al., 2017).

We address these shortcomings by using a multidimensional conceptualization of environmental dynamism consisting of market dynamism and technological dynamism and by theorizing and testing how these dimensions influence the relationship between product changes (as a mode of strategy by doing) and product-market performance (e.g., Eggers, 2012; King & Tucci, 2002). Applying the notion of learning by doing as the foundation of experiential learning via action (Levitt & March, 1988), we first argue that strategy by doing in the form of product changes generally benefits firm performance because it enables novel strategies based on organizational learning (Furr & Eisenhardt, 2021; Gans, Stern, & Wu, 2019). We go on to argue that in environments where market dynamism and technological dynamism are both *high,* the performance effects of strategy by doing are amplified due to the abundance of opportunities that can be captured via product changes. In stable environments where both forms of dynamism are *low*, strategy by doing can also be effective because making product changes can help firms learn to challenge conventional assumptions within the industry and create opportunities (e.g., Danneels, 2002; Eisenhardt & Bingham, 2017; Ford & Ogilvie, 1996). Finally, in environments with *mixed* levels of dynamism (one is high but the other is low), strategy by doing likely does not improve performance because opportunities are not abundant enough to reward learning by doing as a means of formulating strategy, nor is the environment stable enough to allow for challenging assumptions.

We analyze a large panel dataset of over 4,000 firms in the United States and find that strategy by doing does not influence product-market performance under all circumstances, but rather its effects are highly dependent on the environmental context. It improves performance in highly dynamic and stable environments but reduces performance in mixed environments. This study makes three main contributions. First, we clarify and extend the strategy-by-doing literature by theorizing about and testing a multidimensional conceptualization of environmental dynamism, contributing a contingency-based view of strategy by doing that also challenges the assumption that strategy by doing is not applicable in stable environments (e.g., Eisenhardt & Bingham, 2017; Ott et al., 2017). Second, we explicate how product changes can foster organizational learning by doing, which contrasts with organizational-learning theory research

that has tended to focus on product diversification and learning by doing via repetition of the same actions (Argote, 2013). Finally, we advance the theory of organizational adaptation—"an essential mission for management scholarship" (Vergne & Depeyre, 2016, p. 1653)—by demonstrating a convergence mechanism between strategic change, the environment, and resulting firm performance (Sarta, Durand, & Vergne, 2021) and by highlighting strategy by doing as a potential antecedent of dynamic capabilities (Furr & Eisenhardt, 2021).

The remainder of this paper is organized as follows. The next section provides an overview of strategy by doing and highlights product changes as a means of organizational learning. We then develop hypotheses regarding how different aspects of environmental dynamism affect the utility of strategy by doing. After testing these hypotheses with our dataset, we discuss how our findings provide insights into theory and managerial practice.

Strategy by Doing

Strategy by doing is based on the recognition that strategic planning and decision-making in highly dynamic environments is challenging (Eisenhardt, 1989), instead highlighting the benefits of taking action as a means of experiential learning about what works—and what does not—in product markets (Ott et al., 2017). For example, firms may extemporaneously change product attributes or change the types of products they sell to identify successful strategies and opportunities rather than carefully planning strategies and then executing them (Eisenhardt & Bingham, 2017). Strategy by doing emphasizes trial-and-error and experimentation as key activities supporting experiential learning, which are especially suited for highly dynamic environments. In these settings, the criteria for viable products change quickly, meaning more variation of products by the firm increases the chances that the firm will discover products that will be "selected" by the environment, in the parlance of evolutionary economics (e.g., Ford & Ogilvie, 1996; Gavetti, Helfat, & Marengo, 2017). That is, by changing products or product features, firms can capture opportunities, establishing a series of temporary competitive advantages that sustain firm performance in a fast-changing environment (Eisenhardt & Bingham, 2017; Rindova & Kotha, 2001). Indeed, numerous case studies have explored how managers develop and deploy appropriate actions to navigate dynamic environments (e.g., Brown & Eisenhardt, 1997; Davis et al., 2009; Rindova & Kotha, 2001). Similarly, recent quantitative studies have begun to substantiate the importance of strategy by doing when sampling firms operating within highly dynamic contexts (e.g., Chen et al., 2021).

Yet, despite the central role of environmental dynamism within the strategy-by-doing perspective, few studies directly theorize about its different dimensions or measure the potentially different effects of such dimensions on the relationship between strategy by doing and performance. This oversight is consequential because dynamic environments are an integral focus of strategy by doing and are conceptualized as multidimensional (Eisenhardt & Bingham, 2017), so an understanding of precisely when and how different aspects of dynamism can shape the efficacy of strategy by doing is critical. Moreover, in this stream of literature, "much of the research . . . relies on inductive (qualitative) methods including ethnographic, interpretivist, and case study approaches" (Ott et al., 2017, p. 320). Although informative for their rich insights, the plethora of case studies and fewer large-*N* studies have hindered our understanding of the "normative implications" of strategy by doing, thereby limiting this stream's capacity to apply "more clearly to the central concerns of strategy" (Ott et al., 2017, p. 321). Finally, the corollary of the proposition that strategy by doing is effective in dynamic environments is the assumption

that strategy by doing is significantly less important in stable environments (Ott et al., 2017). We challenge this assumption by theorizing how strategy by doing may benefit firms in stable environments, thereby expanding the purview of strategy by doing to more environmental settings.

Given our interest in the performance effects of strategy by doing in different environments, in the following sections we theorize about one type of strategy by doing at the enterprise level to fully capture the pressures of the firm's environment on its product-market strategy: product changes across the firm's offerings, which represent adjustments to product attributes and the types of products the firm sells in the marketplace (Hoberg, Phillips, & Prabhala, 2014). For example, the firm may alter existing products, stop selling certain products, or start selling new products. Such product changes have been viewed as important strategy-by-doing activities (e.g., Brown & Eisenhardt, 1997; Eggers, 2012), providing impetus for focusing on the firm's entire product offerings and thus highlighting the importance of being able to view markets holistically (Eisenhardt & Bingham, 2017). Although we do not capture the intention to adapt, the level of product changes may represent "market adaptation" in that its effects on product-market performance reflect "the degree to which the organization's value proposition addresses its main audience's demands, such as customers" (Sarta et al., 2021, p. 65).

Given this stream's foundations in organizational learning, we explicate our hypotheses using the notion of *learning by doing* (e.g., Levitt & March, 1988; Schilling, Vidal, Ployhart, & Marangoni, 2003). According to the strategy-by-doing perspective, product changes ought to be underpinned by experiential learning; that is, firms should change products and product attributes in an experimental fashion as a means of seeking out which products and product attributes are most desirable to customers (Eisenhardt & Bingham, 2017). Changes to a firm's products create valuable experiences that enhance firms' product-market learning (Nerkar & Roberts, 2004), ultimately reducing the likelihood of organizational inertia by ensuring evolutionary fitness for the firm within its environment (e.g., Amburgey, Kelly, & Barnett, 1993; King & Tucci, 2002; Tushman & Romanelli, 1983). For example, experience could have a facilitating effect that allows for more effective product changes in the future (Reuer, Zollo, & Singh, 2002). Consequently, the learning that results from changing products represents strategy by doing, indicating that the firm engages in an iterative search for what works in the market (Eisenhardt & Bingham, 2017).

In line with this view of product changes as a strategy-by-doing activity, our outcome of interest is product-market performance because it denotes the successful pursuit of products that are highly desired by customers (e.g., Bingham et al., 2007; Chen et al., 2021; Eisenhardt & Bingham, 2017). Within the strategy-by-doing perspective, product-market performance in the form of "growth is the primary performance outcome, contrasting with [strategic] positioning's emphasis on profitability, for example" (Eisenhardt & Bingham, 2017, p. 247). Our theoretical framework is depicted in Figure 1.

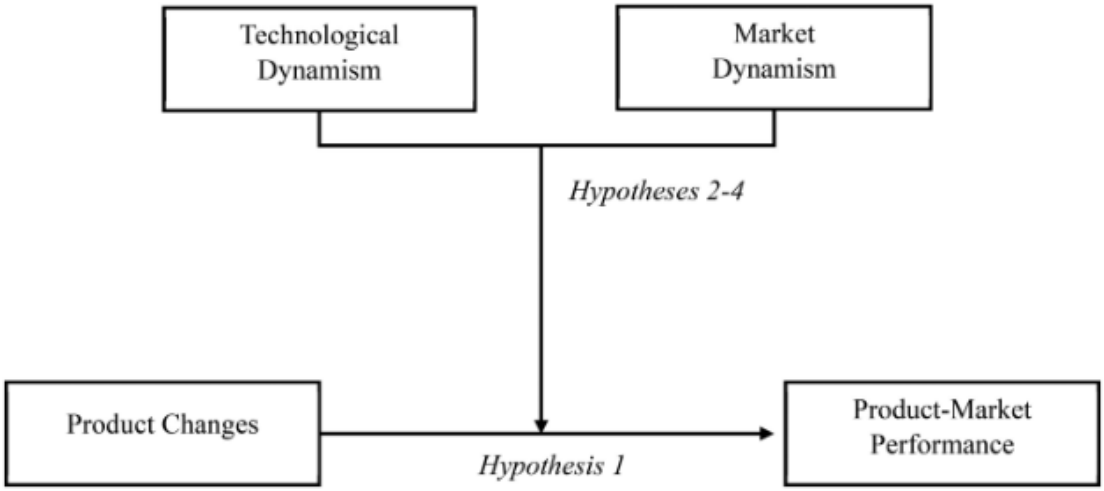

Figure 1 Conceptual Model of the Relationship between Product Changes, Market Dynamism, Technological Dynamism, and Product-Market Performance

Product Changes as Strategy by Doing

An important outcome of organizational learning is the development of new insights (e.g., Fiol & Lyles, 1985). This is especially the case in the context of strategy by doing, wherein such insights consist of knowledge of customers and products that could be used to develop a competitive advantage (Eisenhardt & Bingham, 2017). The strategy-by-doing perspective emphasizes learning by doing, which means deriving knowledge from direct experience based on actions (Levitt & March, 1988). Often, learning by doing has been applied to understand learning curves in production, whereby firms improve task performance as they gain experience making a given product (e.g., Ryu, McCann, & Wan, 2022). This improvement can be considered lower-level learning because it entails adjustments to what the organization already does (Fiol & Lyles, 1985). However, variation in the actions being performed is critical for achieving higher-level learning, which involves developing insights that can affect the entire organization, such as the strategy of the firm (e.g., Fiol & Lyles, 1985; Randhawa, Wilden, & Gudergan, 2021). Thus, highly consequential knowledge can be gained when firms learn by "doing *something else*" (Schilling et al., 2003, p. 44). Overall, learning by doing is one of the most effective methods of organizational learning because "learning begins with experience" (Argote & Miron-Spektor, 2011, p. 1126).

Strategy by doing in the form of product changes is a form of learning by doing because it involves making changes to the products sold by the firm (i.e., doing something else) and testing such changes with customers to ascertain the optimal types and features of products (e.g., Ahuja & Katila, 2004; Brown & Eisenhardt, 1997; Laursen, 2012). In contrast, product development comprises internally directed activities that may take a significant amount of time and analysis before products are perfected and brought to market (Kiss & Barr, 2017). The strategy-by-doing perspective suggests that action is more favorable than analysis because of the higher-level learning that can be gained from direct feedback from customers (Eisenhardt & Bingham, 2017; Fiol & Lyles, 1985). The products or services an organization provides are a manifestation of at least some of its knowledge (Argote & Miron-Spektor, 2011). By changing existing products, introducing new ones, or removing old ones, firms can access information

from customers quickly and directly, iterating their products and updating their knowledge as they go along rather than engaging in lengthy product development processes (e.g., Chen et al., 2021; Rindova & Kotha, 2001). In this way, "managers can use multiple product offerings to gather information about the distribution of customer preferences. Selection amongst these offerings can provide an effective means of aligning the firm's product line with demand" (Sorenson, 2000, p. 577).

Such actions help firms develop strategies that evolve as they gain new experiences, allowing them to be well positioned to exploit opportunities that may arise (Bingham et al., 2007; Gans et al., 2019). Actions in the form of product changes provide consequential and timely organizational learning that may enhance performance because firms can avoid time-consuming mistakes regarding products or product features that may not resonate with customers (Brown & Eisenhardt, 1997; Danneels, 2003). Thus, changing the products offered enhances organizational learning and thereby future performance because the knowledge from new experiences increases the likelihood that firms possess relevant insights when problems or opportunities arise (e.g., Schilling et al., 2003). New or revised products need not be successful to provide important lessons by revealing significant gaps in organizational knowledge (Madsen & Desai, 2010): "Even when initial performance is low, the knowledge gained from past experience is thought to be valuable to organizations and associated with high levels of learning" (Angus, 2019, p. 2013). Overall, strategy by doing is therefore likely to engender higher-level organizational learning that will ultimately improve product-market performance.

However, firms that fail to change their products at least periodically often suffer from poor performance or do not survive because customer preferences or technologies may change, rendering existing routines obsolete (Nelson & Winter, 1982). Engaging in too much internally focused learning may endanger the firm because it leads to short-term learning at the expense of long-term strategic responses (Levinthal & March, 1993). By orienting their learning externally and focusing on customers via product offerings, firms can help ensure superior performance (e.g., Forti, Sobrero, & Vezzulli, 2020; Sorenson, 2000). Thus:

Hypothesis 1: Product changes have a positive effect on product-market performance.

Product Changes in Highly Dynamic Environments

Strategy by doing is likely more important in highly dynamic environments (Eisenhardt & Bingham, 2017). However, environmental dynamism is multidimensional. It is often characterized as consisting of *market* and *technological* dynamism (Dowdy & Nikolchev, 1986; Sharfman & Dean Jr, 1991; Sorenson, 2003). Market dynamism refers to changes in the magnitude of sales or demand and is sometimes referred to as "demand variation" (e.g., Claussen, Essling, & Peukert, 2018, p. 2880). *Technological* dynamism, on the other hand, reflects novelty in the types of products being created (e.g., Atuahene-Gima & Li, 2004). The strategy-by-doing literature typically discusses these subdimensions of environmental dynamism as consequential (e.g., Bingham et al., 2007; Eisenhardt & Bingham, 2017; Ott et al., 2017), so they are our focus here. Specifically, environments that feature high levels of both market and technological dynamism can be classified as truly "highly dynamic" because they reflect the strategy-by-doing perspective's emphasis on unpredictability of demand and technological change (Dowdy & Nikolchev, 1986; Eisenhardt & Bingham, 2017).

Scholars have suggested that "a super-abundance of opportunities" means that

"opportunity capture for firms in dynamic markets may be more about appropriate selection and execution of opportunities, and less about discovery or creation" (Bingham et al., 2007, p. 42). This abundance of opportunities exists in highly dynamic environments because of the many "objective opportunities formed by exogenous shocks to preexisting industries. These shocks can be caused by changes in technology, changes in consumer preferences, changes in demographics, and so forth" (Alvarez & Barney, 2010, p. 559). That is, change in the environment naturally leads to opportunities because the contemporary conditions are different from those in the recent past. Particularly in environments with high levels of both market and technological dynamism, the intensity of change likely engenders opportunities that are fairly visible to managers (Bingham et al., 2007), obviating the need for extensive search to discover them (Barreto, 2012). Although firms in these settings may benefit from product changes as attempts to create opportunities for the firm (Alvarez & Barney, 2010), for most firms, "creation can be inefficient when it leads to the under-exploitation of present possibilities" (Bingham et al., 2007, p. 42). Moreover, opportunity creation depends on learning from sequential actions (Barreto, 2012), which may be challenging in highly dynamic environments where the value of any new knowledge erodes quickly (Kauppila, 2018; Posen & Levinthal, 2012).

Technological dynamism engenders a high degree of ambiguity that defies traditional strategic planning and generates shortened product life cycles (Atuahene-Gima & Li, 2004; Atuahene-Gima, Li, & De Luca, 2006), favoring action in the form of product changes as a means of strategy formulation (Eisenhardt & Bingham, 2017). The knowledge generated from this learning by doing entails a continuous update of information from the environment, enabling firms to be better positioned to capture any opportunities that arise (Minniti & Bygrave, 2001). Such an approach is particularly relevant when market dynamism is also present because firms benefit from faster changes in their products to remain competitive (Cui, Griffith, Cavusgil, & Dabic, 2006). Although the instability of customer demand creates additional unpredictability, it also implies greater potential for success for firms that take risks with new or revised products because of the chance of a rapid, substantial increase in demand; indeed, market dynamism is associated with higher market-based performance (Keats & Hitt, 1988). In other words, market dynamism can increase the potential growth for a firm that selects the "right" product quickly in response to emerging market opportunities. Environments featuring high levels of both types of dynamism are therefore likely to reward firms that create broad variations of products because "choosing among technologies is challenging because of the uncertainty and ambiguity that arise as a result of [market] turbulence" (Danneels & Sethi, 2011, p. 1030). Rather than committing to products based on a single technology, exploring many types of products is preferable because it prepares the firm for large upswings in demand for certain products (Brown & Eisenhardt, 1997). In this way, organizational learning that accompanies product changes fosters strategic flexibility to help the firm anticipate and respond to external opportunities (Santos-Vijande, López-Sánchez, & Trespalacios, 2012).

For example, Brown and Eisenhardt (1997) documented how successful firms in the computer industry engaged in strategy by doing via continuous changes to their products to capture opportunities in the environment that arose from both "changing markets and technologies" (p. 14). Doing so generated important insights that prepared them with several product options they could deploy in response to future shifts. Less successful firms, in contrast, did not engage in strategy by doing. Rather than test what worked in the market, they planned on how to adapt their products based on a single interpretation of future conditions and were therefore less able to adjust to unpredicted demand and technological changes because they had

fewer variations of their products. Consistent with the literature on strategy by doing, we therefore expect that operating in highly dynamic settings will increase the utility of strategy by doing for achieving superior product-market performance. Therefore:

Hypothesis 2: In environments characterized by high levels of both market and technological dynamism, the positive effect of product changes on product-market performance is amplified.

Product Changes in Stable Environments

In contrast to highly dynamic environments, stable environments are characterized by low levels of both market and technological dynamism (Dowdy & Nikolchev, 1986). Firms face a lower risk of poor performance arising from shifts in market demand or changing technologies (e.g., Fainshmidt, Wenger, Pezeshkan, & Mallon, 2019). Under such conditions, firms typically focus on creating cost efficiencies related to existing products (e.g., Eisenhardt, Furr, & Bingham, 2010). The lack of exogenous shocks from technological and market dynamism in stable environments results in a dearth of opportunities available in the environment (Alvarez & Barney, 2010), so it is unlikely that there would be abundant opportunities that could be easily captured without significant search, as in highly dynamic environments (Barreto, 2012). As such, traditional strategic analysis and planning are often appropriate in stable settings (Eisenhardt & Bingham, 2017).

Yet, using product changes to engage in learning by doing may represent an additional way to improve product-market performance, but for different reasons than in a highly dynamic environment. Although learning from product changes in highly dynamic environments is useful for capturing existing opportunities, product changes can improve performance in stable environments via opportunity creation that taps into latent demands, meaning "consumers have bounded foreknowledge of their own needs" (Priem, Li, & Carr, 2012, p. 362). Created opportunities are different from captured ones because they "are not formed by exogenous shocks to preexisting industries, but are formed by the actions of entrepreneurs themselves. In this sense, creation opportunities are endogenous to entrepreneurs. . . ." (Alvarez & Barney, 2010, p. 560).

Actions like product changes can foster opportunity creation because they can be used to "test previously untested aspects of a relatively stable environment effectively . . . they can facilitate organizational learning by providing fresh insight into even the most familiar circumstances" (Ford & Ogilvie, 1996, p. 58). Making changes to products is necessary to test assumptions because customer preferences are highly ingrained in stable environments and customers might not know that they want something new. By changing product features, firms can induce demand from existing customers, and by introducing new products, they can attract new customers (Fosfuri & Giarratana, 2009). Substantial changes to existing products or entirely new products are needed for customers to overcome their established preferences and buy the product (e.g., Aboulnasr, Narasimhan, Blair, & Chandy, 2008), thereby allowing the firm to gain sales feedback that supports organizational learning and advances the creation of an opportunity. Opportunity creation is "essentially iterative and social. . . . At each iteration, the entrepreneurs listen to their customers and other strategic partners' responses to the outputs of their actions. . . . Then, new actions are initiated" (Barreto, 2012, p. 361). Thus, repeated and significant product changes are likely needed to sustain opportunity creation in stable settings, and the slower pace of change facilitates this process because "past actions are durable, increasing the potential for

feedback-based learning" (Nadkarni & Chen, 2014, p. 1814).

By engaging in this kind of iterative cycle of learning, firms can create opportunities by identifying unmet needs (e.g., Randhawa et al., 2021; Wilden, Gudergan, & Lings, 2019): "The advantage of using product offerings as a search strategy accrues by identifying unique products that meet the demands of a segment of consumers not addressed by rivals" (Sorenson, 2000, p. 579). Over time, firms in stable environments can use the insights generated by changing their product offerings to create segments for themselves that are distinct from the established positions of other firms in the industry (Bradley, Shepherd, & Wiklund, 2011). Importantly, such a strategy is different from disruption or other forms of market shaping because it exists alongside industry structures rather than drastically altering such structures. Building novel product segments "does not imply strategic assaults on rivals" (Luksha, 2008, p. 273).

For example, the furniture company IKEA operates in an industry with low technological dynamism and low market dynamism (Baraldi, 2008), yet it has succeeded because its founder "challenged established views from the beginning" (Edvardsson & Enquist, 2011, p. 542). Within the furniture industry, it was assumed that customers wanted products to be professionally assembled and delivered to their homes, but IKEA has succeeded by designing products that can be shipped in flat packs and assembled by the consumer at home (Edvardsson & Enquist, 2011). Moreover, IKEA often engages in product changes (Baxter & Landry, 2017), and through such changes explores new products that customers may want (Baraldi, 2008). Given the firm's low-cost focus, IKEA designers begin with the premise of making furniture cheaper than previous products, and only after that do they consider form and functionality (Edvardsson & Enquist, 2011). For example, the company developed a low-cost production process to print patterns on wood in a way that resembled higher-quality veneers and then marketed products using this technique to customers (Baraldi, 2008). Similarly, the company has introduced Scandinavian designs to new customers outside Scandinavia who may not know that they appreciate such designs, thereby building new segments within the stable furniture industries of many countries (Kling & Goteman, 2003). Importantly, IKEA has not made a stable industry more dynamic through radical innovation or industry disruption—many if not most of its rivals still produce furniture within the bounds of the aforementioned assumptions—but rather has created a unique segment for itself by targeting younger and less affluent customers who are not traditionally served by existing furniture companies (Kling & Goteman, 2003). That is, it created its position by attracting a substantial amount of new customers using new products that catered to latent demands (Fosfuri & Giarratana, 2009; Priem et al., 2012).

Overall, although minor changes related to improving efficiencies are a common and often successful strategy in stable environments, firms can also create opportunities by using product changes to test established assumptions and possibly open up new customer segments with growth potential. Thus:

Hypothesis 3: In environments characterized by low levels of both market and technological dynamism, the positive effect of product changes on product-market performance is amplified.

Product Changes in Mixed Environments

We use the phrase *mixed environments* to identify those that feature opposite levels of dynamism: either high market dynamism paired with low technological dynamism, or low market dynamism and high technological dynamism. Although they differ in terms of the source of dynamism, they

are similar in that their overall level of dynamism is moderate, which creates ambiguity regarding an appropriate strategy (Dowdy & Nikolchev, 1986). As such, the benefits of strategy by doing may be questionable.

In mixed environments that exhibit high market dynamism but low technological dynamism, technologies are relatively stable but demand fluctuates significantly (e.g., Nadkarni & Chen, 2014; Sorenson, 2003). The static nature of technologies greatly reduces the need to engage in product changes as a means of understanding customer preferences that may change rapidly, as well as the need to act quickly to capture fleeting opportunities (Nadkarni & Chen, 2014). Although market dynamism creates some unpredictability, it "is perceived as more analyzable, making it more amenable to formal search and analysis with rules and criteria for interpretation" (Atuahene-Gima & Li, 2004, p. 586). Thus, traditional product development based on analysis and planning (rather than strategy by doing) can be beneficial because it can "lead to the acquisition of more relevant information, an in-depth understanding of the market and the products offered . . . and mindful resource allocation that translates into better product and firm outcomes" (Kiss & Barr, 2017, p. 1188). Products can be changed less frequently and more incrementally in direct response to existing demand trends and analysis, rather than as a proactive means of strategy by doing. Moreover, the challenges associated with market dynamism tend to be operational in nature: increasing capacity by leveraging supplier relationships is needed during upturns, whereas efficient resource allocation and customer retention are key during downturns (Rockart & Wilson, 2019). Product changes as part of a strategy-by-doing approach likely will not help firms meet such challenges but rather could exacerbate problems related to resource allocation, for example, given the costs associated with developing new products (Gans et al., 2019).

In mixed environments with high technological dynamism but low market dynamism, "technological information is dense, reflecting a high frequency of unexpected and novel changes that make it difficult for firms to respond with objective and formal procedures. . . it has multiple and ambiguous underlying meanings and causes that defy specific analysis and uniform interpretation" (Atuahene-Gima & Li, 2004, p. 585). However, a lack of market dynamism may make strategy by doing unnecessary. We previously argued that swings in demand resulting from market dynamism could, when coupled with technological dynamism, enhance the benefits of a broad array of product changes because such changes prepare the firm for multiple future possibilities regarding different types of products. However, the *absence* of such swings implies that the benefits of strategy by doing are limited because there is less need to be prepared for unpredictable swings in demand related to novel products. Scholars have suggested that there ought to be a fit between the timing of new product introductions and the pace of change in the external environment (Nadkarni & Chen, 2014), so changing products too frequently and intensely as part of strategy by doing may be detrimental in settings with technological dynamism but not market dynamism. Rather, because there are few large swings in demand that reward fast product changes, a more deliberate and comprehensive approach to strategic decision-making can help managers cope with the ambiguity associated with technological dynamism (Heavey, Simsek, Roche, & Kelly, 2009). Indeed, when technologies change rapidly, firms can often find ways to make minor changes to rivals' products (Pérez-Luño, Wiklund, & Cabrera, 2011), negating some of the advantages of experimenting with new products or product attributes because of the lack of potential for large upswings in demand. That is, a firm that engages in strategy by doing likely cannot capitalize on quick changes in demand before competitors catch up.

Overall, these arguments suggest that strategy by doing may not improve product-market performance if only one form of dynamism is high while the other is low because in isolation, each can be navigated using more deliberate modes of strategic decision-making. Without both forms of dynamism being high, product changes are unlikely to help the firm *capture* opportunities that arise from simultaneous changes in technologies and large upswings in demand for products using such technologies. Additionally, although *creating* opportunities can be successful in dynamic environments due to uncertainty (e.g., Alvarez, Young, & Woolley, 2015), traditional strategic analysis and planning can also be surprisingly useful in these settings (Gruber, 2007). In particular, it is used to support creative strategic approaches when dynamism is at a moderate level (Furr & Eisenhardt, 2021). Moreover, the lack of stability in mixed environments limits the potential for iterative, feedback-based learning that can be used to challenge assumptions (Barreto, 2012; Nadkarni & Chen, 2014). Thus, gathering and analyzing information to adapt to an overall moderate amount of dynamism is likely appropriate in mixed environments (Schilke, 2014). Hence:

Hypothesis 4: In mixed environments characterized by either high levels of market dynamism and low levels of technological dynamism, or by high levels of technological dynamism and low levels of market dynamism, the positive effect of product changes on product-market performance is reduced.

Methods

Data and Sample

We constructed a panel dataset that includes a text-based analysis of firms' product offerings to investigate the relationship between product changes and product-market performance. To create our dataset and calculate the main explanatory variable, we built on Hoberg and Phillips (2016) and Hoberg et al. (2014), who used web-crawling and text-parsing algorithms to process descriptions of businesses and generate text-based data for all publicly traded and domestic U.S. firms whose 10-K filings were available in the EDGAR database of the U.S. Securities and Exchange Commission (SEC). We then matched this data with accounting and stock market data available from the CRSP-Compustat Merged database from 1996 to 2016 to create our dependent variable, moderators, and controls. Our model specification required a lagged structure because product-related changes impact organizational performance over time (e.g., Fresard, 2010; Kor & Mahoney, 2005; Schilke, 2014). Thus, we excluded firms with fewer than five consecutive firm-year observations. The final sample contained 4,851 firms with 38,942 firm-year observations.

Measures

Dependent variable. To determine the consequences of product changes, we required a measure that captures each firm's success in its product market. Following prior research (e.g., Fresard, 2010; Mueller, Titus, Covin, & Slevin, 2012; Richard, Devinney, Yip, & Johnson, 2009), we used *sales growth* relative to the industry average. Product-market performance is one of the three essential areas of organizational performance, next to financial outcomes and shareholder returns (Richard et al., 2009). The latter two types of performance measures capture firm

efficiency, whereas product-market measures, particularly sales growth, are conducive to capturing firms' effectiveness in addressing customer demands and customer acceptance of products (e.g., Collins & Clark, 2003; Sarta et al., 2021; Tuli, Bharadwaj, & Kohli, 2010). Within the strategy-by-doing literature, performance "should be gauged by its continual value creation for consumers" (Chen et al., 2021, p. 1381). Accordingly, "[r]elative sales growth is probably the best indicator of whether superior customer value is being created" (Slater & Narver, 2000, p. 121). We measured *sales growth* using the change in sales of each firm between time *t* and time *t*-1*,* minus the industry-year average to adjust for industry based on each firm's dominant standard industrial classification (SIC) four-digit group (e.g., Fresard, 2010; Mueller et al., 2012).

Independent variable. In light of prior studies on strategy by doing and changes in firms' products (e.g., Michael & Palandjian, 2004; Rothaermel, Hitt, & Jobe, 2006; Srivastava, Sahaym, & Allison, 2021), we assessed *product changes* using the approach and data of Hoberg et al. (2014) and Hoberg and Phillips (2016), which leverages changes in the business descriptions in firms' 10-K filings. Business descriptions give rigorous insights into a firm's product offerings, as item 101 of regulation S-K in the United States requires firms to describe their products and update these descriptions each year. First, the cosine similarity between the focal firm's year *t* and its year *t*-1 product descriptions is determined. Common and irrelevant words, such as personal pronouns, are filtered out (Hoberg & Phillips, 2010). If a firm does not alter its product offerings, the value of the cosine similarity that compares a firm's product description in year *t* with the product description in year *t*-1 is one. Values lower than one indicate changes in a firm's product offerings. Hence, the relevant variable to capture change is one minus the cosine similarity and is shown in percent, such that "higher values indicate that the firm is changing its own product composition" (Hoberg et al., 2014, p. 306). This could include the introduction of new products, changes to existing products, or the discontinuation of products. We measured firms' patterns of product changes by calculating the average over periods *t-2*, *t-3*, and *t-4*. Higher values indicate that the firm is engaged in strategy by doing because there is greater intensity in changing the firm's products. We employed a temporal lag between product changes and sales growth based on Kor and Mahoney (2005), who suggested that the marketing of changed products has economic effects that materialize after more than one year, and Fresard (2010), who recommended the use of a 2-year lag structure for examining product-market outcomes. Thus, we used a 2-year lag.

Moderating variables. To measure *market dynamism*, we followed Dess and Beard (1984) to capture the unpredictability of demand, a common approach in the management literature (e.g., Datta, Guthrie, & Wright, 2005; Lepak, Takeuchi, & Snell, 2003; Tang, Mack, & Chen, 2018; Wang & Li, 2008). Accordingly, we regressed four-digit SIC level industry sales over 5 years against time. We then extracted the standard error of the rate of change of industry sales before dividing it by the mean industry sales and taking the logarithm to account for skewness. To measure *technological dynamism*, we used the average R&D intensity of an industry—that is, the four-digit SIC industry average of R&D expenditures divided by sales (e.g., Gentry & Shen, 2013; Habel & Klarmann, 2015), based on the notion that technologically dynamic environments are reflected in firms' R&D investments (e.g., Lepak et al., 2003; Saboo & Grewal, 2013; Titus, House, & Covin, 2017). Results were qualitatively similar using the industry median instead of the mean.

Control variables. We controlled for various alternative explanations of a firm's product-market performance. First, we included the 1- and 2-year lag of our dependent variable, *sales growth*, to control for the impact of unobserved firm characteristics that gave rise to sales growth in prior years, such as changes in store outlets, distribution networks, diversification, or vertical integration (e.g., Helfat & Winter, 2011). Second, we included firms' *financial slack*, captured via cash and short-term investments scaled by total assets (e.g., John, Li, & Pang, 2017), as an indicator of financial strength, because excess financial resources can help fuel growth through strategic flexibility and investments (Kim & Bettis, 2014). Furthermore, firms with lower *leverage*, approximated via long-term debt scaled by total assets (Fresard, 2010), tend to have unused debt capacity that permits investments to foster growth. Third, *firm size*, measured as the logarithm of total assets, was included because larger firms have greater market power than smaller firms, shaping their potential to grow their sales (Haveman, 1993). Fourth, we controlled for a firm's *degree of internationalization*, measured as the pre-tax foreign income, with missing values replaced by zero and scaled by total assets, because it may shape organizational performance (e.g., Marano, Arregle, Hitt, Spadafora, & van Essen, 2016). Fifth, we controlled for *capital expenditures* scaled by total assets, because such expenditures mirror a firm's commitment to expanding its asset base, which can fuel growth (e.g., Arrfelt, Wiseman, & Hult, 2013). Sixth, we controlled for a firm's *R&D intensity*, measured as the R&D expenses scaled by sales (e.g., Xia, Wang, Lin, Yang, & Li, 2018), which can support new product introductions and be an alternative driver of a firm's growth (e.g., Nunes, Serrasqueiro, & Leitão, 2012). Seventh, we controlled for a firm's *advertising intensity*, measured as the advertising expenses scaled by sales (e.g., Kim & Bettis, 2014), to control for growth that may result from higher marketing activity, such as better communication and positioning of products in the market. Because firms are not required to disclose R&D intensity and advertising intensity if related expenses are below 10 percent of sales and general administrative expenses, we followed prior literature and replaced nonreported values with zero (e.g., Blagoeva, Mom, Jansen, & George, 2020). We included a dummy variable to capture any effects of such replacement.

We followed Fresard (2010) and included the 1- and 2-year lagged values for our control variables, except firm size, as it could create a potential issue of multicollinearity (results were substantively similar when lagged firm size was included). We included the squared term of product changes within our models to control for the potential of curvilinear effects of strategy by doing (e.g., Chen et al., 2021). To control for potential nonlinear direct effects of our moderating variables, we included the squared terms of each moderator in related models (e.g., Chen, Sharma, Zhan, & Liu, 2019; Schilke, 2014). Lastly, we accounted for unobserved heterogeneity across periods that shape product-market outcomes, such as those caused by macroeconomic conditions, by including year dummies in our models. Summary statistics are shown in Table 1.

Table 1 Descriptive Statistics and Correlations[a]

Variable	*M*	*SD*	Min.	Max	1	2	3	4	5	6	7	8	9	10
1 Sales growth	–0.22	1.15	–10.25	3.66										
2 Firm size	6.10	2.10	–.1.95	13.08	.04*									
3 Leverage	.22	.21	.00	.99	.02*	.28*								
4 Financial slack	.19	.22	.00	.94	–.15*	−.33*	−.38*							
5 Degree of internationalization	.01	.03	–.08	.12	.02*	.24*	−.06*	−.02*						
Capital expenditures	.05	.06	.00	.38	.04*	.09*	.12*	−.22*	−.03*					
R&D intensity	.04	.13	.00	.74	–.24*	−.16*	−.11*	.47*	−.05*	−.15*				
Advertising intensity	.01	.03	.00	.20	.00	.00	−.01	.05*	.02*	−.04*	−.01*			
Product changes	18.31	10.39	1.53	75.98	–.03*	.01*	−.01	.14*	−.06*	−.01	.06*	.03*		
Market dynamism	–1.33	.62	–2.99	2.70	–.02*	−.21*	−.05*	.11*	−.07*	.03*	–.05*	−.03*	.14*	
Technological dynamism	.59	2.78	.00	18.50	–.45	–.09*	–.03*	.33*	−.05*	−.10*	.54*	.00	.04*	–.01*

[a] $n = 38{,}942$. *M*, *SD*, Min., and Max. are used to describe the mean, standard deviation, minimum, and maximum, respectively. The variables firm size and market dynamism are logged. Unstandardized variables are reported. *$p < .05$.

To better understand our explanatory variable, we follow prior research (e.g., Knott & Posen, 2005) and provide a transition matrix of product changes. The transition matrix, shown in Table 2, indicates how a focal firm's product changes in 1 year are related to its product changes in the following year. The transition matrix decomposes our explanatory variable into quintiles and shows yearly movements across these quintiles. For instance, the row labeled 5 represents the firms with the most product changes in a given year. The transition matrix shows that the majority of firms (70.68%) remain in the top quintile in the following year, whereas 21.22 percent drop one quintile, hence they curb product changes somewhat in the following year. The transition matrix shows that product changes are relatively stable across time because the highest shares are along the diagonal of the transition matrix. This indicates that firms mostly stay in their product changes quintile from year to year, reflecting their propensity to engage in strategy by doing

Analysis

To control for unobserved heterogeneity, we employed an industry fixed-effects model using four-digit SIC codes (e.g., Kim & Bettis, 2014). The Hausman test also favored a fixed-effects model over a random-effects model ($p = .000$). Our variables were winsorized at the 1st and 99th percentile to avoid the possibility that outliers may drive results. All variables included within interactions were standardized to ameliorate multicollinearity concerns. Mean variance inflation factors ranged between 2.94 and 5.15, well below the threshold of 10, thus indicating multicollinearity was not a concern (Hair, 2010).

Results

Main Results

The results are presented in Table 3. Model 1 included controls only. As for our controls, sales growth$_{t-2}$, leverage$_{t-1}$, financial slack$_{t-2}$, and R&D intensity$_{t-1}$ have positive and statistically significant effects on product-market performance. In contrast, sales growth$_{t-1}$, firm size$_{t-1}$, leverage$_{t-2}$, and R&D intensity$_{t-2}$ exhibit negative and statistically significant effects.

We added product changes in model 2 to test hypothesis 1, which predicted a positive effect of product changes on product-market performance. Results show no statistically significant effect of product changes on product-market performance ($\beta = 0.00$; $p = .515$), indicating hypothesis 1 is not supported.

Testing hypotheses 2 to 4 requires joint consideration of market and technological dynamism; hence we added these variables in model 3. Moreover, we needed to include the three-way interactions and lower-order interactions of product changes with the moderators of market dynamism and technological dynamism, which was done in model 4 of Table 3, our reference model for analysis of hypotheses 2 to 4. Notably, Model 4 indicates that both market dynamism ($\beta = 0.03$; $p = .001$) and technological dynamism ($\beta = 0.05$; $p = .078$) show positive and statistically significant two-way interaction effects, respectively, substantiating that subdimensions of environmental dynamism may matter as boundary conditions of the relationship between strategy by doing and product-market performance.

Table 2 Year-to-Year Transition Matrix of Product Changes[a]

			Quintile $t + 1$					
			Low EV				High EV	
			1	2	3	4	5	**Total**
	Low EV	1	8,333	2,243	614	235	144	**11,569**
			72.03	19.39	5.31	2.03	1.24	**100**
		2	2,361	5,581	2,559	725	234	**11,460**
			20.60	48.70	22.33	6.33	2.04	**100**
Quintile t		3	589	2,639	5,078	2,539	585	**11,430**
			5.15	23.09	44.43	22.21	5.12	**100**
		4	232	740	2,600	5,470	2,320	**11,362**
			2.04	6.51	22.88	48.14	20.42	**100**
		5	96	200	611	2,367	7,878	**11,152**
	High EV		.86	1.79	5.48	21.22	70.64	**100**
		Total	**11,611**	**11,403**	**11,462**	**11,336**	**11,161**	**56,973**
			20.38	**20.01**	**20.12**	**19.90**	**19.59**	**100**

[a] Transition matrix for product change based on all firm-year observations of our explanatory variable (EV), that is, product changes. Observations are unrestricted to streamlined sample observations. Upper values indicate the frequency; lower values indicate the row percentage.

Table 3 Regression Results of the Effect of Product Changes on Product-Market Performance and the Moderating Impact of Market Dynamism and Technological Dynamism[a]

	Model 1			Model 2			Model 3			Model 4		
Variables	Coeff.	*SE*	*p*	Coeff.	*SE*	*p*	Coeff.	*SE*	*p*	Coeff.	*SE*	*p*
Explanatory												
Product changes$_{t-2}$				.00	(.01)	.515	.00	(.01)	.938	.02	(.01)	.008
Product change squared$_{t-2}$				.00	(.00)	.898	.00	(.00)	.826	−.01	(.01)	.028
Market dynamism$_{t-2}$							.07	(.01)	.000	.11	(.02)	.000
Technological dynamism$_{t-2}$							.14	(.08)	.002	.45	(.06)	.000
Interactions (two-way)												
Product changes$_{t-2}$ × market dynamism$_{t-2}$										.03	(.01)	.001
Product changes squared$_{t-2}$ × market dynamism$_{t-2}$										−.02	(.01)	.001
Product changes$_{t-2}$ × technological dynamism$_{t-2}$										.05	(.03)	.001
Product changes squared$_{t-2}$ × technological dynamism$_{t-2}$										−.04	(.02)	.028
Market dynamism$_{t-2}$ × technological dynamism$_{t-2}$										.40	(.04)	.000
Interactions (three-way)												
Product changes$_{t-2}$ × market dynamism$_{t-2}$ × technological dynamism$_{t-2}$										.20	(.04)	.000
Product changes squared$_{t-2}$ × market dynamism$_{t-2}$ × technological dynamism$_{t-2}$										−.09	(.02)	.000
Controls												
Sales growth$_{t-1}$	−.05	(.01)	.000	−.05	(.01)	.000	−.15	(.01)	.000	−.19	(.01)	.000
Sales growth$_{t-2}$	.09	(.01)	.000	.09	(.01)	.000	.08	(.01)	.000	.05	(.01)	.000
Firm size$_{t-1}$	−.01	(.00)	.015	−.01	(.00)	.021	−.01	(.00)	.044	−.01	(.00)	.017

Leverage$_{t-1}$	.32	(.09)	.000	.32	(.09)	.000	.26	(.08)	.001	.26	(.08)	.001
Leverage$_{t-2}$	−.17	(.09)	.049	−.17	(.09)	.050	−.11	(.08)	.185	−.12	(.08)	.131
Financial slack$_{t-1}$	−.01	(.09)	.936	−.01	(.09)	.937	−.13	(.08)	.096	−.15	(.08)	.056
Financial slack$_{t-2}$	.38	(.09)	.000	.38	(.09)	.000	.38	(.08)	.000	.44	(.08)	.000
Degree of internationalization$_{t-1}$	.00	(.27)	.986	−.01	(.27)	.974	.25	(.27)	.352	.27	(.27)	.320
Degree of internationalization$_{t-2}$	−.14	(.29)	.627	−.15	(.29)	.618	−.33	(.28)	.239	−.43	(.27)	.118
Capital expenditures$_{t-1}$	−.02	(.16)	.927	−.02	(.16)	.926	−.03	(.16)	.835	−.06	(.16)	.722
Capital expenditures$_{t-2}$	.10	(.15)	.495	.10	(.15)	.494	.08	(.14)	.563	.08	(.14)	.589
R&D intensity$_{t-1}$	.52	(.16)	.001	.52	(.16)	.001	.54	(.15)	.000	.45	(.14)	.001
R&D intensity$_{t-2}$	−1.33	(.19)	.000	−1.33	(.19)	.000	−.41	(.18)	.021	−.45	(.17)	.009
Missing R&D dummy	−.01	(.02)	.554	−.01	(.02)	.579	.03	(.02)	.100	.02	(.02)	.268
Advertising intensity$_{t-1}$	.70	(.79)	.379	.70	(.79)	.378	.53	(.79)	.500	.49	(.75)	.516
Advertising intensity$_{t-2}$	−.39	(.74)	.602	−.38	(.74)	.606	−.01	(.74)	.984	.03	(.72)	.964
Missing advertising dummy	.02	(.01)	.176	.02	(.01)	.175	.02	(.01)	.095	.03	(.01)	.013
Market dynamism squared$_{t-2}$							.03	(.01)	.008	.04	(.01)	.000
Technological dynamism squared$_{t-2}$							−.08	(.01)	.000	−.09	(.01)	.000
Intercept	−.15	(.07)	.024	−.18	(.07)	.009	−.27	(.08)	.001	−.24	(.08)	.004
R^2		.20			.20			.28			.31	
Industry fixed effects	Yes			Yes			Yes			Yes		
Year fixed effects	Yes			Yes			Yes			Yes		
N		38,942			38,942			38,942			38,942	

[a] Coeff. = coefficient; robust standard errors are reported in parentheses. $n = 38{,}942$. The variables firm size and market dynamism are logged. Unstandardized coefficients are presented, except for the main explanatory variable included in the interactions.

Because lower-order interaction terms are of less relevance for interpretation when higher-order interaction terms are found that are statistically significant (e.g., Aiken & West, 1991; Goldman, 2003), we focus on the relevant three-way interaction term. We find a positive and significant three-way interaction effect among product changes, market dynamism, and technological dynamism ($\beta = 0.20$; $p = .000$), suggesting that they jointly influence product-market performance. Analyses showed that compared to a model containing only the two-way interaction effects of our moderators, adding the three-way interaction increases the R^2 by 0.03. To interpret the three-way interaction, we followed the approach of Aiken and West (1991), which is commonly used in management studies (e.g., Goldman, 2003).

To facilitate interpretations, we supplement the regression output with an interaction plot in Figure 2. We also indicate the statistical significance of simple slopes in the parenthesis of each environmental setting and show pairwise slope difference tests via t-tests in the upper-left window of Figure 2. Figure 2 shows that when market dynamism and technological dynamism are both high (setting 1), product changes are positively related to product-market performance, supporting hypothesis 2. When market dynamism and technological dynamism are both low (setting 4), product changes are also positively related to product-market performance, supporting hypothesis 3. The highest product-market performance occurs when product changes, market dynamism, and technological dynamism are all high simultaneously, with the slope in setting 1 being significantly different from the slopes of the other settings. This evidence supports our theorizing that strategy by doing is effective when both market and technological dynamism are high. Moreover, these slope difference tests indicate that the positive slopes in settings 1 and 4 are statistically different from each other ($p = .015$), with the slope being higher in setting 1 than in setting 4 (slope difference = 0.17), and both the slopes in setting 1 ($\beta = 0.31$; $p = .000$) and setting 4 are positive and statistically significant ($\beta = 0.14$; $p = .000$), respectively. In other words, holding other factors constant, one standard deviation increase of product changes increases sales growth by about 0.31 in environments where both market dynamism and technological dynamism are high (setting 1). In environments where both market dynamism and technological dynamism are low (setting 4), an increase of one standard deviation in product changes increases sales growth by about 0.14.

In mixed environments where there are contrasting levels of market dynamism and technological dynamism—that is, one is high while the other is low (setting 2 and setting 3)—the plots show that the relationship between product changes and product-market performance becomes negative. Tests indicate that setting 2 and setting 3 exhibit both a negative and statistically significant slope (setting 2: $\beta = -0.20$; $p = .000$; setting 3: $\beta = -0.16$; $p = .000$). An increase of one standard deviation in product changes dampens sales growth by about 0.20 (0.16) in mixed environments (setting 2 / setting 3). This pattern provides evidence in support of hypothesis 4. Tests also show that for both mixed environments, the slope differences are negative and statistically different from settings 1 and 4 ($p = .000$). Notably, both mixed settings are not statistically different from each other (slope difference = −0.04; $p = .482$). Thus, mixed environments appear to be the same in that strategy by doing reduces product-market performance, regardless of which form of dynamism is high or low.

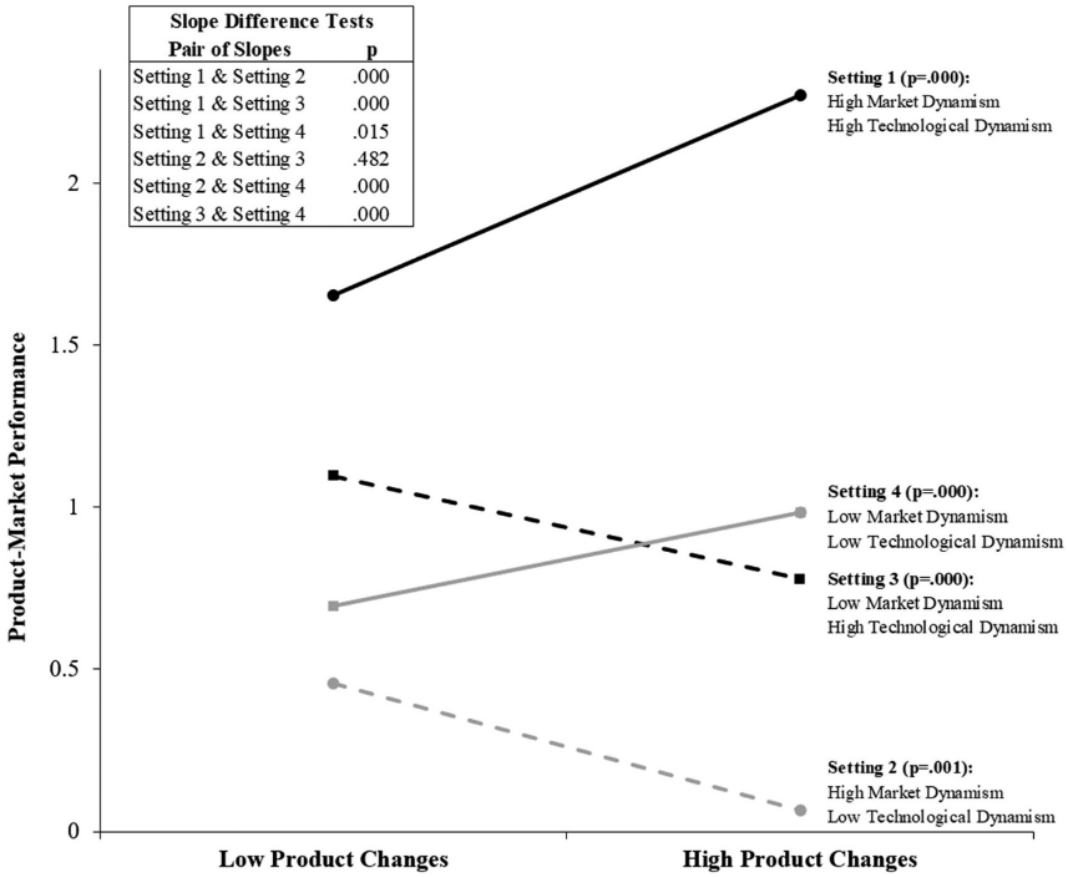

Figure 2 Plot of the Three-Way Interaction Between Product Changes and Product-Market Performance, in the Context of Market Dynamism and Technological Dynamism[a]

[a]The plot is based on results from model 4 in Table 3. Standardized values are plotted for one standard deviation below and above the mean of the explanatory variable—that is, low versus high product changes. For convenience, the intercept is indicated as 1 in this plot (intercept in case of standardizing all model variables is 0.09; all underlying patterns are unaffected). This figure illustrates the relationships between product changes and product-market performance in varying market dynamism and technological dynamism contexts.

Additional Analyses

Robustness checks. We ran several robustness checks and further analyses (all results are available upon request). First, we altered the lag structure of our model specification to ensure that our findings did not depend on a particular choice of lag structure. We reestimated the models using a lag structure of 3 years between the dependent variable and right-hand-side variables and found qualitatively similar results. Furthermore, we used combinations of fixed-effects/random-effects models and the inclusion of lagged dependent variables and found that our results were not driven by the simultaneous inclusion of both fixed-effects or lagged dependent variables. We also altered our winsorization procedure of the main analyses to a more conservative threshold of the 2nd and 98th percentile of our explanatory variable and found that our results held.

We also performed sensitivity tests to examine potential bias related to omitted variables that can lead to endogeneity concerns, although there is literature suggesting that omitted variable bias is less pertinent for moderation analysis as compared to conventional direct effects

of explanatory variables (e.g., Bun & Harrison, 2019). Based on the approaches of recent management studies (e.g., Hubbard, Christensen, & Graffin, 2017; Quigley & Graffin, 2017; Xia, Jiang, Wang, & Li, 2022), we determined the impact threshold of the confounding variable (ITCV) to examine the degree to which potential confounding variables would be strong enough to alter an inference. For the relevant interaction term of product changes, market dynamism, and technological dynamism (model 4 of Table 3), our analyses using two-tailed tests yielded 59.04% as the invalidation threshold. Hence, to invalidate our findings, 22,991 sample observations would need to be replaced with observations for which the effect was zero. Although absolute standards for invalidation thresholds are difficult to establish given varying contexts (e.g., Larcker & Rusticus, 2010; Xia et al., 2022), such an enormous portion of our sample that would have to be replaced by cases with null effects suggests that our results are unlikely driven by confounding variables. Furthermore, the result further showed an ITCV of 0.0138, tentatively indicating that partial correlations between the key interaction term and sales growth with a confounding omitted variable would have to be about 0.118 (the square root of 0.0138) to overturn our results. Hence, to invalidate our results, a correlated omitted variable would need to be about as strongly correlated with the dependent variable as the current strongest model predictor. Given our rigorous selection of control variables, these additional analyses suggest that our findings are unlikely biased by an omitted variable.

Further analyses. To better understand the underlying mechanism related to organizational learning, we provide an additional empirical assessment. As part of our theorizing, we proffered that product changes can be a form of organizational learning by doing. Hence, we expect product changes to be positively related to learning. To test this assumption, we used the measure created by Uotila, Maula, Keil, and Zahra (2009), which serves as a proxy for organizational learning (e.g., Gupta, Dutta, & Chen, 2014), and applied their validated dictionary to perform a textual analysis of firms' 10-K reports. We used a lagged model structure as product changes are assumed to precede learning according to the strategy-by-doing literature. Results indicate a positive and statistically significant effect of product changes on this proxy for firms' organizational learning ($\beta = 0.005$; $p = .000$), substantiating our theorized mechanism.

Furthermore, we tested alternative dependent variables. The strategy-by-doing literature emphasizes that sales growth is an indicator of what customers prefer (e.g., Chen et al., 2021), so we do not necessarily expect the same relationship when predicting other types of organizational performance, such as financial performance. For instance, short-term growth often comes at the expense of profitability (e.g., Manu & Sriram, 1996), suggesting that firms that engage in strategy by doing may achieve profitability only belatedly after learning what works in the marketplace, and it may be short-lived in highly dynamic environments (Eisenhardt & Bingham, 2017). Still, we tested the financial implications of product changes. To measure financial performance, we used Total q, an improved version of Tobin's q that accounts for a firm's intangible assets (Peters & Taylor, 2017), comprising a market-based, forward-looking measure of long-term financial performance that reflects both current and foreseeable profitability (e.g., Li & Tallman, 2011; Peters & Taylor, 2017). We also used return on assets as an accounting-based, backward-looking measure (e.g., Ye, Yu, & Nason, 2021). For each performance outcome, we adapted the required lag structure of the model specifications following prior studies (e.g., Kim & Bettis, 2014; Lu & Beamish, 2004), respectively, to account for the forward- and backward-looking features of these alternative measures of financial performance. Our results show a positive and statistically significant effect of product changes on Total q ($\beta = 0.047$; $p = .006$). In contrast, our results for return on assets indicate a negative

and statistically significant effect of product changes ($\beta = -0.015$; $p = .000$).

We wanted to understand if these results are driven by a firm's strategic orientation—that is, if firms that engage in strategy by doing are, on average, not pursuing short-term profitability but growth instead. To capture a firm's profitability orientation, we followed McKenny, Aguinis, Short, and Anglin (2018) and applied a validated dictionary approach to firms' 10-K statements. Profitability orientation is the ratio of profitability terms scaled by the total words to account for the length of the text documents. Regression results show a negative and statistically significant effect of product changes on profitability orientation ($\beta = -0.028$; $p = .000$). This result indicates that firms engaged in strategy by doing may not be seeking profitability in the short term but rather are oriented toward long-term growth (Eisenhardt & Bingham, 2017). It is possible that such firms are focused on growth first and then later pursue efficiencies to improve profitability (e.g., Davidsson, Steffens, & Fitzsimmons, 2009).

Discussion

This study set out to investigate how market and technological dynamism affect the relationship between strategy by doing and product-market performance. Strategy by doing does not appear to improve performance for every firm, but we find empirical support for our theorizing that strategy by doing in the form of product changes can enhance performance in highly dynamic and stable environments. However, when market and technological dynamism are at contrasting levels, strategy by doing does not improve performance. We next discuss the implications of these findings.

Implications for Theory

Our study makes contributions to several streams of literature. First, we contribute to research on strategy by doing by explicating how a multifaceted conceptualization of environmental dynamism affects the utility of strategy by doing. Although the strategy-by-doing literature generally discusses highly dynamic environments, studies do not typically test how different dimensions of dynamism may alter the relationship between strategy by doing and performance in distinct and sometimes dissimilar ways (Danneels & Sethi, 2011). Our theory and findings indicate that distinguishing between dimensions of environmental dynamism is highly consequential to understanding the performance ramifications of strategy by doing.

One finding that ran counter to our expectations was that product changes do not exert a significant direct influence on firms' product-market performance when holding different forms of environmental dynamism constant. These findings speak to the complex role that the external environment plays, indicating that strategy by doing is not a one-size-fits-all approach but rather is effective under specific circumstances. One possible explanation for the lack of support for hypothesis 1 is that for the average firm in an average industry, strategy by doing is not beneficial because there are costs associated with product changes (Gans et al., 2019), meaning the environment must make product changes worthwhile for the firm to recoup such costs (Schilke, 2014). Buyers often prefer product changes that do not force alterations to their patterns of using the product (Chen, Zhang, Li, & Turner, 2022), suggesting that they may not view new products or product changes favorably if the environment has not changed drastically. Another possible explanation is that strategy by doing is thought to constitute an alternative approach in settings where common means of adaptation fail (Chen et al., 2021). This implies that in

nonentrepreneurial settings or when the firm does not seek to create opportunities in stable environments, other approaches to adaptation, such as R&D activities, may be sufficient to improve performance. Our finding that there is not a statistically significant effect of strategy by doing on product-market performance for an average firm in an average industry reinforces the rationale of prior research to assess the effects of strategy by doing in very specific "entrepreneurial settings, i.e., nascent, unpredictable and high-velocity markets" (Chen et al., 2021, p. 1380), such as the top segment of mobile app producers (Chen et al., 2021), or industries where young technology-based ventures operate (Eisenhardt & Bingham, 2017; Ott et al., 2017). However, whereas the literature typically casts dynamism in general as a contingency, our study shows that both market and technological dynamism are required for strategy by doing to improve performance.

Interestingly, if only one of these dimensions is high and the other is low, then strategy by doing usually results in lower product-market performance. It seems that technological dynamism and market dynamism work in tandem to create conditions favorable for strategy by doing; technological change creates opportunities for new or different products, and unpredictable demand rewards firms that can change products when upswings in demand occur. Such unpredictability of demand may forestall imitation in a way that does not occur in environments with only technological dynamism: "Market uncertainty makes it difficult for the firm to know precisely, during the R&D phase, which specifications or features to incorporate in its products, especially in dynamic environments" (Toh & Kim, 2013, p. 1246). By the time a dominant product design emerges, new changes in demand levels may be underway. These insights extend recent works regarding the limits of strategy by doing (e.g., Chen et al., 2021), contributing toward a contingency-based view of strategy by doing.

An important finding of our study is that strategy by doing can be effective in stable environments as part of an opportunity creation strategy to develop new segments of customers (Bradley et al., 2011; Luksha, 2008). This last contingency challenges the implicit assumption that strategy by doing would not be applicable in stable environments. Our theory and results show how strategy-by-doing research can expand its purview beyond only highly dynamic settings, creating connections to larger questions in management research (Ott et al., 2017). For example, although strategy by doing is often described as entrepreneurial (e.g., Eisenhardt & Bingham, 2017; Ott et al., 2017), the literature seems to have overlooked how strategy by doing may aid in opportunity creation, a common entrepreneurial strategy (e.g., Priem et al., 2012). Toward the goal of creating linkages between strategy by doing and other streams of literature, we next highlight implications for theories of organizational learning and firm adaptation.

Research on product changes as a means of learning has focused on product portfolio breadth and degree of diversification as sources of new knowledge (e.g., Chen et al., 2021), rather than the actual change in products. Extending previous work (e.g., Eggers, 2012; King & Tucci, 2002), we demonstrate that changing products can also generate knowledge that influences firm performance. Thus, managers may not always need to look to diversify the product portfolio, as too much diversification can have negative effects on performance (Chen et al., 2021). Product changes can create knowledge via learning by doing, but the organizational learning literature has focused on learning curves in production as the most common form of learning by doing (Argote, 2013). This state of affairs is somewhat strange because organizational learning theory states that novel actions are needed for higher-level learning to occur (Schilling et al., 2003), whereas learning curve improvements are based on cumulative experience from repeating the same actions (Argote, 2013), conforming to the definition of

lower-level learning (Fiol & Lyles, 1985). Our study shows that product changes constitute new actions that facilitate learning by doing, advancing our understanding of how variation improves organizational learning and performance. Relatively large organizational shifts like product changes appear to have beneficial learning effects that can improve performance under the right conditions.

Finally, we provide valuable insights for understanding adaptation and related areas within management research. A recent literature review exhorted scholars to move beyond conflations of adaptation and performance in favor of uncovering mechanisms showing the convergence between strategic actions, adaptation, and performance outcomes (Sarta et al., 2021). Although we do not capture the intention to adapt, the performance effects we observe conform to the definition of market adaptation (Sarta et al., 2021), suggesting that product changes may be a means of adaptation in certain circumstances, particularly in highly dynamic settings where firms can capture opportunities. Moreover, we advance a nuanced understanding of adaptation by showing how "change may not be necessary or appropriate in adaptive decision making depending upon the environmental dynamics" (Sarta et al., 2021, p. 64). Our finding that product changes are associated with lower product-market performance in mixed environments indicates how change is not always beneficial. Additionally, our finding that strategy by doing contributes to higher performance in stable environments—which do not typically require that firms change frequently—as part of an opportunity-creation strategy reflects the suitability of change-based strategies that are not related to adaptation. These insights advance scholarly understanding of when "strategic nonadaptation" can improve performance (Sarta et al., 2021, p. 62).

These findings also have implications for related areas of adaptation studies, such as dynamic capability research. Our measure of product changes may not reflect any underlying organizational capabilities because it only captures product-related actions that firms took over a given period of time without also measuring routinized behaviors (Teece, 2007). That said, our theory suggests that strategy by doing may aid in the eventual development of dynamic capabilities because strategy by doing can foster adaptation or change based on learning. Eisenhardt and Martin (2000, p. 1106) stated that dynamic capabilities are built on "simple, experiential, unstable processes that rely on quickly created new knowledge and iterative execution to produce adaptive, but unpredictable outcomes." This suggests a close relationship between learning-based actions and dynamic capabilities development, meaning that strategy by doing activities "may themselves become dynamic capabilities" (Furr & Eisenhardt, 2021, p. 1927). Our theory and findings can help scholars "better understand the relationships among the elements of organizational learning in different parts of the dynamic capabilities framework" by suggesting that *ad hoc* strategic actions foster learning that may eventually form the basis of dynamic capabilities (Schilke, 2018, pp. 418–419).

Practical Implications

This study suggests that managers should carefully consider environmental conditions when extemporaneously adjusting their firm's product offerings. Managers may be tempted to engage in substantial product changes to keep pace with a fast-changing environment, but they should resist the urge to change if they do not operate in a highly dynamic environment characterized by both market and technological dynamism. In such settings, product changes can be a valuable means of learning by doing. Strategy by doing in mixed environments may be detrimental, so

managers should perhaps use more traditional product development processes and strategic analysis. Likewise, although discussions of strategy by doing have centered on dynamic environments, managers in stable environments could consider using strategy by doing as a way to learn about potential avenues for opportunity creation.

Limitations and Conclusion

This study is not without limitations that lead to avenues for future research. First, firms may engage in strategy by doing in various forms besides product changes. Future research could use the findings and text-based measurements applied herein to examine the effects of other strategy-by-doing activities. Second, environmental dynamism, even if measured multidimensionally, is only one of several environmental attributes (e.g., Dess & Beard, 1984). There may be others that shape the consequences of strategy by doing. Hence, future studies could extend the environmental conditions examined in this study, such as by examining the relationship between strategy by doing and environmental complexity or munificence. Finally, because organizational performance measures differ (e.g., Barney, 2020; Richard et al., 2009), readers should interpret our results from a product-market perspective, consistent with the strategy-by-doing literature. Future research could investigate when strategy by doing may lead to improved financial performance in the form of profitability, taking into account the costs associated with product changes. These limitations allow future research to delve into this and other consequential features of strategy by doing.

This study guides such future research because it both expands and challenges key assumptions of the strategy-by-doing perspective. Although engaging in strategy by doing can be beneficial in highly dynamic environments, it can be detrimental in mixed environments. Additionally, we show that strategy by doing can improve performance in stable environments, contradicting the assumption that strategy by doing is generally applicable only in dynamic settings. These findings have implications for strategy-by-doing research, organizational learning, and theories of organizational adaptation.

Acknowledgements

We would like to thank our action editor Sali Li and three anonymous reviewers for their helpful comments and suggestions throughout the review process. We also wish to thank Ilya Cuypers, Stav Fainshmidt, and Erk P. Piening for providing valuable feedback on earlier drafts of this paper. In addition, we thank the participants of the paper presentation at the 80th Annual Meeting of the Academy of Management.

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