# 4 COMPETITIVE IMPACTS OF DIGITALIZATION ON BRAZILIAN MARKET DYNAMICS: CASE STUDY ON RETAIL[1–2]

*Impactos concorrenciais da digitalização na dinâmica do mercado brasileiro: estudo de caso sobre o varejo*

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## STRUCTURED SUMMARY

**Context**: The Brazilian economy has undergone significant digital transformation, and retail is no exception. More retailers are now using digital tools and offering customers more attractive offers on how to shop, which in turn has brought offline and online retail closer together to the benefit of consumers.

**Objective**: To analyze how increasing retail digitalization has altered competitive dynamics between sales channels and how these changes are reflected in consumer behavior patterns and choices.

**Method**: Economic literature review and descriptive statistics using publicly available data.

Conclusions: Digital transformation in Brazilian retail has been incremental rather than disruptive, with evidence showing that online and offline channels compete while serving complementary roles.

**Keywords**: digitalization; retail sector; market competition; transaction costs; e-commerce; Brazilian market.

**JEL Classification**: L81; L86; D23; O33.

## RESUMO ESTRUTURADO

**Contexto**: a economia brasileira passou por significativa transformação digital, e o varejo não é exceção. Cada vez mais varejistas estão usando ferramentas digitais e oferecendo aos clientes propostas mais atraentes de como comprar, o que por sua vez aproximou o varejo *offline* e *online* em benefício dos consumidores.

**Objetivo**: analisar como a crescente digitalização do varejo alterou a dinâmica competitiva entre canais de venda e como essas mudanças se refletem nos padrões de comportamento e escolhas dos consumidores.

**Método**: revisão de literatura econômica e uso de estatísticas descritivas a partir de dados públicos.

**Conclusões:** a transformação digital no varejo brasileiro tem sido incremental ao invés de disruptiva, com evidências mostrando que os canais online e offline competem enquanto desempenham papéis complementares.

**Palavras-chave**: digitalização; setor varejista; competição de mercado; custos de transação; comércio eletrônico; mercado brasileiro.

## 1 INTRODUCTION

Digital adoption represents a fundamental shift in how many companies and industries operate, creating new markets and services, with disruption manifesting in different ways across sectors. While in some cases digitalization has enabled the rapid creation of entirely new digital markets and services, in many traditional sectors the transformation has been more cumulative, with digital technologies gradually enhancing and complementing existing market dynamics rather than replacing them entirely. This transformation has delivered benefits to consumers and businesses, enhanced competition, and boosted productivity across sectors. By reducing transaction costs, increasing price transparency, and enabling the development of new business models, digital technologies create new business models that foster a more dynamic landscape, catalyzing productivity gains across the economy while changing and preserving the fundamental characteristics and nature of these markets (Vial, 2019)[7].

Cennamo (2021) states that the effects of digitalization are also evident in many traditional sectors that have undergone digital transformation, such as banking, media, and hospitality[8]. While creating opportunities for smaller, innovative firms to enter and disrupt some markets, the competitive dynamics between traditional and digital channels have been at the forefront of discussion amongst antitrust regulators and policymakers in several jurisdictions, including in Brazil. The competition between online and offline channels is a key element in this discussion.

The improvements for customers caused by digital tools are particularly evident in e-commerce, where technologies have enabled new sales strategies, optimized inventory, and streamlined operations. Traditional brick-and-mortar stores and online sales methods now consistently interact and compete, blurring the lines between offline and online channels.

Recent evidence from the Brazil's Ministry of Finance[9] report on the competition of digital platforms demonstrates that economic growth and productivity gains are directly linked to the adoption of digital technologies across different sectors of the economy. The magnitude of these effects, however, varies significantly across markets and depends on structural conditions and competitive dynamics. Understanding these market-specific characteristics and their broader impact on competition and productivity is crucial as Brazilian regulators and policymakers debate regulatory approaches to digital markets.

Given this context of broad digital transformation across the economy, this paper focuses on digitalization impacts on Brazilian retail's dynamics as a case study of particular interest. The present work has three specific objectives: (1) to analyze how digitalization has reshaped competitive structures in Brazilian retail by examining the interaction between traditional and digital channels; (2) to identify digital adoption patterns across different retail segments, highlighting sectoral variations; and (3) to assess whether online and offline channels constitute

7 As Vial (2019) points out, digital transformation brings structural changes that help companies reduce frictions in value creation, particularly in sectors where transaction and operational costs were initially high.

8 In Cennamo (2021, p. 39), the author affirms that digitalization has led to the creation of new business models in traditional sector of the economy, such as automotive, retail and hospitality, and that the creation of these new models has often originated in startups.

9 The recent report released by the Finance Ministry on the economic and competition aspects of platform regulation associates digitalization with significant productivity gains and economic growth (Brasil, 2024).

separate relevant markets or compete directly with each other.

Retail provides an ideal setting to examine how digitalization affects market dynamics, as it combines traditional physical infrastructure with emerging digital capabilities, while directly interfacing with evolving consumer preferences and behaviors. Specifically, this study investigates market shares outcomes disaggregated by sales channels and sector over time, and explores consumers behavior linked with competitive findings. Through analyzing the Brazilian retail sector's digital transformation, this analysis provides better understand both the opportunities and limitations of digitalization in traditional industries.

The following sections explore a central question driving debate about retail digitalization: to what extent do online and offline channels compete with each other? Section 2.1 examines the theoretical foundations of this competition, drawing on transaction cost economics and recent literature on omnichannel retail dynamics. Sections 2.2 and 2.3 then apply this framework to the Brazilian market, analyzing empirical data on consumer behavior, price convergence, and channel interactions. This analysis challenges simplistic narratives of digital disruption, revealing instead a more nuanced competitive relationship where channels simultaneously compete and complement each other, while traditional retailers adapt through hybrid business models and consumers demonstrate increasingly fluid "zigzag" shopping patterns across digital and physical environments.

The primary contribution of this paper is to provide a theoretical framework, through literature review and the use of complementary data to provide evidence that the digitalization process in Brazilian retail has been more incremental than disruptive. Using data from IBGE (Brazilian Institute for Geography and Statistics), CETIC (Center for Studies on Information and Communication Technologies), together with the finds of the Ministry of Finance's report on digital regulation. These findings have important implications for competition policy, suggesting that regulatory frameworks should recognize the complex interplay between online and offline channels rather than treating them as separate markets.

## 2 HOW DIGITALIZATION CHANGED RETAIL IN BRAZIL

Digital transformation in retail has been examined through multiple theoretical lenses in the literature. This section builds on several complementary frameworks including transaction cost economics (Williamson, 1985; North; Wallis, 1994), platform competition theory (Parker; Van Alstyne; Choudary, 2016; Evans; Schmalensee, 2016), and digital business model innovation (Vial, 2019; Verhoef *et al*., 2021). Together, these perspectives help explain how digitalization has reshaped retail by reducing various transaction costs, enabling new competitive dynamics, and transforming business models. This section first examines the theoretical foundations of digital transformation in retail before analyzing the specific case of Brazilian retail markets.

Digital technologies have emerged as important tools in reducing operational and transactional costs across sectors. By creating shared infrastructure and standardized processes, digital solutions help minimize many traditional barriers to transactions, such as search costs and information asymmetries.

Through mechanisms like digital search tools, standardized payment systems, and automated feedback mechanisms, digital technologies facilitate smoother exchanges and lower frictions



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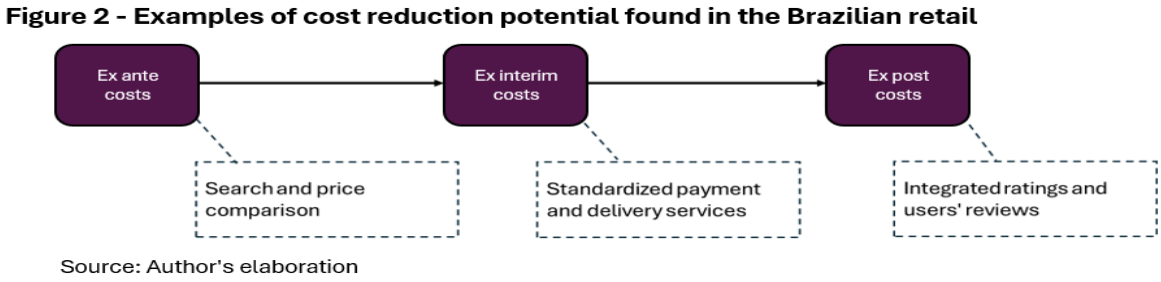
traditionally associated with transactions (Cusumano; Gawer; Yoffie, 2019). By facilitating smoother exchanges through transparent feedback systems and data algorithms, digitalization lower frictions traditionally associated with negotiations and post-transaction enforcement, ultimately improving market efficiency. This is particularly relevant in retail settings, where digital adoption enables matches and transactions that might be economically unfeasible through traditional channels due to high search, coordination, or monitoring costs.

The reduction of transaction costs may not be automatic, as its intensity depends on the nature of the product, service and business model. Following Williamson (1985) and North and Wallis (1994) proposed framework, Golovanova *et al*. (2024) analyze how digitalization may help reduce transaction costs at different stages:

1. *Ex ante* costs: Costs incurred before a transaction, including search and information costs, as well as negotiation and contracting costs.
2. *Ex interim* costs: Costs associated with executing the transaction itself.
3. *Ex post* costs: Costs related to monitoring, enforcement, and dispute resolution after a transaction.

Figure 1 illustrates how digitalization may work to minimize costs at each of these stages in a retail setting. At the ex-ante stage, search and price comparison tools have significantly reduced information gathering costs, with CETIC data showing increasing use of online price research by Brazilian consumers, even for offline purchases. For ex-interim costs, standardized payment systems and delivery services streamline transaction execution. In addressing ex-post costs, integrated rating systems and user reviews create transparent feedback mechanisms, reducing monitoring and enforcement costs through automated reputation systems.

**Figure 1 -** Examples of cost reduction potential found in the Brazilian retail




**Source**: Author's elaboration

This systematic reduction of transaction costs at each stage is evidence of how digitalization may be transforming Brazilian retail by addressing specific friction points in the transaction process (Goldfarb; Tucker; 2019, Calvano; Polo, 2021). To further discuss the impacts of digitalization on the economy, it is important to distinguish between two broad categories of digital transformation. The first category, referred to as "Primarily Digital Sectors", includes services that operate predominantly online, such as search engines, social media platforms, and pure digital content providers. This distinction between born-digital and digitally transformed sectors aligns with typologies proposed by several scholars (McIntyre; Srinivasan; 2016, Nooren *et al*.; 2018) who emphasize the different

transformation paths across industries.

These sectors were born digital and maintain minimal physical infrastructure beyond their technical operations.

The second category encompasses traditional sectors that have undergone significant digitalization while maintaining substantial offline presence. This includes industries like retail, banking, and transportation, where physical infrastructure and face-to-face interactions remain important despite increasing digital capabilities. These sectors present particularly interesting cases for analyzing how digital transformation affects existing market structures and competitive dynamics.

This paper focuses on the second category, examining how traditional sectors - particularly retail - adapt to and benefit from digital technologies while maintaining significant offline operations[10]. The evidence, as it later explored in more detail, indicates that digital and offline channels do indeed compete across many sectors of the economy.

## 2.1 Does online channel compete with offline channel?

Evidence suggests that companies compete across multiple channels, particularly as digitalization has reduced operational frictions and business models vary in their reliance on physical assets and technological capabilities, with different features and cost structures. This competitive interaction is especially evident in markets where companies combine physical infrastructure with digital capabilities to serve customer needs, the "brick-and-click" model[11].

Hovenkamp (2024) makes a compelling case that online and offline channels are not siloed, but rather exist in a state of active competition. He argues that the focus should be on the products and services being offered, rather than the digital or physical nature of the firm itself. According to the author, digitalization does not create an absolute separation between the two types of markets, and competition actively occurs between the products offered by digital and offline firms.

Hovenkamp (2024) also points out that hybrid models - where companies operate both digital and physical channels in an integrated way, often called "bricks-and-clicks"[12] - blur the lines between digital and offline channels. Many firms now operate in both digital and physical spaces, eroding any clear distinction between the two. The author emphasizes that market definition should rely on empirical evidence of substitutability rather than the nature of the channel. In this direction, Cade has employed consumer surveys to assess substitutability patterns and define competition boundaries based on actual user behavior rather than theoretical assumptions[13]. This perspective is

10 These categories are used as analytical constructs to help understand different patterns of digital adoption and their implications. In practice, virtually all modern businesses utilize some degree of digital technology in their operations. The distinction lies in the extent to which digital technologies are central to the business model and service delivery, rather than implying a complete absence of digital tools in traditional operations.

11 See Hovenkamp (2024), "Antitrust and eMarkets", for a discussion of how brick-and-click models enhance competition across channels, integrating physical and digital infrastructures.

12 Hovenkamp (2024) refers to this as the "Bricks-and-Clicks" model, where companies integrate their physical operations with e-commerce channels to create a more dynamic and flexible business model.

13 See Cade's analysis in the iFood case (Processo Administrativo nº 08700.004588/2020-47) and Google cases (Inquérito Administrativo nº 08700.003498/2019-03), where surveys were used to understand consumer behavior and market boundaries. For a comprehensive analysis of these cases, see Bastos (2023) 'Mercados de Plataformas Digitais - Versão Revista e Atualizada'. **All Cade's cases mentioned in this article can be consulted at: https://tinyurl.com/y7obr4z5.**

consistent with Rochet and Tirole (2003) seminal work on platform competition, which emphasizes how interactions between different user groups shape competitive dynamics.

When assessing whether digital goods and services compete with those from offline channels, the key consideration is whether consumers view and treat these options as substitutes. The ability to substitute between digital and traditional offerings is critical in determining whether they truly compete within the same market, reinforcing the need for an empirical approach to market definition. This perspective aligns with the broader discussion of product-centric competition, where the focus is not on the nature of the firm - whether digital or offline - but rather on how well its products or services meet the same consumer needs.

This is particularly evident in the case of the retail sector, where the distinction between digital and offline channels becomes increasingly blurred. Consumer behavior has evolved to what has been termed 'zigzag consumption', where individuals move fluidly between online and offline channels throughout their purchasing journey (Brasil, 2024, p. 26). While shopping experiences may differ between channels, consumers exhibit heterogeneous preferences regarding these differences - some value the immediate access and tactile experience of physical stores, while others prioritize the convenience of digital. A book purchased online through a marketplace competes directly with one bought from a local bookstore, with consumers choosing based on their individual preferences for factors such as price, convenience, delivery speed, or in-store experience. This pattern of consumer behavior, where individuals actively switch between channels to optimize their purchasing decisions, has led retailers to adopt omnichannel strategies, further intensifying the competitive interaction between online and offline channels.

It is then straightforward to understand how the rise of hybrid models, such as "Bricks-and-Clicks", further blurs the lines, as many offline retailers integrate digital channels into their operations to meet evolving consumer preferences. This convergence underscores the importance of considering empirical evidence when defining relevant markets in retail, as the nature of competition is shaped more by consumer behavior and the interchangeability of products than by the business model and the digital or physical presence of the firm. As Hagiu and Wright (2015) demonstrate, the boundaries between different business models become increasingly flexible as firms adapt their strategies to changing market conditions and consumer preferences.

Across these sectors, the competition between different business models exemplifies the core arguments presented by Hovenkamp (2024). It reinforces the idea that digital and offline channels are not distinct or isolated, but rather, they compete for the same consumer needs.

As a result, the competition between digital and offline channels has significant implications for both innovation and productivity growth. In one side, offline channels face increased pressure to innovate, as they must adopt more efficient processes to remain competitive with digital-focused companies. As highlighted in the Ministry of Finance report (Brasil, 2024), the intensive use of digital technologies is crucial for driving productivity gains across various sectors of the economy, emphasizing the importance of fostering competitive environments that stimulate innovation and ongoing development. This competitive pressure drives offline businesses to rethink their strategies and embrace digital transformation to stay relevant in the evolving marketplace.

In the present case, digital retailers observe substantial gains in efficiency, as they operate with fewer assets while achieving faster growth compared to traditional firms, as demonstrated by Parker,

Van Alstyne, and Choudary (2016). In the Brazilian context[14], most of the potential gains stemming from the digitalization process remain to be fully realized, as Brazilian companies lag behind in the productive use of digital tools compared to OECD averages despite ample access to broadband (OECD, 2020).

As mentioned above, beyond traditional benefits such as economies of scale, scope, and network effects, a crucial advantage of digitalization lies in its ability to reduce transaction costs, particularly in retail settings. This reduction enables matches and transactions that might be economically unfeasible in offline channels due to high search, coordination, or monitoring costs (Goldfarb; Tucker, 2019). For instance, niche products that would be too costly to stock and sell in physical stores can find viable markets through digital channels, where the costs of matching buyers with specific preferences to specialized sellers are significantly lower. This transaction cost reduction is especially relevant in retail as it can facilitate a higher volume of transactions at lower costs per-transaction, enabling markets to operate more efficiently. The ability to reduce these friction costs represents a distinct contribution to market efficiency, separate from traditional scale, scope and network effects.

Furthermore, digitalized sectors exhibit significant user heterogeneity and more localized rather than global network effects, which is key to understanding retail competition dynamics. While global network effects depend on the total user base, retail network effects are typically local - consumers mainly value users in their own segment or "neighborhood". As Calvano and Polo (2021) point out, this supports competition by allowing multiple firms to coexist serving different market segments and enabling new entrants to compete by focusing on specific niches rather than needing to build a large total user base. This explains, for instance, the rise of specialized retail business focusing on specific product categories (Xu, 2014).

Multi-homing is another key factor boosting competition in digital retail, as both consumers and sellers frequently use multiple online retailers simultaneously with low switching costs[15]. This fundamentally changes competitive dynamics, as using online retailers no longer requires giving up access to incumbent networks. This makes it significantly easier for new entrants to persuade consumers to 'try out' their services, even if they initially lack the scale of established incumbents (Calvano; Polo, 2021).

Additionally, the high heterogeneity of business models and the large number of players still active in these markets contribute to the competitive gains mentioned. As highlighted in the ALAI study (2023), the e-commerce sector in Brazil includes dozens of relevant players. This diversity supports a more balanced competitive environment, allowing numerous firms to coexist and thrive. Brazil's large market size plays a crucial role in enabling sustainable operations for multiple companies. As Morais, Lima and Takahashi (2023) demonstrate, companies can achieve minimum viable scale with relatively small market shares, allowing various firms to reach sustainable growth levels while serving different customer segments.

14 The Ministry of Finance further reinforces that digitalization has the potential to significantly boost productivity in Brazil, contributing to economic growth by fostering a competitive environment that promotes the adoption of digital technologies (Brasil, 2024).

15 According to Akman (2022), Brazilian consumers demonstrate a high propensity for multi-homing in digital retail, surpassing all other countries in the study. The research revealed that Brazilian shoppers actively engage with an average of four different online retail platforms for their purchasing needs.

In the light of the digitalization process that many industries have been through, it is expected that industries with high transactional and operational costs should be the first to digitalize due to the significant potential for efficiency gains[16]. The innovation provided by digitalization has also allowed sectors heavily dependent on personnel and physical operations to reduce transaction and operational costs, as is the case with retail.

## 2.2 Data and methodology

This section presents the data sources and methodology used in this analysis of Brazilian retail digitalization. This study draws primarily from two complementary datasets that provide both supply-side and demand-side perspectives on digital transformation in the retail sector.

The data from CETIC is the result of an annual survey on domiciles and firms regarding the level of access and use of information and communication technologies. Both the individual-level and firm-level surveys examine household access to and use of information and communication technologies, with recent iterations including detailed questions about online purchasing habits, delivery preferences, and price research behavior.

It is important to note that CETIC's survey design varies across years, with some questions administered annually while others do not appear every year, often biannually. Throughout this study the most recent data available for each indicator is presented, which means that not all statistics necessarily correspond to the same reference period. To mitigate potential comparison issues arising from this approach multiple years of data are presented whenever possible, allowing for meaningful temporal analysis despite variations in data collection schedules.

The other main data source is the Annual Trade Survey (PAC, from Portuguese *Pesquisa Anual de Comércio*) (IBGE, 2022), which investigates information about the basic structural characteristics of the business segment of commercial activity in Brazil. The survey uses formally constituted commercial companies whose main source of revenue is commercial activity as the unit of investigation.

PAC collects various economic and financial information, including gross and net revenues; marketing margin; number of companies and local units; employed personnel; personnel expenses; financial, operational and non-operational expenses; purchases and inventories of goods for resale; and acquisitions and disposals of fixed assets, among other aspects.

The survey is conducted annually with national geographic coverage, and results are published for Brazil, Major Regions, and Federation Units. This comprehensive dataset allows the analysis of the evolution of traditional and digital sales channels across different retail segments and regions, providing crucial insights into how digitalization has impacted the structure and dynamics of Brazilian retail. The PAC data is particularly valuable for examining revenue distribution between online and offline channels, as well as tracking changes in market structure over time.

16 Digitalization has notably reduced search costs, improved price transparency, and enhanced operational efficiency, making these industries prime candidates for early adoption of digital technologies (Goldfarb; Tucker, 2019). In retail, for example, the rise of e-commerce led to a redistribution of market share from higher-cost producers to more efficient digital firms, driven by the reduction of transaction costs (Goldmanis et al., 2010). Furthermore, online business models have streamlined previously high-friction processes, enabling industries with significant operational burdens to operate more efficiently (Hanelt *et al.*, 2022).

From the PAC (IBGE) data, was extracted information on revenue distribution across sales channels, with special attention to the proportion of sales conducted through internet channels versus traditional methods. To account for sectoral differences, separate analyses for specific retail divisions were conducted, excluding categories like supermarkets and fuel retail where physical infrastructure requirements create natural barriers to digital adoption.

The CETIC survey data complemented this analysis by providing insights into consumer behavior, including online purchasing habits, delivery preferences, and price research practices. This dual approach - examining both supply-side data from PAC and demand-side information from CETIC - provided a more comprehensive understanding of the Brazilian retail digitalization process.

When presenting results, data from multiple years are often displayed to facilitate temporal comparisons, especially important given the acceleration of digital adoption during the COVID-19 pandemic period. For certain analyses, this study focuses on firms with over 20 employees to minimize the impact of infrastructural challenges that smaller businesses face when transitioning to digital channels, allowing better isolation of competitive dynamics from structural limitations.

This methodological approach enables the observation of not only the growth of e-commerce in Brazil but also the emergence of hybrid business models and the persistent importance of traditional retail channels, reflecting the incremental rather than disruptive nature of digitalization in Brazilian retail.

## 2.3 The digitalization impact on retail competition dynamics

Evidence shows that technology adoption can enhance retail market competition through several channels. Although online and offline prices can be nearly identical (Abrantes-Metz; Maloney, 2022), research shows that online prices tend to be more responsive, changing approximately every three weeks *versus* every four to five months in physical stores (Gorodnichenko; Talavera, 2017).

Technology adoption has also significantly lowered barriers to entry, allowing small sellers to reach broader markets and quickly scale their operations (Verhoef *et al*., 2021; Lendle *et al*., 2016). In sectors like retail, small sellers can reach broader markets through e online marketplaces, directly competing with established brands. The ability for small entrants to quickly scale through these marketplaces increases competitive pressure on incumbent firms, driving innovation and efficiency within the market[17]. Studies consistently show significant consumer benefits from these competitive dynamics, driven by increased choice (Dolfen *et al*., 2023). Digital technologies also reduce search costs, which enable consumers to easily compare prices and features across sellers, making it harder for inefficient or overpriced sellers to survive while expanding consumer choice (Goldfarb; Tucker, 2019).

The pro-competitive effects of digitalization described above are evident both in general retail transformation and specifically within the Brazilian market. Brazil's retail sector demonstrates many of the pro-competitive elements discussed in the theoretical framework, where digitalization helps reduce transaction costs and enhance market efficiency. Consistent with the theoretical predictions about how digital transformation affects market dynamics, the analysis of empirical data

17 For Verhoef *et al.* (2021, p. 893) this phenomenon is called digital agility and relates to the "ability to sense and seize market opportunities provided by digital technologies", and in the digitalization process is related to the intensified competition due to the removal of barriers to entry.



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from the Brazilian retail market reveals how competition, consumer behavior, and business strategies have evolved as firms adopt digital technologies and new business models emerge.

The following analysis examines key dimensions of this transformation in Brazilian retail: omnichannel strategies, sectoral variations, e-commerce growth patterns, and resulting competitive dynamics.

### 2.3.1. Omnichannel shopping: the hybrid approach

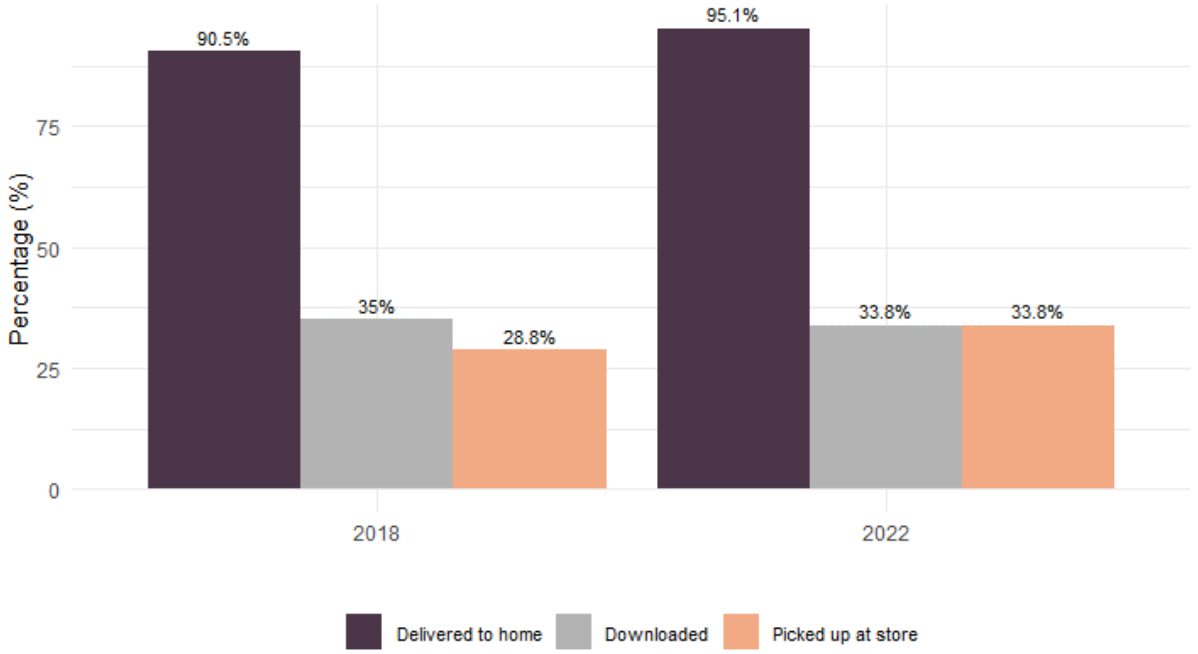
In the Brazilian context, the "TIC Indivíduos" survey data[18] demonstrates the integration of hybrid retail models into consumer behavior. By 2022, approximately one-third of online shoppers reported using hybrid shopping models. This adoption pattern indicates that the "brick-and-click" approach aligns with consumer preferences while providing established retailers with a competitive strategy to respond to ongoing digitalization.

As previously exposed, omnichannel approaches have become standard practice among traditional retailers, reflecting evolving consumer preferences. Data demonstrates the diverse ways consumers receive their online purchases: research conducted by McKinsey and Company (2024) shows that 55% of consumers prefer digital or omnichannel shopping experiences. The research also indicates that, in the foreseeable future, online channel will not prevail as the only way to shop, since a significant group of consumers still values traditional retail channels. IBGE data demonstrates that, even with accelerated e-commerce growth, especially during the pandemic, online sales still represent a relatively small portion of total retail[19].

18 All the CETIC data used is available at https://cetic.br/pt/microdados/ (Bases [...], 2024).

19 Digital retail companies, despite their growing visibility and increasing presence, represent only a small portion of the broader Brazilian retail market. This becomes more apparent when analyzing data from IBGE's Annual Commerce Survey (PAC), which tracks the share of retail revenue attributed to online sales. The data indicates that, while e-commerce is gaining momentum, traditional sales channels continue to dominate the Brazilian market. Data from IBGE's PAC shows that since 2019, traditional brick-and-mortar retail has maintained its position as the primary sales channel. This has important implications for understanding the dynamics of digitalization in the retail sector.

**Graph 1** – Share of users that purchased products online, by delivery method (2018 and 2022)




**Source**: TIC Indivíduos (Bases [...], 2024), author's elaboration. Graph displays the share of interviewed consumers that indicates that has, on the last 12 months preceding the interview, utilized each delivery method.

Graph 1 above presents results from the TIC survey on consumer behavior towards omnichannel shopping. The data shows that by 2022, nearly a third of consumers had adopted omnichannel options when receiving products purchased online. This trend reflects the growing consumer preference for flexibility in how they shop and receive goods, blending online and offline experiences to meet their needs.

While this hybrid approach gains traction, digital adoption varies significantly across retail segments, with product characteristics and consumer preferences influencing digitalization patterns.

### 2.3.2. Differences in consumer behavior across sectors

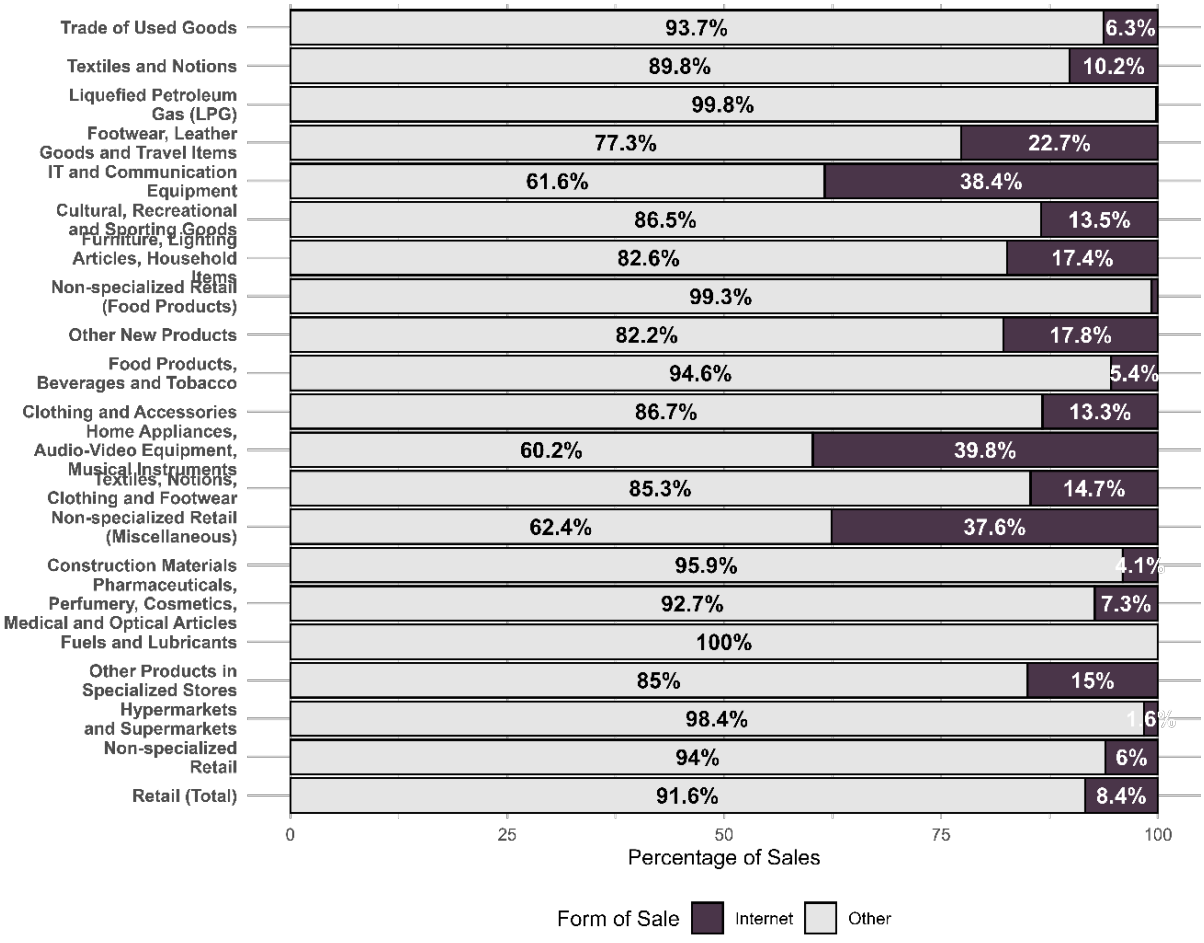
As Hovenkamp (2024) highlights the extent of competition between online and offline channels varies depending on the product category. In some cases, such as consumer electronics or books, e-commerce has become very popular due to the convenience of online product searches. However, in other sectors, such as grocery retail, physical stores still capture the lion's share of sales, as logistical challenges and consumer preferences for inspecting products in person limit the growth of online channels.

Data from CETIC shows that digitalization adoption varies significantly across retail sectors in Brazil. While some segments readily embraced e-commerce, others face substantial barriers - particularly in categories like supermarkets and fuel retail, where physical infrastructure requirements and logistical demands create natural obstacles to online operations.

The last available official data related to the Brazilian retail sector (PAC-IBGE, 2022), that shows how different channels and sector of Brazilian retail have adopted digital sales, as shown in Graph 2. It is possible to identify another perspective of the progress of the digital channel in Brazil. The percentage of sales conducted through the internet for different retail divisions reveal significant discrepancies. For instance, sectors like electronics, home appliances, and furniture have shown a much higher propensity to adopt digital sales channels. This can be attributed to several factors, including the nature of the products (which are easier to sell and distribute online) and the consumers' willingness to purchase these goods without the need for physical inspection.

Sectors such as clothing, which might seem ripe for digital transformation, have faced slower adoption rates. Consumers often prefer to physically try on clothes before purchasing. Although these discrepancies may also result from the potential for reducing operational and transaction costs, cultural factors and local consumer preferences should not be disregarded.

**Graph 2** – Percentage of total revenue divided into internet channels and others (2022)

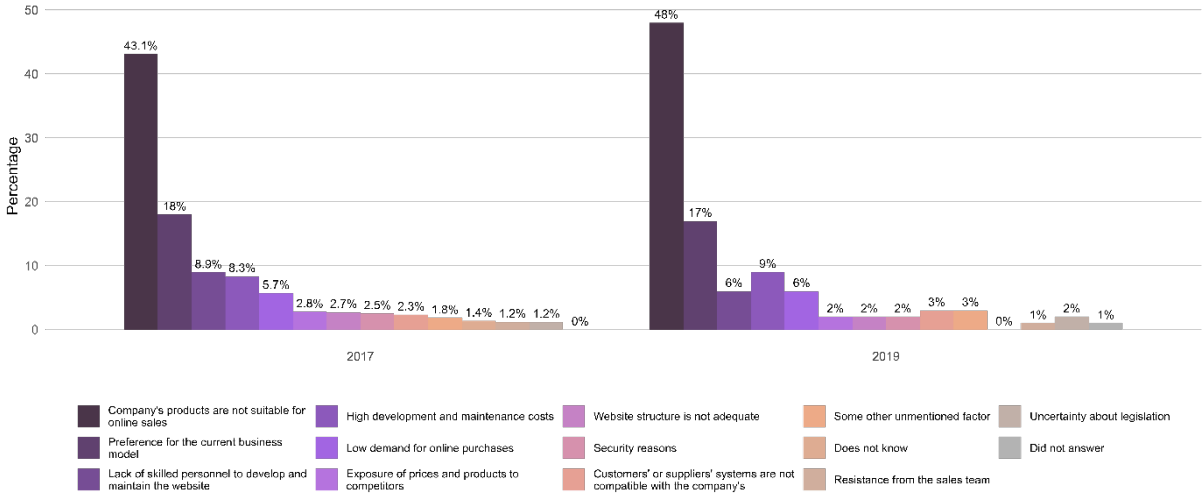



**Source:** PAC (IBGE, 2023), author's elaboration. Notes: The divisions of the retail and commerce presented are the same as those presented in the IBGE's survey. The graph presents the share of total retail value in each category that is sold through internet or other channels.

A more suitable approach to assess the degree of digitalization should consider how product characteristics and consumer preferences shape channel selection decisions, rather than merely

identifying which segments are more digitalized. Specific product attributes - such as need for physical inspection, perishability, and purchase frequency - interact with consumer preferences to determine online-offline channel suitability. For instance, consumers often prefer to personally examine perishable items in supermarkets. Similarly, the inherent physical nature of fuel retail presents particular challenges for digital distribution. This product and preference-centered perspective provides a more nuanced understanding of online-offline competition across retail contexts, beyond simple categorization of sectors by digitalization potential.

**Graph 3** – Main obstacle to selling online, as answered by companies (2017 and 2019)




**Source**: TIC Empresas (Bases [...], 2024). Notes: This identifies the main, but not all, obstacles the companies face when selling online. The graph displays the percentual of business interviews that identified each presented answer as the main obstacle for selling products or services online.

These sectoral variations and obstacles help explain why e-commerce in Brazil has followed an incremental rather than disruptive growth trajectory.

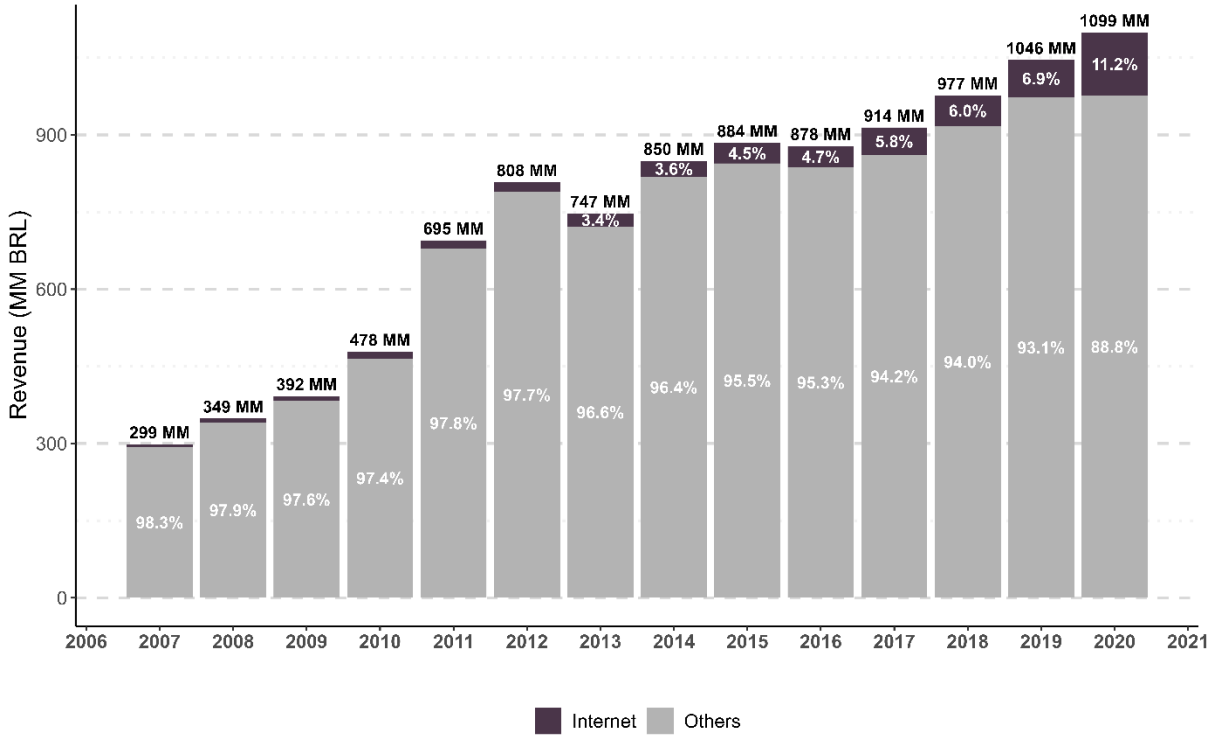
### 2.3.3. E-commerce growth and its challenges

Graph 4 tracks the overall growth of e-commerce in Brazil over a series of years, illustrating the steady increase in the share of retail revenue generated online. Between 2006 and 2021, there was a clear upward trajectory, with online sales gaining importance, particularly during the COVID-19 pandemic, when lockdowns and health concerns drove consumers towards online shopping. However, even with this boost, the proportion of total retail revenue derived from online sales remains modest.

The pandemic undoubtedly accelerated the growth of e-commerce, but this growth has not =displaced traditional retail to a significant degree. In 2021, online sales still represented only a small fraction of total retail revenue. This highlights an important characteristic of the Brazilian market: while digitalization is progressing, it is still in its early stages compared to more developed economies. Factors such as internet infrastructure, consumer trust in online transactions, and payment system

accessibility continue to influence the slower adoption of e-commerce.

**Graph 4** – Percentage of total retail and commerce revenue divided between internet and other channels (2006 – 2020)




**Source:** PAC (IBGE, 2023). Notes: This graph presents the division based on the total revenue of commerce and retail. Revenue in the x-axis in millions of BRL and displayed on the top of the bars. The share of sales through internet or other channels in displayed inside the bars of each category.

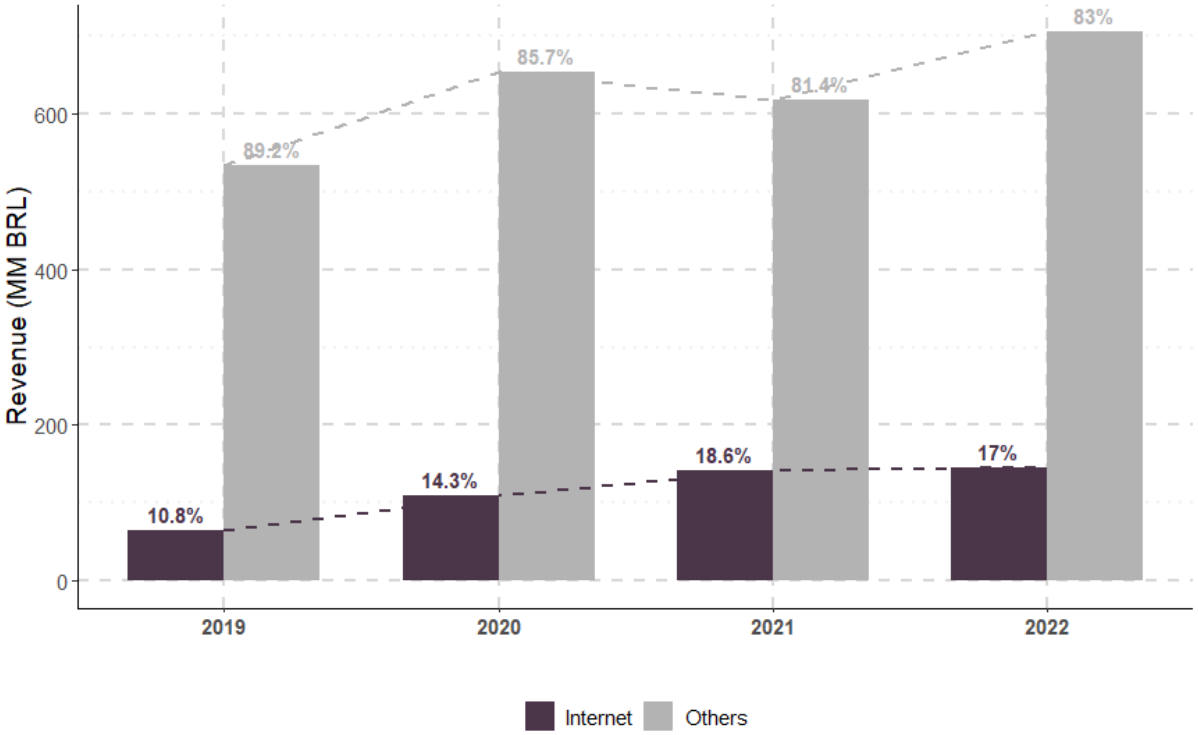
The geographic distribution of digital retail adoption reflects broader structural challenges in the Brazilian market. Urban centers demonstrate higher digital engagement due to superior infrastructure and logistics networks, while rural areas show limited adoption. This spatial heterogeneity provides important context for understanding the pace and extent of retail digitalization across Brazil's diverse regions. This geographical variance in digital adoption reflects both infrastructure limitations and socioeconomic differences between urban and rural areas, directly impacting retailers' ability to implement digital strategies and consumers' capacity to engage with online commerce.

Graph 5 provides a more focused analysis by examining firms with over 20 employees. By restricting the data to larger companies, the impact of infrastructural challenges that smaller businesses face when transitioning to digital channels can be reduced. These larger firms are more likely to have the resources to invest in technology and logistics, which are critical for e-commerce success.

Despite these advantages, the graph reveals a similar pattern: while the percentage of sales made through the internet has increased, it still accounts for less than 20% of total sales by 2022. This finding underscores a key point about the Brazilian retail market: even among larger, more resource-

rich companies, the shift to online sales has been slower than might be expected. Offline sales channels continue to play a dominant role, and the reliance on physical infrastructure remains strong.

**Graph 5 –** Percentage of selected retail categories revenue divided between internet and other channels (2019 – 2022)

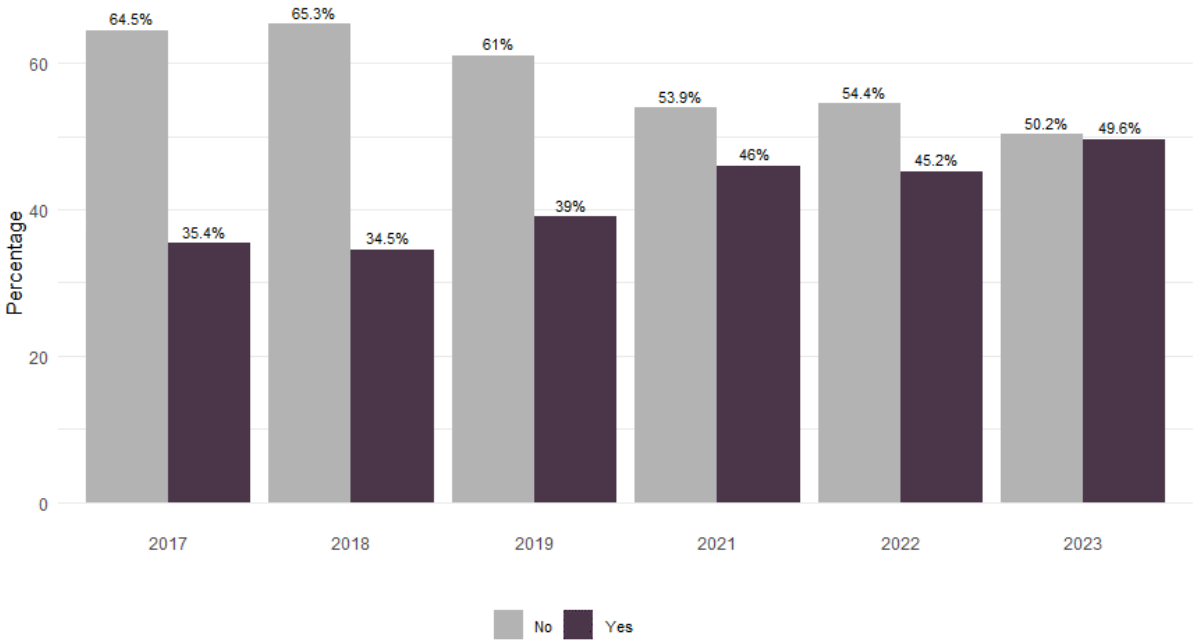



**Source**: PAC (IBGE, 2023). Notes: This graph presents the division based on the revenue of selected categories of the total survey. From the total amount, the following categories were subtracted: supermarkets and hypermarkets, fuels, lubricants and GLP. Revenue is displayed in millions of BRL, for the period of 2019 to 2022 for firms with over 20 employees.

The same can be seen on the demand side where consumers, while progressively adapting to online orders, still prefer interaction with the offline channels. In the last six years the share of consumers willing to buy from online retailers grew from 35% in 2017, reaching almost half the consumers in 2022. Although this showcases the undeniable growth of online retail it also points to the fact that a significant share of consumers still prefers the traditional offline channel.

One possible reason for this may be some persistent preference of part of the Brazilian consumers for physical stores. The experience of in-store shopping, which includes personal interaction with sales staff and the ability to inspect products, seems to remain valued. Additionally, part of the consumers seems to prefer the immediacy of purchasing products in person, rather than waiting for delivery, which can still be slow in certain regions despite improvements in logistics.

**Graph 6** – Share of consumers that purchased products or services online, in the last 12 months. (2017-2023)




**Source**: TIC Indivíduos (Bases [...], 2024), author's elaboration. The graph displays the percentual of individuals interviewed that purchased products online in the 12 months preceding the interview. Series available from 2017 to 2023.

These consumer preferences create a distinctive competitive landscape where digital and traditional channels interact in complementary ways.

### 2.3.4. Competition dynamics in Brazil

In Brazil, the dominance of offline channel creates a unique competitive landscape. Rather than simply displacing brick-and-mortar stores, the digital channel faces competition within a dual-channel system, where physical stores continue to capture the majority of consumer spending.

A significant factor shaping Brazilian retail is the heterogeneity in internet access across income levels and regions. While about a quarter of the population still lacks fixed broadband access (reaching 40% in lower-income brackets), CETIC data shows robust growth in connectivity: fixed broadband adoption increased by 22% in the last 7 years, while mobile internet has become widespread, with cellphone being the main way individuals interact with the internet specially in segments where broadband is less common. This widespread mobile connectivity has enabled significant engagement with digital retail channels, as smartphones provide essential features for omnichannel experiences such as price comparison, product research, and mobile purchases, helping explain the increasing adoption of hybrid shopping behaviors among Brazilian consumers.

The prevalence of mobile internet access has created alternative pathways for digital commerce engagement. Many consumers, particularly those without traditional broadband access, actively participate in digital retail through mobile and messaging applications. These consumers navigate between physical and digital environments in ways that might not be fully captured by conventional e-commerce statistics, suggesting that actual digital retail engagement could be more extensive than official metrics indicate. This phenomenon helps explain the increasing adoption of hybrid shopping behaviors among Brazilian consumers.

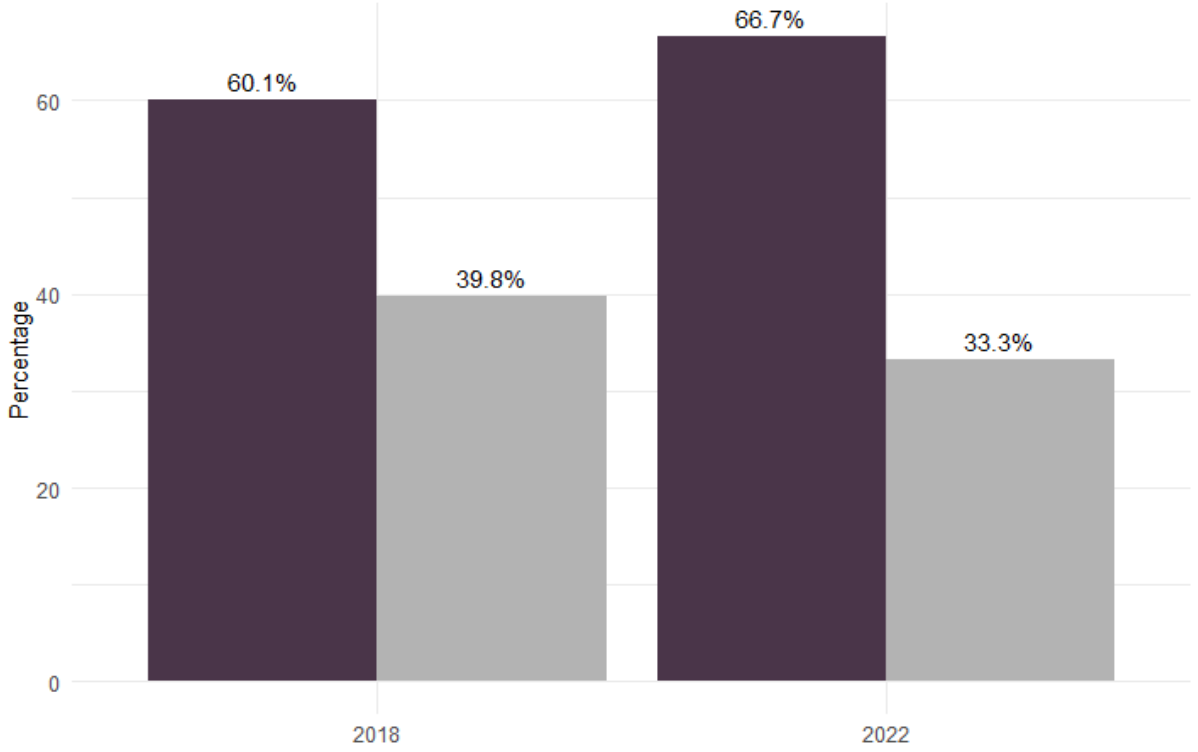
As broadband infrastructure continues to expand across different socioeconomic segments and geographical areas, the productivity gains from retail digitalization are expected to intensify. The ongoing improvement in connectivity, combined with the already substantial mobile internet penetration, provides a strong foundation for further digital transformation across the retail sector, potentially amplifying efficiency gains and market competition.

Moreover, the relatively low market share of online retail reflects the effective competition posed by digitalized established retailers. These established firms have made investments in e-commerce capabilities while maintaining their physical presence. This hybrid approach combines online convenience with the trust and familiarity of established retail brands.

A key feature of retail digitalization is how it affects pricing dynamics. Digital channels show two distinct pricing patterns: more frequent price adjustments compared to traditional retail, and a tendency toward price convergence between online and offline channels over time. The economic literature, drawing primarily from North American and European markets, demonstrates a trend of price convergence between channels (Cavallo, 2017; Gorodnichenko; Talavera, 2017). This analysis reveals that the Brazilian market exhibits both characteristics: the higher frequency of online price changes and the gradual alignment of prices across channels.

The impact of increased price transparency is evident in consumer behavior and plays an important role in price convergence between channels. As shown in Graph 7, CETIC's data demonstrates that an increasing share of Brazilian consumers uses the internet for price research, surpassing the proportion who actually make online purchases. This suggests that digital channels influence retail competition even when transactions occur offline.

**Graph 7 -** Share of consumers that conducted price research of products or services on the internet in the last 12 months (2018 and 2022)




**Source**: TIC Indivíduos (Bases [...], 2024). The graph displays the percentual of individuals interviewed that conducted, or not, price research using the internet 12 months preceding the interview.

Despite difference in pricing patterns between channels, omnichannel strategies provide consumers with tools to compare prices directly, reinforcing competition through price convergence over time. This demonstrates that, while channel-specific differences exist, they do not justify a fundamental separation between online and offline markets. Instead, each channel's unique features, combined with competitive pricing, serve to enhance consumer choice and flexibility.

## 3 CONCLUSION

The analysis of Brazilian retail demonstrates that traditional sectors undergoing digitalization often adopt hybrid models rather than fully transitioning to digital operations. The widespread adoption of the "bricks-and-clicks" approach reflects both the persistent value of physical infrastructure and the continued importance of consumer preferences for traditional retail channels.

The Brazilian evidence regarding retail sector showed a cumulative and incremental digitalization process, impacting the competitive environment. Retailers continue to operate in the offline channel, seeking hybrid models, with different business models, with no prospect of the online channel prevailing. Similarly, in a heterogeneous way, consumers tend to present zig and zag behavior, mixing online and offline channels, with price being preserved as a relevant competitive variable.

The varied manifestation of digitalization across contexts presents a key policy challenge: designing regulations that preserve efficiency gains while addressing competition concerns. This is particularly relevant for emerging markets like Brazil, where substantial productivity gains from digital adoption remain unrealized, especially among smaller firms. As documented by Brazil's Ministry of Finance report, capturing these benefits requires careful regulatory design that promotes competition without disrupting the mechanisms that make digitalization effective.

This study has limitations that suggest directions for future research. The analysis focuses primarily on broad sectoral trends and consumer behavior patterns but could be complemented by firm-level studies examining specific adaptation strategies and performance outcomes.

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