MARKETING ANALYTICS CENTRE WORKING PAPER SERIES

WORKING PAPER NUMBER:

MAC.2026.005

Title:

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MORE DOLLARS BUT DISSATISFIED CUSTOMERS: ON THE PARADOX OF INTRABRAND AGGLOMERATION

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Last Revision: June, 2026

More Dollars but Dissatisfied Customers: On the Paradox of Intrabrand Agglomeration

Cities increasingly host many stores of the same brand, making intrabrand agglomeration a central question for marketing. We propose customer variety seeking as the central mechanism linking intrabrand agglomeration to store performance, developing a framework in which high intrabrand agglomeration suppresses variety seeking, which in turn generates opposing effects on two store performance outcomes: store sales and customer satisfaction. Furthermore, the effect of intrabrand agglomeration varies with two local market conditions: interbrand agglomeration and relative service intensity. Using an industry-wide panel of 33,382 U.S. pizza chain restaurants from 72 brands and a behavioral co-visitation measure of variety seeking drawn from foot traffic data, we find that high intrabrand agglomeration suppresses variety seeking, which in turn raises store sales but dampens customer satisfaction. A particularly counterintuitive finding emerges: high interbrand agglomeration amplifies, rather than buffers, the negative effect of intrabrand agglomeration on variety seeking. In contrast, greater relative service intensity attenuates the negative effect of intrabrand agglomeration on variety seeking, buffering the performance paradox. The study advances agglomeration research by placing variety seeking, a demand-side mechanism, at the center of agglomeration theory, uncovering a counterintuitive amplification effect of interbrand agglomeration, and introducing relative service intensity as a boundary condition.

Key words: intrabrand agglomeration, variety seeking, store sales, customer satisfaction, interbrand agglomeration, relative service intensity

"Fortressing (high intrabrand agglomeration) enabled us to maintain our delivery services better than others." Russell Weiner, CEO of Domino's (Fantozzi 2024).

"*A major issue (with intrabrand agglomeration) is a decline in the specialness of the brand.… Ubiquity breeds contempt."* Rick Vanzura, COO of Panera Bread (Haddon 2025).

Cities today are strewn with multiple stores of the same brand, making intrabrand agglomeration—concentration of a chain's same-brand stores—a central puzzle for marketing and strategy scholars. The phenomenon became a cultural punchline. A 1998 *Onion* headline joked about a new Starbucks opening inside the restroom of an existing one, and comedian Lewis Black later quipped that he had found the "end of the universe" in Houston, where two Starbucks stood directly across the street from each other (Meyersohn 2025).

Past work on the effects of intrabrand agglomeration pivots around two competing logics. A *benefits-oriented* stream argues that higher same-brand store concentration improves performance through knowledge sharing (Butt et al. 2018) and increased customer utility (Kim and Jap 2022), whereas a *cost-oriented* stream contends that it fuels cannibalization (Guler 2018). We attribute this ambiguity to two shortcomings in the agglomeration literature.

First, the performance effect of intrabrand agglomeration remains ambiguous on two fronts: outcomes and process. Extant work focuses on supply-side outcomes such as knowledge spillovers (Butt et al. 2018) or competitive crowding (Zheng, Ji, and Su 2020), overlooking the possibility that intrabrand agglomeration creates a performance paradox. While Kim and Jap (2022) find that intrabrand agglomeration increases ex ante customer utility and store sales, this same agglomeration may dampen customer satisfaction by restricting choice and reducing the novelty of experiencing multiple brands—yet that very constraint may simultaneously boost sales by consolidating repeat patronage within the focal brand. Intrabrand agglomeration may thus represent a double-edged sword that cannot be evaluated through a single performance lens.

The process through which intrabrand agglomeration produces these contrasting outcomes also remains a black box. Prior studies identify mechanisms such as quality signaling (Kim and Jap 2022) and knowledge sharing (Butt et al. 2018), but each examines a single outcome, leaving unaddressed the question of what unified mechanism explains the paradoxical effects of intrabrand agglomeration. These gaps (gap ① in Figure 1) motivate our first research question. **RQ1**: *How does intrabrand agglomeration shape paradoxical effects on store sales and customer satisfaction?*

Second, the agglomeration literature lacks a contingency view of intrabrand agglomeration. Prior studies concede that agglomeration pays off only "under certain conditions," such as store maturity (Butt et al. 2018), brand system design (Kim and Jap 2022), or governance (Zheng, Ji, and Su 2020), yet these conditions are framed primarily from an internal perspective centered on a store or chain. Prior research has overlooked the effect of two local market conditions under which the effect of intrabrand agglomeration may vary: competitive density of a local market, such as interbrand agglomeration, and service positioning of a store, such as service intensity.

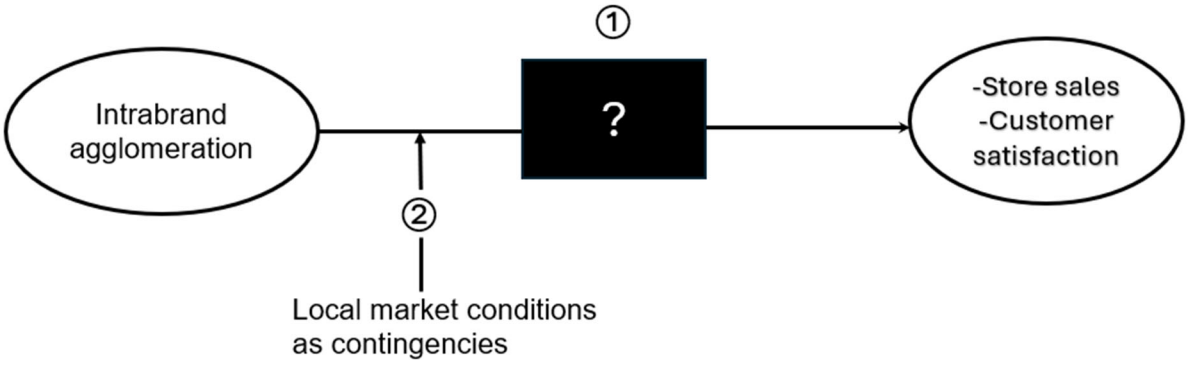


Figure 1: The two research questions we address

Regarding the effect of competitive intensity, past research on intrabrand agglomeration

implicitly assumes a competitive vacuum by ignoring the presence of rival stores in the local market (e.g., Butt et al. 2018). Yet intrabrand agglomeration and interbrand agglomeration (i.e., the extent to which a focal store is located near rival brand stores) coexist in reality, and their joint presence may interact to shape customer behavior in ways the extant literature has not examined.

Regarding the effect of service positioning, a store's relative service intensity ("service intensity" hereafter)—the extent to which it offers a higher or lower level of service relative to local rival stores' service—is likely to condition how intrabrand agglomeration affects customer behavior. This matters because service intensity is a managerial lever under a chain's control, and a chain's service positioning decision is likely to interact with its store location decision (i.e., intrabrand agglomeration). Yet how these two strategic decisions jointly shape customer behavior remains unstudied. Without accounting for such contingencies, the questions of when and for whom intrabrand agglomeration pays off remain unresolved. This gap (gap ② in Figure 1) motivates our second research question. **RQ2**: *How do local market conditions alter the effects of intrabrand agglomeration?*

We address these research questions from two angles, beginning with defining key constructs in Table 1 and a store as unit of analysis.[1] First, we propose customer variety seeking as the central demand-side explanatory mechanism that connects intrabrand agglomeration to two contrasting performance outcomes (e.g., Liu, Steenkamp, and Zhang 2018). We first predict that greater intrabrand agglomeration suppresses customer variety seeking by anchoring customers to the focal brand through familiarity, convenience, and reduced search incentives. This suppression of variety seeking in turn generates a performance paradox for a store: high

[1] We examine agglomeration at the *store level* rather than the cluster level, as our store-based measures exhibit meaningful variation across stores and accurately capture local competitive and complementary dynamics.

intrabrand agglomeration increases store sales by consolidating repeat patronage within the brand while simultaneously dampening customer satisfaction by constraining novelty and cross-brand comparison.

Table 1: Definition of key constructs

Construct	Conceptual definition	Representative references
Intrabrand agglomeration	The proximity of a store to the same-brand stores in a market	Kim and Jap (2022); Rawley and Seamans (2020); Kalnins and Chung (2004)
Interbrand agglomeration	The proximity of a store to different-brand stores in a market	Ganesan, Malter, and Rindfleisch (2005); Lu and Wedig (2013)
Customer variety seeking	The degree to which customers of a focal store disperse their visits across competing brands rather than concentrating them in a single rival brand	Steenkamp and Baumgartner (1992); Liu, Steenkamp, and Zhang (2018)
Service intensity	The degree to which a store offers a higher level of service relative to nearby different-brand stores	Ghemawat and Thomas (2008); Alcácer (2006)

Second, we theorize when two local market conditions—interbrand agglomeration and service intensity—change the relationship between intrabrand agglomeration and variety seeking and its downstream performance consequences. While it is logical that the close proximity of rival brands (i.e., high interbrand agglomeration) by itself encourages variety seeking, we posit the opposite when it comes to the interplay with intrabrand agglomeration: high interbrand agglomeration amplifies, rather than buffers, the suppression of variety seeking due to high intrabrand agglomeration by intensifying choice complexity and pushing customers further toward the familiar same-brand default (Gourville and Soman 2005; Chernev and Hamilton 2009). In contrast, greater service intensity of a store, by fulfilling variety needs internally within the focal brand, attenuates the variety-suppressing effect of high intrabrand agglomeration (Maimaran and Wheeler 2008). These tempering effects propagate downstream: high interbrand agglomeration amplifies, while high service intensity buffers, the indirect effects of intrabrand agglomeration on store sales and customer satisfaction through variety seeking.

Expanding the scope of prior studies that examine agglomeration of a single brand (Butt et al. 2018) or a single multi-brand firm (Kim and Jap 2022), we adopt an industry-wide

perspective of agglomeration and analyze 33,382 pizza restaurants of 72 brands in the entire U.S. pizza chain industry from 2017–2019. Our results show that greater intrabrand agglomeration suppresses customer variety seeking. This suppression simultaneously raises store sales but lowers customer satisfaction, engendering a performance paradox. Rather than buffering the suppressing effect of intrabrand agglomeration on variety seeking, high interbrand agglomeration amplifies it. In contrast, high service intensity attenuates the suppressing effect of intrabrand agglomeration on variety seeking, thereby providing a lever to mitigate the paradoxical effects of intrabrand agglomeration.

Our study offers two contributions to agglomeration research. First, we extend agglomeration research by placing a demand-side construct—customer variety seeking—at the center of the intrabrand agglomeration story. Rather than linking intrabrand agglomeration directly to performance outcomes (e.g., Butt et al. 2018; Guler 2018), we theorize on the underlying process through which intrabrand agglomeration first suppresses variety seeking, and variety seeking as a mechanism generates opposing effects on store sales and customer satisfaction. This advances theory from a monolithic view of store performance to a nuanced account of how a single behavioral mechanism (i.e., variety seeking) simultaneously drives customer-centric and store-centric outcomes to opposite directions.

Second, we theorize on how local market conditions change the intrabrand agglomeration–variety-seeking pathway. When combined with high intrabrand agglomeration, high interbrand agglomeration amplifies the suppression of variety seeking. In contrast, high service intensity attenuates these effects. Together, these findings extend agglomeration research by showing that the performance effects of intrabrand agglomeration are contingent on the competitive density of the local market and the service positioning of a store against local rivals

(Geyskens, Gielens, and Gijsbrechts 2010). The next sections develop the theory and hypotheses, present the empirical analysis, and discuss contributions and implications.

Theory and Hypotheses

Conceptual Foundation #1: Agglomeration

We report our conceptual framework in Figure 2 and a summary of previous studies on the outcomes of agglomeration in Web Appendix 1. Our review suggests two research opportunities that mirror our research questions.

Opportunity 1: Identifying the paradoxical effect of intrabrand agglomeration

Past research on intrabrand agglomeration has focused on store outcomes such as sales (Guler 2018), leaving demand-side outcomes underexamined. A notable exception is Kim and Jap (2022), who infer customer utility alongside sales using a structural choice model. We extend their work by directly measuring customer satisfaction to capture actual customer experience.[2]

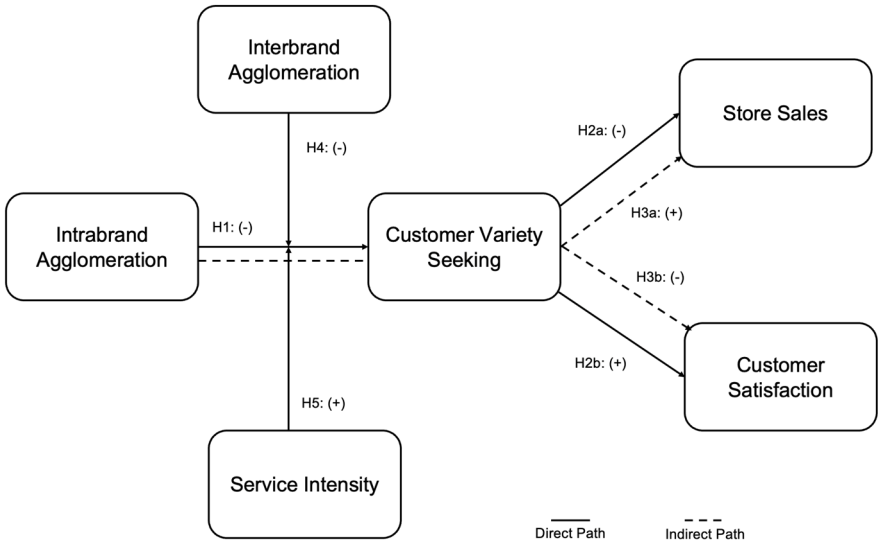


Figure 2: The conceptual framework

[2] Customer utility is the value a customer derives from a product (Franke and Schreier 2008), while customer satisfaction is the post-use evaluation against expectations (Oliver 1999). High utility may not mean high satisfaction.

Examining the effects of intrabrand agglomeration on both sales performance and customer satisfaction is essential because such agglomeration may create a performance paradox through its suppression of variety seeking: by anchoring customers to the focal brand and reducing cross-brand exploration, high intrabrand agglomeration simultaneously consolidates repeat patronage to raise store sales while constraining novelty and choice to lower customer satisfaction. Whereas Kim and Jap (2022) find evidence that greater intrabrand agglomeration may enhance customer utility, our account suggests it dampens customer satisfaction precisely because it suppresses the variety of choices that drives novelty, cross-brand comparison, and experiential satisfaction (Liu, Steenkamp, and Zhang 2018). Therefore, although it has been assumed widely that customer satisfaction and store sales move in tandem (Otto, Szymanski, and Varadarajan 2020), this potential paradox underscores the need to distinguish between store-centric (sales) and customer-centric (satisfaction) consequences of intrabrand agglomeration.

Opportunity 2: Contextualizing the performance effects of intrabrand agglomeration

Two facets of a local market stand out: interbrand agglomeration and service intensity. Prior studies focus on intrabrand agglomeration of a single brand (Butt et al. 2018) or a single multi-brand firm (Kim and Jap 2022; Janakiraman et al. 2025), while overlooking its interplay with agglomeration of rival brands in a local market. Considering interbrand agglomeration in conjunction with intrabrand agglomeration highlights the nuanced effects of intrabrand agglomeration on store performance.

On one hand, high interbrand agglomeration may weaken the suppressive effect of intrabrand agglomeration on variety seeking by lowering search costs and making cross-brand exploration effortless (Liu, Steenkamp, and Zhang 2018). On the other hand, a dense cluster of rival stores due to high interbrand agglomeration may overwhelm customers with competing

options, induce choice overload, and drive them toward the familiar same-brand default, thereby strengthening the suppressive effect of intrabrand agglomeration on variety seeking (Natan 2025). These diverging logics suggest that the performance effects of intrabrand agglomeration cannot be fully understood in isolation. Instead, they must be evaluated in conjunction with the existence of surrounding rival stores (i.e., interbrand agglomeration), which acts as a boundary condition shaping when intrabrand agglomeration enhances or diminishes store performance.

While accounting for the presence of rivals (i.e., interbrand agglomeration) is important, it is equally critical to consider how a focal brand is positioned relative to rival brands in a local market (Sharma and Chung 2022). Even within the same geographic cluster, a store's performance may vary depending on its positioning relative to competitors, making it essential to examine a store location decision (i.e., intrabrand agglomeration) and a store positioning decision (e.g., service intensity) together to fully understand a store's performance outcomes (Alcácer 2006). Studying a store's service intensity is important because it shapes how customers evaluate alternatives in dense clusters (i.e., high intrabrand agglomeration) where direct comparisons are inevitable. Differences in service levels across brands under such environments provide customers with salient cues that influence their choices among competing brands. Service intensity therefore becomes a critical contingency to grasp how intrabrand agglomeration plays out in a market with rival brands, specifically by shaping the degree to which customers seek variety across competing brands (Zeithammer and Thomadsen 2013).

Conceptual Foundation #2: Variety Seeking

We report the literature review on customer variety seeking in Web Appendix 2. Variety seeking is driven by psychological (Steenkamp and Baumgartner 1992), emotional (Kahn and Isen 1993), and socioeconomic (Yoon and Kim 2018) factors. Its outcomes include increased exploratory

behavior (Steenkamp and Baumgartner 1992), enhanced satisfaction (Hirschman 1980), and reduced brand loyalty (Chintagunta 1998). As for the mechanisms linking intrabrand agglomeration to store performance, prior studies primarily emphasized supply-side mechanisms, such as knowledge sharing between stores (Butt et al. 2018) and cannibalization (Guler 2018). Kim and Jap (2022) add to this perspective by highlighting brand-level mechanisms such as quality signaling and customer utility within a single franchise network, while Liu, Steenkamp, and Zhang (2018) connect interbrand agglomeration to electronic word-of-mouth through variety seeking. Building on these studies, we propose variety seeking as a key demand-side mechanism for intrabrand agglomeration, while controlling for the supply-side mechanisms.

Why variety seeking as the mechanism?

We posit variety seeking as the focal demand-side mechanism for three reasons. First, variety seeking possesses unique explanatory scope: its suppression by intrabrand agglomeration consolidates repeat patronage within the focal brand to raise store sales, while variety seeking itself, when present, enhances satisfaction by delivering novelty and cross-brand experiential richness, a dual directional logic that no alternative mechanism produces. Second, variety seeking rests on established theoretical foundations, with prior research documenting its role as the demand-side force linking agglomeration to customer behavior (Liu, Steenkamp, and Zhang 2018). Third, variety seeking offers superior causal testability, as it is behaviorally observable through cross-brand traffic patterns.

Table 2 compares the alternative mechanisms of intrabrand agglomeration and shows that variety seeking explains the multifaceted effect of intrabrand agglomeration. Supply-side mechanisms affect sales but remain neutral regarding satisfaction, while convenience and brand

salience mechanisms generate uniformly positive effects without negative satisfaction consequences. This divergent impact pattern positions variety seeking as theoretically indispensable for explaining the paradoxical performance effects of intrabrand agglomeration.

Table 2: Alternative mechanisms of intrabrand agglomeration

Mechanism	Type	Effect on ex ante utility	Effect on store sales	Effect on ex post satisfaction	How we address it	Representative studies
Knowledge sharing	Supply	Neutral	Positive	Neutral	Control: store efficiency and intrabrand store age	Butt et al. (2018); Lu and Wedig (2013)
Cannibalization	Supply	Neutral	Negative	Neutral	Control: intrabrand openings/closings	Butt et al. (2018); Guler (2018)
Convenience/ accessibility	Demand	Positive	Positive	Neutral	Implicit in variety-seeking pathway	Arentze, Oppewal, and Timmermans (2005); Kim and Jap (2022)
Brand salience/ signaling	Demand	Positive	Positive	Neutral	Control: store effectiveness	Kim and Jap (2022)
Variety seeking	*Demand*	*Positive*	*Positive*	*Negative*	*Analysis using sales-based and traffic-based measure*	*Liu, Steenkamp, and Zhang (2018); Steenkamp and Baumgartner (1992)*

Hypotheses Development

The effect of intrabrand agglomeration on variety seeking

Greater intrabrand agglomeration suppresses customer variety seeking through two reinforcing pathways. *First*, high intrabrand agglomeration increases customer utility within the focal brand by making it more convenient and accessible, reducing the incentive to explore alternatives (Kim and Jap 2022). When same-brand outlets cluster densely, customers can fulfill a wide range of needs through a single familiar brand with minimal decision effort or travel cost. This convenience-driven lock-in dampens the inclination to seek variety, as customers gravitate toward familiar and easily accessible options rather than expending effort to compare competing brands, a pattern evident in such agglomeration strategies as Domino's fortressing strategy.

Second, high intrabrand agglomeration anchors customers to predictable choices by reinforcing brand familiarity and habitual purchasing through repeated quality signaling, limiting experimentation with new options (Kim and Jap 2022). Consumers are less likely to switch brands when their needs are met with minimal effort, as in densely agglomerated same-brand

markets (Steenkamp and Baumgartner 1992). When customers repeatedly encounter the same brand across a market, brand familiarity compounds over time, making the default choice increasingly automatic and reducing the motivation to seek variety. Therefore, we predict that

H_1: High intrabrand agglomeration reduces customer variety seeking.

The effects of variety seeking on store sales and customer satisfaction

When customers of a focal store actively seek variety across competing brands, they are likely to redistribute their visits away from the focal store toward rival alternatives, reducing the focal store's revenue capture. Cross-brand exploration reduces the frequency and consistency of repeat visits to the focal store, lowering its share of customer wallet (Chintagunta 1998). Customers who regularly patronize competing brands consolidate less of their spending at the focal store, making patronage less predictable and purchase occasions at the focal store less frequent (Liu, Steenkamp, and Zhang 2018). High variety seeking also weakens repeat visits, as customers sampling competing alternatives are less likely to default to the focal brand (Fishbach, Ratner, and Zhang 2011). Therefore, we predict that

H_{2a}: High customer variety seeking reduces store sales.

While variety seeking reduces the focal store's sales by redistributing visits, it simultaneously enhances satisfaction with the focal store by raising the quality of consumption experiences customers bring to it. Customers who freely explore competing brands develop richer and more calibrated preferences, making them better equipped to evaluate and appreciate what the focal store offers when they do visit (Hirschman 1980; Kahn and Isen 1993). Exposure to diverse competing offerings sharpens customers' ability to recognize and value the distinctive qualities of the focal store, elevating their satisfaction with it relative to customers whose experience is confined to a single rival brand. Research consistently shows that access to diverse

offerings enhances perceived value and experiential satisfaction, while the absence of variety renders individual consumption occasions less exciting and contributes to dissatisfaction (Liang, Huang, and Su 2023). Beyond preference calibration, variety seeking enhances satisfaction with the focal store by preserving customers' sense of autonomy and personal control. When customers are free to choose among competing brands, their visits to the focal store feel self-determined, and autonomy in decision making is a well-established driver of satisfaction with a chosen option (Pansari and Kumar 2017). Therefore, we predict that

H_{2b}: High customer variety seeking increases customer satisfaction.

Indirect effect of intrabrand agglomeration

Combining H_1 (intrabrand agglomeration → customer variety seeking) with H_2 (customer variety seeking → store sales and customer satisfaction), we propose a demand-side construct—customer variety seeking—as a mechanism that unpacks how intrabrand agglomeration shapes two paradoxical outcomes: store sales and customer satisfaction. For store sales, high intrabrand agglomeration has the indirect effect of increasing store sales because it reduces customer variety seeking (H_1), which has the effect of reducing store sales (H_{2a}). In contrast, for customer satisfaction, high intrabrand agglomeration has the indirect effect of decreasing customer satisfaction because it reduces customer variety seeking (H_1), which has the effect of increasing customer satisfaction (H_{2b}). These explanations lead us to predict that

H_3: *High intrabrand agglomeration (a) increases store sales but (b) decreases customer satisfaction because it reduces customer variety seeking.*

The moderating effect of interbrand agglomeration

The coexistence of intrabrand and interbrand agglomeration creates a choice environment that is simultaneously familiar but overwhelming. On one side, dense same-brand presence anchors customers to a reliable default through convenience and brand familiarity (Kim and Jap 2022).

Simultaneously, the close proximity of rival brands compresses the competitive landscape, making alternative brands more visible and physically accessible, thereby raising the cognitive demands of cross-brand evaluation. We argue that these two forces do not cancel each other out but instead work in concert to suppress variety seeking, with high interbrand agglomeration amplifying, rather than buffering, the loyalty-reinforcing effect of intrabrand agglomeration.

The mechanism runs through the logic of choice complexity and cognitive simplification (Natan 2025). When interbrand agglomeration is low, rival brands are spatially distant and the competitive landscape is sparse. The suppressive effect of intrabrand agglomeration on variety seeking operates in a relatively unchallenged way in this condition: dense same-brand presence anchors customers to a reliable default through convenience and brand familiarity, and the convenience and accessibility advantages of intrabrand agglomeration go largely uncontested (Kim and Jap 2022).

In contrast, when rival brands are in close proximity to the focal store (i.e., high interbrand agglomeration), the resulting choice environment becomes cognitively demanding: alternatives are immediately visible, comparisons across brands become unavoidable, and evaluation costs rise sharply (Chernev and Hamilton 2009). Research on assortment complexity demonstrates that when options are hard to compare, customers experience greater decision difficulty and anticipated regret, conditions that systematically reduce choice likelihood and weaken the motivation to explore (Gourville and Soman 2005). Critically, this choice overload effect intensifies as the competitive environment becomes denser, with evaluation costs eventually dominating any variety benefits that greater brand accessibility might deliver.

In this cognitively taxing landscape, customers rely on simplifying heuristics to reduce decision effort, and the dense same-brand presence created by high intrabrand agglomeration

provides exactly that heuristic (Kahn and Isen 1993). Customers facing an overwhelming proximate multi-brand environment retreat toward the path of least cognitive resistance, which is the brand they already know, trust, and can access with little effort. This retreat is actively reinforced: repeated exposure to the same brand across a market strengthens habitual purchasing patterns and subconsciously activates consistency-oriented decision making over variety-oriented exploration (Fishbach, Ratner, and Zhang 2011). The two forces thus create a compounding suppression of variety seeking: brand familiarity reinforced by high same-brand proximity (i.e., intrabrand agglomeration) makes the default choice cognitively cheap, while choice complexity introduced by high rival-brand proximity (i.e., interbrand agglomeration) makes exploration cognitively costly. Together they drive customers further into habitual same-brand patronage than either force would do alone. Therefore, we predict that

> *H_4: High interbrand agglomeration amplifies the negative effect of intrabrand agglomeration on customer variety seeking.*

The moderating effect of service intensity

Higher service intensity weakens the negative effect of intrabrand agglomeration customer variety seeking. The mechanism under low service intensity runs through convenience lock-in and experiential homogeneity (Kim and Jap 2022). When a focal store's service level is low relative to that of rivals in a local market, the standardized and utilitarian experience the focal brand delivers across multiple same-brand outlets amplifies customers' perceptions of monotony and brand fatigue (Hirschman 1980). In this condition, dense intrabrand agglomeration makes the focal brand appear repetitive and inferior relative to higher-service rivals in close proximity. However, the convenience and accessibility of multiple same-brand outlets simultaneously raise the cost of switching, as customers in low-service environments prioritize speed, predictability, and minimal decision effort over novelty and experiential richness (Trijp, Hoyer, and Inman

1996). The functional sameness of the focal brand across outlets therefore traps customers in a cycle of habitual patronage, suppressing variety seeking.

The mechanism under high service intensity runs through the logic of hedonic motivation and experiential curiosity (Arentze, Opperwal, and Timmermans 2005). High-service brands attract customers who are experientially motivated and novelty oriented by nature, seeking personalized service, distinctive ambience, and diverse menus rather than speed and convenience (Kahn and Isen 1993). For such customers, perceived variety increases with attribute dispersion and experiential distinctiveness within a brand rather than with mere brand switching (van Herpen and Pieters 2002), meaning that the dense presence of high-service same-brand outlets does not create monotony but rather signals richness and quality.

As customers of high-service stores become more attuned to experiential quality, their hedonic consumption goals intensify rather than diminish under higher intrabrand agglomeration, making them more inclined to explore other brands in search of comparable or superior experiential richness. Therefore, experientially motivated customers use the high-service focal brand as an anchor that raises their expectations and curiosity about what rival brands might offer, stimulating cross-brand exploration (Zeithammer and Thomadsen 2013) and weakening the negative effect of intrabrand agglomeration on variety seeking. Therefore, we predict that

> *H_5: High service intensity buffers the negative effect of intrabrand agglomeration on customer variety seeking.*

Method

Data

We conducted a store-level analysis of 33,382 locations of the top 72 U.S. pizza chains (see Web Appendix 3 for a list of the chains), which together account for 99% of total sales in the U.S. pizza chains (Statista 2024). We assembled the data from multiple sources. First, we used Chain

Store Guide to obtain location and sales data at the store level. Second, we used weekly patterns data from Advan Research Corporation (Advan 2025) to capture customer foot traffic and measure variety seeking. Third, we used Google reviews to obtain customer ratings for the stores, including those no longer operational, because of its broad coverage of all pizza stores. We collected 5.33 million customer reviews, averaging 198 (SD 272) reviews per store. Fourth, we used the U.S. Census database to collect zip code–level demographic data to account for market-level characteristics. Overall, we collected 93,117 store-year observations for 2017–2019. Fifth, we collected service intensity (e.g., quick service) information of a store from Yelp.

Defining a Market

We adopted the "closest store approach" to define market boundaries for agglomeration, following prior research (Kalnins 2004; Woo, Cannella, and Mesquita 2019). This method delineates a store's market by identifying a specific number of nearest competing stores, thereby enabling a flexible and context-sensitive interpretation of market limits. For our analysis, we define a store's market as comprising up to 15 closest neighboring stores with a maximum radius of 30 miles (Woo, Cannella, and Mesquita 2019). Prior findings indicate that customers are unlikely to travel beyond 30 miles for casual dining (Pancras, Sriram, and Kumar 2012). Although prior studies have used fixed geographic units such as zip codes (Gill and Kim 2021) or census tracts (Butt et al. 2018) to define a market, these definitions are limited in two ways: they fail to reflect the dynamic nature of market reach and overlook contextual differences in distance perception—for instance, what constitutes a "long" trip may vary between urban area and rural area. In contrast, the closest store approach accounts for actual competitive proximity and accommodates regional differences in distance perception.

Construct Measures

We report a summary of constructs and measures in Table 3.

Table 3: Summary of constructs and measures

Construct (*Label*)	Operational definition	Measure
Dependent variables		
Store sales (*Sales*)	Total annual sales in dollars (log-transformed)	Log of total annual sales for store *i* during year *t*
Customer satisfaction (*Customer satisfaction*)	Average star rating based on Google reviews	Mean of star ratings received by store *i* during year *t*
Customer variety seeking (*Variety seeking*)	Degree to which customers of a focal store co-visit across competing restaurant brands during the same week	1 minus the Herfindahl-Hirschman Index computed from the distribution of estimated same-week co-visits to competing restaurant brands by visitors of store *i*. For each week, Advan Research estimates the number of store *i*'s visitors who also visited each competing restaurant brand during the same week.
Independent variables		
Intrabrand agglomeration (*Intrabrand agglomeration*)	Proximity of a store to same-brand stores in a market	Negative average distance to 15 nearest same-brand stores within 30 miles at start of year *t*
Interbrand agglomeration (*Interbrand agglomeration*)	Proximity of a store to different-brand stores in a market	Negative average distance to 15 nearest different-brand stores within 30 miles at start of year *t*
Service intensity (*Service intensity*)	Service tier positioning relative to local competitors	Ratio of focal store *i*'s service level (based on Yelp's four-tier classification) to average service level of 15 closest different-brand stores
*Control variables**		
Store traffic (*Traffic volume*)	Total number of visits to the store	Total number of visits to the store *i* during year *t*
Satisfaction heterogeneity (*Satisfaction heterogeneity*)	Consistency in customer satisfaction	Standard deviation of star ratings for store *i* during year *t*
Store age (*Store age*)	Operational tenure at current location	Years since 2012 that the store has been continuously open at the same location
Store efficiency (*Store efficiency*)	Sales performance relative to physical size	Ratio of total sales to estimated store size
Store effectiveness (*Store effectiveness*)	Relative performance within a brand	Negative log (rank of store sales within the same-brand stores and year)
Relative price (*Relative price*)	A focal store's pricing relative to its competitors in a market	Ratio of focal store *i*'s price level (based on Yelp's three-tier cost classification) to average price level of 15 nearest different-brand stores
Commute time (*Commute time*)	Average local commute duration	Zip code–level average commute time (minutes) for year *t*
Population growth (*Population growth*)	Change in local population	Total population (year-on-year) growth in the zip code of the store *i*'s location
Household size (*Household size*)	Average household size	Average number of people per household in the zip code of the store *i*'s location
Household income (*Household income*)	Average household income	Average income of households in the zip code of the store *i*'s location
Population (*Population*)	Total local population	Total number of residents in the zip code of the store *i*'s location
Customer diversity (*Customer diversity*)	Demographic heterogeneity	Probability that two people in the zip code do not belong to same age, income, education and gender groups
Intrabrand store openings (*Intrabrand store openings*)	Expansion of same-brand stores in a market	Number of new same-brand stores among 15 closest during year *t*
Intrabrand store closings (*Intrabrand store closings*)	Reduction of same-brand stores in a market	Number of closed same-brand stores among 15 closest during year *t*
Interbrand store openings (*Interbrand store openings*)	Expansion of other-brand stores in a market	Number of new other-brand stores among 15 closest during year *t*

Interbrand store closings (*Interbrand store closings*)	Reduction of other-brand stores in a market	Number of closed other-brand stores among 15 closest during year *t*
Intrabrand store age (*Intrabrand store age*)	Experience of same-brand stores in a market	Average age of 15 nearest same-brand stores
Interbrand store age (*Interbrand store age*)	Experience of other-brand stores in a market	Average age of 15 nearest other-brand stores
Restaurant competition (*Restaurant competition*)	Competition faced by the store from other restaurants including chain and independent restaurants	Total number of restaurants (chain + independent) during year *t* in store *i*'s zip code
Customer engagement (*Customer engagement*)	Duration a customer spends at a store location during a visit, measured in minutes.	Average of the weekly median dwell time at store *i*'s location during year *t*

* We acknowledge that several control variables are measured at the zip code level due to data availability.

Dependent variables

Store sales ($Sales_{it}$) is measured as the log of the total annual sales in dollars accumulated by store *i* during year *t.* Customer satisfaction ($Customer\ satisfaction_{it}$) is measured, using Google star ratings, as the mean of star ratings received by store *i* during year *t*. Customers rate their experience from one to five stars. We verify the face validity of using Google star ratings to measure customer satisfaction in Web Appendix 4.

We measure customer variety seeking ($Variety\ Seeking_{it}$) at the store-year level using same-week co-visitation data from Advan Research's Weekly Patterns dataset (Advan Research 2025). For each store-week observation, Advan reports the top 20 competing brands that the focal store's visitors also patronized during the same week, along with the estimated number of the focal store's visitors who visited each competing brand. This field captures the revealed competitive consideration set of a store's customer base, specifically the set of rival restaurant brands that the store's own visitors chose to patronize within the same week.

To construct an annual store-level measure of variety seeking, we aggregate weekly co-visitor counts for each competing restaurant brand across all weeks within the calendar year, yielding an annual co-visitation vector for each store. From this vector we compute the Herfindahl-Hirschman Index (HHI_{it}) as the sum of squared shares, where each share is the cumulative annual co-visitor count for a competing brand divided by the total co-visitor count

across all competing brands:

$$HHI_{it} = \sum_{b' \neq b} \left(\frac{\sum_w c_{ib'w}}{\sum_{b'} \sum_w c_{ib'w}}\right)^2$$

where $c_{ib'w}$ is the number of store *i*'s (brand *b*) visitors who also visited competing brand b′ in week *w* of year *t*. Our variety seeking measure is then

$$Variety\ Seeking_{it} = (1 - HHI_{it})*100$$

Variety Seeking$_{it}$ ranges from 0, indicating that all co-visits by store *i*'s customers are concentrated in a single rival brand, to 100, indicating that co-visits are spread evenly across all competing brands in the consideration set. Higher values reflect a customer base with broad, dispersed brand exposure where customers patronize many rival brands with similar frequency, while lower values reflect a customer base whose brand switching is dominated by a single rival.

Independent variables

We measure agglomeration at a store level because customer experiences and performance outcomes (e.g., sales and satisfaction) are inherently localized and shaped by the immediate competitive environment surrounding each individual store. Longer distance between stores indicates a lower level of agglomeration. Therefore, we measure intrabrand agglomeration (*Intrabrand agglomeration*$_{it}$) as the negative of the average distance (in miles) between the focal store *i* and the 15 closest same-brand stores within a 30-mile radius during year *t*. Similarly, we measure interbrand agglomeration (*Interbrand agglomeration*$_{it}$) as the negative of the average distance between the focal store *i* and the 15 closest different-brand stores within a 30-mile radius during year *t*. We measure intrabrand and interbrand agglomerations at the beginning of year *t*, thereby introducing a time lag between these independent variables (measured at the beginning of year *t*) and the dependent variables (measured throughout year *t*).

We measure service intensity (*Service intensity*$_{it}$) as the ratio of the focal store *i*'s service

level to the average service level of the 15 closest different-brand stores. We applied Yelp's service tier classification: Quick Service (1; fast food), Limited Service (2; cafés), and Full Service (3; restaurants). This ratio captures how a focal store's service positioning compares with that of nearby competitors, providing a relative and time variant measure of service intensity.

Control variables

We control for store-level variables to reflect the internal capabilities and operational performance of the focal store. First, we measure store traffic (*Traffic volume*$_{it}$) as the total number of visits to store *i* during year *t*, computed by summing the weekly estimated visit counts from Advan Research's Weekly Patterns dataset across all weeks within the calendar year, where each weekly visit count represents the scaled estimate of the total number of visits to the store's geographic location during that week. Second, we control for satisfaction heterogeneity (*Satisfaction heterogeneity*$_{it}$) to capture the consistency in customer experiences and measure it as the standard deviation of customer ratings for store *i* during year *t*.

Third, we measure store age (*Store age*$_{it}$) as the number of years since 2012 that the store has operated at the same location.[3] Older stores may benefit from operational experience and customer familiarity, which can enhance sales performance. Fourth, using SafeGraph' s Parking Lots dataset (SafeGraph 2022), we constructed a store efficiency metric (*Store efficiency*$_{it}$), which is defined as the ratio of a store's total sales to its estimated store size in terms of its square footage. This measure captures how efficiently a store generates sales relative to its physical footprint. Higher agglomeration is likely to increase a store's efficiency by improving operational performance and access to resources (McCann and Folta 2009).

Fifth, we measure store effectiveness (*Store effectiveness*$_{it}$) by ranking each store *i*'s sales

[3] We used historical data on store locations dating back to 2012 because we lack the opening dates for the stores.

relative to sales of all other same-brand stores within the year *t*. We generate a within-year, within-brand sales rank and then take the natural logarithm of the rank to construct this measure. Higher intrabrand agglomeration is likely to improve store effectiveness by enabling resource sharing, operational efficiencies, and brand spillovers across nearby same-brand stores (Alcácer and Chung 2014). Sixth, we measure relative price (*Relative price*$_{it}$) as the ratio between the price level of the focal store *i* and the average price level of different-brand stores among the 15 closest competitors in year *t*. Price levels are based on Yelp's three-tier cost classification: $ (inexpensive, under $10), $$ (moderate, $11 to $30), and $$$ (expensive, over $30). This measure reflects how the store's pricing compares with that of nearby alternatives. Higher relative price may deter price-sensitive customers, potentially lowering store traffic and sales.

We control local market conditions that may influence the potential demand environment surrounding each store. First, using census data, we measure commute time (*Commute time*$_{it}$) as the average number of minutes those residents in the store *i*'s zip code spend in commuting to work in year *t*. Longer commutes may reduce local shopping activity, especially during weekdays, decreasing store traffic. Second, higher population growth (*Population growth*$_{it}$) is likely to be associated with higher agglomeration levels. It is measured as the total population (year-on-year) growth in store *i*'s zip code.

Third, we also control for household size (*Household size*$_{it}$), which is measured as the average number of people per household in the zip code of store *i*'s location, and household income (*Household income*$_{it}$), which is measured as the average income of households in the zip code of store *i*'s location. Fourth, we then control for population (*Population*$_{it}$), which is measured as the total number of people living in the zip code of store *i*'s location. Fifth, we control for customer diversity (*Customer diversity*$_{it}$), which is captured using a fractionalization

measure as the probability that two people in a zip code do not belong to the same age, income, education, and gender groups (Gill and Kim 2021). Greater demographic diversity may foster demand for differentiated offerings, affecting the benefits of agglomeration.

We control for variables that capture the store's local competitive environment. First, intrabrand store openings (*Intrabrand store openings*$_{it}$) and intrabrand store closings (*Intrabrand store closings*$_{it}$) are measured as the total number of same-brand stores opened or closed in year *t* within the market. Interbrand store openings (*Interbrand store openings*$_{it}$) and interbrand store closings (*Interbrand store closings*$_{it}$) are measured as the total number of different-brand stores opened or closed in year *t* within the market. Second, intrabrand store age (*Intrabrand store age*$_{it}$) and interbrand store age (*Interbrand store age*$_{it}$) are measured as the average age of 15 closest same-brand and different-brand stores, respectively, located within the market.

Third, we measure *restaurant competition*$_{it}$ as the total number of restaurant establishments, including both chain and independent restaurants, located within the zip code of store *i* in year *t*. This count-based measure captures the overall density of the competitive environment faced by the focal store. Fourth, we measure *Customer engagement*$_{it}$ using median dwell time data from Advan Research's Weekly Patterns dataset. For each store-week observation, Advan Research computes the median of the minimum dwell times across all visits to the focal store in that week, where minimum dwell time is determined by the elapsed time between a visitor's first and last recorded GPS pings within the store's geographic boundary. We aggregate this weekly measure to the store-year level by taking the average of weekly median dwell times across all weeks in year *t*.

Finally, we include fixed effects to account for time-invariant characteristics at the chain and state levels as well as temporal trends. Specifically, we add chain-level, state-level, and year-

level fixed effects. This approach controls for brand-specific temporal trends that may affect agglomeration and sales patterns, as well as for regional, economic, or policy shifts that could influence customer behavior.

Descriptive Statistics

We report correlations among variables and their descriptive statistics in Table 4. The mean store sales level is 13.60 (SD .40). This indicates that stores generate $867,837 in annual sales on average. The mean customer satisfaction level is 3.79 (SD .59) out of 5, which is comparable to satisfaction levels of fast-food restaurants (Gill and Kim 2021). The variety-seeking variable has a mean of 67.47 (SD = 16.56) on a 0 to 100 scale, indicating that on average the customers of a focal store distribute their same-week co-visits across competing restaurant brands in a moderately dispersed fashion. Intrabrand agglomeration has a mean of –14.73 (SD 7.53), indicating the negative of the average distance (in miles) between a focal store and its 15 closest same-brand stores within a 30-mile radius. Service intensity has a mean of 1.03 (SD .61), indicating that, on average, stores offer slightly higher service levels compared with those of nearby competitors. We report more detailed information—number of stores, their intra- and interbrand agglomeration, variety seeking, customer satisfaction, and store sales—on the top twenty pizza chains (in terms of number of stores) in Web Appendix 5.

Model Development

We estimate the following equations. Equations (1.1) and (1.2) represent the main effects and interaction effects on customer variety seeking. Equations (2) and (3) represent the effects of customer variety seeking and agglomeration on sales and customer satisfaction, respectively. The mean variance inflation factor is 1.51; therefore, multicollinearity is not a concern.

$$\text{Customer variety seeking}_{it} = \alpha_1 \text{Intrabrand agglomeration}_{it} + \alpha_2 \text{Interbrand agglomeration}_{it} + \alpha_3 \text{Service intensity}_{it} + \alpha_4 \text{Traffic volume}_{it} + \alpha_5 \text{Satisfaction heterogeneity}_{it} + \alpha_6 \text{Store age}_{it} + \alpha_7 \text{Store efficiency}_{it} + \alpha_8 \text{Store effectiveness}_{it} + \alpha_9 \text{Relative price}_{it} + \alpha_{10} \text{Commute time}_{it} + \alpha_{11} \text{Population growth}_{it} + \alpha_{12} \text{Household size}_{it} + \alpha_{13} \text{Household income}_{it} +$$

α_{14} Population$_{it}$ + α_{15} Customer diversity$_{it}$ + α_{16} Intrabrand store openings$_{it}$ + α_{17} Intrabrand store closings$_{it}$ + α_{18} Interbrand store openings$_{it}$ + α_{19} Interbrand store closings$_{it}$ + α_{20} Intrabrand store age$_{it}$ + α_{21} Interbrand store age$_{it}$ + α_{22} Restaurant competition$_{it}$ + α_{23} Customer engagement$_{it}$ …. (1.1)
+ α_{24} (Intrabrand agglomeration$_{it}$ x Interbrand agglomeration$_{it}$) + α_{25} (Intrabrand agglomeration$_{it}$ x Service intensity$_{it}$) + γ_t + ρ_i + φ_i + ε_{it}…. (1.2)

Sales$_{it}$ = ψ_1Customer variety seeking$_{it}$ + ψ_2Intrabrand agglomeration$_{it}$ + ψ_3 Interbrand agglomeration$_{it}$ + ψ_4 Service intensity$_{it}$ + ψ_5 Traffic volume$_{it}$ + ψ_6 Satisfaction heterogeneity$_{it}$ + ψ_7 Store age$_{it}$ + ψ_8 Store efficiency$_{it}$ + ψ_9 Store effectiveness$_{it}$ + ψ_{10} Relative price$_{it}$ + ψ_{11} Commute time$_{it}$ + ψ_{12} Population growth$_{it}$ + ψ_{13} Household size$_{it}$ + ψ_{14} Household income$_{it}$ + ψ_{15} Population$_{it}$ + ψ_{16} Customer diversity$_{it}$ + ψ_{17} Intrabrand store openings$_{it}$ + ψ_{18} Intrabrand store closings$_{it}$ + ψ_{19} Interbrand store openings$_{it}$ + ψ_{20} Interbrand store closings$_{it}$ + ψ_{21} Intrabrand store age$_{it}$ + ψ_{22} Interbrand store age$_{it}$ + ψ_{23} Restaurant competition$_{it}$ + ψ_{24} Customer engagement$_{it}$ + γ_t + ρ_i + φ_i + θ_{it}…. (2)

Customer satisfaction$_{it}$ = β_1Customer variety seeking$_{it}$ + β_2Intrabrand agglomeration$_{it}$ + β_3 Interbrand agglomeration$_{it}$ + β_4 Service intensity$_{it}$ + β_5 Traffic volume$_{it}$ + β_6 Satisfaction heterogeneity$_{it}$ + β_7 Store age$_{it}$ + β_8 Store efficiency$_{it}$ + β_9 Store effectiveness$_{it}$ + β_{10} Relative price$_{it}$ + β_{11} Commute time$_{it}$ + β_{12} Population growth$_{it}$ + β_{13} Household size$_{it}$ + β_{14} Household income$_{it}$ + β_{15} Population$_{it}$ + β_{16} Customer diversity$_{it}$ + β_{17} Intrabrand store openings$_{it}$ + β_{18} Intrabrand store closings$_{it}$ + β_{19} Interbrand store openings$_{it}$ + β_{20} Interbrand store closings$_{it}$ + β_{21} Intrabrand store age$_{it}$ + β_{22} Interbrand store age$_{it}$ + β_{23} Restaurant competition$_{it}$ + β_{24} Customer engagement$_{it}$ + γ_t + ρ_i + φ_i + τ_{it}…. (3),

where γ_t are time fixed effects, ρ_i are chain fixed effects, φ_i are state-level fixed effects, and (ε_{it}, τ_{it}, and θ_{it}) are the error terms.

Addressing Endogeneity

Instruments for intrabrand agglomeration.

Intrabrand agglomeration reflects a strategic decision by the chain (Kalnins 2004). The key endogeneity comes from omitted variable bias: unobserved factors that raise performance (e.g., latent market attractiveness, site quality, and managerial ability) also encourage agglomeration. To address endogeneity, we use a random-effects instrumental variables approach[4] that separates persistent store or market heterogeneity from within-panel variation and instruments intrabrand agglomeration with plausibly exogenous predictors described in the methods section, thereby purging the correlation between agglomeration and the omitted variables.

We introduce two distinct instruments to address the endogeneity of intrabrand agglomeration. First, we use the total land area of the store's state excluding its own zip code

[4] We use a random effects model because several key control variables drawn from census data exhibit low within-store variation over time and would be absorbed or imprecisely estimated under fixed effects, whereas random effects preserve their identifying variation and yield more informative estimates (e.g., Schneider et al., 2018).

(*State land area*) as an instrument. States with greater land area outside the focal store's zip code offer more accessible locations for chain expansion, lowering the cost of opening new stores across a wider geographic footprint. As a result, chains operating in land-abundant states tend to distribute their stores more densely across the region, increasing the likelihood that multiple same-brand stores locate in proximity to the focal store, thereby driving higher levels of intrabrand agglomeration to attain its benefits. For example, Texas, the state with the most Domino's locations in the United States, has 775 stores, yielding one location for every 37,414 residents, compared with New York, where 239 stores yield one location for every 81,380 residents, despite New York's having a far larger population base relative to its land area (roughly one-fifth the size of Texas). Texas's vast land area lowers the cost of identifying and securing new store sites across the state, making it easier for chains to open multiple locations in close proximity to one another, thereby driving higher levels of intrabrand agglomeration.[5]

Second, we consider the log of the average household income of the store's state excluding the store's own zip code (*State income*) as an instrument. Higher income levels in the broader state market outside the focal zip code reflect greater economic development and higher real estate costs across the state, raising the cost of new store entry and discouraging chains from densely clustering same-brand stores in expensive markets. Chains in high-income states therefore tend to space their outlets more selectively, reducing the density of same-brand stores near the focal store and leading to lower levels of intrabrand agglomeration. For example, Massachusetts—the highest median household income state in the United States at $102,872—has only 160 Domino's locations serving a population of approximately 7 million, yielding

[5] These comparisons are intended only to provide intuition for the instrument's identifying variation and do not account for other factors that may influence store density, such as population distribution or urbanization.

Table 4: Descriptive statistics

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
2	-.08																									
3	-.60	.01																								
4	.16	-.17	.01																							
5	.24	-.06	-.01	.65																						
6	-.13	-.11	.11	-.01	-.03																					
7	.02	.09	-.19	-.02	.08	.01																				
8	-.06	-.34	-.01	-.01	-.03	-.05	.02																			
9	.12	-.10	-.02	.07	-.04	-.09	-.08	-.09																		
10	.08	-.01	-.03	.01	.03	.01	.11	.01	.01																	
11	-.23	.28	-.03	-.50	-.32	-.12	-.10	.01	-.15	.03																
12	.01	.23	-.04	-.18	.02	.02	.18	-.09	-.10	.03	.38															
13	.06	-.09	.13	.24	.16	-.01	.01	.01	-.04	.01	-.12	-.01														
14	.03	-.01	.01	.06	.10	-.01	.02	-.01	-.04	.01	-.02	-.02	.09													
15	.03	-.02	.05	.11	.09	-.01	-.01	-.02	.01	-.03	-.10	-.03	.42	.07												
16	.08	.01	.05	.19	.29	-.01	.05	.07	-.08	.03	-.13	.01	.38	.13	.17											
17	.24	-.05	-.01	.29	.56	-.02	.07	-.06	-.01	.02	-.29	.01	.12	.09	.23	.17										
18	.12	-.13	.03	.27	.34	-.01	.02	-.04	-.02	.03	-.18	-.01	.25	.06	.32	-.08	.38									
19	.04	.07	.05	.05	.08	.02	.03	-.01	-.30	.01	-.01	-.06	.11	.02	.02	.11	.05	.04								
20	-.10	-.06	.16	.08	.02	.14	-.02	.02	.03	-.01	-.10	-.03	.09	-.01	-.02	.05	.01	.01	-.04							
21	.07	-.10	-.06	.11	.12	.01	.06	.14	-.14	.01	-.10	-.04	.11	.05	.03	.14	.09	.06	.10	-.02						
22	.05	.01	-.01	.04	.02	-.06	-.03	-.04	.06	.01	-.02	.01	.01	-.02	-.08	.04	.01	-.03	-.01	.07	-.01					
23	.15	-.14	.28	.36	-.03	-.08	-.11	-.06	.53	.01	-.30	-.18	.11	-.01	.07	-.01	-.01	.01	-.32	.07	-.09	.08				
24	-.05	.13	.09	-.02	.02	.01	-.07	-.20	.20	-.01	.06	.03	-.05	-.06	-.01	-.10	.01	-.03	-.10	.07	-.58	.10	.20			
25	-.02	.16	-.13	.24	.41	-.01	.08	-.04	-.02	.03	.17	.03	.04	.13	-.01	.10	.65	.24	.04	.01	.06	.01	-.04	-.01		
26	-.01	.05	.11	.05	.02	-.05	-.11	-.01	.03	-.01	.05	-.02	.01	-.01	-.04	-.01	-.01	.01	-.01	-.01	.01	.03	.04	-.01	.01	
Mean	13.6	3.79	67.47	-14.73	-6.31	1.03	48.11*	.08	4.67	7.02*	-6.8	.99	26.86	.27	2.56	10.94	10.45	.34	.45	.4	.9	.65	4.4	4.59	88.09	53.81
SD	.4	.59	16.56	7.53	5.87	.61	85.75*	.14	2.15	83.56*	1.6	.36	6.5	.93	.41	.35	0.76	.17	1.68	1.07	1.21	.97	1.98	1.01	62.72	74.67
Min	10.93	1	0	-30	-30	.33	16	.01	0	5.73	-8.86	0.5	2.5	0	1.66	9.02	1.38	.01	0	0	0	0	0	0	0	1
Max	15.18	5	96.99	-.01	-.03	3	364*	2	8	64.70*	0	3	95	10.3	4.96	12.42	12.16	.77	15	15	12	14	7.5	7	277	343.41

*in 1000s

1 Sales	8 Satisfaction heterogeneity	15 Household size	22 Interbrand store closings
2 Customer satisfaction	9 Store age	16 Household income	23 Intrabrand store age
3 Variety seeking	10 Store efficiency	17 Population	24 Interbrand store age
4 Intrabrand agglomeration	11 Store effectiveness	18 Customer diversity	25 Restaurant competition
5 Interbrand agglomeration	12 Relative price	19 Intrabrand store openings	26 Customer engagement
6 Service intensity	13 Commute time	20 Intrabrand store closings	
7 Traffic volume	14 Population growth	21 Interbrand store openings	

one store per 43,750 residents, compared with Mississippi—the lowest median household income state at $54,203—which has a notably denser footprint of one Domino's store per roughly 18,000 residents (U.S. Census Bureau 2023). This pattern is consistent with higher real estate costs and selective site entry in affluent states, discouraging chains from clustering same-brand stores.

The instruments are constructed using state-level land area and household income measured exclusively outside the focal store's zip code, ensuring that they capture broad regional geographic and economic conditions beyond the focal store's immediate market and thus have no direct pathway to the focal store's own sales or customer satisfaction. Furthermore, this disassociation arises because our model controls for a comprehensive set of store-level, competitive, and local market factors that capture the direct pathways through which state-level geography and income could influence store outcomes. Furthermore, chain-level, state-level, and yearly dummy variables absorb any remaining time-invariant chain characteristics, broader state-level demand conditions, and common time trends, respectively. The exclusion restriction therefore rests on the premise that state land area and state household income outside the focal zip code affect store performance only through the spatial configuration of same-brand outlets (i.e., intrabrand agglomeration).

The first-stage results in Appendix A confirm that both instruments are strong and individually significant predictors of intrabrand agglomeration. *State land area* is positively associated with intrabrand agglomeration (b = .01, p = .001), and *State income* is negatively associated with intrabrand agglomeration (b = -132.12, p = .001). The Cragg-Donald F statistic of 238.52 far exceeds the Stock-Yogo critical value of 19.93 for 10% maximal instrumental variables (IV) size, rejecting the null hypothesis of weak instruments and confirming that the

instruments provide strong identification of the endogenous variable. The overidentification test further supports instrument validity, as the Hansen *J* statistic of .05 (p = .812) fails to reject the null hypothesis that the instruments are valid.

Instruments for customer variety seeking.

Customer variety seeking at the focal store is potentially endogenous because of reverse causality and omitted variable bias. For the reverse causality, stores that perform well in terms of sales or customer satisfaction may themselves attract a more loyal and less variety-seeking customer base. For the omitted variable bias, unobserved store or location characteristics such as brand prestige, store ambiance, or local market vibrancy may simultaneously attract a particular type of customer who is either more or less inclined to seek variety while also independently driving store sales and satisfaction outcomes, creating a spurious correlation between variety seeking and performance outcomes.

We instrument customer variety seeking with the log of the elevation of the focal store's zip code. The relevance argument rests on the relationship between terrain elevation and consumer mobility patterns. Stores located in higher-elevation areas tend to be situated in more geographically constrained environments where natural terrain features such as hills and slopes create physical barriers that limit the ease of travel between locations. This constrains consumers' ability to make quick, routine trips to a single familiar brand and instead encourages them to explore and patronize a broader set of available restaurant brands during their limited mobility windows, thereby increasing variety seeking among the focal store's customer base. The first-stage results in Appendix A confirm instrument relevance, as elevation has a positive association with variety seeking (b = .01, p = .001), and the Cragg-Donald F statistic of 69.19 far exceeds the Stock-Yogo critical value of 19.93 for 10% maximal IV size, firmly rejecting the null hypothesis

of weak identification.

The exclusion restriction holds because elevation is a fixed physical characteristic of the zip code's terrain that has no direct pathway to store sales or customer satisfaction once the comprehensive set of controls are accounted for. Elevation does not determine service quality or any other store-level attribute that directly drives customer satisfaction or sales outcomes. Local demand conditions that could be correlated with elevation, such as population density, household income, and demographic composition, are directly absorbed by the zip code–level controls for population, household income, household size, customer diversity, and commute time. Furthermore, the instrument captures physical geography at the zip code level, ensuring it influences store outcomes solely through consumer mobility and the resulting dispersion of visits across competing brands.

Analyses and Results

We report regression estimates of the effects of agglomerations across four model specifications (Columns I to IV) in Table 5. We estimate equations 1.1 (Column I) and 1.2 (Column II) using random effects two-stage least squares (2SLS). We estimate equations 2 (Column III) and 3 (Column IV) using three-stage least squares with separate instruments for intrabrand agglomeration and customer variety seeking.

Controls and main effect of intrabrand agglomeration on variety seeking (Column I).

Store traffic is negatively associated with variety seeking (b = -.01, p = .000), suggesting higher foot traffic attracts a more loyal customer base, while satisfaction heterogeneity is positively associated with variety seeking (b = 1.11, p = .023), indicating service inconsistency encourages customers to explore competing brands. Household size (b = 1.84, p = .000) is positively, while household income (b = -1.35, p = .000) and commute time (b = -.10, p = .000) are negatively,

associated with variety seeking, reflecting that larger but lower-income households in less mobile areas exhibit more concentrated brand patronage.

Intrabrand store closings (b = .18, p = .009) and interbrand store closings (b = .16, p = .011) are positively, while interbrand store openings are negatively (b = -.11, p = .012), associated with variety seeking, reflecting how shifts in the local competitive landscape alter customer exploration. Restaurant competition negatively predicts variety seeking (b = -.01, p = .000), suggesting denser local markets concentrate rather than disperse customer patronage. Customer engagement positively predicts variety seeking (b = .01, p = .000), consistent with more engaged customers being more exploratory.

Turning to the focal predictors, high intrabrand agglomeration negatively affects customer variety seeking (b = -.45, p = .024), supporting H_1 and indicating that as the density of same-brand stores increases in the vicinity of the focal store, the customers of that store become less likely to patronize competing brands. Interbrand agglomeration is marginally positively associated with variety seeking (b = .27, p = .076), suggesting that a greater nearby concentration of competing brands encourages customers to spread their visits across a broader set of stores.

The effect of variety seeking on store sales (Column III).

Store traffic (b = -.01, p = .048) and satisfaction heterogeneity (b = -.01, p = .016) are negatively associated with store sales, suggesting that service inconsistency undermines store revenue. Store age is negatively (b = -.01, p = .000), while store efficiency (b = .01, p = .011), store effectiveness (b = .04, p = .000), and relative price (b = .03, p = .000) are all positively, associated with store sales, indicating that better-performing and higher-priced stores generate greater sales.

Commute time is positively (b = .01, p = .000), while population growth (b = -.01, p =

.000), household size (b = -.01, p = .000), and household income (b = -.01, p = .000) are negatively, associated with store sales. Population (b = .01, p = .000) and customer diversity (b = .03, p = .000) are positively associated with sales, suggesting that stores in more demographically heterogeneous markets generate higher revenue. Intrabrand store openings positively predict sales (b = .01, p = .000). Intrabrand store age is negatively (b = -.01, p = .000), while interbrand store age (b = .01, p = .015) and restaurant competition (b = .01, p = .005) are positively, associated with sales. Customer engagement positively predicts sales (b = .01, p = .000), consistent with longer dwell times reflecting more involved consumption occasions.

Turning to the focal predictors, variety seeking negatively affects store sales (b = -.12, p = .010), supporting H_{2a} and indicating that stores whose customers exhibit broader competitive exploration garner lower sales. Intrabrand agglomeration positively affects sales (b = .01, p = .000), consistent with demand expansion and traffic generation effects of same-brand clustering. Interbrand agglomeration negatively predicts sales (b = -.01, p = .001), indicating that a denser presence of competing brands reduces focal store revenue.

The effect of variety seeking on customer satisfaction (Column IV).

Store traffic is positively (b = .01, p = .000), while satisfaction heterogeneity is negatively (b = -1.22, p = .000), associated with customer satisfaction, indicating that service inconsistency substantially undermines average customer satisfaction. Store age is negatively associated with satisfaction (b = -.01, p = .005), suggesting older stores receive lower ratings. High relative price positively predicts satisfaction (b = .13, p = .000), indicating that stores priced higher relative to nearby competitors receive higher ratings. High commute time is negatively (b = -.01, p = .000), while household size (b = .05, p = .000) and household income (b = .06, p = .000) are both positively, associated with satisfaction. Greater population (b = -.03, p = .000) and customer diversity (b = -.38, p = .000) are

Table 5: Estimation results on variety seeking, store sales, and customer satisfaction

Dependent variables ->	Variety seeking						Store sales			Customer satisfaction		
Control variables	Column I			Column II			Column III			Column IV		
	Main effects			*Interactions*			*Main effects*			*Main effects*		
	b	*se*	*p*	*b*	*se*	*p*	*b*	*se*	*p*	*b*	*se*	*p*
Traffic volume	-.01	.00	.000	-.01	.00	.000	-.01	.00	.048	.01	.00	.000
Satisfaction heterogeneity	1.11	.49	.023	.23	.58	.682	-.01	.00	.016	-1.22	.01	.000
Store age	-.04	.04	.358	.02	.05	.644	-.01	.00	.000	-.01	.00	.005
Store efficiency	.01	.00	.535	.01	.00	.257	.01	.00	.011	-.01	.00	.314
Store effectiveness	-.40	.23	.086	.63	.40	.123	.04	.00	.000	.01	.00	.052
Relative price	.53	.76	.479	-.02	.82	.980	.03	.00	.000	.13	.01	.000
Commute time	-.10	.01	.000	-.08	.02	.000	.01	.00	.000	-.01	.00	.000
Population growth	-.11	.09	.213	-.09	.09	.340	-.01	.00	.000	.01	.00	.174
Household size	1.84	.24	.000	1.04	.38	.006	-.01	.00	.000	.05	.00	.000
Household income	-1.35	.29	.000	-2.13	.39	.000	-.01	.00	.000	.06	.00	.000
Population	.31	.27	.252	.34	.35	.325	.01	.00	.000	-.03	.00	.000
Customer diversity	-1.68	.94	.076	1.16	1.33	.380	.03	.00	.000	-.38	.02	.000
Intrabrand store openings	.11	.06	.113	.19	.08	.029	.01	.00	.000	-.01	.00	.953
Intrabrand store closings	.18	.07	.009	.11	.09	.216	.01	.00	.253	-.01	.00	.000
Interbrand store openings	-.11	.04	.012	-.04	.05	.364	-.01	.00	.073	-.01	.00	.768
Interbrand store closings	.16	.06	.011	.21	.07	.003	.01	.00	.083	-.01	.00	.000
Intrabrand store age	.23	.12	.071	.43	.14	.003	-.01	.00	.000	-.01	.00	.733
Interbrand store age	-.14	.14	.340	-.40	.16	.013	.01	.00	.015	.02	.00	.000
Restaurant competition	-.01	.00	.000	-.01	.00	.000	.01	.00	.005	.01	.00	.000
Customer engagement	.01	.00	.000	.01	.00	.000	.01	.00	.000	-.01	.00	.001
Independent variables												
Variety seeking							-.12	.04	.010	1.56	.36	.000
Intrabrand agglomeration	-.45	.20	.024	-1.60	.40	.000	.01	.00	.000	-.01	.00	.001
Interbrand agglomeration	.27	.15	.076	-1.67	.69	.015	-.01	.00	.001	.01	.00	.137
Service intensity	-.59	.62	.338	11.11	4.09	.007	.01	.00	.211	-.08	.01	.000
Interactions												
Intrabrand agglomeration x Interbrand agglomeration				-.08	.03	.006						
Intrabrand agglomeration x Service intensity				.68	.25	.006						
Number of observations (Number of stores)	71,758 (27,042)			71,758 (27,042)			71,758 (27,042)			71,758 (27,042)		
F/Wald χ^2 (Cragg Donald F statistic)	85823.59 (238.52)			76176.63 (69.19)			2.13e+06 (85.07)			30464.12 (98.16)		
Hansen *J* test of overidentifying restrictions (χ^2)	.05 (p = .812)			3.47 (p = .176)			┼			┼		

Note: Chain, state, and year dummy variables are included in the estimation. ┼ The equation is exactly identified; shaded cells are hypothesized effects.

negatively associated with satisfaction, suggesting that stores in more demographically heterogeneous markets receive lower satisfaction ratings.

Intrabrand store closings (b = -.01, p = .000) and interbrand store closings (b = -.01, p = .000) are also negatively associated with customer satisfaction. Interbrand store age positively predicts satisfaction (b = .02, p = .000), suggesting that markets with more established competing brands are associated with higher focal store satisfaction. Restaurant competition positively predicts satisfaction (b = .01, p = .000). Customer engagement negatively predicts satisfaction (b = -.01, p = .001), indicating that longer dwell times are associated with lower satisfaction, possibly reflecting wait times or service delays.

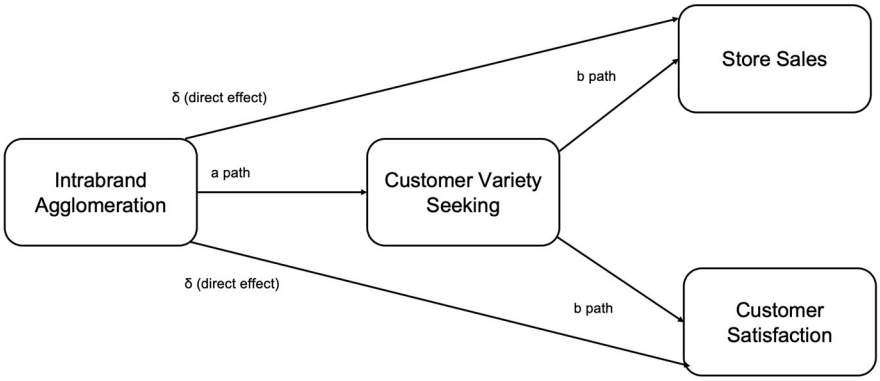
Turning to the focal predictors, variety seeking positively affects customer satisfaction (b = 1.56, p = .000), supporting H_{2b} and indicating that stores whose customers exhibit broader competitive exploration are associated with higher satisfaction ratings. High intrabrand agglomeration negatively affects customer satisfaction (b = -.01, p = .001), suggesting that greater same-brand density in the vicinity of the focal store undermines customer satisfaction. Service intensity negatively predicts customer satisfaction (b = -.08, p = .000), which may reflect the higher expectations customers bring to more service-intensive dining options.

The indirect effects of intrabrand agglomeration.

To test the mediating role of customer variety seeking for the relationship between intrabrand agglomeration and two store performance outcomes, we adopt the instrumental variables mediation framework proposed by Dippel, Ferrara, and Heblich (2020). This framework is specifically designed for settings in which both the treatment variable and the mediator are endogenous. Following Dippel, Ferrara, and Heblich (2020), we estimate three separate 2SLS equations using the ivreghdfe command of STATA with high-dimensional fixed effects absorbed

at the state, year, and chain levels, and standard errors clustered at the store level.

The three models illustrated in Figure 3 are (I) the effect of intrabrand agglomeration on variety seeking (the *a* path, instrumented by state land area and state income excluding own zip code); (II) the reduced-form total effect (τ) of intrabrand agglomeration on each performance outcome (instrumented by the same set); and (III) the direct effect of intrabrand agglomeration on each outcome conditional on the instrumented mediator (variety seeking), from which both the direct effect (the δ path) and the effect of variety seeking on the outcome (the b path) are recovered, with both intrabrand agglomeration and variety seeking treated as endogenous. The indirect effect is recovered by two internally consistent methods: (1) as the difference $\tau - \delta$ (total effect minus direct effect), and (2) as the product $\alpha \times \beta$ (a path times b path). Convergence of these two estimates provides a model consistency check (Dippel, Ferrara, and Heblich 2020). We assessed the significance of indirect effects using 1000-replication bootstrap confidence intervals.



* $\tau = \delta + (\alpha \times \beta)$

Figure 3: Mediation framework

Table 6.1 shows that intrabrand agglomeration reduces variety seeking (b = −.42, CI [−.72, −.12]), and variety seeking reduces store sales (b = −11.28, CI [−19.11, −4.45]), thereby together producing a positive indirect effect ($\tau - \delta$ = .05, CI [.01, .10]; $\alpha \times \beta$ = .05, CI [.01,

.10])—both CIs exclude zero, confirming mediation and supporting H_{3a}. The direct effect of intrabrand agglomeration on store sales remains positive and significant (b = .28, CI [.14, .43]), as does the total effect (b = .33, CI [.19, .48]), with the indirect path accounting for 15.15% (.05/33) of the total effect, indicating partial mediation.

Table 6.1: The effect of intrabrand agglomeration on store sales via variety seeking

	b	*se*	*ci*
Intrabrand agglomeration → Variety seeking (a path)	−.42	.15	[−.72, −.12]
Variety seeking → Store sales (b path)	−11.28	3.78	[−19.11, −4.45]
Indirect effect (τ − δ)	.05	.02	[.01, .10]
Indirect effect (α × β)	.05	.02	[.01, .10]
Direct effect (δ): Intrabrand agglomeration → Store sales	.28	.08	[.14, .43]
Total effect (τ): Intrabrand agglomeration → Store sales	.33	.07	[.19, .48]

Note: b, se, and ci are scaled by 10^{-2}.

Table 6.2 shows that intrabrand agglomeration reduces customer variety seeking (b = −.42, CI [−.72, −.12]), but variety seeking in turn strongly increases satisfaction (b = 154.36, CI [85.61, 233.22]). The suppression of variety seeking by intrabrand agglomeration thus transmits negatively to satisfaction, yielding a significant negative indirect effect (τ − δ = −.65, CI [−1.33, −.16]; α × β = −.66, CI [−1.34, −.17]), with both bootstrap CIs excluding zero, supporting H_{3b}. The direct effect of intrabrand agglomeration on satisfaction is also negative and significant (b = −1.26, CI [−2.50, −.04]), as is the total effect (b = −1.91, CI [−2.89, −.90]). The indirect effect accounts for 34.03% of the total effect (−.65/−1.91), indicating partial mediation.

Table 6.2: The effect of intrabrand agglomeration on customer satisfaction via variety seeking

	b	*se*	*ci*
Intrabrand agglomeration → Variety seeking (a path)	−.42	.15	[−.72, −.12]
Variety seeking → Customer satisfaction (b path)	154.36	37.47	[85.61, 233.22]
Indirect effect (τ − δ)	−.65	.29	[−1.33, −.16]
Indirect effect (α × β)	−.66	.29	[−1.34, −.17]
Direct effect (δ): Intrabrand agglomeration → Customer satisfaction	−1.26	.62	[−2.50, −.04]
Total effect (τ): Intrabrand agglomeration → Customer satisfaction	−1.91	.51	[−2.89, −.90]

Note: b, se, and ci are scaled by 10^{-2}.

Moderating effects of local market conditions (Column II).

The interaction between intrabrand agglomeration and interbrand agglomeration is negatively associated with variety seeking (b = -.08, p = .006), supporting H_4. Instead of offsetting the

loyalty-reinforcing effect of intrabrand agglomeration, the presence of dense competing brands (i.e., high interbrand agglomeration) alongside dense same-brand stores further concentrates customer patronage, suggesting that customers in highly agglomerated environments of both types settle into habitual consumption patterns rather than exploring broadly.

The interaction between intrabrand agglomeration and service intensity is positively associated with variety seeking (b = .68, p = .006), supporting H_5 and indicating that the negative effect of intrabrand agglomeration on variety seeking is attenuated when service intensity is high. When service intensity of a restaurant is high, the loyalty-reinforcing effect of intrabrand agglomeration weakens, consistent with the notion that customers of high-service stores are more experiential and exploratory in their consumption behavior and are therefore less susceptible to the convenience-driven lock-in that same-brand density otherwise creates. We illustrate the interaction effects in Web Appendix 6.

Testing conditional indirect effects.

To examine how interbrand agglomeration and service intensity condition the indirect effects of intrabrand agglomeration on store sales and customer satisfaction through variety seeking, we computed conditional indirect effects with significance assessed using 1,000-replication bootstrapped percentile confidence intervals. Table 7 shows that the conditional indirect effects of intrabrand agglomeration on store sales are positive and significant across all levels of both moderators. However, as interbrand agglomeration increases from low to high, the positive indirect effect of intrabrand agglomeration on store sales strengthens (b = $.20 \times 10^{-2}$ to b = $.22 \times 10^{-2}$), while as service intensity increases from low to high, that positive indirect effect attenuates (b = $.18 \times 10^{-2}$ to b = $.08 \times 10^{-2}$).

The corresponding pattern for customer satisfaction is significant across all moderator

levels: the negative indirect effect of intrabrand agglomeration on customer satisfaction deepens as interbrand agglomeration increases from low to high ($b = -1.92 \times 10^{-2}$ to $b = -2.14 \times 10^{-2}$), whereas that negative indirect effect attenuates substantially as service intensity increases from low to high ($b = -1.71 \times 10^{-2}$ to $b = -.74 \times 10^{-2}$). Since no confidence interval includes zero, these results underscore that while the performance paradox of intrabrand agglomeration persists across market conditions, its severity is meaningfully contingent on the local competitive density (i.e., interbrand agglomeration) and service positioning (i.e., service intensity) of the focal store.

Table 7: Conditional indirect effects of intrabrand agglomeration

Moderator level	Outcome: Store sales			Outcome: Customer satisfaction		
Moderator: Interbrand agglomeration						
	b	*se*	*ci*	*b*	*se*	*ci*
Low (-1 SD)	.20	.09	[.06, .40]	-1.92	.85	[−3.92, −.58]
Medium (Mean)	.21	.10	[.06, .42]	-2.03	.89	[−4.13, −.60]
High (+1 SD)	.22	.10	[.06, .45]	-2.14	.94	[−4.33, −.62]
Moderator: Service intensity						
Low (-1 SD)	.18	.08	[.05, .36]	-1.71	.75	[−3.49, −.52]
Medium (Mean)	.13	.06	[.04, .26]	-1.23	.53	[−2.50, −.39]
High (+1 SD)	.08	.03	[.02, .15]	-.74	.32	[−1.49, −.26]

Note: b, se, and ci are scaled by 10^{-2}.

Additional Analyses

We conducted a series of additional analyses to affirm the robustness of our methods and results.

Estimation with store-level fixed effects

We reestimated the models using store-level fixed effects in place of random effects, and replaced our baseline instruments with time-varying alternatives. For intrabrand agglomeration, we instrumented using the average intrabrand agglomeration of stores located within the same year, more than 100 miles but fewer than 200 miles from the focal store, a geographic band sufficiently distant to be exogenous to local demand conditions yet close enough to reflect systematic variation in brand expansion patterns. For customer variety seeking, we instrumented using the average variety seeking experienced by stores within the same state but outside the focal store's county, isolating regional competitive patterns while purging local demand shocks.

The results, reported in Web Appendix 7, are fully consistent with our main findings across all hypothesized relationships, affirming the robustness of our results.

Alternative measures of a market

We estimated the models using alternative market definitions based on the closest 10 and 20 stores instead of the 15-store baseline. The results (reported in Columns I and III of Appendix B) remain fully consistent in sign and significance across these alternative specifications, affirming the robustness of our market definition measure.

Standardized coefficients

We calculated standardized coefficients for all focal relationships to facilitate interpretation of effect sizes. Intrabrand agglomeration exerts a negative effect on variety seeking ($\beta = -.17$, $p = .024$), such that a one-standard-deviation increase in same-brand store density (SD = 6.29) is associated with a .17 standard deviation reduction in the breadth of customers' competitive exploration (SD = 16.56). The interaction between intrabrand agglomeration and interbrand agglomeration exerts a stronger negative effect ($\beta = -.70$, $p = .006$). The interaction between intrabrand agglomeration and service intensity positively predicts variety seeking ($\beta = .48$, $p = .006$). Turning to the consequences of variety seeking, a one-standard-deviation increase in customer variety seeking is associated with a .05 standard deviation decrease in store sales ($\beta = -.05$, $p = .010$) and a .43 standard deviation increase in customer satisfaction ($\beta = .43$, $p = .000$).

Count-based measure of intrabrand agglomeration

As an additional robustness check, we reestimated our models using a count-based measure of intrabrand agglomeration. Specifically, we measured intrabrand agglomeration as the total number of same-brand stores located within the zip code of the focal store in year *t*. The results of this alternative specification, reported in Appendix B (Column IV), are fully consistent with

our main findings, affirming that our findings are not an artifact of the proximity-based operationalization of agglomeration.

Economic significance of agglomeration effect

How much does a change in same-brand store proximity affect customer satisfaction and store sales? We examined the impact of a 15-mile increase in intrabrand agglomeration to answer this question. Such an increase in proximity reduces customer variety seeking by 5.60 units on a 0 to 100 scale, increases annual store sales by $40,370 (+5.00%), and reduces customer satisfaction by .29 stars (−7.55% relative to the sample mean of 3.79 stars). These effects are economically meaningful at scale, and the fact that variety seeking simultaneously drives sales gains but satisfaction penalties points to an inherent trade-off that location strategy alone cannot resolve, making the management of customer exploration behavior a strategic priority.

Discussion

Intrabrand agglomeration is a critical yet underexplored issue in retail competition: prior research treats intrabrand, interbrand agglomeration and service intensity separately, leaving managers with little guidance on how their joint presence shapes performance. This study addresses that gap by centering customer variety seeking in the intrabrand agglomeration story, revealing that it produces not a single outcome but a paradox contingent on local competitive density and a chain's service positioning relative to rivals, with implications for both agglomeration theory and managerial strategy.

Theoretical Implications

Our findings contribute to agglomeration theory along three dimensions: the paradoxical nature of its performance consequences, the mechanism through which intrabrand agglomeration operates, and the contingencies that may amplify or buffer its effects.

First, a foundational assumption in marketing is that customer satisfaction and store sales move in tandem: satisfying customers is the pathway to superior financial performance (Otto, Szymanski, and Varadarajan 2020). This assumption has shaped how agglomeration scholars evaluate store location strategy, with studies treating sales gains as indicative of positive customer responses (Butt et al. 2018; Guler 2018) and Kim and Jap (2022) interpreting higher customer utility and store sales as jointly favorable outcomes of intrabrand agglomeration.

Our findings offer a nuance to this picture in a theoretically important way. By distinguishing between store-centric outcomes (i.e., sales) and customer-centric outcomes (i.e., satisfaction) and tracing both to a common behavioral mechanism, we show that intrabrand agglomeration is a double-edged sword that produces a paradox: the same process that makes a store more financially productive makes its customers less satisfied. This matters theoretically because it means that evaluating intrabrand agglomeration through a single performance lens systematically obscures half of its consequences. Stores that read rising sales due to high intrabrand agglomeration as a signal of strategic success may simultaneously be eroding the customer experience in ways that are invisible to revenue-based metrics but consequential for long-run brand health (Hirschman 1980; Liu, Steenkamp, and Zhang 2018).

Second, research on intrabrand agglomeration has long privileged supply-side accounts of how intrabrand agglomeration affects performance, emphasizing knowledge sharing across stores (Butt et al. 2018; Lu and Wedig 2013) or cannibalization (Guler 2018). These contributions have been foundational in establishing the recognition that a chain's store location strategy has real performance consequences, and Kim and Jap (2022) meaningfully extend this tradition by showing that intrabrand agglomeration shapes customer utility alongside store sales. Building on these insights, we ask what behavioral process connects intrabrand agglomeration to

customer responses, and we propose variety seeking, a well-established demand-side construct (Liu, Steenkamp, and Zhang 2018), as the answer. Variety seeking as a mechanism complements rather than displaces prior accounts on intrabrand agglomeration: whereas supply-side mechanisms focused on explaining how chains benefit internally from intrabrand agglomeration, variety seeking explains how customers respond to it.

Note that variety seeking carries unique explanatory scope that prior mechanisms lack. Supply-side mechanisms such as knowledge sharing and cannibalization focus on financial outcomes, but they are agnostic about customer satisfaction, whereas demand-side mechanisms such as quality signaling and convenience generate uniformly positive effects without negative satisfaction consequences (Kim and Jap 2022). Variety seeking breaks this pattern: suppression of variety seeking due to intrabrand agglomeration consolidates repeat patronage to raise store sales while simultaneously depriving customers of the novelty, cross-brand comparison, and experiential richness that drive satisfaction (Liu, Steenkamp, and Zhang 2018). It is precisely this dual directionality, the capacity of a single behavioral mechanism to drive two performance outcomes to opposite directions, that positions variety seeking as theoretically indispensable for agglomeration research and opens a new demand-side lane in the literature (Geyskens, Gielens, and Gijsbrechts 2010).

Third, prior agglomeration research has largely treated intrabrand and interbrand agglomeration as separate phenomena, studying the effects of intrabrand agglomeration either in isolation (Butt et al. 2018) or within a single multi-brand firm (Kim and Jap 2022), while implicitly assuming a competitive vacuum in which the existence of rival brands in the local market is set aside. Moreover, prior work has examined store location decisions and service positioning decisions independently, leaving unaddressed how a chain's service positioning

relative to local rivals conditions the behavioral consequences of its store location strategy (Ghemawat and Thomas 2008). Treating service positioning decision separately from store location decision is analytically convenient but practically limiting, because chains simultaneously make store location and service positioning decisions in markets already populated by competing brands, and customers experience all of these forces at once.

We address this gap by theorizing intrabrand agglomeration, interbrand agglomeration, and service intensity as interdependent forces operating within a single framework. Specifically, our results sharpen agglomeration theory in two distinct ways. First, interbrand agglomeration's effect of further amplifying suppression of variety seeking due to intrabrand agglomeration challenges the intuition that a denser competitive environment would encourage customer exploration by lowering search costs (Liu, Steenkamp, and Zhang 2018). Instead, high interbrand agglomeration, when combined with high intrabrand agglomeration, overwhelms customers with excessive competing options, inducing choice overload and pushing them further toward the familiar same-brand default (Gourville and Soman 2005; Chernev and Hamilton 2009) rather than motivating customers to explore variety of choices. This finding suggests that the customer cost of choice overload due to high interbrand agglomeration outweighs the customer benefit of lower search cost that has been touted as a key benefit of interbrand agglomeration (McCann and Folta 2009).

Second, high service intensity of a brand fulfills variety needs internally within the focal brand, weakening the lock-in that same-brand proximity otherwise creates and preserving customers' motivation to explore (Maimaran and Wheeler 2008). This distinction is theoretically significant: whereas interbrand agglomeration is a market-level force largely outside a chain's control, service intensity is a chain's positioning decision that management can calibrate.

Together, these two contingencies reveal that the performance consequences of intrabrand agglomeration are not fixed but are actively shaped by the competitive density (i.e., interbrand agglomeration) and service positioning (i.e., service intensity) in the local market, extending agglomeration theory from a store-level phenomenon to one that is fundamentally relational and context-dependent (Geyskens, Gielens, and Gijsbrechts 2010).

Managerial Implications

Our findings offer three implications for retail decision-makers. First, fortressing has gained renewed attention, with brands like Domino's embracing it (Fantozzi 2024) but Starbucks opposing it (Meyersohn 2025). Our findings urge caution: evaluating fortressing through a sales lens alone looks unambiguously successful, as greater same-brand density consolidates patronage and reduces defection to rivals. But this reading is incomplete. The same mechanism driving sales gains also erodes the novelty and experiential richness that sustain satisfaction. Rising sales from intrabrand agglomeration may mask a satisfaction deficit invisible to revenue dashboards but consequential for long-run brand health. Chains should therefore adopt a dual scorecard tracking both sales and satisfaction, treating divergence between the two as a signal that the trade-off is beginning to surface.

Second, location decisions are rarely made in a competitive vacuum, yet managers often evaluate intrabrand agglomeration through internal metrics alone. Our findings offer a warning: high interbrand agglomeration does not neutralize the intrabrand paradox but reinforces it. When a chain agglomerates stores in a market already dense with rivals, customers are not liberated to explore nearby options but instead retreat further into habitual same-brand consumption. The satisfaction penalty of fortressing is thus more severe in competitively crowded markets. Managers should audit competitive density before committing to aggressive intrabrand

agglomeration, treating high interbrand agglomeration as a risk amplifier rather than a buffer. Markets already saturated with rivals are poor candidates for further same-brand density from a customer satisfaction perspective, even when sales projections appear favorable.

Third, unlike interbrand agglomeration, service intensity is a lever managers can control. High relative service weakens the lock-in that same-brand proximity creates, keeping customers more exploratory and substantially reducing the satisfaction penalty. This means the agglomeration paradox is not immutable but can be actively managed through service positioning. For practitioners, this finding reframes location strategy and service positioning as interdependent rather than separate decisions. Chains pursuing aggressive fortressing should simultaneously invest in service differentiation relative to local rivals, not merely to attract customers but to preserve satisfaction once patronage is consolidated. Service intensity thus functions as a behavioral counterweight to the variety suppression that fortressing creates, giving managers a tool to manage the trade-off that location strategy alone cannot resolve.

Limitations

Two important limitations of the study warrant consideration. First, while our study analyzes data from 33,282 stores across 72 U.S. pizza chains and customer foot traffic data, relying solely on the secondary data limits insight into customer motivations for seeking variety of choices. Second, while our sample covers numerous brands and markets in the U.S. pizza chain industry, generalizability may be limited. Pizza's low switching costs, frequent purchases, and strong local competition may amplify variety seeking and agglomeration effects. Industries with different consumption patterns (e.g., luxury goods) or international contexts with varying customer expectations, urban density, and competitive norms may show different patterns.

Future Research Directions

Our findings suggest two research directions. First, future work could examine how firms navigate the sales-satisfaction trade-off under varying agglomeration conditions, for example, whether competitive position shapes agglomeration strategy or whether tools like loyalty programs (Taylor and Hollenbeck 2021) or localized branding (Zhang and Schmitt 2001) help balance these outcomes. Second, digital platforms introduce new complexities into store agglomeration (Ye and Shankar 2025). Digital platforms and online ordering have weakened the link between geography and customer decisions, challenging traditional agglomeration logic. Future research should examine how these technologies reshape agglomeration effects and the intersection of physical and digital retailing (Bell et al. 2018).

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Appendix A: The results of first-stage regressions

Variables	**Endogenous variables**					
Exogenous variables	*Intrabrand agglomeration*			*Customer variety seeking*		
	b	*se*	*p*	*b*	*se*	*p*
Interbrand agglomeration	.72	.00	.000	-.01	.00	.822
Service intensity	-2.49	.10	.000	.01	.00	.232
Traffic volume	-.01	.00	.000	-.01	.00	.000
Satisfaction heterogeneity	1.05	.15	.000	.01	.00	.128
Store age	.02	.01	.005	-.01	.00	.066
Store efficiency	.01	.00	.000	.01	.00	.222
Store effectiveness	.93	.03	.000	-.01	.00	.000
Relative price	.89	.18	.000	.01	.00	.806
Commute time	.03	.00	.000	-.01	.00	.000
Population growth	.10	.01	.000	-.01	.00	.004
Household size	-.04	.05	.367	.01	.00	.000
Household income	-.53	.06	.000	-.01	.00	.000
Population	-.87	.04	.000	.01	.00	.000
Customer diversity	3.37	.12	.000	-.02	.00	.000
Intrabrand store openings	-.07	.02	.003	.01	.00	.127
Intrabrand store closings	-.16	.01	.000	.01	.00	.001
Interbrand store openings	.07	.01	.000	-.01	.00	.003
Interbrand store closings	.12	.01	.000	.01	.00	.059
Intrabrand store age	.48	.02	.000	.01	.00	.618
Interbrand store age	.33	.03	.000	-.01	.00	.009
Restaurant competition	.01	.00	.000	-.01	.00	.000
Customer engagement	.01	.00	.000	.01	.00	.000
Instruments						
State land area	.01	.00	.000			
State income	-132.12	17.63	.000			
Elevation				.01	.00	.000
Number of observations	71758			71758		
Wald Chi	119.22			935.08		
Sanderson-Windmeijer test of excluded instruments	73.84			104.00		

Note: Chain, state, and year dummies are included in estimation.

Appendix B: Results based on alternative market definitions (distance in radii)

	Column I			*Column II*			*Column III*			*Column IV*		
Dependent variable – Variety seeking	*Closest 10 stores*			*Closest 15 stores*			*Closest 20 stores*			*Count-based measure*		
Main effect	*b*	*se*	*p*	*b*	*se*	*p*	*b*	*se*	*p*	*b*	*se*	*p*
Intrabrand agglomeration	-.39	.17	.024	-.45	.20	.024	-.53	.22	.017	-29.38	10.40	.005
Moderating effects												
Intrabrand agglomeration x Interbrand agglomeration	-.08	.02	.003	-.08	.03	.006	-.09	.04	.023	-2.85	.88	.001
Intrabrand agglomeration x Service intensity	.48	.18	.009	.68	.25	.006	1.04	.34	.003	39.11	12.74	.002