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# Evolution of Entry and Competition in U.S. Food Retailing

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# 1 Introduction

2 The food retailing landscape is evolving rapidly due to the entry and exit of various  
3 food retailers. Nontraditional store formats, such as supercenters, warehouse clubs,  
4 and dollar stores, are expanding in both size and number of outlets. Conversely, tra-  
5 ditional formats like conventional grocery stores are declining (Stevens et al., 2021),  
6 highlighting growing consolidation in the United States (Zeballos et al., 2023). Al-  
7 though more than half of consumer expenditures for food-at-home (54%) still occurred  
8 at grocery stores in 2021, this share has significantly decreased from 72% in 1997.  
9 Meanwhile, sales shares in warehouse clubs and supercenters have increased from 8%  
10 in 1997 to 23% in 2021.

11 Recent and growing literature analyzes market dynamics in retail markets. Given  
12 the importance of traditional grocery stores and the rise of big-box stores, most previ-  
13 ous studies focus on these two retailer formats. Researchers have examined how the  
14 entry of supercenters affects grocery stores in terms of prices (Basker and Noel, 2009;  
15 Arcidiacono et al., 2020), quality, and service (Matsa, 2011). The entry of supercenters  
16 also impacts the local labor market through wages, employment, and workers' benefits  
17 (Basker, 2005; Dube et al., 2007; Neumark et al., 2008; Lopez et al., 2023). Addi-  
18 tionally, studies investigate how the entry and exit of various retail formats affect food  
19 accessibility, particularly dollar stores (Chenarides et al., 2021) and Walmart (Courte-  
20 manche et al., 2019). The entry of dollar stores has also been investigated due to its  
21 impact on the survival of independent grocery stores (Lopez et al., 2023).

22 While work has described the evolution of the number of establishments, sales,  
23 and employment among various food retail formats in rural America in recent decades  
24 (e.g., (Stevens et al., 2021)), studies examining the dynamics of entry and exit behind the  
25 evolution are lacking and have focused on the entry of particular retail formats such as  
26 dollar stores (Chenarides et al., 2023; Lopez et al., 2023), supercenters (Arcidiacono  
27 et al., 2020; Çakır et al., 2020), and grocery stores (Hanner et al., 2015; Cleary and

1 Chenarides, [2022](#).

2       Given the importance of the food retail industry in providing healthy foods, job  
3 opportunities, and generating tax revenues, its prosperous growth is crucial. The evo-  
4 lution of the food retail landscape reflects changes in local competition. The entry of  
5 nontraditional retailers into local markets and increasing consolidation create entry bar-  
6 riers for new entrants, thereby affecting competitive conduct. Documenting changes in  
7 competitive conduct over time, along with market dynamics, has significant implica-  
8 tions for antitrust policy. However, a comprehensive analysis that considers the entry  
9 and exit of all retail formats shaping the structure and competitive conduct of U.S.  
10 retailing is lacking.

11       To answer how the market structure affects the intensity of competition, Bresnahan  
12 and Reiss, [1991](#) developed a novel structural framework that requires limited data. This  
13 framework infers local competitiveness from the relationship between the number of  
14 firms and the market size. If a disproportional market size is needed to support an addi-  
15 tional firm, it suggests intensified competition with the new entry. The intuition behind  
16 this is that a monopoly can charge a high price and recover entry costs with a small  
17 number of customers. As additional firms enter, the power to set prices diminishes and  
18 prices fall. Therefore, a larger group of customers is needed to recover the entry costs  
19 (Xiao and Orazem, [2011](#)). Bresnahan and Reiss, [1991](#) introduced the concept of Entry  
20 Threshold Ratios (ETRs), indicating the percentage increase in market size per firm  
21 needed to support an additional entrant. An ETR greater than one suggests intensified  
22 competition upon entry, while an ETR equal to one implies no change in competition  
23 intensity (competitive benchmark). Once the entry thresholds stabilize with additional  
24 entrants, the new entrant would not change the competitive conduct.

25       The strength of Bresnahan and Reiss, [1991](#) lies in its modest data requirements,  
26 needing only cross-sectional variation in the number of firms per market, population,  
27 and a set of market demographics. No information on price, quantity, or costs is re-

1 quired. This advantage makes the Bresnahan and Reiss (BR) methodology appealing.  
2 Compared to more advanced empirical industrial organization techniques used today,  
3 BR's framework remains intriguing due to its simplicity and straightforwardness.

4 However, several drawbacks should be noted when interpreting estimates from  
5 BR's model. First, the key assumption of BR's method is that homogeneous firms pro-  
6 duce homogeneous products. This assumption implies that entry only leads to business  
7 stealing without creating market expansion. In a differentiated market, this assumption  
8 would be problematic, potentially causing BR's estimates to underestimate the compet-  
9 itive effects of entry (Schaumans and Verboven, 2015). Secondly, BR's framework is  
10 a static model that relies on cross-sectional market observations, which is less realistic  
11 compared to the dynamics captured by more sophisticated dynamic models.

12 In this study, we pursue two objectives. First, we document the dynamic landscape  
13 of U.S. food retailing in nonmetro regions from 1990 to 2021, focusing on entry and  
14 exit patterns, complementing analyses by Stevens et al., 2021 and Cho, 2017. Second,  
15 we apply the BR method to estimate entry thresholds across all U.S. nonmetro counties  
16 for five different years: 2000, 2005, 2010, 2015, and 2020. This period covers signif-  
17 icant structural changes. Following the foundational work of Bresnahan and Reiss,  
18 1991 and extensions by Schaumans and Verboven, 2015, we develop an ordered probit  
19 model to estimate entry thresholds and entry threshold ratios for supermarket chains,  
20 supercenters, dollar stores, and independent grocery stores (IGRs).

21 Using the National Establishment Times Series, we examine the dynamics of the  
22 food retail landscape in U.S. nonmetro counties from 1990 to 2021, focusing on the  
23 evolution of establishments, sales, and employment across all types of food retail-  
24 ers. Traditional grocers, such as supermarkets and IGRs, have experienced declines  
25 in all three dimensions (outlets, sales, and employment). From 1990 to 1994, IGRs ac-  
26 counted for 43% of food retailers, providing 32% of job opportunities and generating  
27 30% of sales in the food retail industry. Over time, IGRs have consistently decreased,

1 representing only 26% of outlets among all food retailers, employing 14% of workers,  
2 and generating 11% of sales from 2015 to 2021. Similarly, supermarket chains have  
3 also seen declines across these dimensions, although they tend to hire more employ-  
4 ees per store, reflecting their competitive strategy against supercenters by emphasizing  
5 service and product quality (Basker and Noel, 2009; Matsa, 2011).

6 Despite supercenters comprising only about 0.3-1.8% of total outlets, their large-  
7 scale operations have supported a significant percentage of employees, increasing from  
8 3% in the 1990s to 31% in recent years (2015-2021). Sales from supercenters have  
9 similarly grown substantially, from 2% to 22% over the study period.

10 We documented the entry and exit patterns behind the landscape. We found that the  
11 U.S. food retail is a dynamic industry with high entry and exit in the study period (8%  
12 and 7%, respectively). Food retailers with different format presented heterogeneous  
13 entry and exit patterns. Grocery stores presents a relatively low entry and high exit  
14 compared to other formats. On the contrary, the nontraditional food retailers (i.e., big-  
15 box stores and dollar stores) raised since 1990s and grew up with an accelerating speed.  
16 Supercenters expanded with a low entry and an extremely low exit rate, which presents  
17 its strong ability to persist in the market and compete over other formats. Dollar stores  
18 and warehouse clubs demonstrate a high entry and low exits.

19 The BR estimation results are consistent with the dynamic features observed in the  
20 descriptive entry and exit analysis. All estimates indicate an increasing market size  
21 required to support an additional store in local markets, suggesting subsequent stores  
22 face increasing fixed costs. None of the retailers present competitive conduct in any  
23 given year, indicating heightened competition with each additional player in the local  
24 market. Supermarket chains consistently demonstrate decreasing competitiveness from  
25 2000 to 2020, as evidenced by the increasing population required to sustain an individ-  
26 ual supermarket. Entry threshold ratios have risen over time, reaching approximately  
27 1.2 to 1.3 by 2020. In contrast, supercenters exhibit a more competitive behavior over

1 time, although they have the highest entry threshold ratios among all retailers. The  
2 market size required for the first supercenter has decreased from 28.4 thousand in 2000  
3 to 14.6 thousand in 2020, suggesting supercenters are entering smaller markets. Sim-  
4 ilarly, dollar stores show declining entry threshold ratios over the years, all of which  
5 remain above 1. IGRs have entry threshold ratios closest to 1, indicating competitive  
6 conditions, with a slight increase over time.

7 Our study contributes to the literature in three ways. First, it provides evidence  
8 on the changes in the competition conduct in a long-run perspective. Second, it pro-  
9 vides estimates with multiple types of food retailers and documented the heterogeneous  
10 competitive effects of entry in nonmetro counties.

11 The remainder of this paper is as follows. Section 2 introduces the background  
12 of evolving food retailing in the U.S. Section 3 describes the conception framework  
13 and empirical specification. Section 4 describes the dataset, and section 5 present the  
14 results. Conclusions limitations are presented in Section 6.

## 15 **2 Background**

### 16 **2.1 Increasing Concentration in the U.S. Food Retailing**

17 Food retailing is economically important. Food and beverage grocery sales in the U.S.  
18 surpassed \$803 billion in 2021 and supported over 3.7 million jobs—more than all the  
19 jobs in farming and food manufacturing combined. The top four retailers accounted for  
20 approximately one-third of food sales (Statista, [2021](#); U.S. Bureau of Labor Statistics,  
21 [2021](#)).

22 Food retailing has experienced increasing market concentration in the United States  
23 (Zeballos et al., [2023](#)). A notable trend is increasing mergers and acquisitions driven  
24 primarily by supermarkets' response to the expansion of general merchandise retail-  
25 ers like Walmart into the food retail space (Ellickson, [2007](#); Çakır et al., [2020](#)). Over

1 300 food industry mergers and acquisitions were recorded in 2019 alone (USDA ERS,  
2 [2021](#)). This increasing concentration has attracted government attention. For example,  
3 President Biden signed an executive order to tackle the rampant concentration across  
4 the U.S. economy, including food and farming, but merges and acquisitions continue:  
5 Two of the largest supermarkets, Kroger and Albertsons, announced a merger agree-  
6 ment in October 2022. In 2024, the Federal Trade Commission sued to block this  
7 largest supermarket merger alleging that the deal is anti-competitive (Federal Trade  
8 Commission, [2024](#)).

9 Statistically, 20 firm concentration ratios (i.e., the market share of the 20 largest  
10 firms) were above 60% in the food retail industry in 2020 (Zeballos et al., [2023](#)). Na-  
11 tional statistics on increasing concentration in food retailing say nothing about con-  
12 centration in local market, however. At the national level, market concentration is  
13 relatively lower when compared to the state, metropolitan statistical area (MSA), and  
14 county levels (Zeballos et al., [2023](#)). Rossi-Hansberg et al., [2018](#) suggest that the aver-  
15 age local market concentration declined while national market concentration increased,  
16 and the narrower the geographic definition, the faster the decline in local concentration.

## 17 **2.2 Competitive Effects of Non-traditional Food Retailer Entry on** 18 **Traditional Grocers**

19 The food environment is a mix of diverse outlets, and those outlets serve the overlapped  
20 consumers. The entry-location decision made by a food retailer is based on an eval-  
21 uation of whether it can recover the cost of opening a new store and generate profits  
22 in the future. The profitability of an outlet is based on population density, consumer  
23 characteristics, its own product assortment, overall store size, and quality level, as well  
24 as the absence or existence of other food retailers in the community. From the perspec-  
25 tive of consumers, the outlets could substitute for or complement each other. Targeting  
26 distinct segments of consumers, food retailers serve heterogeneous populations that



1 could overlap with those of their rivals. Competition among different retail formats is  
2 referred as interformat competition, while retailers of the same retail format is called  
3 intraformat competition.

4 As the local food retail landscape changes with the entry or exit of various food re-  
5 tailers, consumer preferences for what and where to purchase adapt. The location,  
6 product variety, and marketing strategies of various food retailers significantly im-  
7 pact consumer shopping basket. Furthermore, the ever-evolving nature of the food  
8 retail environment not only impacts consumers but also has implications for local eco-  
9 nomic development, especially in rural areas. Since the 1990s, big-box discounters  
10 and wholesalers like Walmart, Costco, and Target have grown markedly in the U.S.  
11 In rural America, where an economically viable grocery retail sector is important to  
12 the sustainability of local communities, traditional grocery stores have continued to  
13 disappear. A handful studies have investigated the impact of Walmart Supercenters to  
14 the competing food retailers (especially traditional grocers and supermarkets) in terms  
15 of price (Hausman and Leibtag, 2007; R. J. Volpe and Lavoie, 2008; Basker and Noel,  
16 2009; Arcidiacono et al., 2020), sales and revenue (Artz and Stone, 2006), employment  
17 (Basker, 2005; Dube et al., 2007; Neumark et al., 2008; Ellickson and Grieco, 2013),  
18 entry and exit (Ellickson and Grieco, 2013), and product variety and quality (Matsa,  
19 2011).

20 In terms of price, the famous race-to-the-bottom pricing strategy of Walmart lures  
21 price-sensitive consumers, numbs their response to promotional activities, and leaves  
22 the rest of the market with more price-inelastic consumers and lower demand (Cleary  
23 and Lopez, 2013). Although numerous studies suggest that Walmart's entry decreases  
24 competitors' prices (Basker, 2005; Hausman and Leibtag, 2007; R. J. Volpe and Lavoie,  
25 2008), more recent studies have found no discernible, long-run impact of supercenter  
26 entry on grocery prices (Arcidiacono et al., 2020). Supermarket responses to Walmart  
27 entry include non-price competition, such as services and product quality. Matsa, 2011

1 found that supermarkets competing with Walmart were less likely to have stock-outs  
2 or shortages, which also suggested an increase in product quality.

3 Walmart Supercenter entry also corresponds to a reduction in supermarket sales and  
4 revenues (Artz and Stone, 2006; Ellickson and Grieco, 2013; Arcidiacono et al., 2020),  
5 although the perishable nature of groceries and the significant travel costs associated  
6 with shopping at Walmart supercenters contribute to localized impacts. Ellickson and  
7 Grieco, 2013 suggest that only firms within a two-mile radius of a Walmart are af-  
8 fected, while Arcidiacono et al., 2020 found that an incumbent within one mile of a  
9 Supercenter entry experienced a sharp reduction (16%) in revenue.

10 Ultimately, incumbents that were unable to compete with Walmart end up exiting  
11 the market. One of the common criticisms of Walmart is their negative impact on  
12 small businesses. Jia, 2008 suggested that Walmart entry causes 40 to 50% of small  
13 discount stores to exit the market. Çakır et al., 2020 also concluded that Walmart  
14 entry is associated with the decreasing number of independent grocery retailers in rural  
15 markets. According to Matsa, 2011, competitors who fail to improve their product  
16 quality and engage in price competition with Walmart stores are more likely to end up  
17 exiting the market. Those who cut prices are low-end, small-scale grocery stores, while  
18 the big retailers are more likely to maintain uniform prices (Basker and Noel, 2009).

19 Contrary to evidence on the detrimental impacts of Walmart stores on small busi-  
20 ness closures, Arcidiacono et al., 2016 suggest that the expansion of Walmart into  
21 the grocery sector primarily affected large incumbent chain stores rather than the small  
22 businesses that had previously suffered due to Walmart's dominance in the general mer-  
23 chandise sector. IGRs actually thrive when Walmart enters, which leads to a reduction  
24 in market concentration (Arcidiacono et al., 2016). Similarly, Ellickson and Grieco,  
25 2013 found no significant impacts of Walmart on retailers other than large chain stores.  
26 Hicks et al., 2012 showed that Walmart entry has discernible impacts on large retailers,  
27 but not on small ones located in downtown areas.

### 1 **3 Data**

2 This study uses the National Establishments Times Series (NETS), which consists of  
3 longitudinally linked Dun & Bradstreet (D&B) establishment-level yearly data on busi-  
4 ness employment, sales, address, and other essential establishment characteristics in  
5 the U.S. from 1990 to 2021. The NETS essentially cover all firms and establishments.  
6 We specify a comprehensive list of food retailers based on North American Industry  
7 Classification System (NAICS) codes. We include grocery stores (445110), conve-  
8 nience stores (445120 & 447110), specialty food stores (445210–445299), and ware-  
9 house clubs (452311) in the study, following (Stevens et al., 2021). We also specify  
10 dollar stores (in 445110, 445120, 452210–452319)<sup>1</sup>, and supercenters including Wal-  
11 mart supercenters (in 452210 & 452319) and Target to better suit our goal <sup>2</sup>.

12 We create indicators to classify grocery stores into independent grocery retailers  
13 (IGRs) and supermarket chains. A grocery store is IGRs if it operates a single store. A  
14 retailer who operates multiple stores is classified supermarket chains. A supermarket  
15 chain store in a single state are classified as a local chain grocery retailer, one who  
16 operates in two to 10 states is classified as a regional chain grocery retailer, and a  
17 retailer operating in more than 10 states is classified as national chain grocery retailer.

18 As a common in the food retail literature in the U.S., we define the geographic  
19 market at the county level (Cleary and Chenarides, 2022). From the demand side,

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<sup>1</sup>Stores with the words DOLLAR, 99, DIME, VALUE, CENT, DISCOUNT, etc., in their names (i.e., NAICS 445110, 445120, 452210, 452311 and 452319) are specified as dollar stores.

<sup>2</sup>We placed stores with WALMART, WAL-MART, and Walmart in the company and trade name with Walmart Inc. (NAICS 452210 & 452319). To validate that the NETS essentially covers most of the Walmart stores in the U.S., we compared NETS to Walmart’s annual reports. Even though we could not capture all Walmart stores as listed in the annual reports, we did capture most of them (Figure A1 and Figure A2). We combine NETS with that posted on Walmart Store Status Public Data (WSSPD, Walmart open data hub: <https://walmart-open-data-walmarttech.opendata.arcgis.com/>) to classify the Walmart store types. The WSSPD lists all types of Walmart stores throughout the U.S. in April 2023, including the coordinates of each store. This public data is updated regularly and presents the most up-to-date situation of all Walmart stores. Comparing the two sets of coordinates from NETS and WSSPD, we assigned the store formats for each Walmart store if the geographic distance between the two data points is less than 250 meters. More than 90% of Walmart stores in the 2021 NETS database was assigned store formats successfully. One potential limitation is that we may not have captured all the supercenters that were converted from discount stores during the initial phase of supercenter expansion, despite our efforts to collaborate with the available dataset from (Holmes, 2011) to track the conversions.

1 county is a reasonable market definition because consumers do not travel far to pur-  
2 chase food. According to the 2017 National Household Travel Surveys in the U.S.,  
3 consumers travel 6.5-7.9 miles for shopping (citation). A more recent study empha-  
4 sized the locality of local competition, suggesting a maximum market extent ranging  
5 from 10 to 16 km Wang et al., 2024. Therefore, there is less likely of overlapping  
6 markets, fulfilling the isolated market assumptions.

7 Following Çakır et al., 2020 and Stevens et al., 2021, we restrict our analysis to  
8 nonmetro U.S. counties due to the substantial transformations observed in the food re-  
9 tail environment over the past decades as well as the essential role of the food retail  
10 sector in these counties. Nonmetro counties identified in the USDA Rural-Urban Con-  
11 tinuum Codes (RUCC) are included.<sup>3</sup> The identified nonmetro counties are further  
12 identified as adjacent or nonadjacent to one or more metro areas. Adjacent counties  
13 physically adjoins one or more metro areas and has at least 2 percent of its employed  
14 labor force commuting to central metro counties.<sup>4</sup>

15 County demographics are sourced from various agencies. Population data by age,  
16 race, sex, and Hispanic origin, along with housing units, come from the US Census  
17 Bureau Population and Housing Unit Estimates Program (PEP). Poverty rates are from  
18 the US Census Bureau’s Small Area Income and Poverty Estimates (SAIPE). Per capita  
19 personal income data is provided by the Bureau of Economic Analysis. Unemployment  
20 rates and average annual weekly wages are obtained from the Bureau of Labor Statis-  
21 tics. Land area data is sourced from the Census TIGER/Line Shapefiles. The county  
22 demographics are summarized in the Table 1.

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<sup>3</sup>The Rural-Urban Continuum Codes (RUCC), developed in 1974, have been updated every decade. Major changes in metro area delineation were made by the Office of Management and Budget in 2000, affecting the comparability of RUCC data before and after 2003. For a consistent comparison of food retail development over time, we used RUCC 2003 to identify nonmetro counties from 1990 to 2012, and RUCC 2013 for the years 2013 to 2021.

<sup>4</sup>We exclude counties with populations below the 1<sup>st</sup> percentile or above the 99<sup>th</sup> percentile.

## 1 **4 The Evolving Food Retail Landscape**

2 Before discussing about the entry and exit patterns of different food retailers, we first  
3 provide an overview of the food retail landscape in nonmetro counties from 1990 to  
4 2021. We focus on three aspects of the landscape: (1) the evolution of establishments,  
5 sales, and employment; (2) the evolution of per store employment and sales; and (3)  
6 average number of establishments, sales, and employment in local markets (nonmetro  
7 counties). To understand the entry and exit patterns in the evolution, we graph the  
8 number of new stores entering and existing stores exiting over time across different  
9 formats.

### 10 **4.1 Evolution of establishments, employment, and sales**

11 Table 2 shows the average establishments, employments, and deflated sales per year  
12 over 1990-2021. Establishments, employment, and deflated sales increased from 1990  
13 until the Great Recession period, followed by a decline.<sup>5</sup> The opening of new stores  
14 before the Great Recession created job opportunities and generated revenue. Along  
15 with the closure of establishments, employment and revenue have contracted disprop-  
16 portionately since the Great Recession, indicating a distribution effect among different  
17 types of food retailers. Compared to the early 1990s, the number of establishments  
18 increased by 14.2%, deflated sales increased by 10.6%, and employment increased by  
19 around 48.8% by the end of 2010s.

20 The composition of the food retail industry continues to evolve (Figure 1). In sum-  
21 mary, the number of nontraditional food retailers, such as dollar stores, supercenters,  
22 and warehouse clubs, has increased in nonmetro counties, while traditional retail for-  
23 mats, such as supermarket chains, IGRs, and convenience stores, have declined re-

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<sup>5</sup>Sales here represent the sales of groceries and other food items. Following Çakır et al., 2020, we used the percentage of sales on groceries and other food items by NAICS codes obtained from the Economic Census (Table 4) to calculate the sales on grocery and food items. With this adjustment, we can properly compare the sales from different formats. The obtained sales were deflated using the 2021 food and beverage CPI from the Bureau of Labor Statistics.

1 markably since the Great Recession. The number of IGRs remained around 22,000 for  
2 nearly two decades before 2008 but dropped to 14,000 by 2021. Despite this decline,  
3 IGRs still have the most outlets after specialty food stores, followed by convenience  
4 stores and dollar stores. In 2017, the number of specialty food stores surpassed con-  
5 venience stores for the first time; in 2018, specialty food stores exceeded IGRs, which  
6 had dominated nonmetro counties for the past 28 years in terms of numbers. Super-  
7 market chains, supercenters, and warehouse clubs have the fewest outlets but hire more  
8 employees and generate more revenue due to their operational nature, which will be  
9 discussed in the following paragraphs.

10 While the overall revenue in the food retail industry has remained relatively un-  
11 changed, there have been significant shifts among different retail formats (Figure 2 and  
12 Figure 3). IGRs have seen a substantial decline in sales share, dropping from approx-  
13 imately 35% in 1990 to 10% in 2021 (Figure 3). Conversely, supercenters have ex-  
14perienced significant growth, increasing their sales share from less than 5% to around  
15 20%. Supermarket chains still dominate the market, though their share slightly de-  
16clined from 50% in 1990 to 48% in 2021. The remaining 20% of the market is shared  
17 by four other retail formats. This shift in market dynamics suggests a replacement of  
18 IGRs by supercenters. The same trend is reflected in employment (Figure 4).

## 19 **4.2 Per store employment and sales**

20 Table 3 provides an overview of average employment and sales per store across vari-  
21 ous food retail formats from 1990 to 2021 in nonmetro counties. Overall, employment  
22 per store increased from 11.36 to 14.79, while sales per store slightly declined from  
23 \$1.80 million to \$1.74 million. Heterogeneous patterns across different retail formats  
24 are also observed from this table. While supercenters had the highest per store em-  
25 ployment and sales, those stores doubled those metrics over time, with employment  
26 increasing from 133.49 to 252.81 and sales rising from \$10.91 million to \$21.24 mil-

1 lion. Following supercenters, supermarket chains consistently had high employment,  
2 slightly rising from 41.54 to 46.68, while sales were stable. IGRs, specialty food stores,  
3 convenience stores, and dollar stores are small formats that had less than 10 employees  
4 per stores. IGRs saw a huge decline in per store sales from \$1.24 million to \$0.75  
5 million. Dollar stores saw declines in both per store employment (10.80 to 7.76) and  
6 sales (\$0.67 million to \$0.40 million). Specialty stores and convenience stores showed  
7 mixed trends, with specialty stores declining in both metrics while convenience stores  
8 saw slight increases.

### 9 **4.3 Market configuration**

10 This study defines nonmetro counties as local markets. On average, each nonmetro  
11 county has 2.7 supermarket chain stores, 8.5 IGRs, 2.7 dollar stores, 5.2 specialty food  
12 stores, and 7.1 convenience stores. While supercenters have been opening more stores  
13 over the years, not every county has one. The number of IGRs per market decreased  
14 from 9.7 to 6.6, while supercenters increased from 0.06 to 0.52. Dollar stores expanded  
15 from about 1 store per market in the early 1990s to around 4 stores per market in the  
16 late 2010s. There were also doubled specialty stores over three decades (from around  
17 3.5 to 6.1).<sup>6</sup>

18 In terms of sales, the average sales generated in each local market is 46.5 million  
19 dollars. Around 50% of sales were generated by supermarket chain stores, followed by  
20 18% from IGRs, 15% from supercenters, and 11% from convenience stores. Similarly,  
21 the average number of employees working in supermarket chain stores per market ac-  
22 counts for around 32%, followed by 22% in supercenters, 19% in IGRs, and 12% in  
23 convenience stores.

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<sup>6</sup>Due to the length limit, please email the author for the corresponding table for more details.

## 1 **4.4 Entry and Exit Patterns**

2 We examine the changes in the food retail industry by plotting the number of entering  
3 and exiting stores over time. We also calculate the entry and exit rates. On average, 8%  
4 of establishments entered the industry each year from 1990 to 2021, while 7% exited.  
5 Figure 5 illustrates a shift in business dynamics: entry rates were higher before the  
6 Great Recession in 2008, but since then, exit rates have surpassed entry rates.

7 We observe heterogeneous entry and exit patterns among various food retailers  
8 (Figure 6). We analyze these dynamics through two dimensions. First, the time di-  
9 mension: we observed heterogeneous dynamics among formats over time, particularly  
10 before and after the Great Recession. Small formats, such as IGRs, convenience stores,  
11 dollar stores, and specialty food stores, were significantly affected by the Great Reces-  
12 sion, experiencing numerous closures. In contrast, large formats (i.e., supermarket  
13 chains and supercenters) were less impacted. Given that the study region is nonmetro  
14 and rural, very few warehouse clubs were observed, and their entry and exit dynamics  
15 may not be informative.

16 Second, the magnitude of the number of entrants and exits: specialty food stores  
17 show relatively higher number of entrants compared to other formats, followed by con-  
18 venience stores, IGRs, and dollar stores. Although specialty food stores opened the  
19 most new stores over time, their ability to remain in the market was insufficient, lead-  
20 ing to high turnover. In contrast, dollar stores exhibited higher entry combined with  
21 lower exit, resulting in significant proliferation. In terms of IGRs, entry and exit rates  
22 were relatively balanced prior to the Great Recession. However, following the reces-  
23 sion, exits remained consistent, while the number of entrants declined. Among large  
24 formats, supermarket chains opened more stores compared to supercenters. During  
25 the study period from 1990 to 2021, many new supermarket chains opened annually  
26 in the 1990s and early 2000s, with fewer entrants since 2004. Along with new en-  
27 trants, supermarket chain stores also experienced increasing closures in the 1990s and



1 early 2000s, suggesting a gradual market shift. After the Great Recession, supermarket  
2 chains demonstrated a stable market with fewer entrants and exits, resulting in a stable  
3 number of incumbents. Supercenters mainly entered the market during the 1990s and  
4 2000s and rarely exited over the study period, indicating their strong ability to sustain  
5 profitability.

## 6 **5 Conceptual Development**

### 7 **5.1 Theoretical Framework**

8 Following seminal work of Bresnahan and Reiss, 1991, we measure changes in local  
9 competitive behavior over time in the food retail industry. The idea of this approach is  
10 to infer the competitive impact of new entrants from the observed incumbents and the  
11 market size. Rather than looking at consumers' choices among existing stores, we will  
12 link the observed entry decisions to the unobserved profits. Retailers assumed to only  
13 enter the market when the local market is profitable.

14 There are  $N$  stores, competing in a local market with a population size  $S$ . Following  
15 Bresnahan and Reiss, 1991, we assume all stores sell homogeneous products, and the  
16 profits  $\pi_N$  of per store operate in a market that has  $N$  stores are

$$\pi_N = V_N \times S - F \quad (1)$$

17 the product between the market size  $S$  and the variable profits  $V_N$  minus the fixed  
18 costs  $F$ . The  $N^{\text{th}}$  store only enter when they will at least break-even. Therefore, the  
19 entry condition for the  $N^{\text{th}}$  store is

$$\pi_N = V_N \times S - F = 0 \quad (2)$$

20 which yields the market size needed to support  $N$  stores in the local market

$$S_N = \frac{F}{V_N} \quad (3)$$

1 Bresnahan and Reiss, 1991 named  $S_N$  the entry threshold, and argue that entry does  
 2 not lead to increasing competition if entry threshold increase proportionally with the  
 3 number of firms. For example, in a market with 100 individuals and one firm, ac-  
 4 commodating two firms requires the market size to increase to 240, with each firm  
 5 needing 120 individuals to be profitable. This represents a 20% increase in population  
 6 per firm compared to a monopoly setup. Therefore, entry of the second firm intensifies  
 7 the competition since each firm needs a larger population to recover the fixed costs  
 8 and to break even. Based on this intuition, Bresnahan and Reiss, 1991 propose the  
 9 entry threshold ratios (ETRs), which is a unit-free measure to test for the presence of  
 10 competition effects from an entrant. ETRs are defined as

$$ETR(N) = \frac{S(N)/N}{S(N-1)/(N-1)} \quad (4)$$

11 indicating the percentage increase in market size per firm needed to support an addi-  
 12 tional entrant. An ETR greater than one suggests intensified competition upon entry  
 13 ( $ETR(N) > 1$ ), while an ETR equal to one implies no change in competition inten-  
 14 sity (competitive benchmark,  $ETR(N) = 1$ ). Once the entry thresholds stabilize with  
 15 additional entrants, the new entrant would not change the competitive conduct. In the  
 16 example provided, an ETR of 1.2 indicates intensified competition with the entry of a  
 17 second firm.

## 18 **5.2 Econometric Model**

19 We follow Schaumans and Verboven, 2015 to estimate and compute ETRs. We com-  
 20 piled a data set with the number of stores by retail formats and a set of county demo-  
 21 graphics. Even though the profits are unobserved latent variable, we infer the bounds

1 based on the free entry assumption, that is, store only enters if it is profitable. Upon ob-  
 2 serving  $N$  stores in the local market, we can infer that  $N$  stores are profitable, whereas  
 3  $N + 1$  stores are not:

$$V_{N+1} \times S - F < 0 < V_N \times S - F \quad (5)$$

4 or, equivalently,

$$\ln \frac{V_{N+1}}{F} + \ln S < 0 < \frac{V_N}{F} + \ln S \quad (6)$$

5 Assuming the logarithmic of per capita variable profits over fixed cost is a function of  
 6 market characteristics, fixed effects of  $N$  stores, and error term

$$\ln \frac{V_{N+1}}{F} = X\lambda - \theta_N - \omega \quad (7)$$

7 where  $X$  presents a set of market characteristics,  $\theta_N$  are the cutoff points, and  $\omega$  is  
 8 an unobserved error term that follow normal distribution  $N(0, \sigma)$ . The inequalities  
 9 between the cutoff points hold:  $\theta_1 < \theta_2 < \theta_3 \dots$ , that is, an additional firm reduce  
 10 the ratio of the variable profits and fixed costs given the reduced demand or reduced  
 11 markup. The store enters if

$$X\lambda - \theta_{N+1} + \ln S < \omega < X\lambda - \theta_N + \ln S \quad (8)$$

12 Assume that  $\omega$  follows a normal distribution  $N(0, \sigma)$ , we estimate the standard probit  
 13 model. The probability of observing  $N$  stores in a market is

$$P(N) = \Phi\left(\frac{X\lambda - \theta_N + \ln S}{\sigma}\right) - \Phi\left(\frac{X\lambda - \theta_{N+1} + \ln S}{\sigma}\right) \quad (9)$$

14

$$P(N) = \Phi(X\beta^* - \theta_N^* + \gamma^* \ln S) - \Phi(X\beta^* - \theta_{N+1}^* + \gamma^* \ln S) \quad (10)$$

1 where  $\beta^* = \frac{\beta}{\sigma}$ ,  $\theta_N^* = \frac{\theta_N}{\sigma}$ , and  $\gamma^* = \frac{1}{\sigma}$ . Different from Bresnahan and Reiss, 1991,  
 2 this specification only identifies the ratio of variable profits over the fixed costs, not  
 3 levels. This method simplifies the estimation procedure, and are still able to provide  
 4 entry threshold estimates based on the estimated parameters. Evaluated at  $\omega = 0$ , we  
 5 convert the entry threshold to support  $N$  stores is

$$S_N = \frac{F}{V_N} = \exp(-X\beta + \theta_N) \quad (11)$$

6 Since the larger markets are expected to support more stores, we computed the per store  
 7 estimated entry threshold

$$s_N = \frac{S_N}{N} \quad (12)$$

8 to understand how much population needed to support each incumbent store. The entry  
 9 threshold ratios (ETRs), the ratio of per store market size to support  $N$  over  $N-1$  stores  
 10 can be computed by

$$ETR(N) = R_{N,N-1} = \frac{S(N)/N}{S(N-1)/(N-1)} = \exp(\theta_{N-1} - \theta_N) \times \frac{N-1}{N} \quad (13)$$

11 We apply this model and estimate entry thresholds and entry threshold ratios for  
 12 supermarket chain stores, supercenters, and dollar stores with seven cross-sections of  
 13 U.S. food retail markets in 2000, 2005, 2009, 2010, 2015, 2019 and 2020, respectively.  
 14 Those chosen years covers a wide period of time that covered the major industry shift.  
 15 The concerns of obtaining quality data deterring us from including years before 2000.  
 16 We include 2009 and 2019 in order to capture the changes because of the Great Re-  
 17 cession and the COVID-19 pandemic. As mentioned above, we identify nonmetro  
 18 counties as local food retail markets. Overall, we have seven samples that contains  
 19 13,653 nonmetro counties, around 2,000 per year. Figure 7 suggest that our sample  
 20 include a wide variety of market size. Large-scale formats (i.e., supercenters and su-  
 21 permarket chain stores) required larger population compared to IGRs and dollar stores.

1 Supercenters required larger population than supermarket chains stores.

2 There are two things needs to be noted before interpreting our results. First, the  
3 ETR statistic does not measure *the level of competition*, but *how the level of competition*  
4 *changes* with the number of stores. Second, the assumption of homogeneous player  
5 and homogeneous products provided is strong, especially in the heterogeneous retail  
6 sector. This assumption implies that an entrant cannot create market expansion but only  
7 business stealing (Schaumans and Verboven, 2015). Schaumans and Verboven, 2008  
8 found that applying this model is likely to underestimate the entry competitive impacts.  
9 However, the estimates provided in this model are still informative and appealing given  
10 its simplicity and relatively modest data requirement.

## 11 **6 Empirical Results of Entry Estimates**

12 The model fits the data well, and we present the entry threshold estimates and ETRs  
13 as follows (Figure 8).<sup>7</sup> First, a larger population is needed to support a supercenter  
14 compared to supermarket chains and dollar stores, as expected. On average, nonmetro  
15 counties with 18,345 residents can support a single supercenter, 8,590 residents can  
16 support a supermarket chain store, and fewer than a thousand residents can support a  
17 dollar store. Additionally, a larger market size is required to support subsequent stores,  
18 which is also expected.

19 Evaluating the entry thresholds over time, we found heterogeneous changes in the  
20 competition conduct among formats. Supermarket chain stores present an increasing  
21 need for a larger population to ensure positive profits. The entry thresholds for a single  
22 supermarket chain store increased from 6,601 in 2000 to 10,984 in 2020, as did the  
23 thresholds for subsequent stores, suggesting a less competitive market over time. In  
24 contrast, supercenters require a smaller market size to break even, with entry thresholds  
25 decreasing from 28,416 in 2000 to 14,551 in 2020. Similarly, dollar stores also need a

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<sup>7</sup>Please contact the authors for the detailed regression tables.

1 smaller population to break even over time, indicating a more competitive market over  
2 time.

3 When checking the population required for the second store to enter, we found that  
4 two supermarket chain stores need more than twice the population of the first entrant in  
5 all sampling years, except 2000. A disproportionately increasing population needed to  
6 support a second entrant persist and the entry threshold ratios  $R_{2,1}$  increased over time  
7 (Figure 9). Note that the food retail sector is differentiated, and  $R_{2,1}$  is underestimated  
8 (Schaumans and Verboven, 2015), which may explain why  $R_{2,1}$  in 2000 is less than  
9 the competitive benchmark. Each of the two supercenter requires around twice the  
10 population of the first entrant to break even. However, apart from supermarket chain  
11 stores, the entry threshold ratios  $R_{2,1}$  are in decline over time. Similar to supercenters,  
12 dollar stores demonstrate a larger population needed to accommodate two players and  
13 a decreasing  $R_{2,1}$  over time.

14 In contrast to the second entrant, a market accommodating three supercenters re-  
15 quires a larger market size, but the increase in required market size is smaller. In other  
16 words, the impact of the third entrant is smaller compared to the second. Unlike super-  
17 centers, dollar stores and supermarket chain stores experience larger impacts from the  
18 third entrant.

19 The point at which the rate of population increase starts to decline differs among  
20 supermarket chain stores, supercenters, and dollar stores. For both dollar stores and  
21 supercenters, the largest impacts come from the second entrant, and this impact begins  
22 to decline with subsequent stores. However, the entry impacts of new supermarket  
23 chain stores increase until reaching the highest value with the fifth store.

## 24 **7 Conclusions and Discussion**

25 We use NETS to describe the evolution of establishments, employment, and sales, as  
26 well as the entry and exit dynamics of multiple formats in the nonmetro U.S. food

1 retail sector from 1990 to 2021. Consistent with previous research, we found that  
2 supercenters began opening stores in the 1990s and sustained significant growth over  
3 the following years. The deflated sales remained stable for about two decades, but the  
4 distribution among formats shifted substantially. Supercenters likely replaced IGRs,  
5 leading to a significant decline in the number of IGR stores, employment, and sales.  
6 As the major player in the food retail sector, supermarket chain stores experienced a  
7 slight decline in all three dimensions.

8 The U.S. nonmetro food retail sector proved to be a dynamic market with an av-  
9 erage 8% entry rate and 7% exit rate over the study period, consistent with previous  
10 studies (Hanner et al., 2015). Heterogeneous entry and exit patterns were observed  
11 among formats. In summary, even though supercenters opened relatively few stores  
12 over time, they rarely closed any. Supermarket chain store entrants dominated exits  
13 before the Great Recession, and entry and exit rates have balanced since then, resulting  
14 in near-zero net growth in store numbers. The entry of dollar stores consistently out-  
15 paced exits, leading to their proliferation. IGRs and convenience stores were severely  
16 impacted during the Great Recession, followed by low entry and high exit rates since  
17 then.

18 The evolution of the food retail landscape reflects changes in local competition.  
19 Increasing consolidation in the food retail sector underscores the importance of ex-  
20 amining competitive conduct (Zeballos et al., 2023). We applied the empirical entry  
21 threshold model of Bresnahan and Reiss, 1991 and Schaumans and Verboven, 2015  
22 to seven cross-sections of data for local markets—counties—for the years 2000, 2005,  
23 2009, 2010, 2015, 2019, and 2020. The estimated entry thresholds suggest that smaller  
24 market sizes are needed to support supercenters and dollar stores over time, while larger  
25 market sizes are required to accommodate supermarket chain stores. The entry thresh-  
26 old ratios indicate increasing competition among supermarket chain stores and declin-  
27 ing competition among dollar stores and supercenters; however, no format approached

1 a nearly competitive market.

2 We acknowledge two limitations. First, given the homogeneous player and product  
3 assumption embedded in the Bresnahan and Reiss, [1991](#) model, it is likely that we  
4 underestimate the entry estimates (Schaumans and Verboven, [2015](#)). Future analysis  
5 will incorporate NETS revenue data to account for heterogeneous settings (Schaumans  
6 and Verboven, [2015](#)). Second, potential competition between formats is not considered  
7 in the model specification, even though within-format competition is more significant  
8 (Cleeren et al., [2010](#)). Addressing this issue in future work would be valuable.



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## 8 Table and Figures

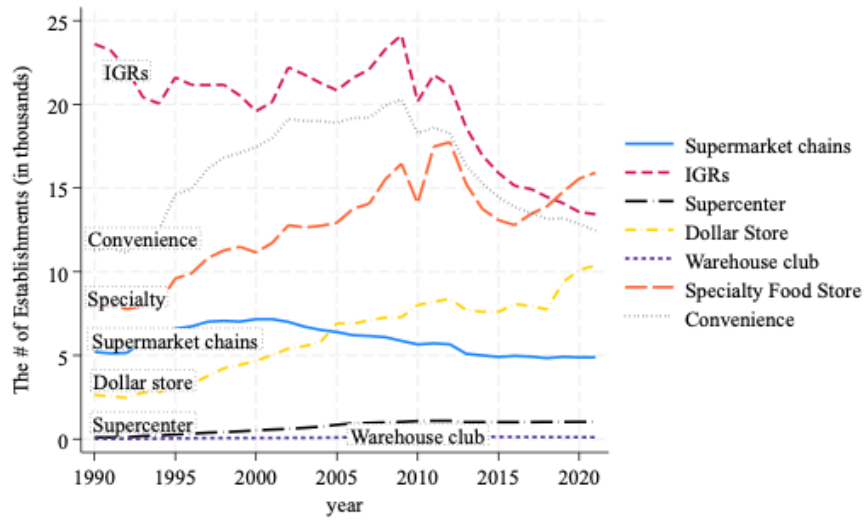


Figure 1: Evolution of the number of establishments by formats, 1990-2021

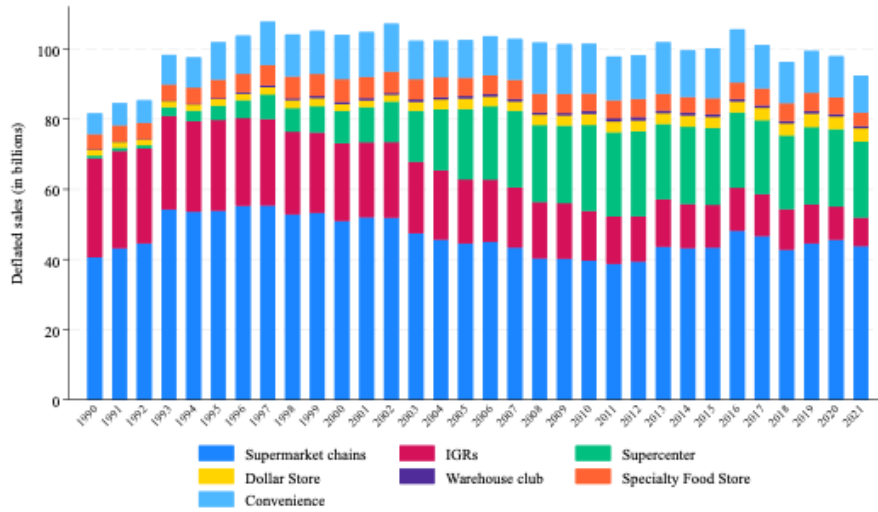


Figure 2: Evolution of the deflated sales by formats, 1990-2021

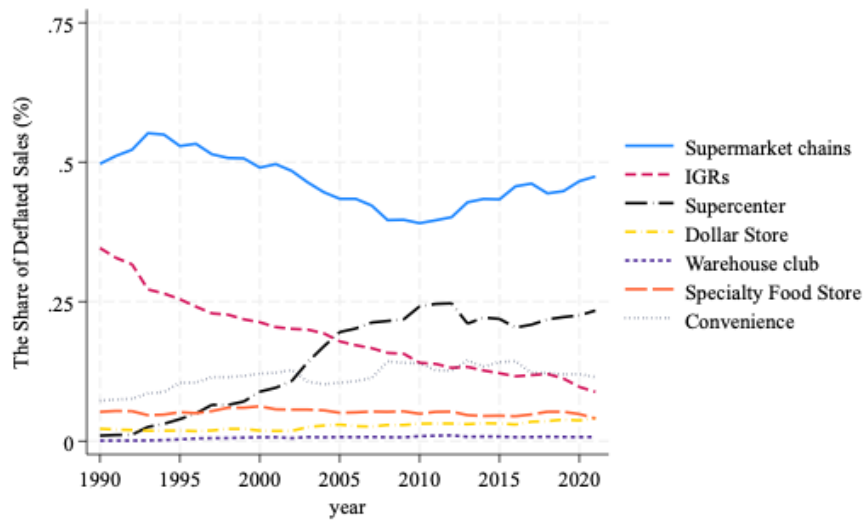


Figure 3: Share of deflated sales by formats, 1990-2021

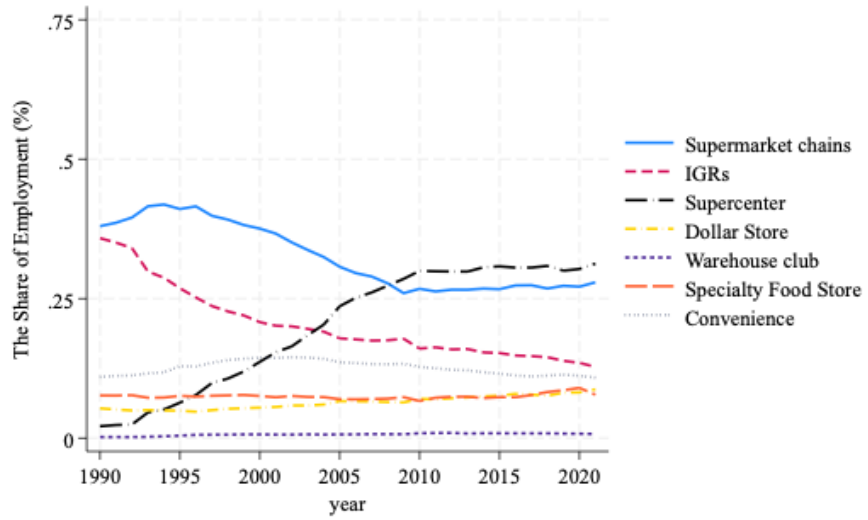


Figure 4: Share of employment by formats, 1990-2021

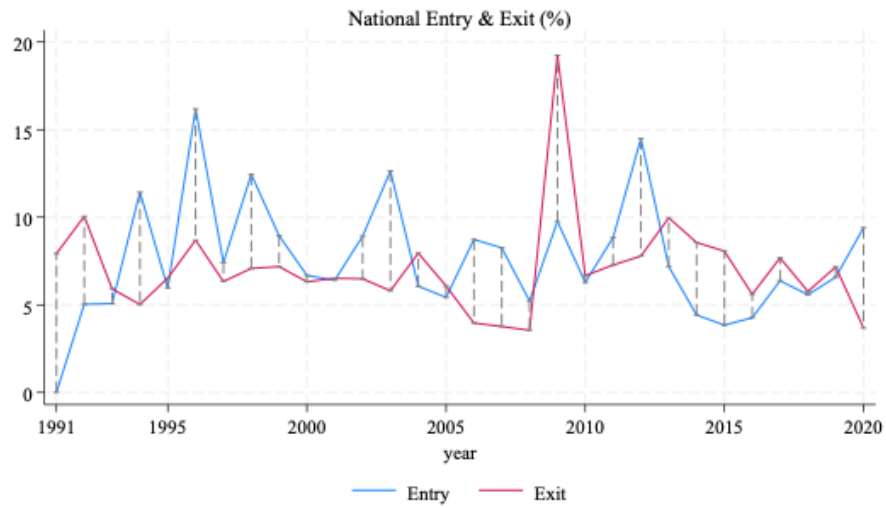


Figure 5: Share of deflated sales by formats, 1990-2021



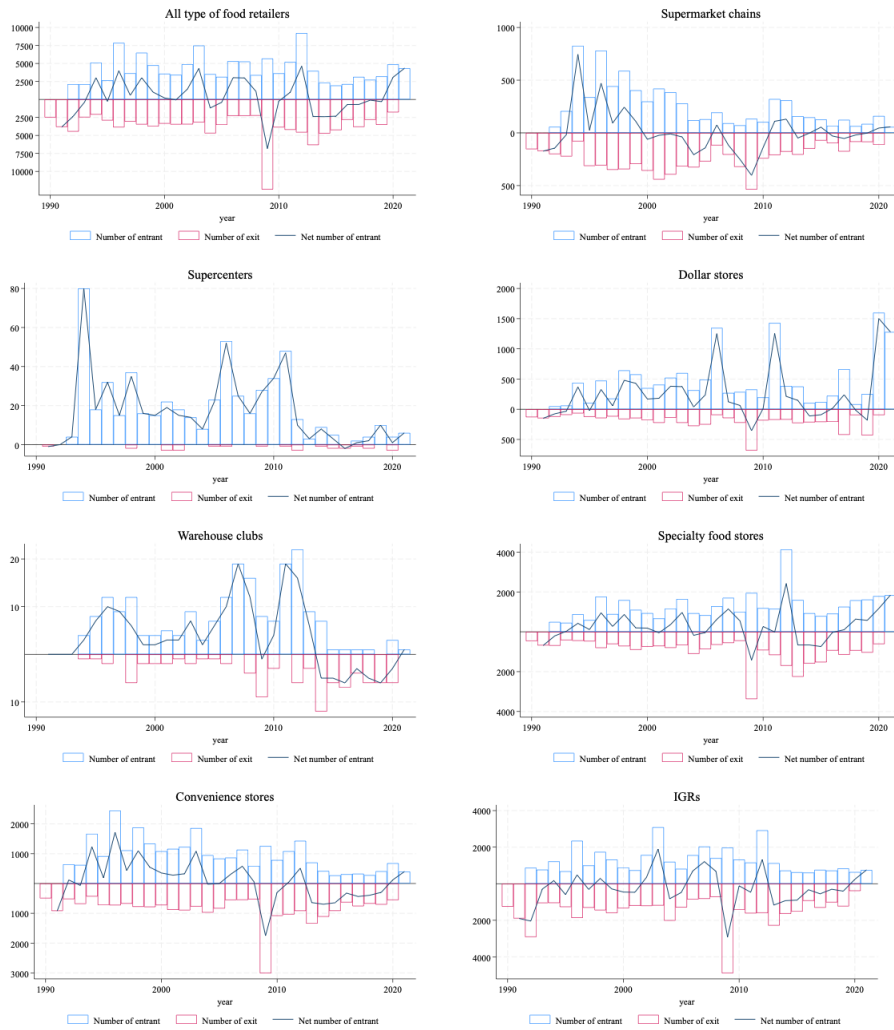


Figure 6: Number of entrant and exiting stores, 1990-2021

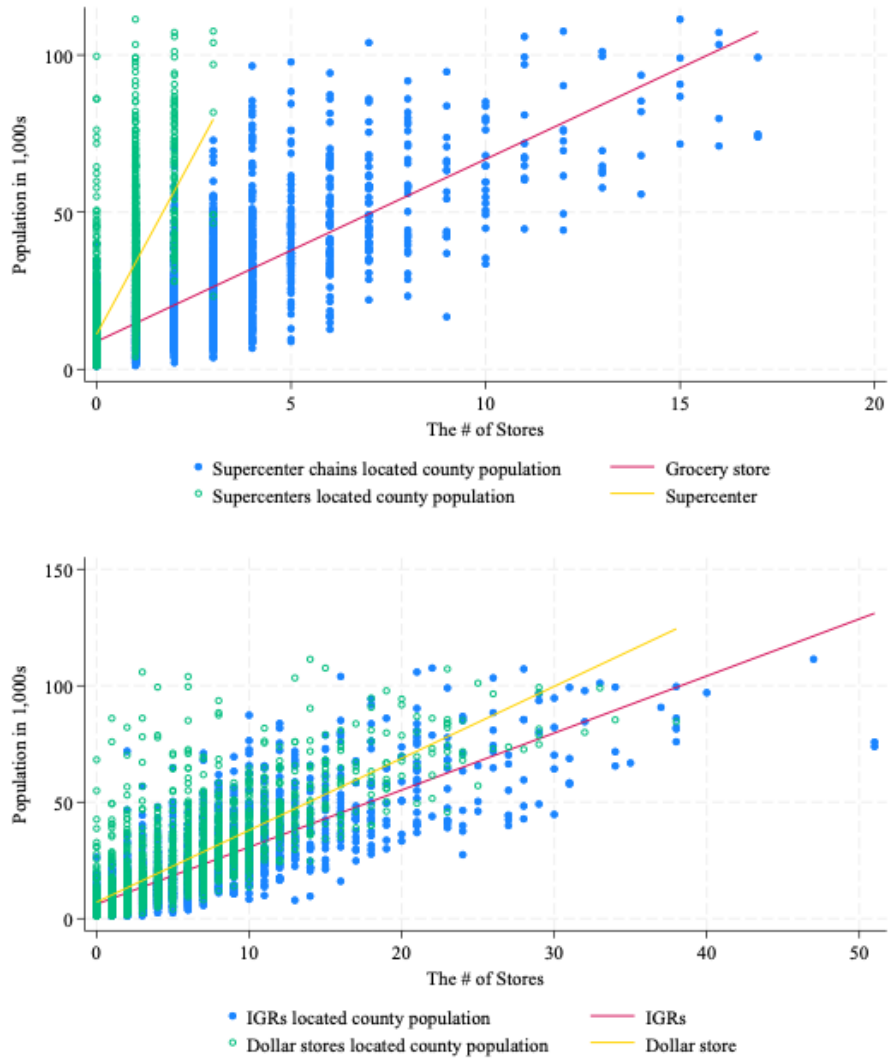


Figure 7: Population by the number of stores

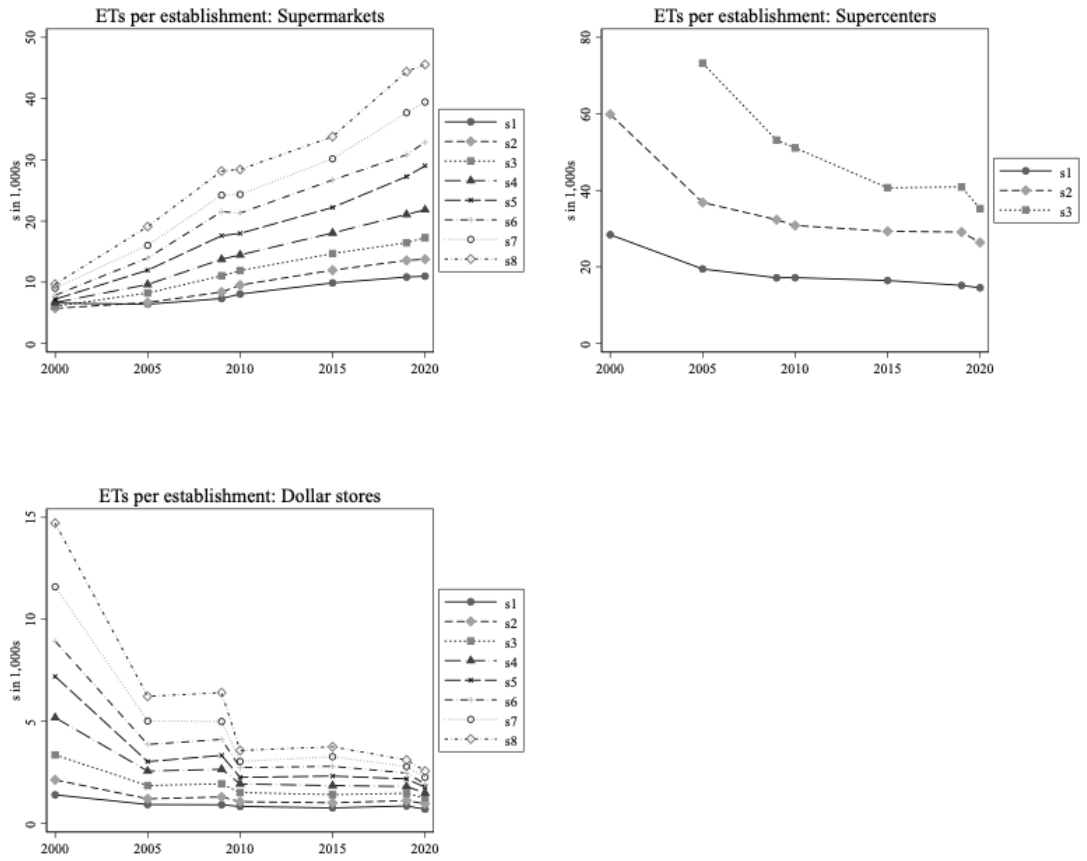


Figure 8: Entry thresholds per store, by formats

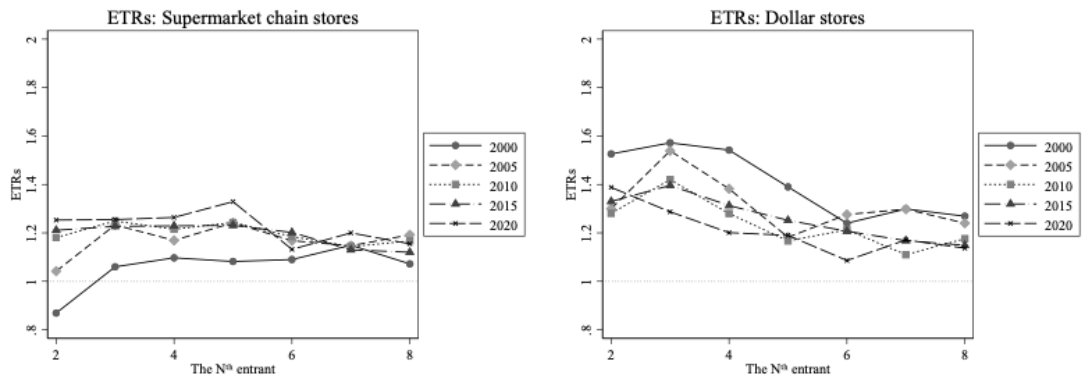


Figure 9: Entry threshold ratios, by formats

Table 1: County Demographics (N = 13,653 county-year)

Variables	(1)	(2)	(3)	(4)
	Mean	Std.dev	Min.	Max.
Population in 1,000	23.140	20.130	0.784	110.4
Population growth in the past 5 years (in 1,000s)	0.273	1.470	-6.785	26.430
Poverty rates (%)	16.470	6.400	2.700	62
Per capita personal income (in \$1,000s)	34.240	11.910	10.340	300.70
Fraction of black alone population	0.081	0.150	0	0.866
Fraction of Hispanic/Latino	0.081	0.138	0.001	0.975
Population share between 15 and 24	0.127	0.033	0.053	0.468
Population share between 25 and 64	0.501	0.033	0.276	0.701
Population share 65 and above	0.183	0.046	0.030	0.438
Per capita housing units	0.509	0.124	0.254	2.077
Unemployment rate (%)	6.427	3.164	1.200	25.800
Annual average weekly wage	359.40	80.64	0	991.400
Land area (in 1,000 sq. miles)	1.027	1.303	0.003	18.180
The number of supermarket chain stores	2.543	2.377	0	8
The number of supercenters	0.459	0.592	0	3
The number of IGRs	8.258	6.448	0	22
The number of dollar stores	3.308	2.640	0	8

Table 2: Average Establishment (in thousands), employment (in millions), and deflated sales (in billions) per year

	(1)	(2)	(3)
	Establishments	Employments	Deflated sales
1990-1994	49.79	0.57	89.51
1995-1999	58.73	0.73	104.59
2000-2004	64.60	0.83	104.17
2005-2009	70.72	0.92	102.47
2010-2014	67.34	0.91	99.84
2015-2021	56.84	0.84	99.02
Total	61.06	0.80	99.88

Table 3: Average per store employment and deflated sales

**Panel A. Average per store employment**

	Total	Supermarket chains	IGRs	Supercenters	Dollar	Warehouse	Specialty	Convenience
1990-1994	11.36	41.54	8.42	133.49	10.80	62.16	5.30	5.47
1995-1999	12.36	42.11	8.25	182.71	9.77	79.23	5.20	6.15
2000-2004	12.89	42.22	7.91	225.73	9.04	75.43	5.07	6.47
2005-2009	12.99	42.65	7.25	251.64	8.43	54.47	4.47	6.29
2010-2014	13.49	44.48	7.33	258.50	8.14	51.88	4.17	6.43
2015-2021	14.79	46.68	8.22	252.81	7.76	59.39	4.74	7.05
Total	13.09	43.49	7.92	219.69	8.91	63.49	4.82	6.36

**Panel B. Average per store sales (\$ in millions)**

	Total	Supermarket chains	IGRs	Supercenters	Dollar	Warehouse	Specialty	Convenience
1990-1994	1.80	8.68	1.24	10.91	0.67	4.56	0.57	0.61
1995-1999	1.78	7.88	1.16	16.38	0.55	9.53	0.54	0.73
2000-2004	1.62	7.18	1.01	19.90	0.42	9.81	0.49	0.65
2005-2009	1.45	6.95	0.77	22.45	0.40	6.36	0.37	0.64
2010-2014	1.49	7.59	0.68	22.09	0.39	5.80	0.31	0.78
2015-2021	1.74	9.18	0.75	21.24	0.40	6.35	0.33	0.93
Total	1.65	7.99	0.92	18.98	0.47	7.02	0.43	0.74

Table 4: Groceries & other foods items' sales as % of total sales

NAICS		Industry	1992	1997	2002	2007	2012	2017
Before 2017	2017 onwards							
4452	4452	Specialty food stores	94.8	94.4	94.6	94.1	95	96.1
445110	445110	Supermarket and other grocery (except convenience) stores	72.4	75.5	73.4	73.2	70.7	82
445120	445120	Convenience stores	46.2	52.1	45.8	37.5	50	54.7
452910	452311	Warehouse clubs and supercenters	37.9	40.9	34.5	38.4	36.4	35.5
452990	452319	All other general merchandise stores	8.6	8.9	14.0	18	23.7	28.6
452111/452112	452210	Department stores	4.3	3.9	4.2	5.7	6.1	0.3

Notes: In 1992, there is no group for the specialty food stores; the sales percent of groceries and other foods in this year is the average of the following years.

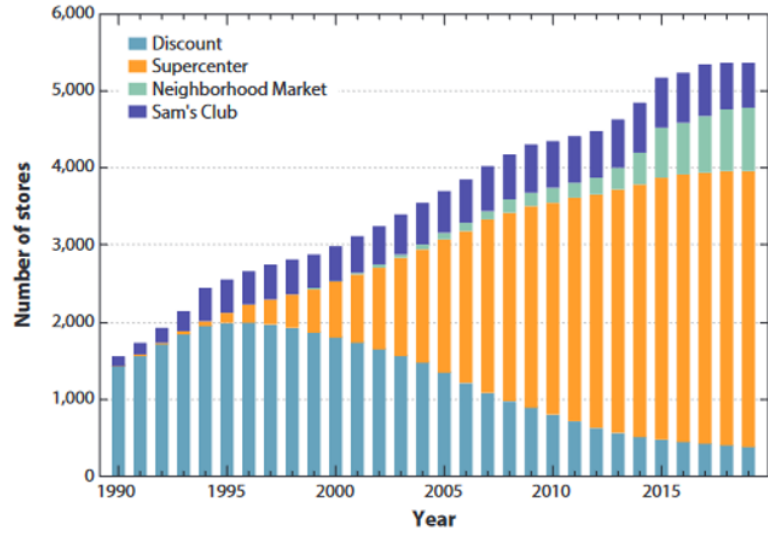


Figure .10: Number of stores in Walmart's four-store formats, 1990-2019, source: R. Volpe and Boland, 2022



Figure .11: Number of stores in Walmart's three-store formats, 1990-2021, source: NETS