Distributional Effects of Exclusive Dealing in Retail Real Estate

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Abstract

We study the welfare implications of exclusive dealing in the U.S. retail sector. Using a novel dataset, we document widespread use of exclusive dealing contracts that exclude local entry by rival stores. Public officials increasingly critique such practices as anti-competitive. At the same time, the extant literature on exclusive dealing has also shown that these contracts can stimulate entry into otherwise under-served markets. Descriptive analysis suggests that stores with exclusive dealing contracts face fewer competitors and higher prices. Yet, almost all major grocers in under-served neighborhoods have exclusive dealing contracts, suggesting they might encourage entry in low-demand settings. We use a structural approach to measure the counterfactual impact of a ban on exclusive dealing. We estimate a model of household-level store choices that accounts for price sensitivity, distance sensitivity, and potential complementarities across retailers. Upstream, we estimate a static entry game between retailers and landlords that accounts for downstream variable profits and information asymmetry between retailers and landlords. Results show that exclusive dealing benefits most landlords, large retailers, as well as households living in sparse retail environments. Banning exclusive dealing would increase welfare for some households, but would cause an increase in the number of households living in food deserts and harm consumers living in these under-resourced areas.

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1 Introduction

Restrictive covenants are exclusive dealing contracts in commercial real estate that forbid certain firms from operating on designated premises. These private agreements, commonly embedded in commercial leases and deeds, are intended to protect the business interests of one or both parties. For example, a Safeway in Chicago forbids its landlord from leasing space to competing grocers, drug stores, liquor stores, and convenience stores. While such contracts are largely unstudied, there is a rising concern that exclusive dealing forecloses on competitor entry and contributes to the creation of food deserts (Leslie (2021), Kang (2022), Frerick (2024)). In fact, both Canada and several U.S. cities have attempted to limit exclusive dealing contracts.[1]

The economic impact of exclusive dealing contracts on market outcomes and welfare is theoretically ambiguous (e.g. Posner (1976), Bork (1978), Rasmusen et al. (1991), Segal and Whinston (2000), Aghion and Bolton (1987)). While exclusive dealing can limit competition by restricting entry of new competitors, it can also stimulate entry of stores into under-served neighborhoods. Therefore, the net welfare effect is an empirical question about the relative magnitudes of these costs and benefits.

Furthermore, the extant literature on exclusive dealing has primarily studied its use to increase efficiency or guarantee product quality (e.g. Klein and Murphy (1988)). Based on discussions with industry professionals, however, exclusive dealing in retail real estate contracts is used to solve the landlord's imperfect information about the actual profitability of a location, which depends not only on the profitability of the tenant retailer but also on potential synergies with other co-locating types of stores. Specifically, large retailers drive demand to their locations and nearby locations, effectively expanding the market size – a foot traffic externality documented by Brueckner (1993) and Konishi and Sandfort (2003). As a result, the entry of a large retailer (e.g. a grocer) can facilitate the entry of smaller retailers which can either be complementary (e.g. an optometry shop) or even competitors (e.g. a liquor store). The exclusive dealing contract ensures retailers that the landlord's property will not be leased to competitors and compensates the landlords for not renting to potentially profitable tenants.

[1] Both Chicago and Washington DC have limited exclusive dealing, and the Canada Competition Bureau is investigating potentially anticompetitive effects. In Chicago, the city limited stores that are greater than 7500 square feet from enforcing the exclusive dealing contract after the store exits. In DC, all exclusive dealing contracts are banned for grocery and all food retail stores.

To assess the implications of exclusive dealing in retail, we conduct a detailed empirical case study of the Chicago retail market. We build a novel database tracking the complete census of all "potential" retail locations, including already developed and planned locations. We also manually collect the complete set of retail real estate contracts, allowing us to determine where and when exclusive dealing has been implemented. We combine these two new databases with Numerator data tracking households' retail store choices and shopping behavior.

Our descriptive findings suggest that exclusive dealing contracts may indeed have harmful effects on consumers. First, we show the widespread use of exclusive dealing contracts and their growth and use over time. We show that each of the large national grocery chains uses exclusive dealing contracts in at least one location. Furthermore, landlords with exclusive dealing contracts charge 20% higher prices, even after controlling for retail chain and surrounding demographics. This is consistent with landlord's need to be compensated for not renting to higher-profit tenants. Stores with exclusive dealing contracts tend to face fewer local competitors, even after controlling for chain.

Second, we turn to effects in the downstream consumer market. Leveraging an event study design of grocery exit in a household's zip code, we show that consumers reduce grocery expenditures when a grocer with an exclusive dealing contract exits. Once the grocery store leaves, consumers substitute away from grocery stores and increase spending at dollar stores. In contrast, consumers expenditure remains unchanged (after the grocer's exit) when the grocer that exits does not have an exclusive contract. These results are driven by changes in the market structure. When there is no exclusive dealing contract, an exit is replaced by a new grocers nearby, when there is an exclusive dealing contract, ane exit is replaced by a new grocer further away, which increases distances for local consumers. The event study results show that the exclusive dealing contracts may have implications for consumer welfare.

At face value, these two facts seem to support the view of public officials, that exclusive dealing contracts are anti-competitive. However, the analysis does not consider the counterfactual impact of exclusive dealing contracts on entry in under-served markets and the potential to mitigate food deserts, which suggests that exclusive dealing may help some consumers. Exclusive dealing can encourage retailer entry on two margins. First, exclusive dealing ensures that competing stores cannot enter after the retailer has paid fixed cost of entry. In this case, the exclusive dealing contract is a commitment device between the large retailer and landlord. Second, exclusive dealing solves the information asymmetry between the landlords and retailers: the exclusive dealing contract allows landlords to screen poten-

tial retailers by their sensitivity to neighboring competition. In this case, exclusive dealing can increase entry of competition-sensitive retailers without the landlord forgoing on the profits from competing, co-locating retailers. In both cases, retailer entry may depend on the exclusive contract's ability to limit competing retailers, for example retailers that can only feasibly enter once the large retailer enters (as a result of the foot traffic externality).

To assess the complete equilibrium implications, we conduct a structural analysis of the Chicago retail market. On the demand side, we model household store choice allowing for price sensitivity, distance sensitivity, and potential complementarities across retailers. On the supply side, we model the game between landlords and retailers allowing for information asymmetry on retailers' profitability. In a first stage, landlords post real estate prices and an incremental premium for exclusivity based on incomplete information about the profitability of retailers in these locations. In the second stage, competing retailers simultaneously select locations and contracts based on incomplete information about other retailer's entry probabilities. Once the retail entry game is realized, retailers set prices and households choose stores.

In order to quantify the effects of exclusive dealing, we first recover key parameters in our model. Consumers distaste for prices, distances, and potential retailer complementarities determine the welfare effects of exclusive dealing because these parameters affect whether consumers benefit from retailers co-locating with or far away from competitors. The stronger the distaste for prices, the greater the consumer welfare benefit from competing retailers co-locating. The stronger the distaste for distance, the more consumers shop locally and close to home. Distaste for prices and distances both increase the profitability of foreclosure of rival entry through exclusive dealing. Cross-retailer complementarities introduce potential complements across retailers (as in Gentzkow (2007)). Complementary stores can soften price competition for retailers and reduce distances traveled for consumers, potentially benefiting both consumers and retailers.[2] For consumers, the estimated demand parameters determine whether welfare benefit due to price competition from competing stores co-locating outweighs the benefit from shorter trip distances when households multi-home at complementary retailers.

We identify parameters in the product market by leveraging individual trips and microdata, as well as market-level variation in shares and prices. Price sensitivity is identified using

[2]When consumers have a strong distaste for distance and when there are within-trip complementarities between retailers, consumers benefit from complementary stores co-locating because this minimizes the total distance traveled when consumers multi-home. The benefit of nearby complementary stores can outweigh the benefit of nearby stores that could compete more strongly over prices.

an instrumental variable approach and exploiting the fact that retailers' marginal costs are likely correlated across markets, but demand shocks for such retailers are likely not (following Hausman et al. (1994)). Leveraging individual trips and consumer microdata, we identify distaste for distance using variation in household locations and distance to retailers. Distance sensitivity is identified using within-zip-code variation of distance to avoid self-selection of households into markets with a more favorable retailer presence. We identify within-trip complementarities using variation in prices and shares from single-retailer trips and multi-homing trips across markets. We find strong distaste for distances, motivating exclusive dealing in the retail real estate market.

We validate the estimated cross-retailer complementarities with data from the exclusive dealing contracts. Both the estimated consumer demand parameters and the exclusive dealing contracts show significant heterogeneity across retailers, and both should provide information on which retailers are substitutes. Without imposing these substitution patterns in the model, the predicted demand effect from an entrant correlates well with the retailer types blocked by the exclusive dealing contracts. This provides an untargeted moment to validate both the estimated complementarities as well as the heterogeneity observed in the exclusive dealing contracts.

In the commercial real estate market, we estimate the parameters that determine landlord prices and retailer location and contract choice. Retailers' fixed cost of entry, landlord's marginal costs of maintaining their property, and information asymmetry between retailers and landlords determine the profitability of exclusive dealing. Our estimated parameters maximize the probability of the observed entry.

Armed with our estimated parameters, we move onto counterfactual simulations where we simulate a ban on explicit exclusive dealing. Instead of offering two prices, in the counterfactual, the landlord can only offer one price and cannot commit to an exclusive dealing contract. We find that in the long run an exclusive dealing ban would lead to an increase in food deserts in Chicago. A back of the envelope calculation suggests that a total ban on exclusive dealing would increase the percentage of people living in food deserts by 10-15 percentage points over 20 years. However, the effects of exclusive dealing on consumers vary by consumer income and by neighborhood; some areas of Chicago see lower prices and lower distances from increased entry of co-locating stores such as drug stores, liquor stores, and dollar stores.

The counterfactual results are also heterogeneous in the upstream commercial real estate

market. Under the counterfactual ban, the very largest retailers (big box stores) would suffer both the greatest profit losses and the largest decrease in probability of entry. The large retailers (the grocers) do not suffer large profit losses but do decrease the probability of entry, while the smallest retailers (liquor stores and dollar stores) gain. Indicating that they are able to extract additional surplus from an exclusive dealing contract, most landlords profits decline after a ban on exclusive dealing.

Related literature This paper contributes to the extant literature on exclusive dealing (Posner (1976), Bork (1978)), Marvel (1982), Hart et al. (1990), Rasmusen et al. (1991), Besanko and Perry (1993), Aghion and Bolton (1987), Bernheim and Whinston (1998), Klein and Murphy (1988), Segal and Whinston (2000), Fumagalli and Motta (2006), Abito and Wright (2006), Simpson and Wickelgren (2007), Asker and Bar-Isaac (2014)).[3] First, we address the conceptual role of exclusive contracts as a solution to landlords' imperfect information about the externalities from nearby competition, which emerges because retailers drive foot traffic to nearby firms, and do not wish to suffer losses from the retailers they attracted to the location. In the case of complete information, the landlord can choose the set of retailers that will maximize total surplus to each location (Bernheim and Whinston (1998), Nurski and Verboven (2016)). In retail real estate, however, landlords cannot exactly predict the retailers' profitability, which leads to the observed exclusive dealing contracts. To our knowledge, this externality has not yet been studied in the context of exclusive dealing.

Second, our comprehensive database on retail contracts allows us to analyze the impact of exclusive dealing *empirically*. In contrast, past work has had to infer the nature of contracts indirectly. To overcome this problem, these papers have instead developed empirical tests to diagnose foreclosure (Asker (2016)) or estimated product market demand to determine both whether exclusive dealing is profitable and firms' willingness to pay (Nurski and Verboven (2016), Sinkinson (2020)). By contrast, our data allow us to fully specify the retailer choice problem and distinguish when the exclusive dealing is explicitly contracted on.[4] In addition,

[3] In the theoretical literature, the welfare effects of exclusive dealing are ambiguous and are tied to the theories of exclusive dealing (or why the exclusive dealing exists). Early work – from the "Chicago school" – showed that absent externalities, exclusive dealing could not be anti-competitive because upstream firm has to pay the downstream firm to accept exclusivity (Posner (1976) and Bork (1978)). Subsequent work found many cases where externalities lead exclusive dealing contracts to be anti-competitive. To summarize the theoretical findings, exclusive dealing is considered pro-competitive when (a) it increases efficiency, for example by reducing double marginalization, (b) ensuring monopoly profits encourages investment and thus a higher-quality product and (c) ensuring monopoly profits allows for retailer entry in the first place. Exclusive dealing is considered anti-competitive when it partially or totally forecloses on another firm's entry, due to an externality.

[4] Furthermore, this distinction also allows us to assess how exclusive dealing changes the equilibrium by estimating counterfactual where exclusive dealing contracts are banned.

the exclusive dealing contracts documented here are heterogeneous and broad – the contracts vary within retailer, across retailers, and across space. Prior empirical work has focused on exclusive dealing contracts in narrow markets such as beer, hamburgers, and cable television (see Lafontaine and Slade (2007) for a survey of the empirical literature, as well as Chipty (2001), Sass (2005), Lee (2013), Chen (2014), Ater (2015), Nurski and Verboven (2016),Chen and Shieh (2016), Asker (2016), Le (2024)).[5] In contrast, in our setting, exclusive dealing contracts affect the location of retailers in Chicago, impacting a wide subset of services.

This paper builds on a long literature in retail on grocery demand and food deserts (for grocery demand, see for example Bell et al. (1998), Smith (2004), Mehta (2007), Song and Chintagunta (2007), Hartmann and Nair (2009), Smith and Øyvind Thomassen (2012), Mehta and Ma (2012a), Mehta and Ma (2012b), Ellickson et al. (2012), Thomassen et al. (2017), Handbury (2021), Leung and Li (2021), for food deserts, see for example Bitler and Haider (2011), Allcott et al. (2019)). Relative to existing literature, particularly the literature on food deserts, this paper endogenizes the retailer location choice problem by incorporating data on real estate prices, exclusive dealing contracts, and potential locations in the estimation. In particular, this paper shows how the existence of exclusive dealing contracts reduce food deserts. Additionally, the paper contributes novel evidence on which stores retailers' view as their competition; the exclusive dealing contracts provide a revealed-preference/profitability approach to understanding local retail competition. By estimating the within-trip complementarities across retailers, the paper contributes demand evidence to how consumers value co-locating stores, the shopping center, and distance. Cao et al. (2024) also estimate preferences for specific retailers, and measures preference heterogeneity, while this paper focuses on multi-homing and complementarities across stores.

This paper also contributes to and expands the policy discussion on non-competes. In the U.S., the Federal Trade Commission proposed a rule banning non-competes in labor (Federal Trade Commission (2023)) which was later struck down, following a nascent but growing literature on non-competes in labor economics (Balasubramanian et al. (2020), Krueger and Ashenfelter (2022), Lipsitz and Starr (2022), Shi (2023), Johnson et al. (2023), Young (2024)). Exclusive dealing in commercial real estate is a type of non-compete in a different factor input – land. This paper determines the welfare effects of exclusive dealing in land, and provides a model that can be used to estimate when exclusive dealing is pro-competitive

[5] Additionally, most empirical work focuses on exclusive dealing in the upstream market, while this paper (along with Lee (2013) and Ater (2015))) study exclusive dealing in the downstream market. The closest paper is Ater (2015), which studies exclusive dealing in Israeli shopping malls, where landlords commit to renting to a single hamburger shop, and finds evidence consistent with foreclosure of rival competition.

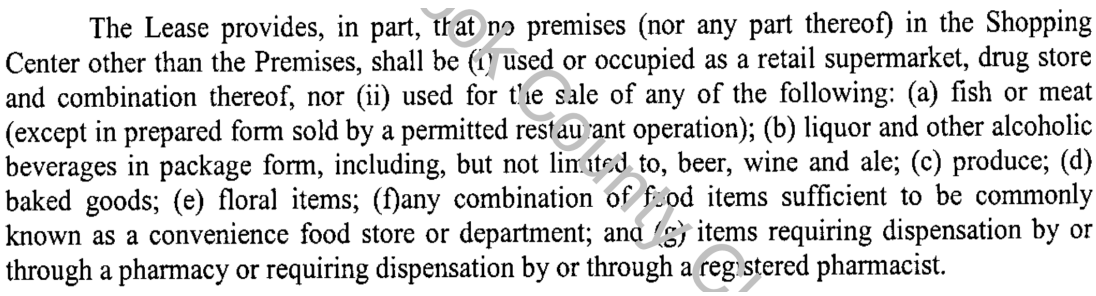
or anti-competitive in other settings.

Finally, this paper is the first to study this type of exclusive dealing in economics. Legal scholarship on these exclusive dealing contracts focuses on the existence and details of the contracts (Sturtevant (1959), Lundberg (1973)), whether they encumber development (Stubblefield (2019)), and whether they are anti-competitive and cause food deserts in the grocery industry (Ziff and Jiang (2012), Leslie (2021), Kang (2022)). This paper provides an empirical answer to the question using a combination of novel data gathering, descriptive evidence, and structural estimation.

2 Exclusive Dealing In Retail Real Estate

The exclusive deals studied in this paper are called restrictive covenants. These restrictive covenants contractually forbid specific retailers from operating at specific locations. Restrictive covenants are put in place to protect the business interests of one or both parties. For example, Figure 1 shows an excerpt from a Safeway restrictive covenant, which blocks the entry of retailers that sell similar or identical products to Safeway – retailers that sell food, drugs, and liquor – in a particular shopping center. As a result, these restrictions are important considerations for retailers choosing locations both because these contracts are an opportunity to limit the retailers' own competition, and because the set of locations they can consider may be limited by other retailers' restrictive covenants.

Figure 1: Restrictive Covenant in a Safeway Lease Memorandum



The Lease provides, in part, that no premises (nor any part thereof) in the Shopping Center other than the Premises, shall be (i) used or occupied as a retail supermarket, drug store and combination thereof, nor (ii) used for the sale of any of the following: (a) fish or meat (except in prepared form sold by a permitted restaurant operation); (b) liquor and other alcoholic beverages in package form, including, but not limited to, beer, wine and ale; (c) produce; (d) baked goods; (e) floral items; (f)any combination of food items sufficient to be commonly known as a convenience food store or department; and (g) items requiring dispensation by or through a pharmacy or requiring dispensation by or through a registered pharmacist.

Source: Cook County Record of Deeds, Document Number 0010276527. This figure is an example of a restrictive covenant from a Jewel Osco (whose parent company is Safeway) store in Chicago, 2001. At this location, this portion of the lease memorandums shows Safeway limits the landlord from renting to grocers, drug stores, and liquor stores.

The content of the restrictive covenants vary greatly across contracts in terms of the retail-

ers blocked, timing, and radius. The language of the exclusive dealing contracts vary from naming the retailers blocked from entering (as shown in Figure 10), to naming a narrow set of industries (as shown in Figure 11), to naming a broad set of industries (as shown in Figure 9). In each case, the contents of the exclusive dealing contract reflect – at least in part – the retailer' perceived competition. For example, Figure 9 shows an excerpt where Safeway prohibits grocers, drug stores, liquor stores, restaurants, gas stations, offices, educational facilities, thrift stores, and funeral homes: these blocked retailers are Safeway's direct competitors in the product market, retailers that compete for parking, and retailers that might reduce demand to the shopping center. The duration of the restriction varies greatly, from only valid while the retailer operates at the premises (as shown in Figure 10), to while the lease is in effect (as shown in Figure 9), to many years after the retailer has left the premises (as shown in Figure 11). The radius varies as well, from the exact premises of the store (as shown in Figure 11), to the shopping center (as shown in Figure 9), to specifying a radius (as shown in Figure 10, which specifies a 1 mile radius wherever the landlord or an affiliate owns property).

There is little policy regulation on exclusive dealing in commercial real estate, and challenges are largely litigated in court. In court, the exclusive deals are held up in some instances and struck down in others. For example, the restrictive covenant usually holds when the provision is negotiated as a legitimate business interest and are struck down then they are deemed not in the public interest[6]. However, there is a growing concern that restrictive covenants cause food deserts by displacing and foreclosing upon rivals (Leslie (2021), Kang (2022), Frerick (2024)). In line with this thinking, several cities have attempted to limit exclusive dealing contracts[7]. Given that food access is a priority for policymakers, it is important to

[6]E.g. of a restrictive covenant holding up: in *Child World, Inc. v. South Towne Centre (1986)* Child World, Inc wanted to vacate the property early but had signed a restrictive covenant limiting competitors, and the "restrictive provision was negotiated as an inducement to enter the lease and in return tenant agreed to 20 years of continuous operation." As a result, the restrictive covenant held up in the court, and as a result Child World could not vacate the premises. E.g. of a restrictive covenant being struck down: a court struck down a restrictive covenant that forbid the operation of a grocery store on a vacant property (similar to the termination restriction in Figure 11), arguing that the covenant was not in the public interest and contributed to food deserts by limiting the availability of grocery stores (*Davidson Bros., Inc. v. D. Katz & Sons, Inc. (1994)*).

[7]In 2005, Chicago attempted to ban restrictive covenants after a Dominick's Finer Foods put a restrictive covenant forbidding future grocery entry on a property in what became a food desert. At first, the Chicago City Council proposed an ordinance to ban restrictive covenants completely. However, the proposal was met by opposition from the Chicagoland Chamber of Commerce and the Illinois Retail Merchants Association. After some negotiation, a measure was passed that bans restrictive covenants put in place on larger (greater than 7500 square feet) when a retailer leaves the community.

understand how retailers sort into locations.[8]

3 Data

This paper uses data from exclusive dealing contracts, commercial real estate transactions, and consumer shopping transactions. In later sections, these data allow quantification of the effect of exclusive dealing on the commercial real estate market and consumer welfare. Details on the data construction are in the appendix.

The empirical analysis focuses on data from Chicago, one of the largest and most diverse cities in the United States. Due to its mix of wealthy and poor neighborhoods, dense and sparse neighborhoods, and variety of retail environments – from standalone stores to shopping malls, Chicago is a good setting to study the average and distributional effects of exclusive dealing.

Exclusive dealing: To document the content of these exclusive dealing contracts, we scrape publicly available county recorder pdfs, digitizes them, and extract the parties (e.g. landlord and tenant), address, date, and the set of retailers forbidden from entering the property. The data come from Cook County, Illinois, and span 1980-present. The resulting dataset documents every exclusive dealing contract in commercial real estate reported, as well as the location where the contract is in effect. The contracts are between private parties. These parties are not required to report exclusive dealing contracts, but do so to prevent the contract from being broken. To the best of my knowledge, this is the first dataset that documents all the exclusive dealing contracts reported to a County Recorder Office in commercial real estate.

Potential Locations: We construct a retailer's potential set of locations from a dataset acquired from Build Central (formerly named Planned Grocery), a startup which collects and sells planned retail locations to retailers so that the retailers know where they and their competitors may enter. Importantly, we observe the date the potential location becomes available, the date a retailer commits to entering the location, and the date the retailer enters the location, as well as locations which are never chosen. Additionally, the data includes projects from the proposal to completion, and includes failed projects as well. The time span is 2015-2024. To establish a longer time horizon, we supplement these data with

[8] See here for an example of how local, state, and federal governments spend resources on improving food access.

data from Historical Supplemental Nutrition Assistance Program (SNAP) Retailer Locator Data and Infogroup and treat the set of potential locations that are eventually entered into as the consideration set.

In the data, retailer store sizes are similar across locations. In general, in retail real estate, stores will keep to a relatively narrow store format and square footage. For example, we can assume that all Walmarts are very large, all Safeways are large, and all dollar stores are small. Similarly, we can assume that Walmarts will locate in larger locations than Safeways, which will locate in larger locations than Dollar General. This allows us to discretize retailer sizes and landlord lot sizes and establish which retailers can enter at each potential location.

Retailer locations, entry and exit: Store locations, entry, and exit dates are compiled from the SNAP Database and from Infogroup's Historical Database. The SNAP Retailer Location Data data spans 1990-2023 and records the date, location, and store name when each store enters and exits the SNAP database. The Infogroup historical data is similar to yellow pages: it provides a yearly directory U.S. companies, addresses, store name, and NAICS/SIC codes.

Lease Characteristics: Lease characteristics are obtained from Compstak. We observe variables such as rent, square footage, tenant industry, location, and duration of the lease. CompStak gathers its data from a network of brokers who report lease characteristics for the properties they rent to in exchange for characteristics of the leases for nearby properties, so that they can infer market prices and lease characteristics. As a result, the data is selected based on the group of brokers. To ensure that the data is representative, we compare moments in the data to industry reports on rents and lease characteristics. We compare moments in the data with 13 and find that the data is representative. In figure Figure 20 and Table 13, we plot a histogram of (CPI-deflated) net effective rents over our time period and provide summary statistics about the rental data.

Panel on consumer purchases: To estimate the demand parameters, we use household-level data on trips, with detailed information of stores shopped at and household purchases. We use data from Numerator, an omni-channel consumer panel data available through the Kilts Center at the University of Chicago. The panel spans 2017-2024 and covers a broad range of consumer purchases from a broad range of stores, including grocery, discount, dollar, convenience, and other stores. Importantly, in terms of retailer characteristics, Numerator provides both store identity and store location (longitude and latitude), retailer, and store identifier. In terms of consumer characteristics, Numerator provides the household zip code

as well as household demographics. In terms of consumer purchases, Numerator provides information about purchase amount, product quantity, product descriptions, brand description, day and time of purchase.

We observe households shopping at all store types, and the most frequent trips are to grocery stores. Since day and time of purchase is available, these data is used to compute when households multi-home, when households take trips to multiple stores. Multi-homing has been highlighted as important in the literature and is important in this setting as well (Oh and Seo (2023), Miyauchi et al. (2022), Rhodes and Zhou (2019), Relihan (2022)). We define a trip as all the stores a household shops at in the same day, and assume that the households take the most efficient route on a trip. We find that household multi-home often, particularly with grocery purchases or when there is a grocery nearby. Concretely, we find that 40% of trips to the grocery stores are multi-homing trips, and that percentage increases when there is a chain grocer or the chain grocer is co-located with another retailer. We focus on trips with at most two stops, because shopping at more than two stores is rare, comprising less than .05% of the data.

To compute prices, bar-code price data is aggregated to the level of retailer. We construct a relative price index of the retailer in the market, and the comparison across retailers is based on products common to all retailers in the market, following Atkin et al. (2018).[9] Specifically, prices are the retailer fixed effects in a regression of expenditure-weighted log bar code prices on retailer fixed effects and bar code fixed effects.[10] Prices of two stores is the sum of the prices, weighted by the expenditures for each retailer. In line with current findings, we assume stores price at the retailer level, but allow the retailer price index to vary by household income group (DellaVigna and Gentzkow (2019), Hitsch et al. (2021), Handbury (2021), Thomassen et al. (2017), Atkin et al. (2018)).

To impute home locations, households are placed at the center of their most likely census block group. The most likely census block group is computed with Bayes rule using household and ACS data on household size, education, ethnicity, unemployment status, income, as well

[9]Results are robust to different aggregation methods, and relative prices are similar when following alternative aggregation methods, such as following Thomassen et al. (2017) or when considering only key purchase categories.

[10]Specifically, we construct prices within each retailer as $\log p_{jst} = \sum_{b \in j} \phi_{bjs} \log \tilde{p}_{bjst}$ where p_{jst} is the price of product j at retailer s in market t, which is comprised of bar codes b, ϕ_b is the household's expenditure on bar code b divided by the household's total expenditures on product j within a year, and $\tilde{p}_b$ is the price paid for bar code b. To recover $\log p_{jst}$ in a way that allows different store products to have different qualities, we regress expenditure weighted log bar code prices on store fixed effects and bar code fixed effects, and use the store fixed effects as the retailer price. We run a regression for each market, so each price is the relative price in the market, and is measured in log dollars.

the population density of each census block group within each zip code and the overlap in area between zip codes and census block groups. Then, distance is computed in log miles. In the data, households shop close to home. Distances between retailers and households are computed as the closest distance from home, which gives a measure of store accessibility to home, and are computed as the crow flies.

Downstream product market We define a market as a city-week-year, and estimate the parameters with data from 2017-2019 Chicago (Cook County). The model is estimated with retailer data (store latitude, longitude, address, retailer name), household purchase data (the bar codes scanned, and the price paid for each bar code, the stores traveled to and the time of day), and household demographic information (income, employment, marital status, number of children, ethnicity, education, five digit zip code).

Upstream commercial real estate market Markets are defined yearly in Chicago, are defined by large and non-overlapping geographical areas, and Figure 28 shows the potential locations color-coded by market across Chicago.

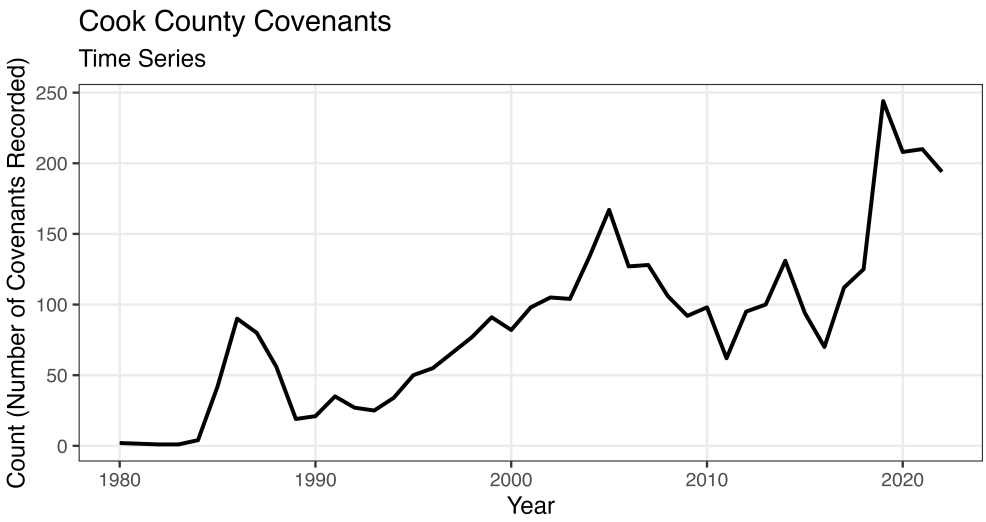
4 Stylized Facts

In this section, we document several empirical facts about exclusive dealing. First, the practice is extensive and has been growing over time. Second, we consider whether exclusive dealing is correlated with demographics of consumer neighborhoods, and find that exclusive dealing is not concentrated in certain "types" of neighborhoods, or correlated with socioeconomic status, or other consumer observables. Third, we test whether exclusive dealing contracts appear to work as intended in the data. In order to work, exclusive dealing contracts should keep competitors further away and retailers may pay a premium for the contracts. We find that retailers pay a 20% price premium for exclusive dealing and that stores with an exclusive dealing provision in their lease contract have fewer nearby competitors.

4.1 Exclusive Dealing is Common and Increasing

Figure 2 shows that the number of exclusive dealing contracts has grown steadily since the 1990s, peaking in 2005 and 2019.

Figure 2: Time Series of Exclusive Dealing Contracts in Cook County IL



Source: Cook County Recorder Office. Figure plots a time series of exclusive dealing contracts recorded at the Cook County Recorder office, 1980-present.

Table 1 shows the prevalence of exclusive dealing contracts in the grocery sector in Chicago. Of the 371 contracts that forbid retailers from selling groceries, 154 are found on grocery store locations, and the rest are found in similar industries such as discount stores and drug stores. Table 9 lists the grocery chain retailers that operate in Chicago with at least one exclusive dealing contract. Importantly, all of grocers with the highest market share use exclusive dealing contracts in their leases (e.g. Safeway and Alberston), and 30% of chain grocers have exclusive dealing contracts on premises (defined as any grocer retailer with more than four stores in the county). We conclude that exclusive dealing contracts are common, particularly in the leases of large national grocery chains.

Within grocery, the content of the contracts vary significantly. Figures 15 and 16 show the asymmetry in exclusive dealing across retail locations within the same retailer, across retail locations, and across industries. All stores block their direct competitors: grocery stores block other grocers, drug stores block other drug stores, and dollar stores block other dollar store. However, across industries, there is more variation. For example, Whole Foods blocks liquor stores far more frequently than Safeway or Aldi and Safeway blocks dollar stores more frequently than Whole Foods or Aldi. We interpret this as indication that sensitivity competition is highly specific to each retailer and retailer location.

Table 1: Prevalence of Exclusive Dealing in the Grocery Industry

	Total	*Total on a Grocer Location*	*Fraction on a Grocer Location*
Exclusive Dealing Contracts Blocking Grocers	371	154	0.42
	Total	*Total with Contracts*	*Fraction with Contracts*
Grocery Chains (Retailers)	33	12	0.36
Grocery Chain Stores	491	113	0.23

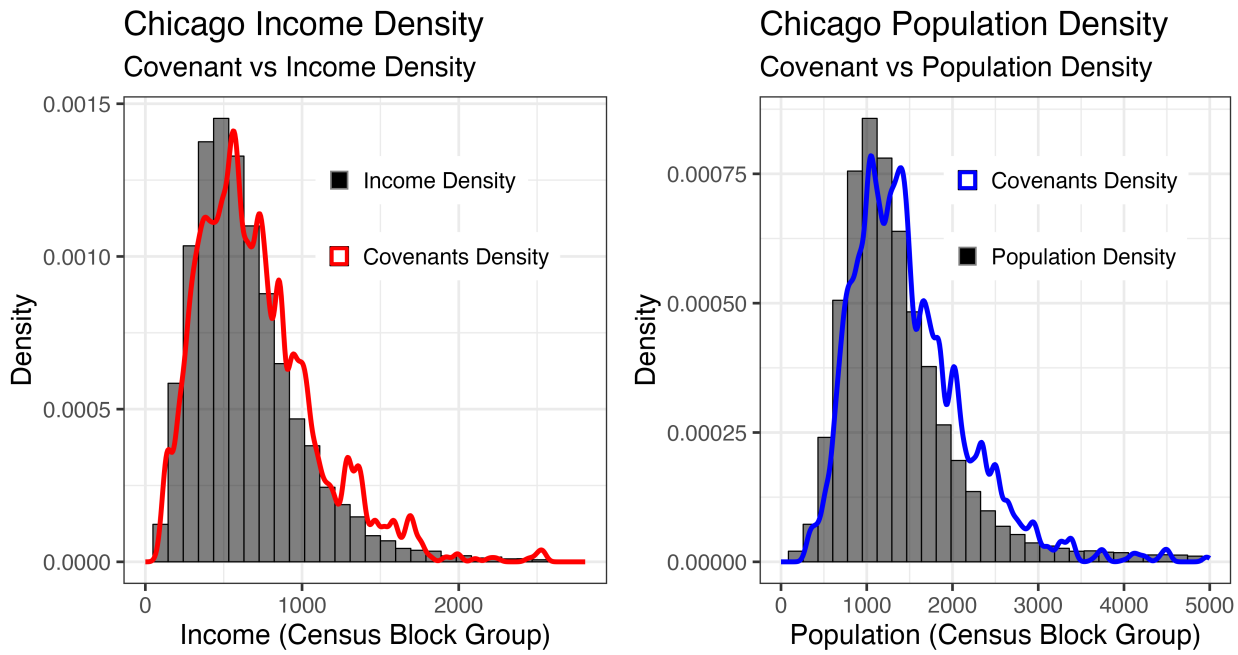
Source: Cook County Recorder Office and SNAP database. Table reports prevalence of exclusive dealing contracts among grocery chains.

Beyond grocery, Figure 13 and Figure 14 show the retailers with the most number of contracts, and the fraction of the retailers' locations with exclusive dealing contracts. These figures show the breadth of retailers that employ these contracts, and that the most common store types are grocery stores, drug stores, discount stores, and dollar stores. Missing are industries that sell highly differentiated products. The industries that have exclusive dealing contracts are industries with relatively low product differentiation, that sell similar products as their direct competitors.

Figure 13 also shows that the prevalence of exclusive dealing locations is heterogeneous across retailers. For example, while some retailers have exclusive dealing contracts on almost all locations, others have such contracts on only half of their properties (Target, Safeway, and Dollar General have exclusive dealing contracts on 90% of their properties, while Aldi, CVS, and Walgreens have exclusive dealing contracts on half their properties).

4.2 Neighborhood Demographics

Figure 3: Exclusive Dealing Contracts, Income and Population Density



Source: Cook County Recorder, ACS 2009- and Census Demographic Data 1980, 1990, 2000. Figure plots histograms of income density (left) and population density (right) in Cook County, Illinois, and overlays the density of exclusive dealing contracts.

Figure 3 shows that exclusive dealing contracts exist in poor and wealthy neighborhoods, as well as low-density and high-density population neighborhoods. In fact, exclusive dealing contracts are not observably selected into particular neighborhoods based on demographic features. Table 15 shows a regression of exclusive dealing status on neighborhood demographics or socioeconomic status, and finds that exclusive dealing status is uncorrelated with neighborhood demographic characteristics. Specifically, Table 18 shows a regression of

$$\text{excl. deal}_{it} = \boldsymbol{\beta X}_{it} + \sigma_i + \lambda_t + \epsilon_{it}$$

where excl. deal is a binary indicator that is one if a contract i signed in year t has an exclusive dealing contract, and zero otherwise, and is regressed on demographic factors in the census block group (median income, population density, travel time to work, ownership

of homes, vacancy status, unemployment, share of the population by gender, share of the population by race), census block group fixed effects, and year fixed effects.

4.3 Rental Prices

Prices are higher in leases with exclusive dealing contracts. Looking within retailer and year, we find that rental prices are 20% higher when exclusive dealing is part of the contract. This is shown by regressing rents on the presence of exclusive dealing, controlling for demographics (such as income), lease characteristics (such as store size), and property characteristics (such as building quality). Additionally, the specification includes location, time, and retailer fixed effects.

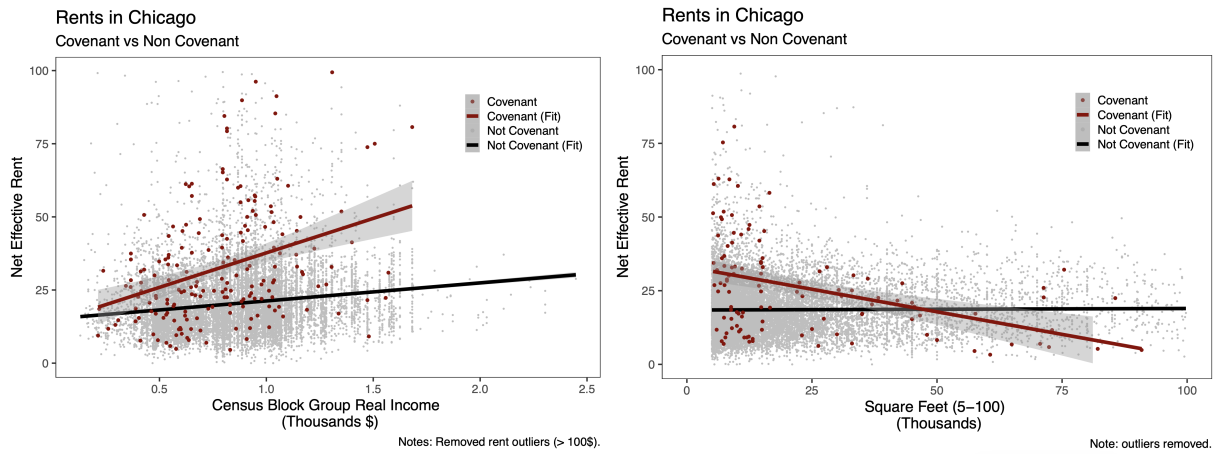
$$\log y_{ijt} = \alpha_0 + \gamma \text{exclusive deal}_{ijt} + \sum_k \beta_k \log x_{kjt} + zip_j + year_t + retailer_i + \epsilon_{ijt}$$

Table 16 shows that prices per square foot per year are 30% higher in properties with exclusive dealing, conditional on covariates. Robustness checks which vary the covariates included report estimates between 20% and 40%. The regressions indicate that the average lease prices would be 4$ higher per square foot per year for an exclusive dealing; for a typical grocery store, this translates to an additional 120,000$ per year for a lease with such a contract, or approximately .24% of average annual revenue.[11]

Figure 4 shows how the exclusive dealing premium varies along two important dimensions: neighborhood income and store size. The literature shows that the higher the neighborhood income, the higher downstream retail prices (for example, Stroebel and Vavra (2019)); this plot shows prices are higher in the upstream [real estate] market as well. Rents with exclusive dealing contracts are higher in all neighborhoods but particularly more expensive in high-income neighborhoods. These findings are consistent both with higher demand from retailers and co-locating stores, as the landlord has to be compensated more to forgo potential profits from possible other retailers.

[11] Typical grocery stores in Chicago average 30,000 square feet and make around 50 million dollars in revenue each year.

Figure 4: Rental Prices as a Function of Neighborhood Income, Store Size, and Exclusive Dealing



Source: Cook County Recorder, ACS 2009-2023 and Census Demographic Data 1980, 1990, 2000, and CompStak lease characteristics data. Figure net effective rents in Cook County as a function of exclusive dealing status (covenant), census block group income, and size of the space. Net effective rent is the rent per square foot per year, averaged over the course of the lease.

Rents with exclusive dealing contracts are inversely related to store size. When the store is very large, retailers with exclusive dealing contracts pay less (red line) than stores without exclusive dealing (black line). Two facts explain the low rent per square foot on the high end. First, since there are relatively few retailers that can fill such a large store size, there is less demand for such large space. Second, the large retailers that do exist likely drive demand for any nearby smaller stores. As a result, the landlords likely internalize the spillovers, offer cheaper rent to large stores as an inducement to enter their locations, and charge higher rents to the co-locating stores. Rents with and without exclusive dealing are the same around 45,000 square feet – approximately the size of a supermarket. However, most retail store fronts are smaller than 45,000 square feet, and so most stores pay a premium for an exclusive dealing. When the store is smaller, retailers pay the highest premium for exclusive dealing (red line) relative to a similar-sized store without exclusive dealing (black line). At this end, high demand from retailers and co-locating stores are consistent with higher prices for exclusive dealing contracts, as the landlord has to be compensated more to forgo potential profits from possible other retailers.

These regressions demonstrate that exclusive dealing should be considered on par with the more traditional factors (like neighborhood demographics, state of the economy, interest rates, lease length) which are thought to determine prices in the commercial real estate market (Stanton and Wallace (2009), Gyourko (2009), Liu et al. (2018), Gupta et al. (2022), Moszkowski and Stackman (2022), Stackman and Moszkowski (2023)).

4.4 Density of Nearby Competitors

Along with higher prices, if exclusive dealing contracts work as intended, then retailers that pay for these contracts should have fewer competitors nearby. In line with this, we find that retailers with exclusive dealing contracts have fewer competitors surround them (0-.3mi), but more competitors farther away. This is consistent with the firms' presumed goal of limiting competition, and consistent with the idea that exclusive dealing only slightly displaces competitors. Figure 5 shows a regression coefficients of the number of stores in the vicinity on whether or not there is a contract on that store.

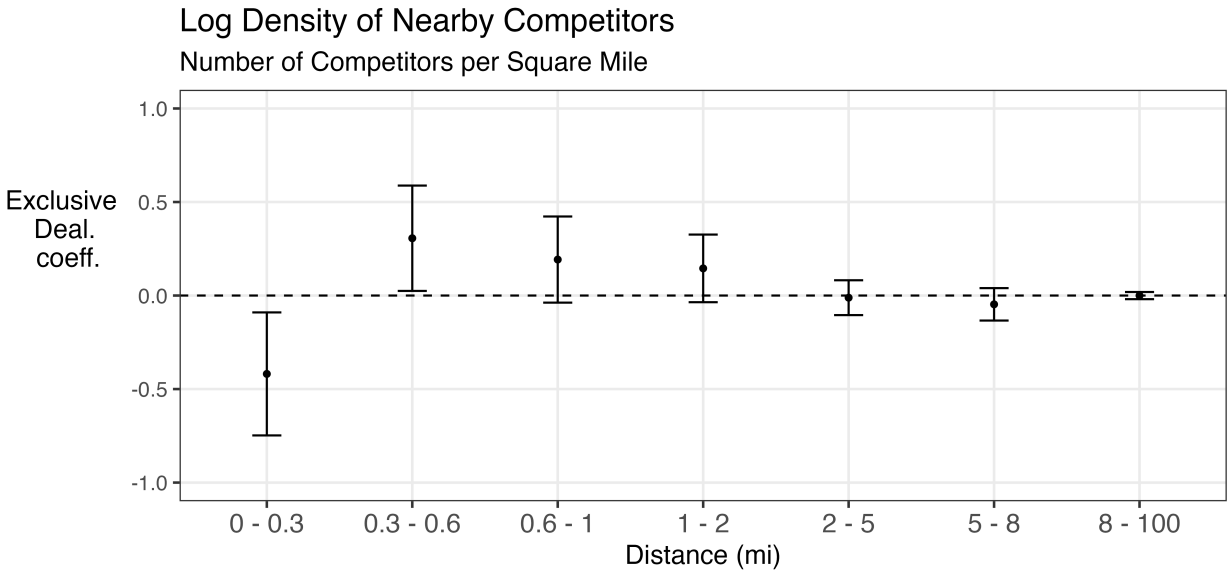
$$num\ stores_{r(i)t} = \beta exclusive\ deal_i + \sigma_i + \lambda_t + retailer_i + \epsilon_{it}$$

where num $stores_{r(i)t}$ are the number of dollar, grocery, drug, and big box stores surrounding a grocery or big box store (excluding the store itself) in a radius $r(i)$ in a year t, *exclusive* $deal_i$ indicates the presence of an exclusive dealing contract benefiting the property i, and σ_i, λ_t, and $retailer_i$ include zip, time, and retailer fixed effects.

The results in Figure 5 show that in the closest vicinity to the property – 0 to .3 mi – grocery stores with exclusive dealing contracts are surrounded by fewer competitors. This 0-.3 mile radius is important both because it is the radius of a typical shopping mall and also because it is the radius at which the trip chaining literature has documented spillovers across stores (Qian et al. (2023), Knight (2023), Baum-Snow et al. (2024)). At a larger radius, expanding to 0-1 mile, the effect goes away: there are similar number of competitors. As a result, between .3 and .6 mile, the result reverses and there are more competitors surrounding stores with exclusive dealing contracts. These results are consistent with the hypothesis that the covenant restrict competitions by pushing competitors farther away. At a large radius, there is no difference between stores with and stores without exclusive dealing

contracts. Tables 17 - 22 in the appendix show the full specification results.

Figure 5: Log Density of Nearby Competitors



Notes: Figure reports coefficients and 95% confidence interval from regression of number of competitors per square mile on whether or not the store has an exclusive deal, with year, zip5, and retailer fixed effects. We only use grocery chains and big box stores. Competitors are defined as grocery, big box, and drug stores. Data is based on the exclusive deal data from the Cook County recorder office and the retailer location, entry, and exit comes from the SNAP data.

4.5 Event Study with Consumer Expenditures

Since exclusive dealing is correlated with different retailer prices and locations in the upstream market, it is plausible the downstream consumer is affected as well. We thus want to understand how consumer outcomes vary with the exclusive dealing status of neighboring retail locations. However, exclusive dealing status only changes with retailer entry and exit.[12] Furthermore, consumers are directly affected by changes in retailer composition, not by changes in contracts. We therefore focus on understanding the effect of retail composition on household outcomes. We treat exclusive dealing status as a dimension of retailer heterogeneity.

[12]There are some cases where an exclusive dealing contract is added or changed during the lease, but it is more rare.

We therefore leverage an event study design of grocery exit in a household's zip code. We run the following regression

$$Y_{it} = \Sigma_{k=-T_1}^{-2} \delta_k \times D_{ik} + \Sigma_{k=0}^{T_2} \delta_k \times D_{ik} + household_i + year_t + \epsilon_{it}$$

where Y_{it} is a household i's outcome in quarter t, D_{ik} is the quarters before or after the grocery event in the zip code of household i. We use within-household variation by conditioning on $household_i$. Standard errors are clustered by zip code.

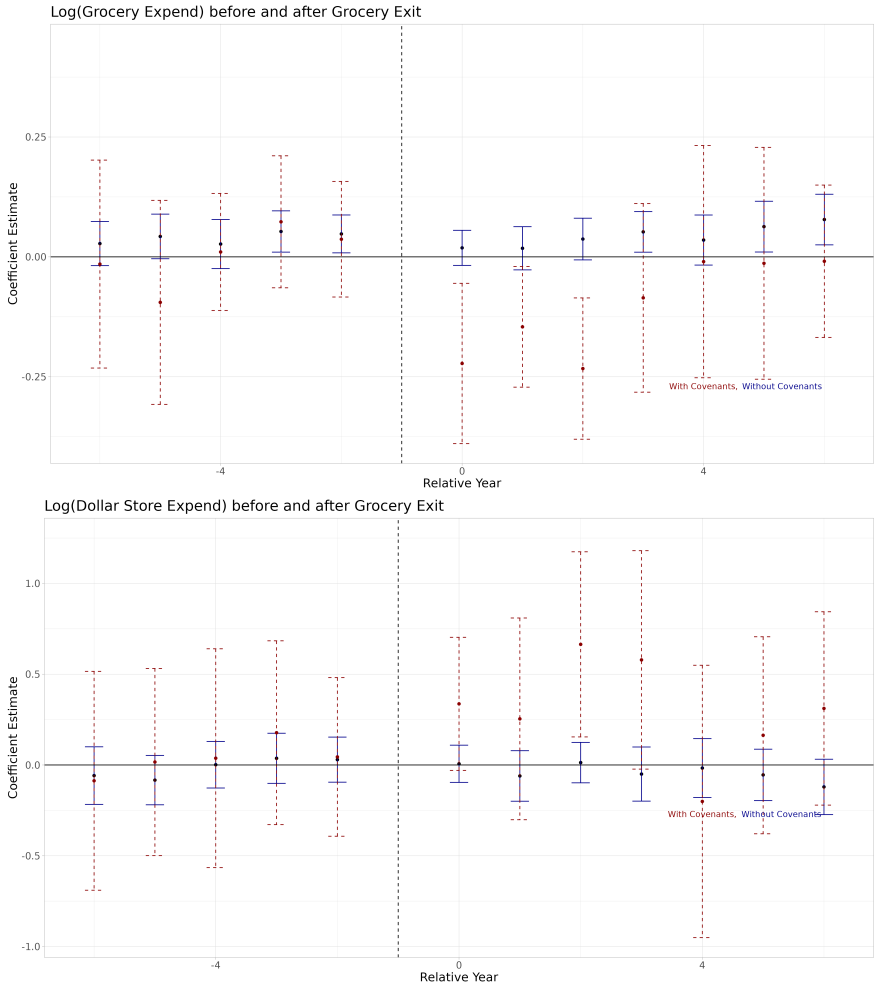
The panel is balanced by restricting to household that appear two quarters before and after the event, and to households that eventually experience a grocery exit; as a result, the control group is the not-yet-treated group and the event study is estimated using heterogeneity-robust estimators developed by Callaway and Sant'Anna (2021).

The results are shown in Figure 6, which shows consumer outcomes for household grocery expenditure and household dollar store expenditure. We present separate event studies by exclusive dealing status of the exiting grocer.

The event study shows that once the grocery store leaves, consumers substitute away from grocery stores and increase spending at dollar stores. This is consistent with the consumer partially substituting to similar options when distances to grocery stores increase. This is also consistent with consumer welfare declining due to fewer options. The consumer spending patterns are persistent for a few years, and after a few years, the consumer expenditure recovers almost to pre-exit levels. In contrast, consumers expenditure remain unchanged (before and after the grocer's exit) when the grocery store that exits does not have an exclusive dealing agreement with the landlord.

Exploring the underlying market structure, we show the effect of a grocery exit on total grocery count within 0-1mi, 1-3mi, and 3-5mi in Figure 26. Grocers without exclusive dealing contracts are replaced by another grocer within a mile, and have no correlation with grocery entry and exit farther away. Grocers with exclusive dealing are replaced by grocers 1-3 miles away, and a the mile within the old grocer stays vacant for at least six years after the exit. The difference in consumer expenditure outcomes between exits with contracts and exit without contracts is likely driven by the replacement grocer (with no contracts) and the lack of replacement (with contracts).

Figure 6: Consumer Expenditure Following Grocery Exit.



Notes: Consumer response (in terms of grocery expenditure) to grocery exit, for those with covenants and those without covenants.

The event study results show not only that there is likely pass through from the commercial real estate market to the product market, but that the exclusive dealing contracts may have implications for consumer welfare.

The assumptions required for the event study are no anticipation and common trends. The identifying assumption is that grocery stores in different zip codes that have a grocery exit in different times but will eventually lose a grocery store would have followed the same pattern regardless. Furthermore, if households anticipated the grocery store exit, anticipation would likely induce a change in consumer outcomes before entry, but pre-trends in this event study are flat.

Another common concern with the event study strategy is that the changes in household expenditures are driven by a different change in the local retail environment (related to the grocery exit). If this were the case, household consumption would likely change before the grocery exit, and we would likely observe pre-trends. However, the flat pre-trend before exits and a significant break at exit indicates that this is not the case.

5 Model

The stylized facts show evidence that exclusive dealing contracts bind and have significant impacts on retailers, landlords and consumers. To evaluate the effect of exclusive dealing for all of Chicago, we conduct a counterfactual analysis where exclusive dealing is banned. Because the counterfactual affects all locations and all retailers, this comparison is ill-suited to reduced form analysis. We therefore answer the empirical question as to the effects of exclusive dealing through the lens of an empirical IO model. In the model, exclusive dealing and prices are endogenous and determined simultaneously in the retail real estate market. The endogeneity reflects that brokers' and real estate agents' practice of using prior prices set in the markets to determine the prices of future retail locations.

Agents:

We consider the location choice problem of the stores most frequented by consumers, which are listed in Table 2. These retailers are grouped into categories: large retailers, which comprise the most frequented big box stores and supermarkets, and small retailers, which comprise drug, dollar, liquor, smaller food, and all other stores.

Timing:

Because large retailers facilitate smaller retailer entry by driving demand to nearby locations, landlords with multiple properties rent first to large retailers and next to smaller, co-locating retailers (Benjamin et al. (1992), Brueckner (1993), Konishi and Sandfort (2003), Burayidi and Yoo (2021), Evensen et al. (2024), Liu et al. (2024)). The timing, shown in Figure 7, reflects this.

In stage 1, each landlord offers two contracts to each retailer, each with a separate price, one for an exclusive contract and one for a non-exclusive contract. Landlord m offers retailer j contracts $a \in \{\text{exclusive}, \text{non-exclusive}\}$ at rental price r_{jma}. An exclusive dealing contract

Table 2: Most Frequented Retailers

Retailer	Type	Size	Stage (Timing)
Jewel Osco (Safeway)	Supermarket	Large	2a, 2b
Mariano's (Kroger)	Supermarket	Large	2a, 2b
Whole Foods	Supermarket	Large	2a, 2b
Aldi	Specialty	Large	2a, 2b
Food 4 Less (Kroger)	Specialty	Large	2a, 2b
Trader Joe's (Aldi)	Specialty	Large	2a, 2b
Costco	Big Box	Large	2a, 2b
Meijer	Big Box	Large	2a, 2b
Sam's Club (Walmart)	Big Box	Large	2a, 2b
Target	Big Box	Large	2a, 2b
Walmart	Big Box	Large	2a, 2b
Drug	Drug Store	Small	3
Dollar	Dollar Store	Small	3
Liquor	Liquor	Small	3
Other Food	Other Food	Small	3
All Other	Outside Good	Both	2a, 2b, 3

Notes: The retailers (and parent company, if retailers share a common parent company) included in the analysis are those with the largest market shares and most frequent trips.

blocks all the competitors that decrease observed expected variable profits. The exclusive dealing contracts can vary across retailers and locations because the observed expected variable profits can vary across retailers and locations.

In 2a, each large retailer simultaneously choose intended locations and contracts. We focus on Bayesian Nash equilibra: retailers take landlords' prices as given but form beliefs over other retailer location choice strategies.

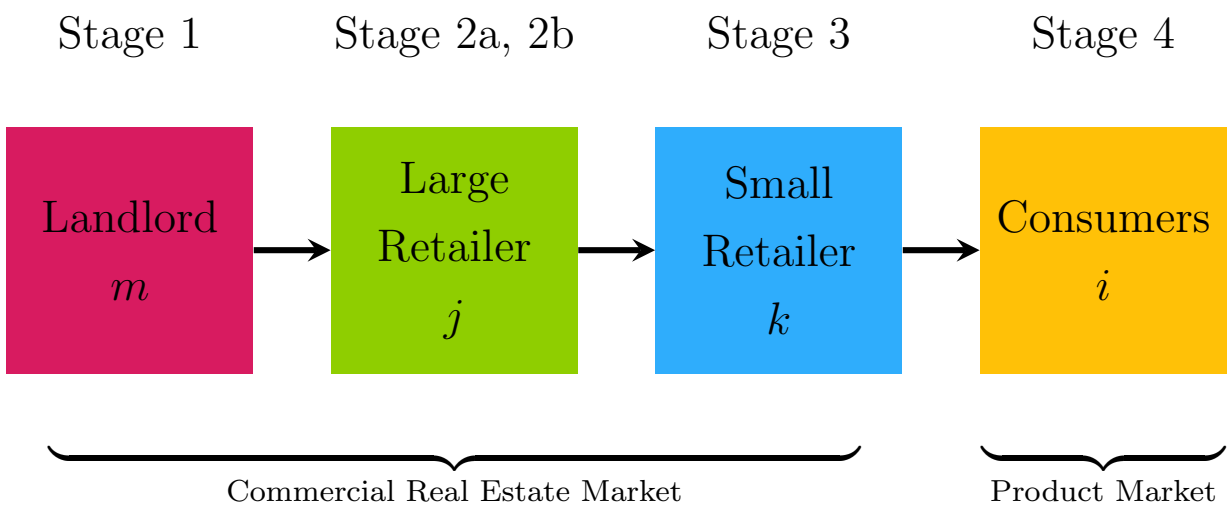
In stage 2b, large retailers entry is determined. Some firms will not enter as a result of capacity constraints or exclusive dealing contracts that their block their entry. In the case of such constraints, the highest-paying retailer enters.

In 3, given large retailer entry, landlords set prices for smaller retailers whose entry is not foreclosed upon by an exclusive dealing contract. Smaller retailers choose locations and enter. Small retailers cannot make exclusive deals. The equilibrium is again Bayesian Nash.

In stage 4, given entry decisions, all retailers set prices in the product market, consumers

shop, and the product market clears.

Figure 7: Model Timing



Notes: First, the landlord rents to the large retailers, second, the landlord rents to the small retailers, third, the retailers set prices in the product market, and fourth consumer shops for good. Landlords that own multiple properties – for example, in a strip mall – will rent to both large and small retailers.

Because large retailers make static, long-term decisions by signing leases that last for at least 10-25 years, and furthermore, because there is little exit for large retailers, the model is static.

The model is estimated in reverse order. Section 5.1 discuss the consumer problem, Section 5.2 discuss the firm problem in the product market, Section 5.3, and Section 5.4.

5.1 Consumer Demand for Retailers (Stage 4)

We model the product market at the level of aggregation of the exclusive dealing contracts, the retailer level. Following McFadden (1978), Berry (1994), Berry et al. (1995), household make a discrete choice of which retailers to shop at in the same trip. Households receive indirect utility

$$u_{ib}^{g} = -\alpha^{g} P_{b}^{g} + \gamma^{g} d_{ib} + \Gamma_{b} + \xi_{b}^{g} + \boldsymbol{\sigma} \boldsymbol{X_{b}} \boldsymbol{y_{i}} + \epsilon_{ib} \tag{1}$$

where u_{ib}^{g} is the utility household i in income group g receives from shopping at a set of retailers $b \in \mathcal{B}$, which can include both both large and small retailers, α^{g} is the price sensitivity, P_{b}^{g} is the total price paid, γ^{g} is the distance sensitivity, d_{ib} is the total distance traveled, Γ_{b} is the complementarity of shopping at retailer(s) b in the same trip relative to the outside good (following Gentzkow (2007)), ξ_{bt} is a market-level unobserved demand shock, σ captures the effect of the interaction between household demographic characteristics y_{i} and retailer characteristics X_{b}, and ϵ_{ib} is a household idiosyncratic preference for retailers b.

Consumer preferences are heterogeneous across demographics and retailer characteristics, as captured by $\sum \sigma X_{b} y_{i}$. These higher order terms allow preferences to vary by consumer demographics and store characteristics. Additionally, consumer preferences have an idiosyncratic component, ϵ_{ib}. For example, ϵ_{ib} may represent daily preferences for a specific meal, which require a set of ingredients across retailers, and is modeled by an additive product-specific Type 1 Extreme Value shock.

Complementarities across retailers can lead households to multi-home at multiple retailers within the same trip. Multi-homing at up to two stores is common in the data, with 40% of expenditure-weighted trips to grocery stores also include additional retailers.[13] Following the data, households in the model shop at to up to two retailers in the same trip. We model trips to the most frequented retailers, listed in Table 2, which include national chain grocers, discount stores, club stores, as well as categories of retailers such as drug stores, dollar stores, and liquor stores. The remaining stores comprise the outside good.[14] We also model households taking the most efficient trip: a household that travels to a single retailer minimizes the trip distance between home→retailer→home, a households that travels to two retailers minimizes the total distance home→retailer 1→retailer 2→home, which is consistent with households shopping close to home.[15] Household's disutility for distance and cross-

[13] Shopping at one ore two stores is common, shopping at more than two stores is rare, as shown in Figures 22 - 25.

[14] The outside group is interpreted as the most preferred of all of the other stores in the market, the same interpretation as in Cao et al. (2024).

[15] This implies that the consumer always shops at the closest store location within retailer, e.g. the closest Trader Joe's to home. This model of multi-homing or trip chaining is modeled this way in Relihan (2022) and departs from most grocery demand literature that assumes households pay the total trip costs to each retailer (for example Thomassen et al. (2017)).

retailer complementarties provide incentives for retailers to co-locate with complementary stores and to exclude rival competitors.

Consumer preferences for prices, distance, retailers, and retailer complementarities determine the effects of exclusive dealing. Since consumers multi-home, high relative complementarity across retailers can soften price competition within retail pairs. As a result, complementarities incentivize retailers to co-locate with complementary stores and foreclose on entry of rival retailers. Foreclosure of other retailers nearby (e.g. in a shopping mall) increases distances between retailers, and decreases the likelihood that the stores are shopped at together. Additionally, foreclosing on entry of rival retailers pushes competitors farther from certain consumers, which can further reduce retail competition. As the disutility for distance, γ^g, becomes more negative, foreclosing on nearby rival entry becomes more profitable, and exclusive dealing becomes more effective.

5.2 Product market supply (Stage 4)

In order to compute the welfare and distributional effects of exclusive dealing, we compute optimal counterfactual prices when exclusive dealing is banned. To do so, we first use our demand estimates and the assumption that retailers maximize profits to compute retailer marginal costs which are kept fixed in the counterfactual.

Retailer j's variable profits are

$$\max_{p_j^g} \sum_g s_j^g (p_j^g - mc_j^g) \tag{2}$$

where p_j^g is the price retailer j sets at all store locations for income group g, s_j^g is retailer j's market share for income group g, and mc_j^g is the marginal cost retailer pays in the product market for income group g. Shares are computed by aggregating individual choice probabilities across bundles and household locations.[16] These marginal costs, mc_j^g, reference operating costs that can be adjusted after entry, such as wholesale prices of products and labor. Since prices are measured as an index relative to other retailers, marginal costs are in the same units as well.

[16]The equilibrium is written in Appendix A.1.

For large retailers, variable profits are determined by Equation 2. For small retailers, each location is assumed to be its own independent store, and households only shop at the store that is the closest within store type (e.g. households shop at the drug store closest to home). As a result, small retailer variable profits for small retailer k in location m are

$$\bar{\pi}_{km} = \sum_i \underbrace{s^*_{ik}\big(d(\boldsymbol{l}_{-k}), x, y; \phi\big)}_{\text{prob. hh } i \text{ picks k}} \Big(p_k^{g(i)*}\big(d(\boldsymbol{l}_{-k}), x, y; \phi\big) - mc_k^{g(i)} \Big) \tag{3}$$

where variable profits are summed over the profits from each household i and individual shares, s^*_{ik}, incorporates that small retailer k is only in household i's choice set if it is the closest store in that store type to the household, if $d_{ik} = \min_{\tilde{k}} d_{i\tilde{k}}$. As a result, the distances to consumers and the set of consumers that shop at a particular store are determined by the location of consumers and other retailers, $d(\boldsymbol{l_{-k}})$. Additionally, profits are determined by demographics, y, store characteristics, x, demand parameters, $\phi = \{\alpha, \gamma, \Gamma, \xi\}$, and marginal costs, mc^g_k.

Consistent with the timing in this market, we assume that each retailer chooses prices to maximize profits once all locations are determined. An extant literature has documented that retailers set uniform prices for the same products across stores (DellaVigna and Gentzkow (2019), Hitsch et al. (2021), Adams and Williams (2019), Butters et al. (2022)), and Butters et al. (2022) document how price increases due to cost shocks are local to each region. To incorporate this finding into the model, we assume that each chain retailer sells the same (representative) good at each store for the same price. However, a separate literature has also documented that households from different income groups pay different prices at the same retailers because they choose different product assortments (Handbury (2021)).[17] To allow retailers to internalize that different-income households will purchase different bundles but to continue modeling the retailer bundle choice problem at the retailer level (the aggregation level of for exclusive dealing), we assume that each retail chain can set a single price for each income group, and that consumers within an income group do not substitute between bundles meant for different income groups.

[17] In the literature estimating grocery demand, demand is often estimated for separately for different income groups (Allcott et al. (2019), Atkin et al. (2018)). This reflects that in reality, the retailers internalize different elasticities across the income distribution and set prices accordingly. For example, Dominick's Finer Foods had higher priced stores and lower priced stores in different locations. Also, grocers sell a wider variety of similar products at different prices to price discriminate across consumers. In the model, this is approximated as three separate prices for different income groups at each retailer.

For example, a Safeway sets three prices in Chicago – a price for the low-income group, a price for the middle-income group, and a price for the high-income group – and these prices are the same at all Safeways in Chicago. Since each Safeway is identical for all consumers, each consumer will buy the same representative product regardless of the Safeway shopped at; as a result, consumers shop at the store closest to home to minimize $\gamma^b d_{ib}$.

Each retailer sets a single price for each income group. The price is determined by the first order condition of the profit function in Equation 2. For large retailers, each retailer has a single price index and a unique store-wide marginal cost. For small retailers, a single price index is set for all drug stores, dollar stores, other food stores, and liquor stores, and the marginal costs are assumed to be the same for all stores within each store type.

$$p_j^g = mc_j^g + \left[\frac{\partial s_j^g}{\partial p_j^g}\right]^{-1} s_j^g \tag{4}$$

These product market parameters, along with household and retailer locations, allow us to compute consumer welfare and retailer variable profits. The variable profits determine the revenue of entering new locations.

5.3 Retailer Location Choice (Stage 2a, 2b, 3)

Large retailers (Stage 2a, 2b): In the commercial real estate market, landlords set prices for contracts and entry occurs in stages 2a, 2b, and 3: large retailers choose locations (simultaneously with one another and then enter simultaneously, following Seim (2006)), and then small retailers choose locations (simultaneously and then enter simultaneously). In stage 2a, a large retailer j, i.e., a retail chain with possible preexisting locations, may choose a new location m and contract $a \in \{\text{Exclusive } (E), \text{Non-Exclusive } (N)\}$ to maximize profits

$$\max_{m,a} \quad E_{\boldsymbol{l}_{-j}}[\bar{\pi}_{jma}|\boldsymbol{a}_{jm}] + \bar{\mathbb{P}}_{jma}(\theta_j 1\{a_{jm} = E\}_{jma} - r_{jma} - F_m + \epsilon_{jm}) + (1 - \bar{\mathbb{P}}_{jma})\epsilon_{j0} \tag{5}$$

where $E_{\boldsymbol{l}_{-j}}[\bar{\pi}_{jma}|\boldsymbol{a}_{jm}]$ are the expected variable profits in the product market given that retailer j picks contract a_{jm} at location m, $\boldsymbol{l_{-j}}$ are the other large and small retailers' location

choice strategies which are unknown in stage 2a, $\bar{\mathbb{P}}_{jma}$ is the probability the large retailer j enters given that it chooses to enter m (the entry is resolved in stage 2b), θ_j represents the information asymmetry regarding the profitability of exclusive dealing between landlords and large retailers, r_{jma} are the rents paid to landlord m for entering with contract a, F_m is the fixed cost of entry, and ϵ_{jm} is the idiosyncratic profitability of a location.[18]

Expected variable profits for large retailer j depend on the locations of consumers and all other store locations. Variable profits from adding a new location and contract (m, a) can be written as $E_{\boldsymbol{l}_{-j}}[\bar{\pi}_{jma}] = \prod_{j' \neq j} \left(\sum_{l'_{j'}=(m',a')} \mathbb{P}_{j'm'a'} \right) \bar{\pi}_{jma}(\boldsymbol{l}'_{j'})$, which is a function of large retailer j's location choice m, as well as possible preexisting locations, the simultaneous decisions of all other large retailers, and the future decisions of small retailers.[19] For large retailers with preexisting locations, adding a new store shortens the distance to some consumers, but in doing so, steals business from competitors and preexisting locations of j to the new one. Thus, in opening a new store, large retailer j balances the benefit from decreasing the distances to certain consumers with the traffic diverted from preexisting stores and entry costs. If the large retailer chooses not to add a store – the outside good –, expected variable come entirely from preexising locations, $E_{\boldsymbol{l}_{-j}}[\pi_{j0}]$, but may change due to expected rival store entry.

The exclusive dealing contract – along with capacity constraints – limits the retailers that can enter a particular location. If multiple retailers try to enter the same location, then the highest paying retailer enters. When a retailer does not enter due to a conflict, it loses the opportunity to enter that location but still collects variable profits from preexisting retailers and the idiosyncratic shock ϵ_{j0}. While conflicts block entry to a particular location, conflicts do not block entry in the market because the retailer can choose enter the market in a different location the following year. Because of these conflicts, the probability of choosing a location is not the same as the probability of entry, and the retailer internalizes the probability of winning entry $\bar{\mathbb{P}}_{jma}$, when choosing locations.[20]

Conversations with industry professionals suggest that exclusive dealing exists in part to solves information asymmetry in the market. In the model, information asymmetry between large retailers and landlords arises from two sources: profitability from the location, ϵ_{jm}, and profitability from exclusive dealing, θ_j. The first, ϵ_{jm} captures elements such as layout or square footage whose effect on profitability are only known to the retailer. The second, θ_j

[18]The probability of winning entry is written in Appendix A.1.
[19]The probability the retailer chooses and then enters location m is written out in Appendix A.1.
[20]The probability the retailer chooses location m is written out in Appendix A.1.

captures landlord's and other retailer's misperception on the profitability of exclusive dealing for retailer j.[21]

Mechanically, an exclusive dealing agreement affects a retailer's competitors (both large and small retailers) in two ways. First, the retailer pushes competitors away from certain consumers and towards other consumers. Second, exclusive dealing increases the total trip distance for multi-homing trips between that retailer and these competitors. When choosing contracts, the retailer balances the benefit of excluding rival entry against increasing the probability of winning entry with higher prices for the contract.

Exclusive dealing solves two main problems between landlords and large retailers: commitment and information asymmetry. At any location m, a retailer will prefer an exclusive dealing contract (E) to non-exclusive contract (N) when

$$\underbrace{E_{\boldsymbol{l}_{-j}}[\bar{\pi}_{jmE}] - E_{\boldsymbol{l}_{-j}}[\bar{\pi}_{jmN}]}_{\text{commitment}} + \underbrace{\bar{\mathbb{P}}_{jmE}\theta_j}_{\substack{\text{info. asy.} \\ \text{excl. deal.}}} + \underbrace{(\bar{\mathbb{P}}_{jmE} - \bar{\mathbb{P}}_{jmN})}_{\text{entry prob.}} \underbrace{(-F_m + \epsilon_{jm} - \epsilon_{j0})}_{\substack{\text{info. asy.} \\ \text{location match}}} > \underbrace{\bar{\mathbb{P}}_{jmE} r_{jmE} - \bar{\mathbb{P}}_{jmN} r_{jmN}}_{\text{rents}} \tag{6}$$

$$\underbrace{E_{\boldsymbol{l}_{-j}}[\bar{\pi}_{jmE}] - E_{\boldsymbol{l}_{-j}}[\bar{\pi}_{jmN}]}_{\text{commitment}} + \underbrace{\theta_j}_{\substack{\text{info. asy.} \\ \text{excl. deal.}}} > \underbrace{r_{jmE} - r_{jmN}}_{\text{rents}} \tag{7}$$

where Inequality 6 is before entry and Inequality 7 assumes entry is guaranteed for retailer j. These differ because entry is not guaranteed at each location. With regards to commitment, a landlord commits to implicit exclusive dealing without an explicit contract when $E_{\boldsymbol{l}_{-j}}[\bar{\pi}_{jmN}]$ is close to $E_{\boldsymbol{l}_{-j}}[\bar{\pi}_{jmE}]$.[22] In fact, the landlord may be most profitable when it can credibly commit to not rent to nearby competitors, because it raises the probability of the large retailer choosing its location. With regards to information asymmetry, retailers choose the exclusive dealing contract when they benefit more from exclusive dealing, due in part to

[21] Reducing information asymmetry is important to landlords: many landlords estimate demand for the shopping center by sitting in parking lot and counting customers, while more sophisticated landlords try to reduce information asymmetry by requesting sales data as part of the lease contract. However, while retailers are good at forecasting their own demand (according to industry professionals), there is still significant information asymmetry especially before the contract is signed.

[22] A landlord may not be able to credibly commit to not renting to competitors in stage 3 when there are large fixed costs of entry. When expected retailer profits are similar regardless of the exclusive dealing status, this indicates that the landlord does not to rent to nearby competitors that will significantly reduce observed variable profits. A landlord can credibly commit to a decision when it maximizes its own profits and there are no incentives to deviate once a large retailer enters.

higher θ_j. In the case of partially unobserved profits, landlords can use exclusive dealing as a screen to differentiate between retailers that are more or less sensitive to competition. Finally, exclusive dealing may benefit retailers as the higher-priced contract may increase the probability of entry to a location, $\bar{\mathbb{P}}_{jmE} - \bar{\mathbb{P}}_{jmN}$, which can be additionally be beneficial, for example, when the location is a particularly good match or for high draws of $\epsilon_{jm} - \epsilon_{j0}$.

Following discussions with industry practitioners, the exclusive dealing contract in the model blocks the set of retailers that reduce observed expected variable profits from entering their property. Specifically, the set of retailers blocked by an exclusive dealing contract from retailer j at location m is determined as follows: (1) observed expected variable profits for retailer j are computed assuming retailer j enters location m and taking all other existing locations as given and (2) observed expected variable profits for retailer j are computed assuming retailer j enters location m and retailer k opens a nearby property owned by the same landlord. The set of retailers that could feasibly co-locate with retailer j in landlord m's property and for which profits under (1) are greater than profits under (2) are the set of retailers blocked by the exclusive dealing contract.

The model pairs important aspects of the commercial real estate market (such as prices, exclusive dealing, landlords, and exact potential locations) with more traditional factors which are thought to determine the retailer entry game (such as business stealing, fixed costs of entry, variable profits) which are prevalent in a long literature in industrial organization on retailer entry and location choice.[23]

[23] A long entry literature goes back to Hotelling (1929) and Salop (1979). In Bresnahan and Reiss (1990) and Bresnahan and Reiss (1991), firms play an complete-information entry game where the equilibrium outcome is retailer entry. Important is determining entry when limited demand means not all retailers can profitably enter. In contrast, in this setting, large retailer entry drives demand to nearby locations, effectively expanding the market and facilitating entry of smaller firms – a location that could not previously accommodate a smaller retailer may accommodate the small retailer once a large retailer enters. This paper follows Seim (2006), modeling the retailer location choice as a static model of incomplete information where firms enter simultaneously, and the Bayesian Nash equilibrium is determined by firm's beliefs over competitors strategies. This paper also follows the literature on (especially) chain location choice, incorporating agglomeration and business stealing (Jia (2008), Holmes (2011), Vitorino (2012), Nishida (2015)). Vitorino (2012) and Vitali (2022) consider the problem where locations with multiple retailers are popular because of agglomeration economies and reduced search cost. Incorporating the extant literature on shopping-mall externalities, in this paper, store co-location is driven by complementarities from the consumer demand; consumers shop at locations with multiple stores when they trip chain and to minimize the total distance of a trip. The model also allows large retailers to choose multiple locations simultaneously (the combinatorial discrete choice problem has been studied by Jia (2008), Nishida (2015), Arkolakis et al. (2023), Yang (2023)); the traditionally computationally-intensive combinatorial discrete problem is reduced to a few choices by collecting data on landlord locations – in the data, few landlords can accommodate a large retailer.

This paper adds several new elements to entry models. First, modeling the retailer choice problem over exact location allows granular variation of consumer demand and retailer's precise location targeting. As a result of new data, retailers pick an exact latitude and longitude to enter, which allows them to precisely

Small retailers (Stage 3): Once the large retailers have entered, the smaller and often co-locating retailers enter. These retailers are in the categories of other food, drug stores, liquor stores, dollar stores, and other stores. Landlords set a single price for all small retailers. There is no exclusive dealing, and when multiple retailers approach, entry is determined at random. These assumptions reflect the large number of potential locations available to these retailers and the few exclusive dealing contracts signed in this market.

In each market, potential entrants choose locations. Each small retailer k's location choice is determined by the probability that the firm will enter that location $\bar{\mathbb{P}}_{km}$ and the expected profits conditional on entry

$$\max_{m} \bar{\mathbb{P}}_{km} \left(E[\bar{\pi}_{km}] - r_m^{small} - F_m^{small} + \epsilon_{km} - \epsilon_{k0} \right) \tag{8}$$

where expected profits conditional on entry depend on expected variable profits, $E[\bar{\pi}_{km}]$ from Equation 3, the rents, r_m^{small}, the fixed cost of entry, F_m^{small}, and the probability of winning entry, $\bar{\mathbb{P}}_{km}$.[24] An exclusive dealing contract that forbids a type of retailer from entering a location limits the choice set of the retailer.

Due to complementarities, large, popular retailers can facilitate the entry of smaller retailers (Benjamin et al. (1992), Brueckner (1993), Konishi and Sandfort (2003), Burayidi and Yoo (2021), Evensen et al. (2024), Liu et al. (2024)) by effectively expand the market at nearby locations. Specifically, small retailer expected variable profits $\bar{\pi}_{km}$ depend on the actions of large retailers, $\boldsymbol{a}_{jm}$. When it is more profitable for small retailers to enter alongside large

target locations based on granular estimates of local demand. This is in contrast to previous work that measure entry at more coarse level such as neighborhood, MSA, or county (for example, in retail, Seim (2006), Jia (2008), Holmes (2011), Vitorino (2012), Nishida (2015), Vitali (2022), Caoui et al. (2022)) In doing so, introducing the landlord, rental prices, and exclusive dealing contracts allows us to endogenize the contract, local retail competition, and capacity constraints. Second, with regard to the entry literature in commercial real estate, this paper focuses first and foremost on exclusive dealing. Moszkowski and Stackman (2022) models a dynamic problem of retailer entry and exit for retailers that are tied to a specific location and rent a property for a relatively short amount of time ($<$ 10 years), focusing on the option value of waiting to rent (landlords) or leaving early (retailers) driven by the idiosyncratic landlord-retailer match. This paper focuses on the segment of the commercial real estate market where exclusive dealing is most prevalent, specifically, retail chains that simultaneously compete for the same locations) and make long-term entry decisions ($>$ 10 years). The mechanism is a need for commitment and an information asymmetry between retailer and landlord. Third, with regard to consumer demand, the model allows the estimation of within-trip complementarities between different retailers which leads to consumers' trip chaining and retailers' co-locating: complementarities leads to a different distribution of firms.

[24] The probability of winning entry is 1 / the number of firms that approach.

retailers, there is a positive "foot traffic externality" in retail.

The Bayesian Nash equilibrium from the smaller retailers is determined by the set of prices landlords set for each store type and the probability a location is chosen by each store type.

5.4 Landlord problem (Stage 1)

Each landlord is assumed to have a limited amount of space (square footage) at a certain location (latitude, longitude). The landlord is assumed to be flexible in terms of which stores it can rent to, but cannot add additional square footage to its lot. For example, the owner of a shopping mall (a typical landlord location) with 100,000 square feet can rent to one Walmart (which is also around 100,000 square feet), or a Safeway, a large other store, and a small other store (each 40,000 square feet, 40,000 square feet, and 20,000 square feet, respectively), or any other combination of retailers that sum to the total capacity of the space.

Each landlord m sets two prices – an exclusive (E) and a non-exclusive (N) price – for each large retailer j: r_{jma}. The landlord balances the probability of a retailer approaching (attempting to enter) with revenue from the entering retailer, including revenue from small retailers

$$\max_{r_{jma}} \sum_{j,a} \underbrace{\mathbb{P}_{jma}}_{\text{prob. choice}} \underbrace{\bar{\mathbb{P}}_{jma}}_{\text{prob. win}} (\underbrace{r_{jma} - mc_m}_{\text{large retailer}}) + \underbrace{E_{\boldsymbol{l_j}}[\pi_m^{small}(\boldsymbol{a_{jm}})]}_{\substack{\text{exp. profits} \\ \text{small retailers}}}$$

where the landlord's profit are the probability-weighted sum of the profits from each retailer entering successfully with contract $a \in \{\text{exclusive, non-exclusive}\}$. The profit depends on the probability large retailer j approaches and wins entry with contract a, $\mathbb{P}_{jma}\bar{\mathbb{P}}_{jma}$, rents, r_{jma}, landlord marginal costs, mc_m, expected profits from the small retailer market, $\pi_m^{small}(a_j)$ which depend on large retailer entry and contracts $\boldsymbol{a_{jm}}$ from retailer j at location m. For example, without any large retailer, the landlord profits $\pi_m^{small}(a = \emptyset)$, where $\vec{O}$ indicates that no large retailers entry.

The landlord has incentives to maximize demand for its property (often a shopping center), and seeks complementary retailers to enter to property. In a full information setting, the

landlord can determine the combination of retailers that maximize total surplus and offer rents accordingly. Absent information on retailer profitability, the exclusive dealing contract mitigates some of the information asymmetry.

For the small retailers, landlords set prices balancing the probability of entry, s_m, with revenues given entry, $r_m^{small} - mc_m^{small}$. The landlord's profits from the small retailer market are

$$\max_{r_m^{small}} \underbrace{\left(s_m^{drug} + s_m^{dollar} + s_m^{liquor} + s_m^{\text{other food}} + s_m^{other}\right)\left(r_m^{small} - mc_m^{small}\right)}_{\pi_m^{small}}$$

Retailers limited from entering due to an exclusive dealing contract and retailers that are too large are not considered as potential entrants by the landlord.

Thus full Bayesian Nash equilibrium is the set of prices, rents and contracts, shares in the product market, shares in the co-locating market, probability of choosing a location (in the real estate market) such that households optimize, retailers and landlords maximize profits. The rents and contracts set according to profit maximization; the first order conditions of the profit function for the retailers (in the product market) or the landlords (in the retail real estate market) are consistent with the demand and shares probabilities at these prices.

6 Estimation and Identification

6.1 Estimation and Identification of the Product Market Parameters

We identify and estimate household following **?**, **?**, and **?**. Specifically, construct the likelihood of each household choosing retailers b on a particular day,

$$\mathcal{L}(b|\theta) = \prod_i \prod_b \underbrace{1\{b_i\}}_{i \text{ chooses } b} \underbrace{\frac{e^{\delta_b + \gamma d_{ib}^g + \phi_i + \sum_{k(b),l} \sigma_{k(b)l(i)} X_{k(')} y_{l(i)}}}{1 + \sum_{b'} e^{\delta_{b't} + \gamma d_{ib'} + \phi_i + \sum_{k(b'),l} \sigma_{k(b')l(i)} X_{k(b')} y_{l(i)}}}}_{\text{prob. } i \text{ chooses } b}$$

Using the probability the households choose a set of retailers to shop at, we construct the likelihood of observing bundle b for the household and identify the parameters in the consumer demand model in two steps following Berry et al. (1995), Berry et al. (2004), Bayer et al. (2007). The likelihood of observing bundle b is

where the mean utility, δ_b^g, is $\delta_b^g = -\alpha P_b^g + \Gamma_b + \xi_b + u_b$ and the mean utility of the outside good is $\delta_0 = 0$. On each shopping trip, the household chooses bundle b among all the other alternatives, indexed by b'.

Given that we observe store choices at the trip level, we estimate household's preference parameters in two steps following Berry et al. (1995), Berry et al. (2004), Bayer et al. (2007)).

Parameters are identified from variation in observable characteristics and trip frequency. Prices are likely correlated with unobservable retailer quality and market demand shocks that bias estimates upwards. Following Hausman et al. (1994), we instrument prices with the average prices of goods in other markets. The intuition for the validity of this instrument is that prices in other markets picks up common retailer costs across markets but does not reflect unobserved demand shocks.

Distances are measured as the total length of the trip: home and back when the household shops at a single retailer, and home - store 1 - store 2 - home when the household stops at two retailers. Like prices, distances are also endogenous: households choose locations based on amenities and retailers choose locations based on where households are located. We address the distance endogeneity by controlling for household zip5. After controlling for zipcode fixed effects, the distance preference parameter is identified using variation of travel distance *within* zipcode.[25]

The complementarity term, Γ_b, is defined as the additional utility of shopping at two stores together in the same day, or as the additional utility of making a single trip to both stores (controlling for total trip distance). The higher the value of Γ_b, the greater the complemen-

[25] As robustness, we use Chicago area instead of zip code.

tarity between two retailers relative to the outside good. We estimate the complementarity term using bundle fixed effects in the second step instrumental variable regression. The mean utilities are determined by the likelihood of shopping at each retailer or each retailer pair relative to the outside good.

One challenge in identifying the complementarity term is that the complementarity term may be identifying preference for shopping in a shopping center or that tastes are correlated across nearby retailers: that shopping at one retailer leads to shopping at another retailer. To address this form of endogeneity, we directly control for whether retailers are co-located. The identifying assumption is that spillovers across retailers are in large part local (the literature finds that spillovers are between 0-.2 miles, roughly the shopping mall distance). Additionally, controlling for co-locating stores controls for preferences for shopping at a shopping center.[26]

Estimated of preference heterogeneity by income over price and distance are reported in Table 3. Results from the estimation show that consumers dislike paying higher prices and traveling longer distances. Moreover, our results also show that price elasticities/sensitivity are negatively correlated with household income.

and that low-income consumers are the most elastic with respect to price, while high-income consumers are the most inelastic with respect to price. The price coefficient is interpreted as the disutility of a 1% increase in retail prices. Estimates imply that each income group is willing to travel only an additional .007, .005, and .003 mi to for a 1% price increase at a retailer half a mile away.

[26] Additionally, the demand specification includes further controls that interact household demographics with retailer characteristics. The identifying assumption is that further controls – such as household income, education, unemployment status, ethnicity, as well as the interaction of these terms with distance fully control for the relevant variables that determine shopping patterns.

Table 3: Price and Distance Demand Estimates

	Estimates by Income Group		
Variable	Low	Middle	High
α^g (price)	-1.569^{***}	-1.262^{***}	-1.001^{***}
	(0.156)	(0.325)	(0.248)
γ^g (distance) (mi)	-2.22^{***}	-2.58^{***}	-3.03^{***}
	(0.394)	(0.391)	(0.559)

Source: Numerator, Chicago, 2017-2022. Standard errors are constructed by bootstrapping a 1,000 times.

Figures 43 reports the complementarity terms across stores, Γ_b, showing a large heterogeneity in complementarities across retailers. Negative estimates indicate that the two goods are relatively close substitutes, or the least preferred combinations for consumers. For example, consumers' least preferred shopping combination is Safeway and drug stores together, likely because Safeway has its own pharmacy and sells almost all products available at the drug store. Similarly, consumers are less likely to shop at Safeway and Aldi together, two grocers, or at dollar stores and Aldi together. Consumers are relatively more likely to shop at Safeway and dollar stores together, or at drug stores and Aldi together.

Figure 27 plots the fraction of addresses with exclusive dealing contracts overlayed with the complementarity estimates. For example, Safeway (Jewel Osco), Whole Foods, and Aldi all block grocers. Stores with positive complementarites are blocked less often, an example of which is Safeway vs liquor stores vs Whole Foods and Liquor Stores.

6.2 Estimation and Identification of the Retail Real Estate Market Parameters

This section covers the identification and estimation of the marginal costs, fixed costs, and asymmetric information parameters in the commercial real estate market. We estimate the model using simulated method of moments. We estimate the landlord and retailer parameters jointly because we observe only the rent for the contract and retailer that enter. We identify the parameters by matching micro moments in the retailer location choice data and landlord problem.

In each market, we observe data on potential locations, retailer entry and exit, lease prices (rents) and exclusive dealing contracts. At each potential new location we observe square footage and the possibility for co-locating firms. In the data, there are typically between zero and five potential locations in each market. We observe retailer entry, retailer exit, parent company and retailer sizes, the later of which allows us to construct the retailer's choice set. We assume that parent companies can make entry and exit decisions for any brands of retailers they own; we consider the location choice at the parent level. We group retailers from the demand estimation by their size and ownership in Table 8,[27] and use the size and ownership to guide where the retailers can enter and which parent company chooses locations. Additionally, we assume that there are other retailers – other and outside food – and include them as other potential entrants in the market. These other retailers are less frequently shopped at. From the demand estimates, we compute the expected profitability of each possible combination of locations.

The moments of the distribution of the asymmetric information parameter, θ_j, are identified by the score of the log likelihood function, as are the fixed costs of entry F_m. The distribution and likelihood function are determined by the distribution of ϵ_{jm} and θ_j. While the realizations of ϵ_{jm} and θ_j are unknown to the landlord, the landlord does know the distribution. The distributions of $(\epsilon_{jm}, \theta_j)$ ar assumed to be independent, $\epsilon_{jm} \sim N(0,1)$ and $\theta_j \sim N(\mu_\theta, \sigma_\theta^2)$. We assume that $\theta_j \sim N(\mu_\theta, \sigma_\theta^2)$ and identify parameters μ_θ and σ_θ^2. The private information is therefore a random coefficient term on the firm's profitability. Similarly, the landlord's marginal cost are computed by taking the first order condition of the profit function. We use the observed rents and marginal costs to compute the remaining costs.

The model-implied likelihood of observing firm entry and the landlord's first order conditions are

$$\log L = \underbrace{\sum_{t}}_{markets} \underbrace{\sum_{j}}_{firms} \log\left(\sum_{\boldsymbol{l_j} \text{ feasible}} \mathbb{P}_j(\boldsymbol{l_j}) \right)$$

[27] Grocery chain exit is rare: as shown in Figure 19, 70% of grocery chain stores that have opened since 1990 have remained open to present day. Since it is so rare, we don't explicitly model the exit choice.

$$[\text{foc: } r_{kmb}] \sum_{j,a} \left(r_{jma} - mc_m + \pi_m^2(a_j) - \pi_m^2(O) \right) \left(\frac{d\bar{\mathbb{P}}_{jma}}{dr_{kmb}} \mathbb{P}_{jma} + \frac{d\mathbb{P}_{jma}}{dr_{kmb}} \bar{\mathbb{P}}_{jma} \right) + \bar{\mathbb{P}}_{knb} \mathbb{P}_{knb} = 0$$

$$mc_m = \frac{\bar{\mathbb{P}}_{knb} \mathbb{P}_{knb} + \sum_{j,a} \left(r_{jma} + \pi_m^2(a_j) - \pi_m^2(O_j) \right) \left(\frac{d\bar{\mathbb{P}}_{jma}}{dr_{kmb}} \mathbb{P}_{jma} + \frac{d\mathbb{P}_{jma}}{dr_{kmb}} \bar{\mathbb{P}}_{jma} \right)}{\sum_{j,a} \left(\frac{d\bar{\mathbb{P}}_{jma}}{dr_{kmb}} \mathbb{P}_{jma} + \frac{d\mathbb{P}_{jma}}{dr_{kmb}} \bar{\mathbb{P}}_{jma} \right)}$$

We assume $\theta_{aj} \sim N(\mu_\theta, \sigma_\theta^2), \epsilon_{jm} \sim N(0,1)$. The likelihood and landlord first order condition are:

We estimate the model with simulated method of moments, comparing model in the simulated model to the data. Marginal costs are computed at the same time as fixed costs and asymmetry parameters, because the marginal costs are needed to compute the unobserved rents, the rents the landlords set for the other tenants and for the contract not taken. For any given value of parameters, we compute an inner loop to solve for optimal rents and an inner-inner loop to solve for tenant probabilities within optimal rents. While Bayesian Nash equilibrium and the landlord market will shrink the possible set of equilibria, one challenge in the entry literature and in this paper is addressing the multiple equilibria possible in model. To address this, we test for multiple equilibria by trying many starting points and find similar results in terms of the probabilities of entry and the rents.

Note, the marginal costs are the cost per square foot, and don't vary across product sold (or store leased to), because the stores are leasing the same space. This gives us the marginal costs, which we can then plug into the other first order conditions to compute the rents and whether or not the firm is offering one or two prices. That is, the first order condition for the observed rents give the marginal costs, the first order conditions for the other rents give the remaining other optimal rents. This setting is similar to multi-product firms but in that case the full vector of prices is observable and the first order condition recovers the full set of marginal costs; here, there is a single marginal cost and a single observable rent, and the first order condition (conduct assumption) recovers the remaining unobservable rents.

Results for the fixed costs and marginal costs for the retailer and co-locating markets are shown in Figures 44- 45. The estimates show that fixed costs vary between 10 and 50 dollars per square foot for year, and the average cost of opening a new retail store front for a 3,000

sqft store is around 50,000$, which is in line with industry estimates. Marginal costs are low, and average around 13$ per square food, or approximately half of the average rent. Marginal and fixed costs (per square foot) are similar in the retailer market as the co-locating market. We find that the mean of the information asymmetry parameter is 3.2$ per square foot per year, and the variance is 1$ per square foot per year. For the average retailer which pays around 20% in rent for each square foot and year, the exclusivity contract increases profits by 15% of rent.

7 Effects of Exclusive Dealing

7.1 Effect of Exclusive Dealing on Retailers and Landlords

With the estimated parameters, we compute counterfactual prices and entry probabilities limiting the landlords to set one price and banning explicit exclusive dealing – there is one contract (that cannot explicitly block other stores) and there is only one price for each contract. This ban on exclusive dealing is thus a ban on explicit exclusive dealing; both landlord and large retailer can commit to not renting to competitors, resulting in an implicit exclusive dealing agreement. We recompute the equilibrium separately for each market.

Counterfactual results show that exclusive dealing contracts encourage entry in Chicago. Table 4 shows the difference in entry probabilities for retailers in each geographic area, averaged over retailers and over years. The results show that in all areas except West Cook County, exclusive dealing increases the probability of entry for (large) retailers. The effect is most pronounced in the poorest and least population dense market, South Chicago, where probability of entry goes from 10% to 0% without exclusive dealing. The interpretation is that exclusive dealing contracts are necessary to ensure entry in the most under-served markets. Suburban areas see the second largest drop in probability of entry in the counterfactual without exclusive dealing. This is likely explained by the retail environment of suburban neighborhoods: suburban areas tend to have a few shopping malls surrounded by many houses, and when the shopping mall is often owned by a single landlord, there are relatively few locations. Without the exclusive contract, the probability of competitor entry decreases the probability of retailers entering in the first place. Finally, the central business district (CBD) and North Chicago have the lowest difference in entry without exclusive dealing. These neighborhoods are dense both in terms of retail and population, and retail often exists in stand alone locations. As a result, the exclusive dealing contracts were least

effective in these neighborhoods, and so the difference is relatively small.

Table 4: Entry Probabilities by Geography for Large Retailers

Geographic Area	Difference (Percentage Points)	Counterfactual Percent	Observed Percent
West Cook County	9.61	16.7	7.09
North Chicago	-6.91	8.76	15.7
CBD	-6.96	15.8	22.8
North Suburban	-8.97	3.09	12.1
Northwest Suburban	-9.95	13.8	23.7
South Chicago	-10.0	0.00	10.0

Notes: Counterfactual: average probability of a particular retailer entry into a market, under the current pricing (Observed) and counterfactual pricing (Counterfactual). Table shows Counterfactual - Observed.

Following entry, all major grocery stores reduce entry probabilities in each market. Table 5 shows difference in entry probabilities (computed in percentage points) and difference in profits (computed in percent) for each major retailer and each major co-locating store industry. Big Box stores Costco and Walmart have both a large loss in profits and also decrease the probability of entry substantially. The retailers' change in entry strategy is not able to offset the loss in profits from competing retailers entering nearby. In fact, in the case of large retailers such as big box stores – Costco, Walmart, Target –, the landlord is already likely internalizing the spillovers to nearby stores. Since, as shown in Figure 4, big box store rents are already quite low (relative to marginal costs) for in the observed equilibrium, a counterfactual without exclusive dealing results in fewer big box stores and fewer profits. The decline in profits is likely due to the fact that the landlord cannot commit to an implicit exclusive dealing contract. In contrast, retailers like Jewel Osco (Safeway), Mariano's (Kroger), and Aldi, are able on average to change retail entry strategies to mitigate the loss in profits. These grocers enter less and change which locations they enter in response to the exclusive dealing ban. Co-locating stores see have slightly higher profits and increase their probability of entry when exclusive dealing is banned. These retailers benefit from a counterfactual world where landlords cannot contract on exclusivity. The intuition is that in locations where retailers enter, the co-locating stores will enter as well. In locations where retailers no longer enter, there still may be some demand for the smaller and cheaper co-locating stores.

The percentage change in landlord profitability is shown in Table 6. The effects of a ban on exclusive dealing are heterogeneous across landlords, but most landlords benefit from

Table 5: Counterfactual Profitability and Probabilities by Retailer

Store Names	Diff. Prob. Entry Percentage Points	Profits Percent Change
Costco	-10.0	-6.01
Walmart	-10.0	-6.17
Whole Foods	-7.82	-7.24
Target	-7.41	-13.1
Jewel	-7.36	0.139
Mariano's	-7.34	-0.459
Aldi	-6.05	-0.513
Drug	3.01	.048
Liquor	5.43	1.34
Dollar	8.23	2.85

Notes: Counterfactual: average change in probability of entry into a market for each retailer across all markets, as well as average percent change in profits for retailers, averaged across each markets. Table shows Counterfactual - Observed.

exclusive dealing, with only 8% of landlords see profits increase as a result of a ban on exclusive dealing. The intuition, thus, is that the exclusive dealing contract allows landlords to monetize their properties.

Table 6: Counterfactual Profitability For Landlords (Percent)

Quantile	5th	25th	50th	75th	95th
	-.095	-.090	-.087	-.086	.041

Notes: Counterfactual: average percent change in profits for landlords, averaged across each markets. Table shows Counterfactual - Observed.

7.2 Effect of Exclusive Dealing on Consumers

Consumer surplus is measured as the compensating variation, the compensation required for a household in the observable world to be indifferent with the distribution of retail location and prices in the counterfactual world (no exclusive dealing). Specifically, we compute

$$\mathbb{E}_{\epsilon_{ib}}\left[CV_i\right] = \frac{1}{I}\sum_i \left(\frac{1}{\alpha^g}\left[\ln\left(\sum_{b\in\mathcal{B}}\exp\left(u_{ib}(P_b^0, d_{ib}^0, \phi)\right)\right) - \ln\left(\sum_{b\in\mathcal{B}}\exp\left(u_{ib}(P_b^{cf}, d_{ib}^{cf}, \phi)\right)\right)\right]\right) \tag{9}$$

where u_{ib} is the utility from Equation 1 and ϕ are all the other non-price and non-distance parameters that are assumed to remain unchanged in the counterfactual where 0 denotes the observed world and cf denotes the counterfactual. $\mathcal{B}$ are the set of bundles computed in the demand estimation.

Table 7: Consumer Welfare

Geography	% Change in CV
CBD	.911
North Chicago	.799
Northwest Suburban	.555
North Suburban	-.330
West Cook County	-.645
South Chicago	-.754

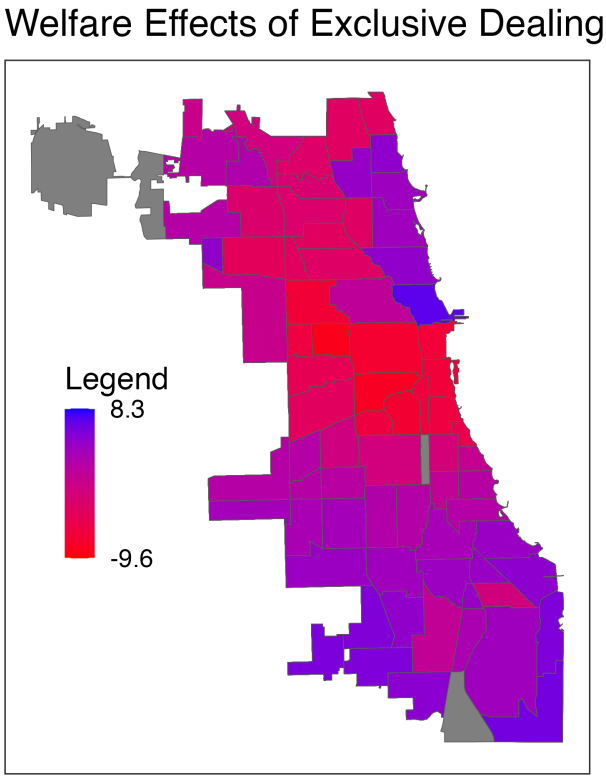
Notes: Average compensating variation across all households, weighting each household equally. Counterfactual - Observed.

Table 7 shows the welfare effects of exclusive dealing in each market in Chicago, computed as the percent change from year to year, holding the market fixed. In the table, a positive value indicates that welfare is higher in the counterfactual than the observed data.

This distribution masks heterogeneity at the neighborhood level, as well as the long run effects of banning exclusive dealing. To explore the welfare effects in more spatial detail, we compute the welfare effects for a representative household living at the center of a census tract in Chicago. We can then compute the average welfare effect for each Chicago area (e.g., a large neighborhood). To understand the long-run effects of an exclusive dealing ban, we set a baseline year for 2000, and compute the aggregate effects of exclusive dealing for each household in each census tract, updating from year to year and using the estimated probabilities from the previous section; the outputs of one year's counterfactuals are the existing locations to the next year's counterfactuals. Additionally, we assume that 10% of chain grocers exit every 20 years, in order to account for exit as well. We then plot the observed reality today subtracted from the counterfactual welfare over a period of 20 years.

We show the long run effects of an exclusive dealing ban across Chicago in Figure 8. Variation in the consumer welfare is a result of variation in the distances to retailers, prices that change for each income group, and consumer demographics. The effects vary within and across neighborhoods, with the most negative effects of exclusive dealing in Chicago in wealthier areas around the downtown, and the most positive effects of exclusive dealing in South Chicago, an undeserved area. Key to the effect is that in South Chicago, there is essentially

Figure 8: Gain in Consumer Welfare From Exclusive Dealing



Notes: Plot shows the average long-run welfare effects across households in different Chicago areas, observed - counterfactual. The map restricts to areas in the city of Chicago. The plot shows that exclusive dealing is welfare-improving in the lowest-income areas (towards the bottom of the map), as well as directly north of the central business district, and welfare decreasing in the central business district.

no entry and there is some exit, which eventually leads to food deserts. In a back-of-the-envelope calculation, we find that the percentage of people living in food deserts would increase by 10-15 percentage points as a result of a total long-run ban on exclusive dealing.

8 Conclusion

This paper is the first to establish the prevalence of exclusive dealing contracts, their effects on consumer welfare and firm profitability, as well as their distributional effects on both consumers and firms. To do so, we document the prevalence of exclusive dealing contracts using data scraped from publicly available leases and deeds. We then provide descriptive evidence for how exclusive dealing is correlated with prices, retail density, and consumer purchases. To quantify the underlying mechanisms, we endogenize exclusive dealing contracts in a model with landlords, retailers, and consumers. This framework enables a counterfactual analysis where landlords and retailers cannot explicitly contract on exclusivity. The counterfactual analysis allows us to understand how exclusive dealing contracts affect where retailers locate, how consumers shop, consumer welfare, and how goods and rental prices are set.

To do so, we focus on Chicago and a specific type of exclusive dealing which exist to protect the business interest of retailers. We find that these exclusive dealing contracts ban a retailer's competitors within .2 miles – approximately a shopping mall – and limit local spillovers across certain types of retailers. While it is clear that the retailer may benefit from limiting nearby competition, we show that landlords also benefit from exclusive dealing by extracting additional rents from the retailer and increasing the probability of retailer entry on their property. In signing the exclusive dealing contract, the retailer and landlord may prevent additional efficient entrants from entering the co-locating property, notably, dollar stores and drug stores, which may decrease consumer surplus.

We find that the welfare effects are heterogeneous across locations, and is most beneficial for consumers living in sparse retail environments. We also find that the profitability of exclusive dealing is heterogeneous across location, and varies both across landlords and store types, with 8% of landlords, dollar stores, and drug stores benefiting from a total ban on exclusive dealing, but large big box retailers and most landlords losing the most. Retailers that suffer the most from are retailers where the landlords already internalized the spillover effects from the retailer onto neighboring properties, and already set low rents even when they can contract on exclusivity.

This paper makes three conceptual points that are relevant for policy. First, the paper studies a type of non-compete in the land market, highlighting the heterogeneous effects on welfare and profitability. Second, the paper contributes to the policy debate on government intervention in local retail markets, in particular, government intervention which attempts to increase food access for under-served households or pay retailers to encourage entry to revitalize a neighborhood. This paper highlights the role of the landlord, in particular, that the landlord already internalizes some of the benefits and spillovers of retailer entry. Third, this paper highlights the role of exclusive dealing in limiting the creation of food deserts.

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A Model Appendix

A.1 Equilibrium

The equilibrium is characterized by the prices set by landlords in the commercial real estate market, the probability retailers will choose each location, and the prices and share in the product market.

Shares for large retailers in the product market:

$$s_j = \underbrace{\sum_i \omega_i}_{\substack{\text{CBG,} \\ \text{demographics}}} \underbrace{\sum_{j'=1}^{J}}_{\text{retailers}} \underbrace{\frac{e^{-\alpha P_{jj'}+\xi_{jj'}+\Gamma_{jj'}+\gamma d_{ijj'}+\sum \boldsymbol{\sigma} X_{jj'} y_i}}{1+\sum_{j,j'} e^{-\alpha P_{jj'}+\xi_{jj'}+\Gamma_{jj'}+\gamma d_{ijj'}+\sum \boldsymbol{\sigma} X_{jj'} y_i}}}_{\substack{i\text{'s share of shopping at } j \text{ and } j' \text{ together} \\ \text{for } j'=j,\ i \text{ shops at } j \text{ alone}}}$$

$$s_j^g = \underbrace{\sum_{i' \in g} \omega_{i'}^g}_{\text{CBG}} \underbrace{\sum_{j'=1}^{J}}_{\text{retailers}} \underbrace{\frac{e^{-\alpha P_{jj'}+\xi_{jj'}+\Gamma_{jj'}+\gamma d_{i'jj'}+\sum \boldsymbol{\sigma} X_{jj'} y_{i'}}}{1+\sum_{j,j'} e^{-\alpha P_{jj'}+\xi_{jj'}+\Gamma_{jj'}+\gamma d_{i'jj'}+\sum \boldsymbol{\sigma} X_{jj'} y_{i'}}}}_{\substack{i\text{'s share of shopping at } j \text{ and } j' \text{ together} \\ \text{for } j'=j,\ i \text{ shops at } j \text{ alone}}}$$

where s_j is the share of retailer j and s_j^g is the share of retailer j within income group g. Households are assumed to live in the center of a census block group *cbg* with demographics g, indexed by $i = (cbg, demographics_i)$. Then, ω_i is the fraction of the total population of Chicago who live in i's census block group with a specific income group. Retailer j's share is weighted sum of each household's total probability of shopping at any bundle that includes retailer j. $P_{jj'}$ is the expenditure-weighted sum of prices from both stores, $P_{jj'} = \phi_{jj'} P_j + (1-\phi_{jj'}) P_{j'}$, where $\phi_{jj'}$ is the fraction of expenditure spent on store j across all trips to j and j' together. When a household shops at a single store, $P_{jj'} = P_j, \phi_{jj'} = 1$. $\Gamma_{jj'}$ are the within-trip complementarities of shopping at jj' together or when $j = j'$, shopping at j alone, relative to the outside good. $d_{ijj'}$ is the minimum distance from a household located at i to travel from home to retailer j, retailer j', and back to home. $X_{jj'} y_i$ are the remaining terms, the interaction terms between retailer characteristics and household characteristics. For household characteristics, we use employment status, household size, ethnicity, education. For store characteristics, we use distance to the retailer and both distance and price as robustness. Additionally, household zip5 is included as a control for household heterogeneity across zip5. The assumption is that within zip5, sorting is random with respect to distance to retailers. $\xi_{jj'}$ is a market-level demand shock or quality of shopping at j and j' together.

Coefficients $\alpha, \gamma, \boldsymbol{\sigma}$ are the coefficients on their respective shocks. The functional form for the shares result form the T1EV assumption of the ϵ_{ib} shock.

The total shares for small retailer store types in the product market:

$$s_j = \underbrace{\sum_i \omega_i}_{\substack{\text{CBG,} \\ \text{demographics}}} \underbrace{\sum_{j'=1}^{J}}_{\text{retailers}} \underbrace{\frac{e^{-\alpha P_{jj'} + \xi_{jj'} + \Gamma_{jj'} + \gamma d_{ijj'} + \sum \boldsymbol{\sigma} X_{jj'} y_i}}{1 + \sum_{j,j'} e^{-\alpha P_{jj'} + \xi_{jj'} + \Gamma_{jj'} + \gamma d_{ijj'} + \sum \boldsymbol{\sigma} X_{jj'} y_i}}}_{\substack{i\text{'s share of shopping at } j \text{ and } j' \text{ together} \\ \text{for } j'=j,\ i \text{ shops at } j \text{ alone}}}$$

$$s_j^g = \underbrace{\sum_{i' \in g} \omega_{i'}^g}_{\text{CBG}} \underbrace{\sum_{j'=1}^{J}}_{\text{retailers}} \underbrace{\frac{e^{-\alpha P_{jj'} + \xi_{jj'} + \Gamma_{jj'} + \gamma d_{i'jj'} + \sum \boldsymbol{\sigma} X_{jj'} y_{i'}}}{1 + \sum_{j,j'} e^{-\alpha P_{jj'} + \xi_{jj'} + \Gamma_{jj'} + \gamma d_{i'jj'} + \sum \boldsymbol{\sigma} X_{jj'} y_{i'}}}}_{\substack{i\text{'s share of shopping at } j \text{ and } j' \text{ together} \\ \text{for } j'=j,\ i \text{ shops at } j \text{ alone}}}$$

The total share for smaller retailers, s_j, is the total share summed over all dollar stores (when j are dollar stores), or all drug stores (when j are drug stores), or all liquor stores (when j are liquor stores), or all other food stores (when j are other food stores), or all other stores (when j are other stores). The total shares is the sum of shares over each location from that store type.

The share for each small retailer in the product market:

$$s_k = \underbrace{\sum_i \omega_i}_{\substack{\text{CBG,} \\ \text{demographics}}} \underbrace{\sum_{j'=1}^{J}}_{\text{retailers}} 1\{d_{ik} = \min_{\tilde{k} \in j} d_{i\tilde{k}j'}\} \underbrace{\frac{e^{-\alpha P_{jj'} + \xi_{jj'} + \Gamma_{jj'} + \gamma d_{ijj'} + \sum \boldsymbol{\sigma} X_{jj'} y_i}}{1 + \sum_{j,j'} e^{-\alpha P_{jj'} + \xi_{jj'} + \Gamma_{jj'} + \gamma d_{ijj'} + \sum \boldsymbol{\sigma} X_{jj'} y_i}}}_{\substack{i\text{'s share of shopping at } j \text{ and } j' \text{ together} \\ \text{for } j'=j,\ i \text{ shops at } j \text{ alone}}}$$

The share for an individual smaller store is s_k, where k is an individual store and j is the retailer or store type (e.g. k is a liquor store and j is the liquor store category). $\tilde{k}$ are the stores that comprise retailer j. Since households take the shortest distance trip, store k's customers are the set of households whose shortest distance trips include store k.

Prices in the product market for large and small retailers:

$$p_j^g = mc_j^g + \left[\frac{\partial s_j^g}{\partial p_j^g}\right]^{-1} s_j^g - \frac{\partial s_j^g}{\partial p_j^g}$$

Both large and small retailers j listed in Table 2 set a unique price for each income group g taking into account total shares and marginal costs. For example, Safeway sets prices $p^g_{safeway}$ for income group g based on a marginal cost $mc^g_{safeway}$ and the share equation $s^g_{safeway}$. Similarly, all dollar stores set the same price p^g_{dollar} as a function of the total shares to all dollar stores s^g_{dollar} and the marginal costs which are assumed to be common to all dollar stores mc^g_{dollar}.

The small retailer variable profits are computed at the store level while demand parameters are estimated at the store type level. Therefore, the model is misspecified both because prices for individual stores vary within store type which can lead to incorrect prices and demand estimates, and because the misspecification of within-store type competition biases retailer marginal costs. On the former point, the current measured prices capture the average price for each store type relative to other retailers in the market. For the consumers, the model is well specified when the variation in prices within store type does not affect consumer choices. Indeed, when consumers shop at the closest store in the store type to home and when variation in prices within store type is small compared to variation across stores types (or if stores of the same store type have similar price indices to average price index), consumer choices are unlikely to be unaffected by variations in prices within store type. These assumptions are in line with the data. Furthermore, estimated parameters suggest that consumers' disutility for distance dominates the disutility for price at the observed prices and distances, or that consumers are not willing to travel long distances to reduce prices.

For the retailer's marginal costs, the model is well specified when entry decisions are the same whether the retailer sets individual prices or the average price across store types. The first concern is that using an average price across all retailers of the same time is a bad approximation to the original price. This assumption can be corroborated in the data. The second assumption is that misspecification of the small retailer profit function leads to misspecification of the marginal costs, counterfactual prices, and variable profits. Specifically, since the profit equations assumes a single retailer per store type instead of many retailers per store type, this form of misspecification will overestimate marginal costs and overestimate prices. The assumption makes it easier for smaller retailers to enter, regardless of the other locations of retailers.

The probability of choosing location m for large and small retailers in the real estate market:

While the estimation restricts large retailers to choose a single location indexed by m, the model allows for large retailers to choose multiple locations and for small retailers to choose a single location. The equilibrium thus allows large retailer j to choose a strategy profile $\boldsymbol{l}_j$, which can be a discrete choice over multiple locations.

The probability the retailer chooses strategy profile $\boldsymbol{l}_j$ to maximize

$$\max_{\boldsymbol{l}_j} \quad E_{\boldsymbol{l}_{-j}}[\bar{\pi}_{j\boldsymbol{l}_j}] + \sum_{(m,a)\in\boldsymbol{l}_j} \bar{\mathbb{P}}_{jma}(\theta_j 1\{excl.\ deal.\}_{jma} - r_{jma} - F_m + \epsilon_{jm}) + (1 - \sum_{(m,a)\in\boldsymbol{l}_j} \bar{\mathbb{P}}_{jma})\epsilon_{j0}$$

where $\boldsymbol{l}_j \in \mathcal{L}_j$ is a set of landlords m and contracts a retailer j chooses to enter. Let $(m,a) \in \boldsymbol{l}_j$. For large retailers, the contract can be explicitly exclusive or not, $a = \{\text{exclusive}, \text{non-exclusive}\}$, and for small retailers, the contract can only be non-exclusive, $a = \{\text{non-exclusive}\}$. If the large retailer chooses a non-exclusive contract, the landlord can still rent to the large retailer exclusively, and the resulting entry would be characterized as non-explicit exclusive dealing. The outside good is choosing no entry.

Expected profits from the outside good are

$$E_{\boldsymbol{l}_{-j}}[\pi_{j0}] + \epsilon_{j0}$$

Expected variable profits are determine by preexisting locations of own and other retailers, the strategy profile $\boldsymbol{l}_j$, and the strategy profile of all other retailers, $\boldsymbol{l}_{-j}$. For large retailers, entry decisions occur simultaneously with other large retailers. For small retailers, location decisions occur after large retailer entry and simultaneously with other small retailers. Variable profits from the product market are determined after all retailer entry.

$$E_{\boldsymbol{l}_{-j}}[\bar{\pi}_{j\boldsymbol{l}_j}] = \sum_{\boldsymbol{l}_{-j}} \mathbb{P}(\boldsymbol{l}_{-j})\bar{\pi}(\boldsymbol{l}_j, \boldsymbol{l}_{-j})$$
$$= \prod_{j' \neq j} \left(\sum_{\boldsymbol{l}_{j'}} \mathbb{P}_{j'\boldsymbol{l}_{j'}} \right) \bar{\pi}(\boldsymbol{l}_j, \boldsymbol{l}_{-j})$$

The expected variable profits depend on the variable profits under each possible combination of other retailer location choice, $\boldsymbol{l}_{-j}$, the probability of each strategy profile from all other retailers, $\mathbb{P}(\boldsymbol{l}_{-j})$, and the realized observed variable profits, $\bar{\pi}(\boldsymbol{l}_j, \boldsymbol{l}_{-j})$, given all retailer decisions $(\boldsymbol{l}_j, \boldsymbol{l}_{-j})$.

When multiple large retailers approach the same location but there are exclusivity or capacity constraints, a limited number of retailers can enter. When there are conflicts, the higher paying large retailer(s) enter.

$$\bar{\mathbb{P}}_{jma} = 1 - \underbrace{\sum_{\boldsymbol{l'}_{-j}} \mathbb{P}(\boldsymbol{l'}_{-j})}_{\text{conflict and no entry}}$$

where $\bar{\mathbb{P}}_{jma}$ is the probability retailer j enters location m with contract a given that it chooses $\boldsymbol{l}_j$ and $(m, a) \in \boldsymbol{l}_j$. $\boldsymbol{l'}_{-j} \in \boldsymbol{l}_{-j}$ is a permutation of other retailer, $-j$, strategy profiles such that a higher-paying combination of retailers will enter and there is an entry conflict where j no longer wins entry. For example, if both retailer j and j' choose location m with contracts (m, a) and (m, a') where $r_{jma} < r_{j'ma'}$ and a' is an exclusive dealing contract that also blocks retailer j, then retailer j would not enter. Capacity constraints are dictated by the landlord's total square footage, and the set of retailers that could feasibly enter and pay the highest total rent to the landlord enter.

Given location choices, entry decisions are deterministic for large retailers. In practice, for each set of location choices $(\boldsymbol{l}_j, \boldsymbol{l}_{-j})$, we first compute if there are possible entry conflicts due to exclusive dealing or capacity. If there are conflicts, the set of possible feasible entry decisions are computed, as are the associated expected landlord profits (expectations are formed over the small retailer location choices). The retailer entry combination that maximizes expected landlord profits is (are) the retailer(s) that enter.

When multiple small retailers approach the same location but there are capacity constraints, a limited number of small retailers can enter. Since small retailer prices are the same for each landlord, the retailer entry is determined randomly with equal probability (e.g. with a coin flip).

$$\bar{\mathbb{P}}_{km}(\boldsymbol{l'}_{-k}) = \frac{N_{allowed}(\boldsymbol{l'}_{-k})}{N_{total}(\boldsymbol{l'}_{-k})}$$
$$\bar{\mathbb{P}}_{km} = \underbrace{1 - \sum_{\boldsymbol{l'}_{-k}} \mathbb{P}(\boldsymbol{l'}_{-k})}_{\text{no conflict and entry}} + \underbrace{\sum_{\boldsymbol{l'}_{-k}} \mathbb{P}(\boldsymbol{l'}_{-k})\bar{\mathbb{P}}_{km}(\boldsymbol{l'}_{-k})}_{\text{conflict and entry}}$$

where $\bar{\mathbb{P}}_{km}$ is the probability small retailer k enters location m given that it chooses location m. $\bar{\mathbb{P}}_{km}(\boldsymbol{l'}_{-k})$ is the probability of winning entry given that small retailer k chooses location m and the other small retailers choose locations $\boldsymbol{l'}_{-k}$, $\mathbb{P}(\boldsymbol{l'}_{-k})$ is the probability other small retailers choose $\boldsymbol{l'}_{-k}$, and $\boldsymbol{l'}_{-k} \in \boldsymbol{l}_k$ are the set of other small retailer location choices that cause capacity conflicts at m. $N_{allowed}(\boldsymbol{l'}_{-k})$ are the set of combinations where small retailer k enters location m given the set of other small retailers that approach determined by $\boldsymbol{l'}_{-k}$, and $N_{total}(\boldsymbol{l'}_{-k})$ are the total number of entry possibilities. If N small retailers approach and there is capacity for one small retailer only, the probability of entry is $1/N$.

In sum, the entry decision for large and small retailers can be re-written as

$$\max_{\boldsymbol{l}_j} \quad A_{\boldsymbol{l}_j} + \vec{B}'_{\boldsymbol{l}_j}\vec{E}_{j\boldsymbol{l}_j}$$

where $A_{\boldsymbol{l}_j}$ is the scalar, observable component of expected profits, $A_{\boldsymbol{l}_j} = E_{\boldsymbol{l}_{-j}}[\bar{\pi}_{j\boldsymbol{l}_j}] - \sum_{(m,a)\in\boldsymbol{l}_j} \bar{\mathbb{P}}_{jma}(r_{jma} + F_m)$, and $\vec{E}_{j\boldsymbol{l}_j}$ is a vector of unobserved retailer-specific profitabilities, which include the idiosyncratic location-specific profitability shocks, ϵ_{jm} and the idiosyncratic exclusivity-specific profitability shocks, θ_j: $\vec{E}_{j\boldsymbol{l}_j} = (\epsilon_{j1}, \epsilon_{j2}, ..., \epsilon_{jm}, ..., \epsilon_{jM}, \theta_j)$. Each draw is independent and identically distributed following the normal distribution, $\epsilon_{jm}, \theta_j \sim N(0,1)$. $\vec{B}'_{\boldsymbol{l}_j}$ is a row vector so that $\vec{B}'_{\boldsymbol{l}_j}\vec{E}_{j\boldsymbol{l}_j} = \sum_{(m,a)\in\boldsymbol{l}_j} \bar{\mathbb{P}}_{jma}(\theta_j 1\{excl.\ deal.\}_{jma} + \epsilon_{jm}) + (1 - \sum_{(m,a)\in\boldsymbol{l}_j} \bar{\mathbb{P}}_{jma})\epsilon_{j0}$. Then $A_{\boldsymbol{l}_j} + \vec{B}'_{\boldsymbol{l}_j}\vec{E}_{j\boldsymbol{l}_j} \sim N(A_{\boldsymbol{l}_j}, \vec{B}'_{\boldsymbol{l}_j}\vec{B}_{\boldsymbol{l}_j})$.

The probability retailer j picks entry strategy $\boldsymbol{l}_j$ is the probability that row $\boldsymbol{l}_j$ gives the

highest value of a vector $\vec{A} + \boldsymbol{B}\vec{E}$ where A is an $|\mathcal{L}_j|$ x 1 vector of all the possible location choice strategies $\boldsymbol{l}_j \in \mathcal{L}_j$, $\boldsymbol{B}$ is a $L = |\mathcal{L}_j|$ x (M+1) matrix that scales the M+1 x 1 vector of idiosyncratic shocks (ϵ_j, θ_j), $\vec{E}$, by the appropriate probabilities to determine expected profits. Written, the probability $\boldsymbol{l}_j$ is chosen is equivalent to the probability that it offers higher profits than all other alteratives, or

$$\mathbb{P}\left(\begin{pmatrix} A_1 + \sum B_{1a}E_a \\ A_2 + \sum B_{2a}E_a \\ \dots \\ A_L + \sum_a B_{La}E_a \end{pmatrix} \leq \begin{pmatrix} A_{\boldsymbol{l}_j} + \sum_a B_{\boldsymbol{l}_j a}E_a \\ A_{\boldsymbol{l}_j} + \sum_a B_{\boldsymbol{l}_j a}E_a \\ \dots \\ A_{\boldsymbol{l}_j} + \sum_a B_{\boldsymbol{l}_j a}E_a \end{pmatrix}\right)$$

Or, alternatively

$$\mathbb{P}\left(\begin{pmatrix} A_{\boldsymbol{l}_j} + \sum_a B_{\boldsymbol{l}_j a}E_a \\ A_{\boldsymbol{l}_j} + \sum_a B_{\boldsymbol{l}_j a}E_a \\ \dots \\ A_{\boldsymbol{l}_j} + \sum_a B_{\boldsymbol{l}_j a}E_a \end{pmatrix} - \begin{pmatrix} A_1 + \sum B_{1a}E_a \\ A_2 + \sum B_{2a}E_a \\ \dots \\ A_L + \sum_a B_{La}E_a \end{pmatrix} \geq \begin{pmatrix} 0 \\ 0 \\ \dots \\ 0 \end{pmatrix}\right) \tag{10}$$

Or alternatively,

$$\mathbb{P}\left(\boldsymbol{\Omega}^{\boldsymbol{l}_j}(\vec{A} + \boldsymbol{B}\vec{E}) \geq 0\right)$$

where $\boldsymbol{\Omega}^{\boldsymbol{l}_j}$ is the $L-1$ x L matrix that transform L x 1 vector $\vec{A} + \boldsymbol{B}\vec{E}$ into Equation 10. That is, $\boldsymbol{\Omega}^{\boldsymbol{l}_j}$ multiplies the expected profits such that the expected profits from the chosen locations $\boldsymbol{l}_j$ are subtracted by a vector of the remaining expected profits. Then $\boldsymbol{\Omega}^{\boldsymbol{l}_j}(\vec{A} + \boldsymbol{B}\vec{E}) \sim N(\vec{A}, \boldsymbol{\Omega}^{\boldsymbol{l}_j}\boldsymbol{B}\boldsymbol{B}'\boldsymbol{\Omega}^{\boldsymbol{l}_j\prime})$.

Therefore, $\mathbb{P}_{j\boldsymbol{l}_j}$ is the multivariate normal distribution evaluated at $\boldsymbol{x} = \boldsymbol{0}$ with mean $\boldsymbol{\mu}^{\boldsymbol{l}_j}$ and variance-covariance matrix $\boldsymbol{\Sigma}^{\boldsymbol{l}_j}$ where

$$\boldsymbol{\mu}_i^{\boldsymbol{l}_j} = \sum_l \Omega_{il}^{\boldsymbol{l}_j} \underbrace{\left(E_{\boldsymbol{l}_{-j}}[\bar{\pi}_{jl}] - \sum_{(m,a)\in l} \bar{\mathbb{P}}_{jma}(r_{jma} + F_m) \right)}_{\text{Lx1 vector, each row for each } l\in\mathcal{L}_j}$$

$$\boldsymbol{\Sigma}_{ii'}^{\boldsymbol{l}_j} = \sum_{l,l',(m,a)} \Omega_{il}^{\boldsymbol{l}_j}\Omega_{i'l'}^{\boldsymbol{l}_j} \underbrace{\bar{\mathbb{P}}_{jma}(l)\bar{\mathbb{P}}_{jma}(l')}_{\substack{\text{prob. retailer } j \text{ enters } m \\ \text{with contract } a \\ \text{with strategy } l \text{ or } l'\in\mathcal{L}_j}} \left(1 + \underbrace{\theta_j 1\{excl.\ deal.\}_{jma}(l)}_{\substack{\text{excl. deal at } m \\ \text{with strategy } l}} \right) \left(1 + \underbrace{\theta_j 1\{excl.\ deal.\}_{jma}(l')}_{\substack{\text{excl. deal at } m \\ \text{with strategy } l'}} \right)$$

and

$$\boldsymbol{\Omega}_{ll'}^{\boldsymbol{l}_j} = \begin{cases} 1 & l = \boldsymbol{l}_j \\ -1 & l = l' \ \underbrace{\left[\boldsymbol{\Omega}_{\boldsymbol{l}_j}/\{\boldsymbol{l}_j\}\right]_{ll'}}_{\substack{-\text{identity matrix} \\ \boldsymbol{l}_j \text{ col. removed} \\ \mathcal{L}\text{x}\mathcal{L}}} \\ 0 & l \neq l' \ \underbrace{\left[\boldsymbol{\Omega}_{\boldsymbol{l}_j}/\{\boldsymbol{l}_j\}\right]_{ll'}}_{\text{off-diagonal}} \end{cases}$$

The price landlords set for large retailers in the real estate market:

Each landlord sets two prices for each large retailer that could be feasibly enter to maximize total expected profits

$$\max_{r_{jma}} \sum_{j,a} \underbrace{\mathbb{P}_{jma}}_{\text{prob. choice}} \underbrace{\bar{\mathbb{P}}_{jma}}_{\text{prob. win}} \underbrace{(r_{jma} - mc_m)}_{\text{large retailer}} + \underbrace{E_{\boldsymbol{l}_j}[\pi_m^{small}(\boldsymbol{l}_j)]}_{\substack{\text{exp. profits} \\ \text{small retailers}}}$$

where the first term are the expected profits from large retailer entry, and the second term are expected profits from small retailer entry. Profits from large retailers are a function of the probability of each retailer j chooses location m with contract a, $\mathbb{P}_{jma}$, and the corresponding probability of entry, $\bar{\mathbb{P}}_{jma}$, as well as the profits conditional on entry, $r_{jma} - mc_m$. Profits from small retailers depend on the location choices of all large retailers, and can be written

as

$$E_{\boldsymbol{l}_j}[\pi_m^{small}(a_j)] = \prod_j \left(\sum_{\boldsymbol{l}_j} \mathbb{P}_{j\boldsymbol{l}_j} \right) \pi_m^{small}(\boldsymbol{l}_j) \tag{11}$$

$$= \prod_j \left(\sum_{\tilde{a}} \mathbb{P}_{jm\tilde{a}} \right) \pi_m^{small}(\tilde{\boldsymbol{a}}_j) \tag{12}$$

$$= \sum_{\rho} \mathbb{P}_{\rho} \pi_m^{small}(\rho) \tag{13}$$

which depends on all permutations of large retailer choices at location m. At location m, large retailers can choose between an exclusive contract, a non-exclusive contract, and non-entry. Thus, $\tilde{a} \in \{\text{exclusivity (E), non-exclusivity (N), non-entry (O)}\}$. For example, with two retailers expected profits from the smaller retailers are $\sum_{\tilde{a}_{j=1}} \sum_{\tilde{a}_{j=2}} \mathbb{P}_{1m\tilde{a}_1} \mathbb{P}_{2m\tilde{a}_2} \pi_m^{small}(\tilde{a}_1, \tilde{a}_2)$. As a second example, if no retailers enter, the expected profitability to the landlord from the small retailers is $\left(1 - \sum_{j,a} \bar{\mathbb{P}}_{jma} \mathbb{P}_{jma}\right) \pi_m^{small}(O)$. In equation 11, the first line shows the expected profits written as all possible entry combinations, the second line shows the expected profits written out as all possible entry combinations at location m, and the third line shows the expected landlord profits where ρ is a permutaion of all the possible location choices.

The landlords compete in multi-product Bertrand with differentiated products and set prices according to

$$[\text{foc } r_{kmb}] : \ \mathbb{P}_{kmb} \bar{\mathbb{P}}_{kmb} + \sum_{j,a} \left(\frac{d\bar{\mathbb{P}}_{jma}}{dr_{kmb}} + \frac{\mathbb{P}_{jma}}{dr_{kmb}} \left(r_{jma} - mc_m \right) \right) + \sum_{\rho} \frac{d\mathbb{P}_{\rho}}{dr_{kmb}} \pi_m^{small}(\rho) = 0$$

The price landlords set for small retailers in the real estate market:

Each landlord sets a single price for all small retailers

$$\max_{r_m^{small}} \underbrace{\left(s_m^{drug} + s_m^{dollar} + s_m^{liquor} + s_m^{\text{other food}} + s_m^{other}\right)\left(r_m^{small} - mc_m^{small}\right)}_{\pi_m^{small}}$$

where $s_m^{drug}, s_m^{dollar}, s_m^{liquor}, s_m^{\text{other food}}, s_m^{other}$ are the probability of entry for drug, dollar, other food, and other stores, respectively. $r_m^{small} - mc_m^{small}$ is the profits conditional on retailer entry. Then, $s_m^k = \mathbb{P}_{km}\bar{\mathbb{P}}_{km}$ where $k \in \{\text{drug, dollar, liquor, other food, other}\}$, $\mathbb{P}_{km}$ is the total probability stores from store of type k chooses location m and $\bar{\mathbb{P}}_{km}$ is the probability of entry conditional on choosing location m. This allows for multiple small retailers to enter the same property if there is capacity.

When a large retailer has an exclusive dealing contract that blocks a subset of small retailers – drug, dollar, liquor, and other food – the retailers no longer consider m as part of the choice set.

B Example of Exclusive Dealing Contracts

Figure 9: Restrictive Covenant in a Safeway Lease Memorandum

2. Restrictions. By virtue of the Lease, Tenant, its subtenants, invitees, customers and employees and parties holding possessory rights in the Premises shall have, and are hereby granted, the use in common with Landlord and other tenants of Landlord and their respective invitees, customers, employees and parties holding possessory rights in the Shopping Center, of "Building Areas" and those portions of Building Areas upon which buildings are not constructed (all of which are referred to as the "Common Areas"). "Building Areas" shall refer to the areas designated as "Jewel/Osco", "Retail Bld'g A", Retail Bld'g B", "Retail Bld'g C" and "Bank" on the Site Plan. The Common Areas are required by the terms of the Lease to be devoted to the purposes of driving and parking motor vehicles, loading and unloading of motor vehicles and vehicular and pedestrian ingress and egress to and from and within the Shopping Center. Additional rights are granted by the Lease to such parties in connection with the construction and maintenance of utility facilities necessary to the Shopping Center. All buildings constructed in the Shopping Center shall be located wholly within the "Building Areas". Additional use and development restrictions and maintenance, development and performance obligations with regard to the Premises and the Shopping Center are specified in the Lease.

In addition to other restrictions and obligations set forth in the Lease, the Lease provides that the types of uses permitted in the Shopping Center shall be of a retail and/or commercial nature found in shopping centers of a similar size and quality in the metropolitan marketing area in which the Shopping Center is located.

The Lease provides, in part, that no premises (nor any part thereof) in the Shopping Center other than the Premises, shall be (i) used or occupied as a retail supermarket, drug store and combination thereof, nor (ii) used for the sale of any of the following: (a) fish or meat (except in prepared form sold by a permitted restaurant operation); (b) liquor and other alcoholic beverages in package form, including, but not limited to, beer, wine and ale; (c) produce; (d) baked goods; (e) floral items; (f)any combination of food items sufficient to be commonly known as a convenience food store or department; and (g) items requiring dispensation by or through a pharmacy or requiring dispensation by or through a registered pharmacist.

In addition, except as expressly permitted in the Lease, none of the following uses shall be conducted in the Shopping Center: (a) offices; (b) funeral homes; (c) any production, manufacturing, industrial, or storage use of any kind or nature; (d) entertainment or recreational facilities; (e) training or educational facilities; (f) restaurants; (g) car washes, gasoline or service stations, or the displaying, repairing, renting, leasing, or sale of any motor vehicle, boat or trailer; (b) dry cleaner with on-premises cleaning; (i) any use which creates a nuisance or materially increases noise or the emission of dust, odor, smoke, gases, or materially increases fire, explosion or radioactive hazards in the Shopping Center; (i) any business with drive-up or drive-through lanes; (k) second-hand or thrift stores, or flea markets; and (1) any use involving any Hazardous Material (as defined in the Lease).

Source: Cook County Record of Deeds, Document Number 0010276527. This figure is an example of a restrictive covenant. Here, Jewel Osco (parent company Safeway) in Chicago at the Intersection of Ashland and Roosevelt in 2001 limits the competitors in the shopping center. At this location, this portion of the lease memorandums shows Safeway is blocking (a) stores that sell similar products: grocers, drug stores, and liquor stores, (b) stores that also compete for food: restaurants and gas stations, (c) stores that compete for parking: offices, educational facilities, and (d) stores that would bring a different aesthetic to the shopping center: funeral homes, second-hand or thrift stores, stores that create a nuissance or materially increase noise.

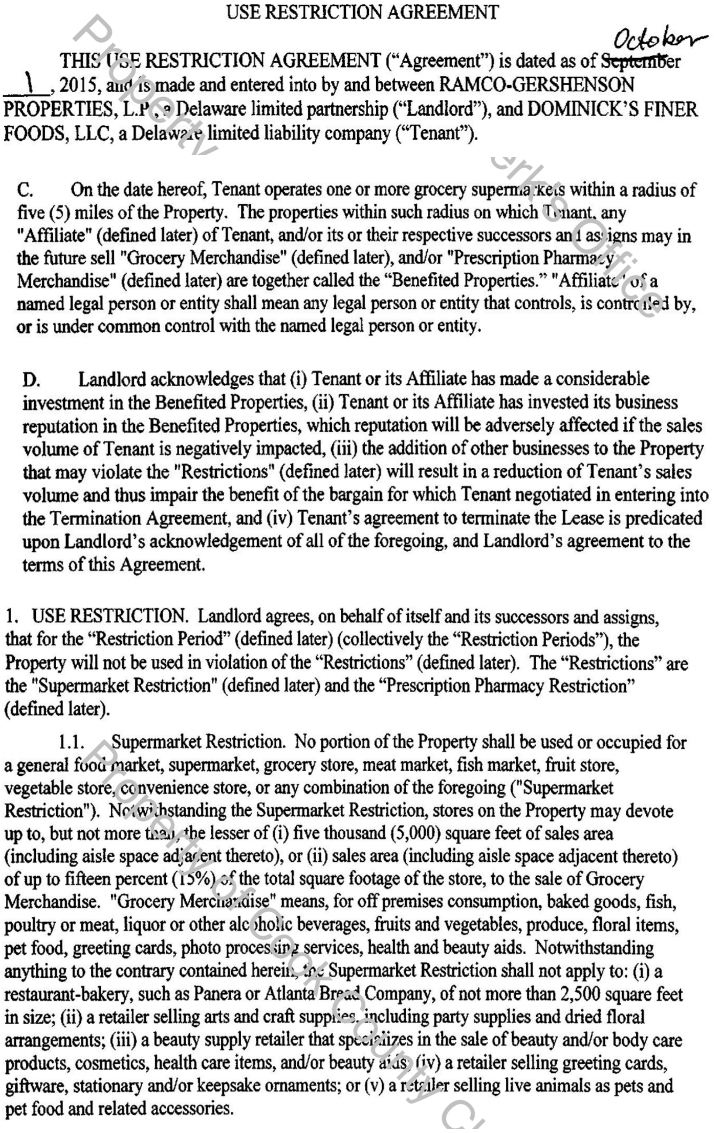
Figure 10: Restrictive Covenant in a Dollar General Lease Memorandum

4. So long as the Demised Premises is being operated as a Dollar General store, Landlord covenants and agrees not to lease, rent or occupy, or allow to be leased, rented or occupied, any property now or hereafter owned by Landlord or an affiliate of Landlord, or developed by Landlord or an affiliate of Landlord (for a third party), within a one (1) mile radius of the boundaries of the Demised Premises for the purpose of conducting business as, or for use as, a Family Dollar Store, Bill's Dollar Store, Fred's, Dollar Tree, Dollar Zone, Variety Wholesale, Ninety-Nine Cents Only, Deals, Dollar Bills, Bonus Dollar, Maxway, Super Ten, McCory's, McCory's Dollar, Planet Dollar, Big Lots, Odd Lots, Walgreens, CVS, Rite Aid, or Wal-Mart Supercenter.

This covenant shall run with the land and shall be binding upon Landlord and its affiliates and their respective successors, assigns and successors in title to the Demised Premises and to any such land owned, developed or acquired in the future within a one (1) mile radius. As of the Effective Date, Landlord does not own land within a one (1) mile radius of the Demised Premises. So long as the Demised Premises is being operated as a Dollar General store, Landlord agrees (for itself and its affiliates) not to accept any engagement as a developer for such purposes in violation of the foregoing restrictive covenants within such one (1) mile radius.

Source: Cook County Record of Deeds, Document Number 1532115028. This figure is an example of a restrictive covenant from a Dollar General Lease Memorandum in 2015, for a store at the intersection of 79th and Marquette Avenue. This restrictive covenant limits the landlord and affiliates from leasing to competitors within a mile radius for as long as the Dollar General is in operation on the premises. The restrictive covenant runs with the land, which means that it binds even if the landlord stays the same. The competitors are listed explicitly, and are largely other dollar stores, but also include discount stores and drug stores that sell similar snacks: Family Dollar Store, Bill's Dollar Store, Fred's, Dollar Tree, Dollar Zone, Variety Wholesale, Ninty-Nine Cents Only, Deals, Dollar Bills, Bonus Dollar, Maxway, Super Ten, McCory's Dollar, Planet Dollar, Big Lots, Odd Lots, Walgreens, CVS, Rite Aid, or Wal-Mart Supercenter.

Figure 11: Restrictive Covenant upon Termination of Dominick's Finer Foods Lease



USE RESTRICTION AGREEMENT

THIS USE RESTRICTION AGREEMENT ("Agreement") is dated as of ~~September~~ October 1, 2015, and is made and entered into by and between RAMCO-GERSHENSON PROPERTIES, L.P., a Delaware limited partnership ("Landlord"), and DOMINICK'S FINER FOODS, LLC, a Delaware limited liability company ("Tenant").

C. On the date hereof, Tenant operates one or more grocery supermarkets within a radius of five (5) miles of the Property. The properties within such radius on which Tenant, any "Affiliate" (defined later) of Tenant, and/or its or their respective successors and assigns may in the future sell "Grocery Merchandise" (defined later), and/or "Prescription Pharmacy Merchandise" (defined later) are together called the "Benefited Properties." "Affiliate" of a named legal person or entity shall mean any legal person or entity that controls, is controlled by, or is under common control with the named legal person or entity.

D. Landlord acknowledges that (i) Tenant or its Affiliate has made a considerable investment in the Benefited Properties, (ii) Tenant or its Affiliate has invested its business reputation in the Benefited Properties, which reputation will be adversely affected if the sales volume of Tenant is negatively impacted, (iii) the addition of other businesses to the Property that may violate the "Restrictions" (defined later) will result in a reduction of Tenant's sales volume and thus impair the benefit of the bargain for which Tenant negotiated in entering into the Termination Agreement, and (iv) Tenant's agreement to terminate the Lease is predicated upon Landlord's acknowledgement of all of the foregoing, and Landlord's agreement to the terms of this Agreement.

1. USE RESTRICTION. Landlord agrees, on behalf of itself and its successors and assigns, that for the "Restriction Period" (defined later) (collectively the "Restriction Periods"), the Property will not be used in violation of the "Restrictions" (defined later). The "Restrictions" are the "Supermarket Restriction" (defined later) and the "Prescription Pharmacy Restriction" (defined later).

1.1. Supermarket Restriction. No portion of the Property shall be used or occupied for a general food market, supermarket, grocery store, meat market, fish market, fruit store, vegetable store, convenience store, or any combination of the foregoing ("Supermarket Restriction"). Notwithstanding the Supermarket Restriction, stores on the Property may devote up to, but not more than, the lesser of (i) five thousand (5,000) square feet of sales area (including aisle space adjacent thereto), or (ii) sales area (including aisle space adjacent thereto) of up to fifteen percent (15%) of the total square footage of the store, to the sale of Grocery Merchandise. "Grocery Merchandise" means, for off premises consumption, baked goods, fish, poultry or meat, liquor or other alcoholic beverages, fruits and vegetables, produce, floral items, pet food, greeting cards, photo processing services, health and beauty aids. Notwithstanding anything to the contrary contained herein, the Supermarket Restriction shall not apply to: (i) a restaurant-bakery, such as Panera or Atlanta Bread Company, of not more than 2,500 square feet in size; (ii) a retailer selling arts and craft supplies, including party supplies and dried floral arrangements; (iii) a beauty supply retailer that specializes in the sale of beauty and/or body care products, cosmetics, health care items, and/or beauty aids; (iv) a retailer selling greeting cards, giftware, stationary and/or keepsake ornaments; or (v) a retailer selling live animals as pets and pet food and related accessories.

Source: Cook County Record of Deeds, Document Number 1527955057. This figure is an excerpt from a Dominick's Finer Foods Lease Termination in 2015. In 1998, Safeway purchases Dominick's Finer Foods. In 2013, Safeway is in the process of closing all of Dominick's Finer Foods stores. Then, in 2015, Safeway acquires Jewel Osco. At this Dominick's location in 2015, Safeway and landlord agree to put a restrictive covenant on the property to prevent the entry of a grocery store for five years after Safeway leaves the premises ("no portion of the property shall be used as a grocery store"). The restrictive covenant specifies the motivation for the restrictive covenants: the tenant made investments to the property which benefited the landlord ("landlord acknowledges tenant has made considerable investment in the property"), and the tenant would stand to lose business if a competitor opened ("tenant operates a grocery store within 5 miles of the property").

C Figures

Figure 12: Numerator Definitions

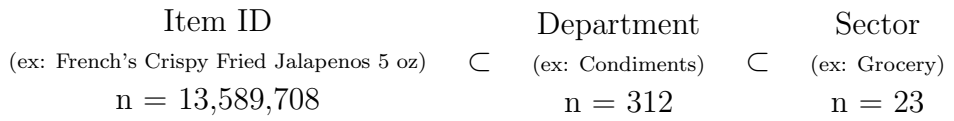
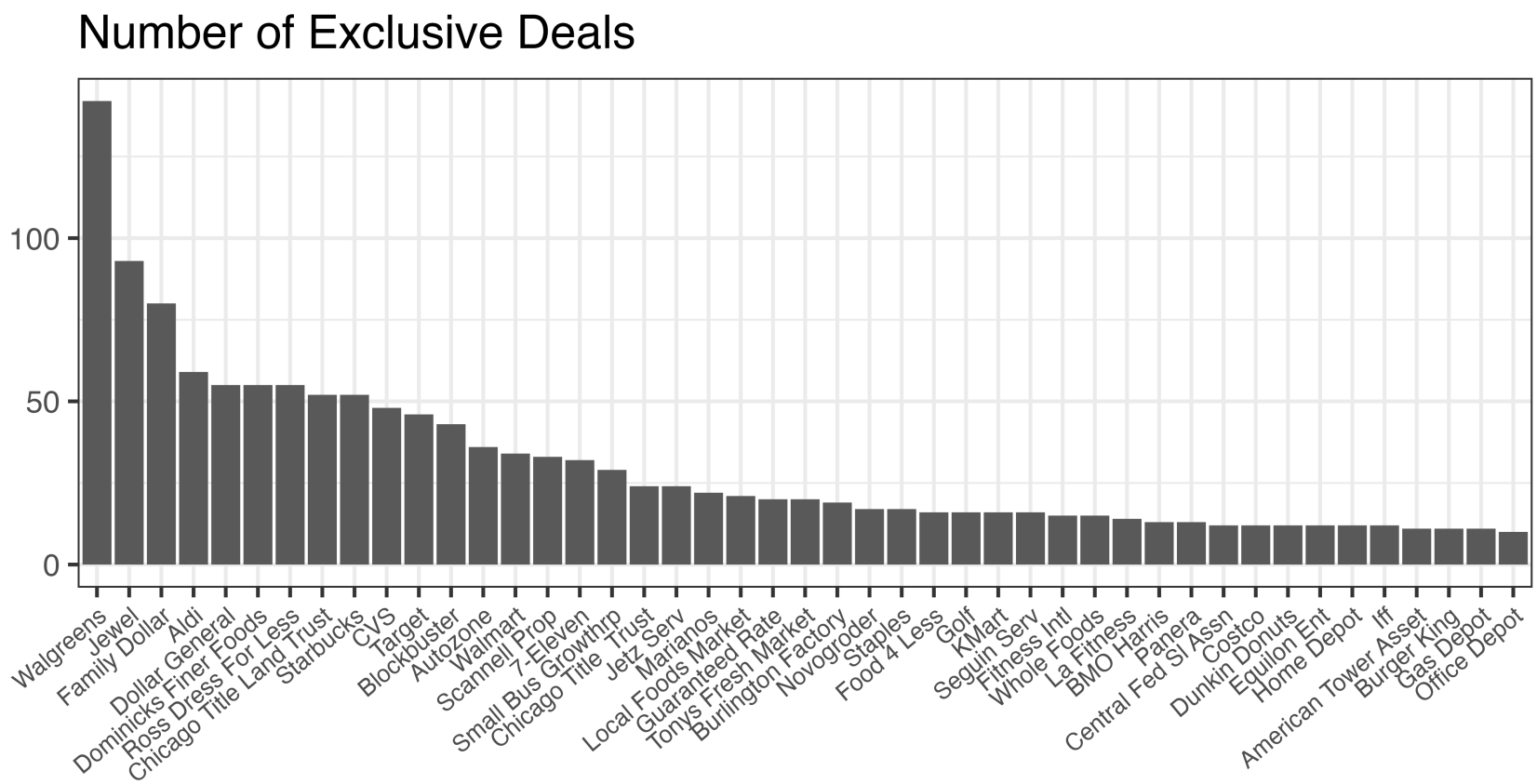


Figure shows three of the levels of aggregation in the Numerator data. This figure follows a similar figure in Handbury (2021). On a trip, a consumer purchases a set of individual items recorded at the barcode level, called Item ID's, that comprise the individual's basket of purchases for that trip. Numerator data classifies items in to several categories, broader and broader categories. Figure 12 shows these categories. For example, a single item "French's Crispy Fried Jalapenos 5oz", belongs to a larger category of goods that are similar to the consumer but might be quite different in terms of content. These categories are then grouped into larger departments, which are itself grouped into larger groceries.

Figure 13: Retailers with the Most Number of Exclusive Dealing Contracts

Source: Cook County Recorder Office. Time span 1980-present. Figure plots the top retailers by exclusive dealing contracts use recorded at the Cook County Recorder office. The percentage of store location that have exclusive dealing contracts is highlighted above the bar in red for stores that accept SNAP-benefits.

Figure 14: Retailers with Exclusive Dealing Contracts



Source: Cook County Recorder Office. Figure plots a the top retailers by exclusive dealing contracts use recorded at the Cook County Recorder office. Time span 1980-present.

Figure 15: Contents of Exclusive Dealing Contracts

Figure 16: Contents of the Exclusive Dealing Contracts Across Select Retailers

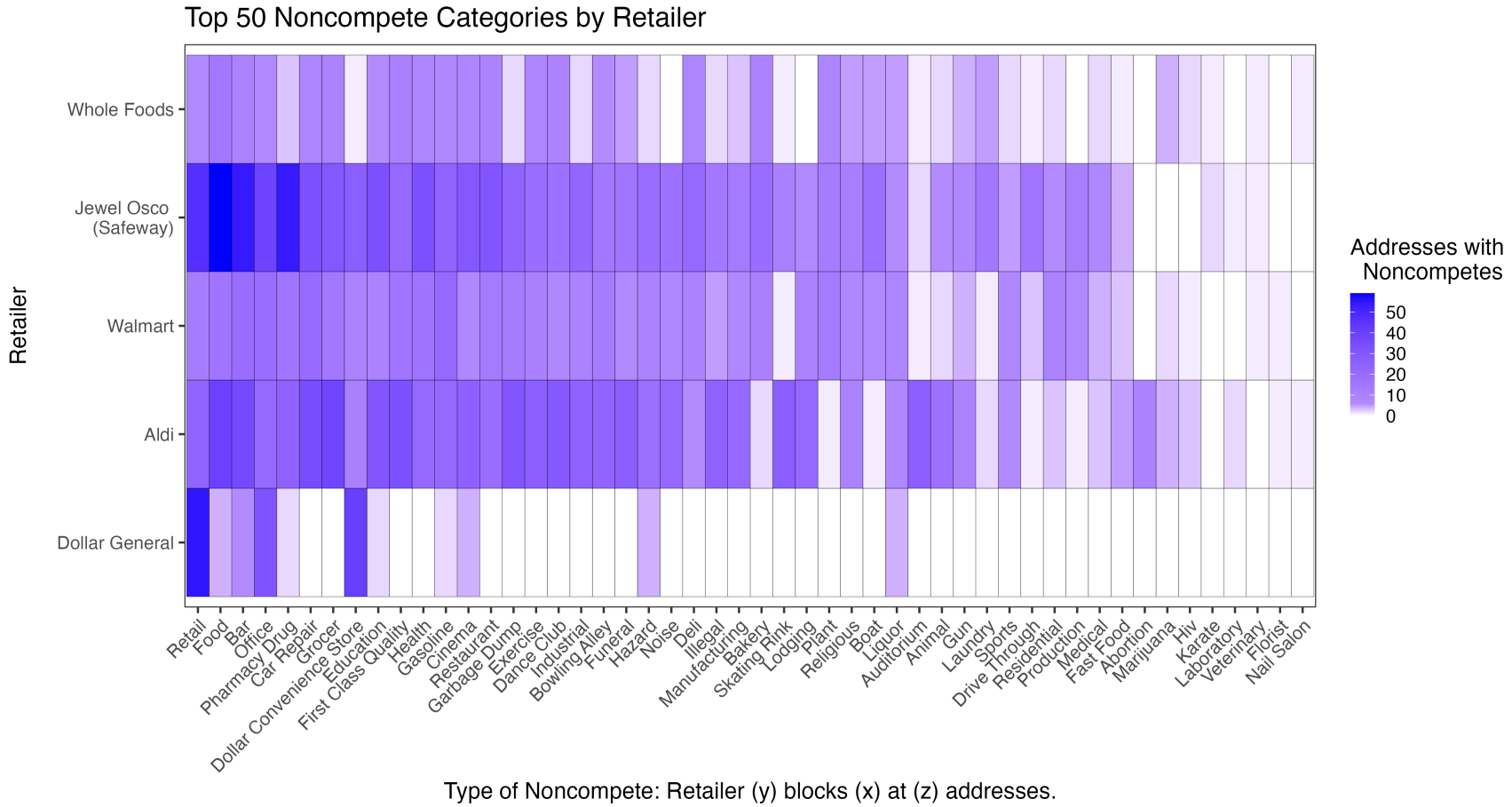


Figure 17: Contents of Exclusive Dealing Contracts: Variation Across Drug Store Chains

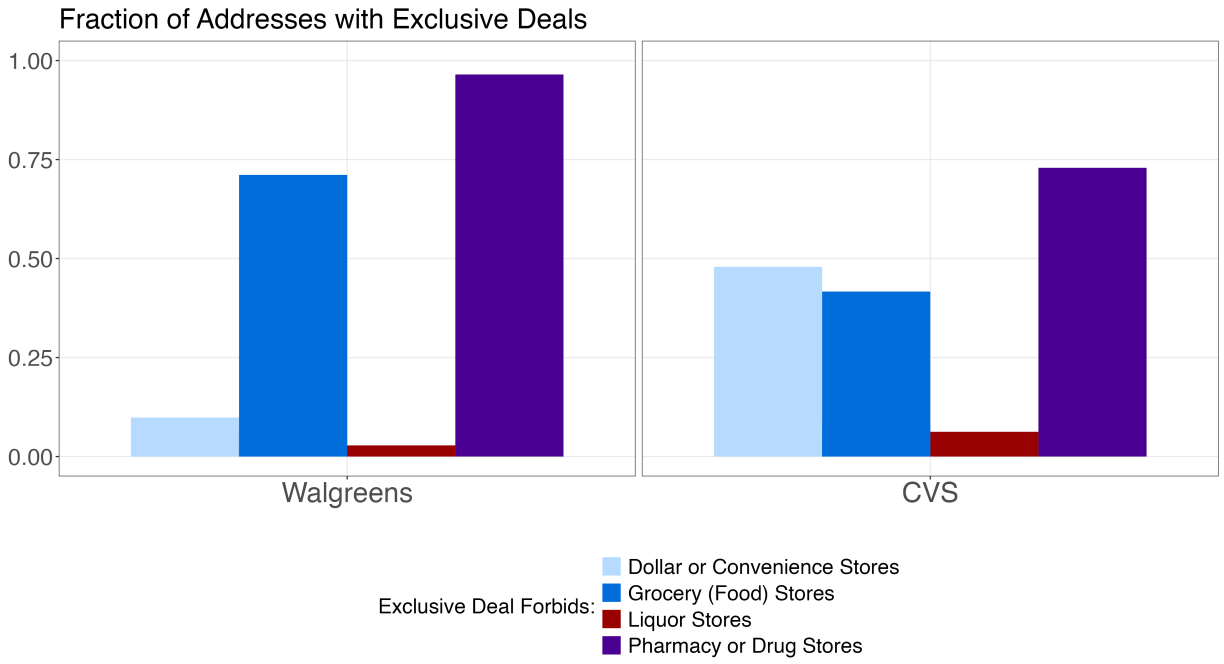


Figure 18: Contents of Exclusive Dealing Contracts: Variation Across Drug Store Chains

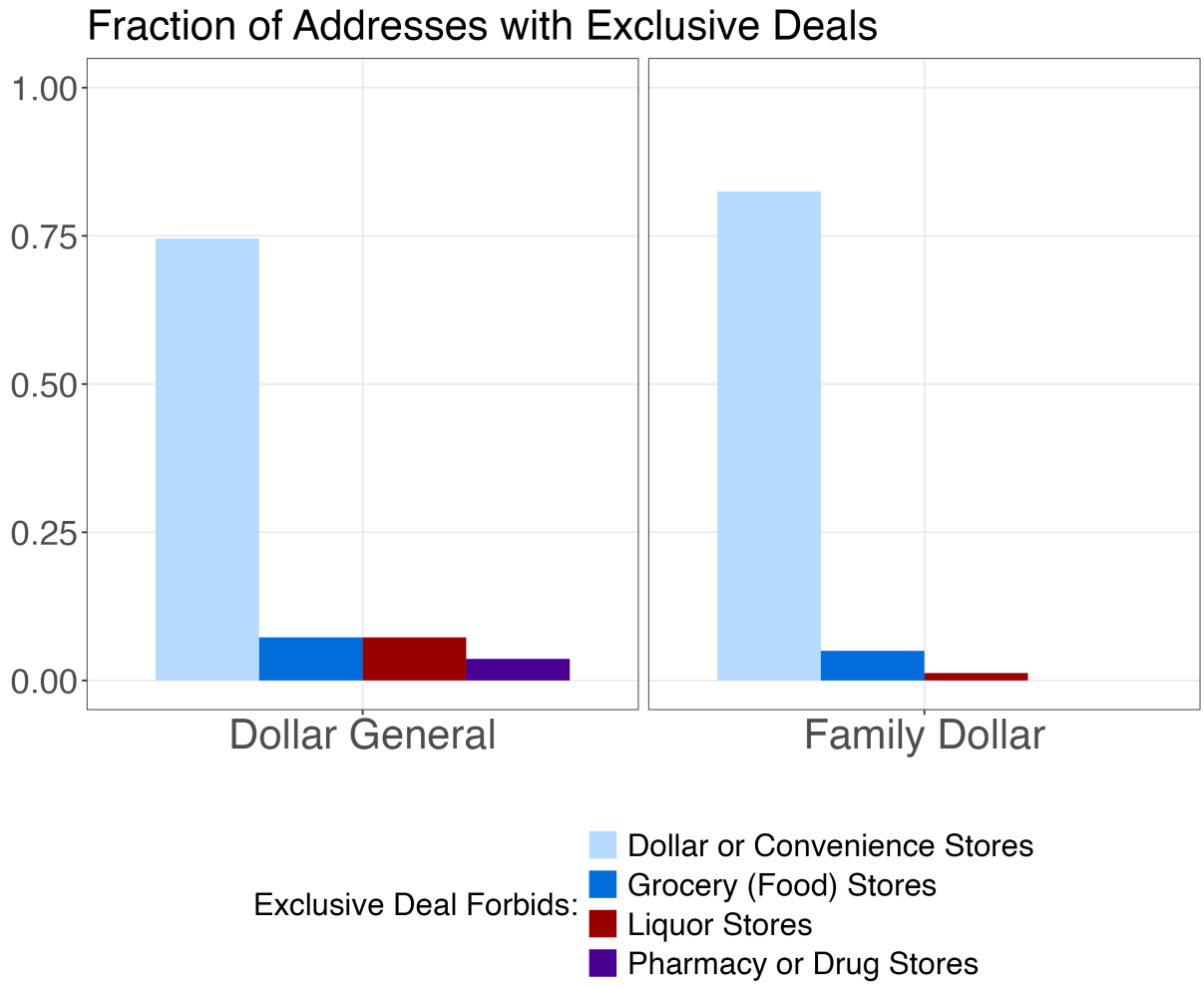
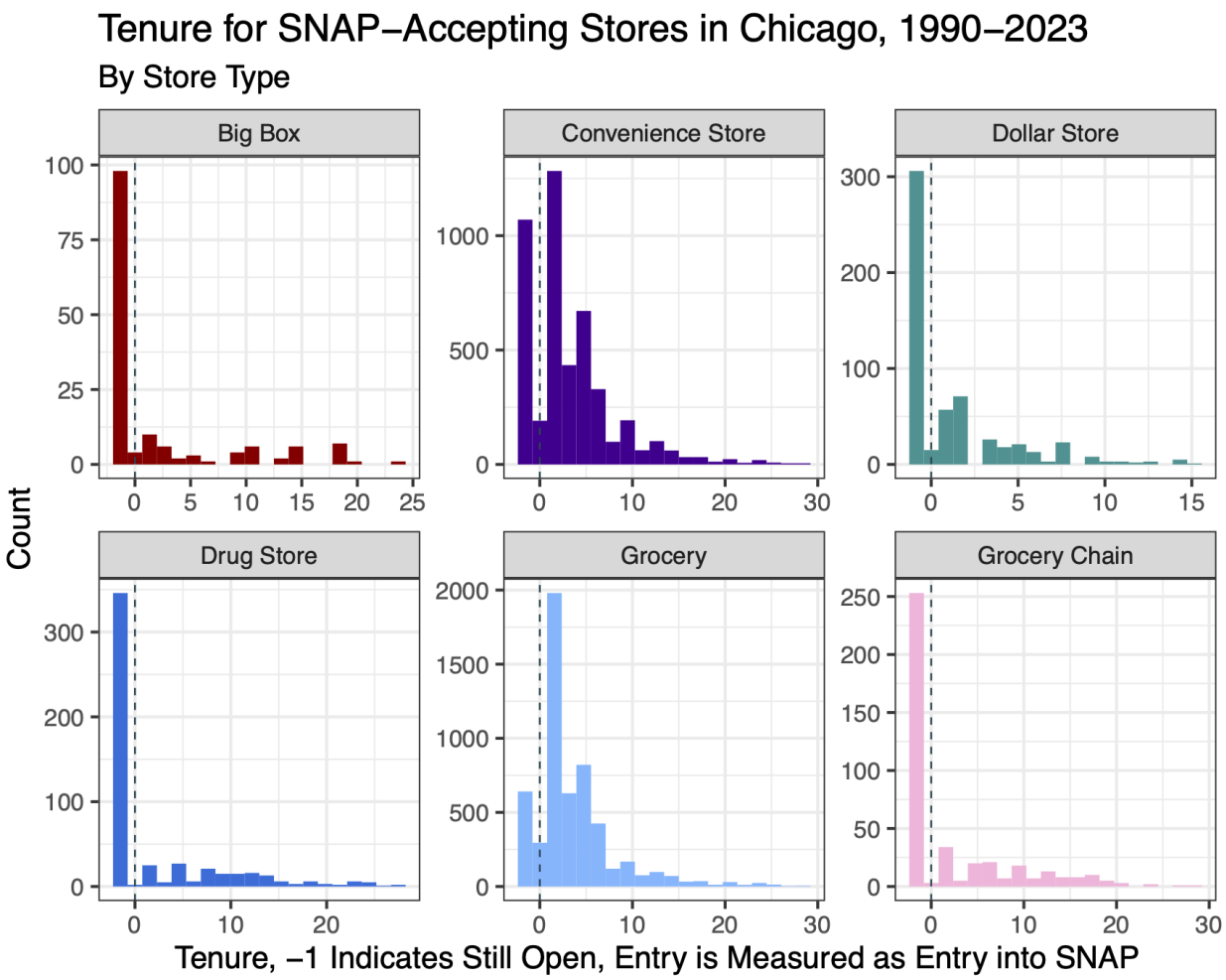
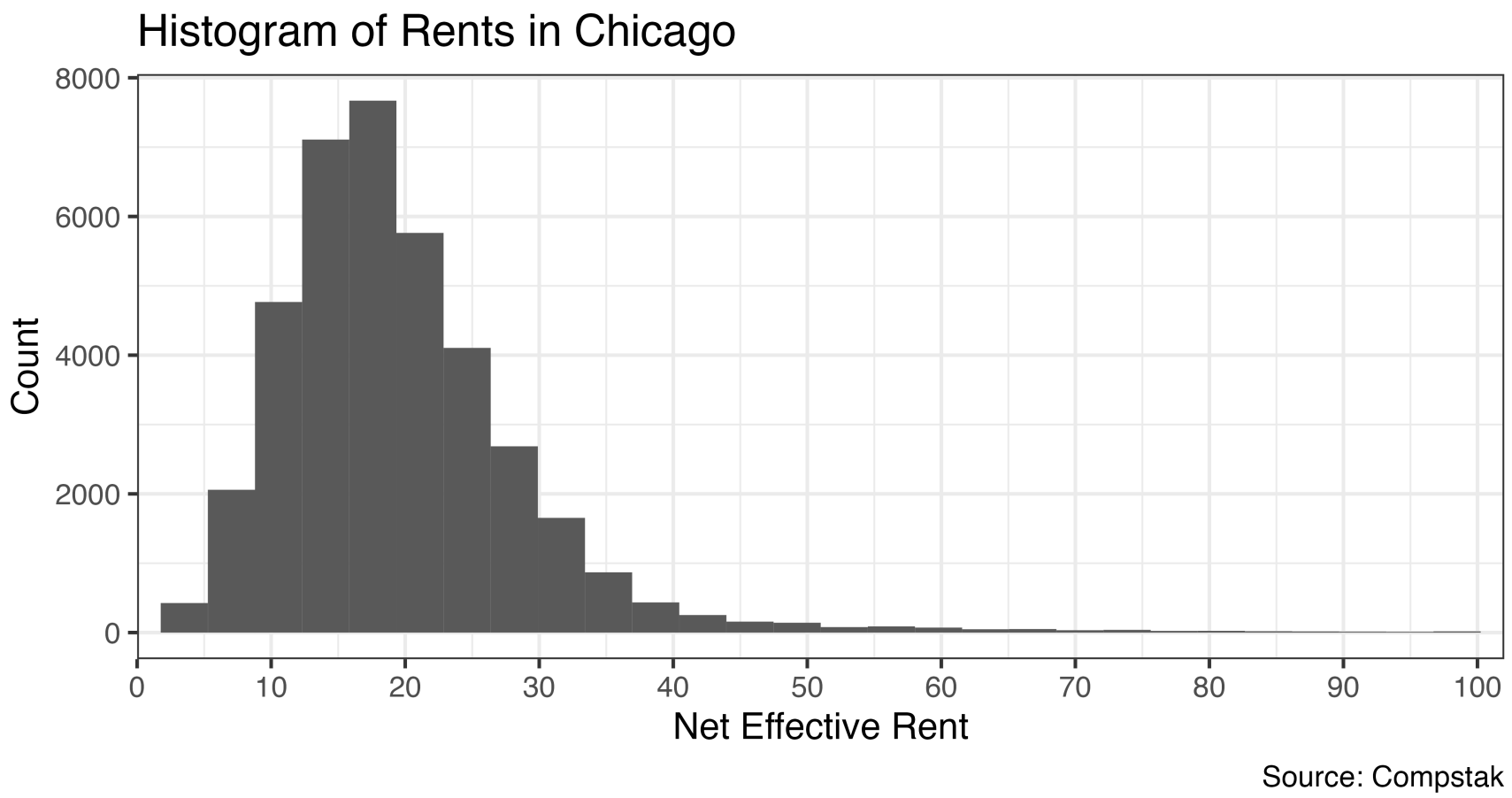


Figure 19: Grocery Store Tenure: Age of the Retailer Location When it Closes



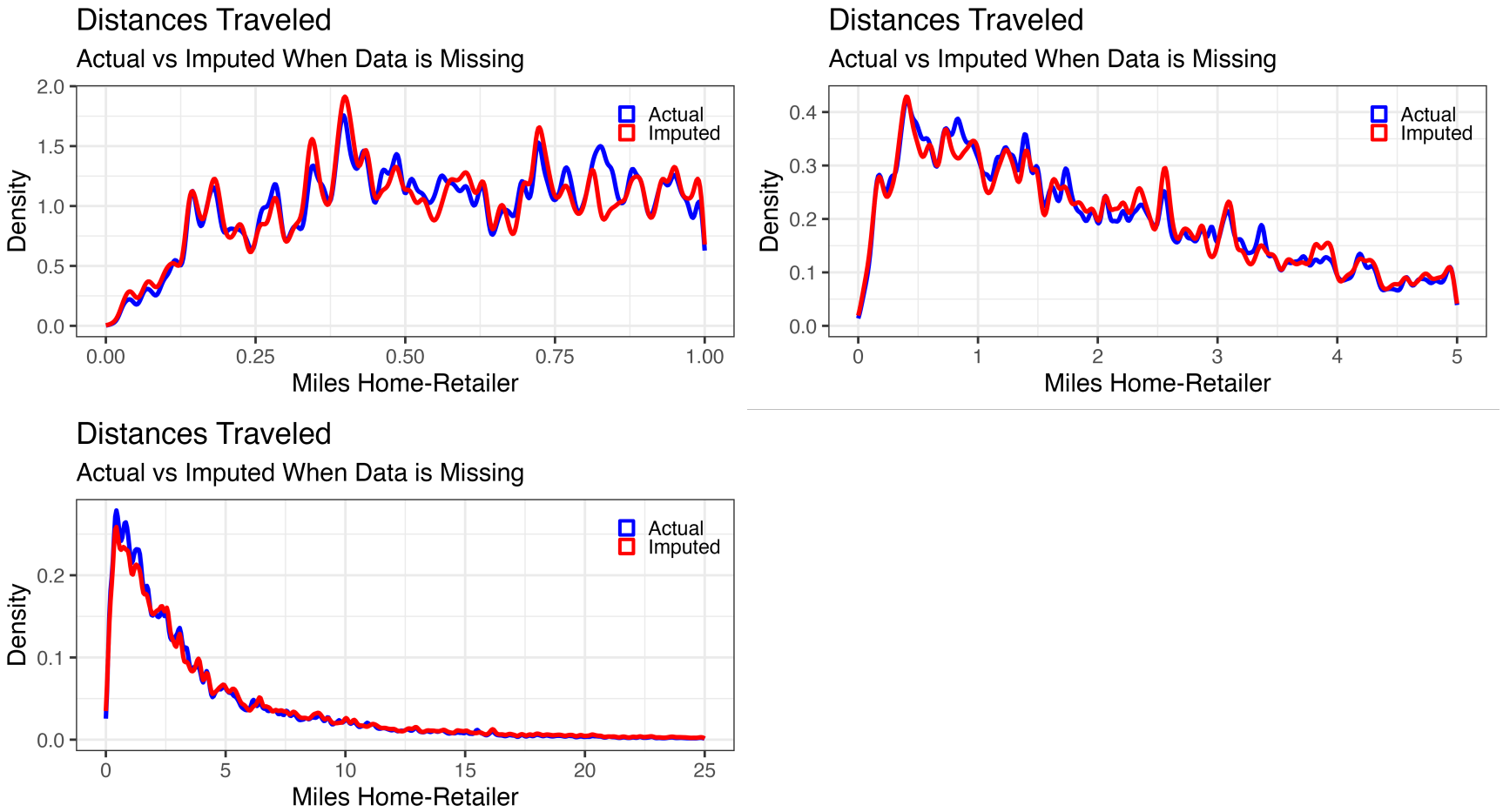
Source: SNAP Retailer Database. Figure plots the number of years each store stays open by store type. At x = -1 is the mass of stores that has not yet closed. The vast majority of chain grocery stores or big box stores do not close over the time period. Each row represents a different city, and each column represents a different variable. Most stores do not exit (column 5), and grocery chains have even fewer exits (column 4). Conditional on there being an exit, the grocery tenure doesn't follow super clear patterns, however there are spikes at 5, 15 and 25 years. Exit is especially common in NYC and for small grocers, and so I expect these all have a good guy guarantee and can leave beforehand. In NYC, these tenures are actually on the upper end of the distribution of lease ages at exit compared other types of commercial space in NYC (Moszkowski and Stackman (2022)), even if the NYC grocers exit at a much younger lease age than grocers in other cities. Large grocers tend to have longer tenures than small grocers and convenience stores.

Figure 20: Rental Prices in the Data



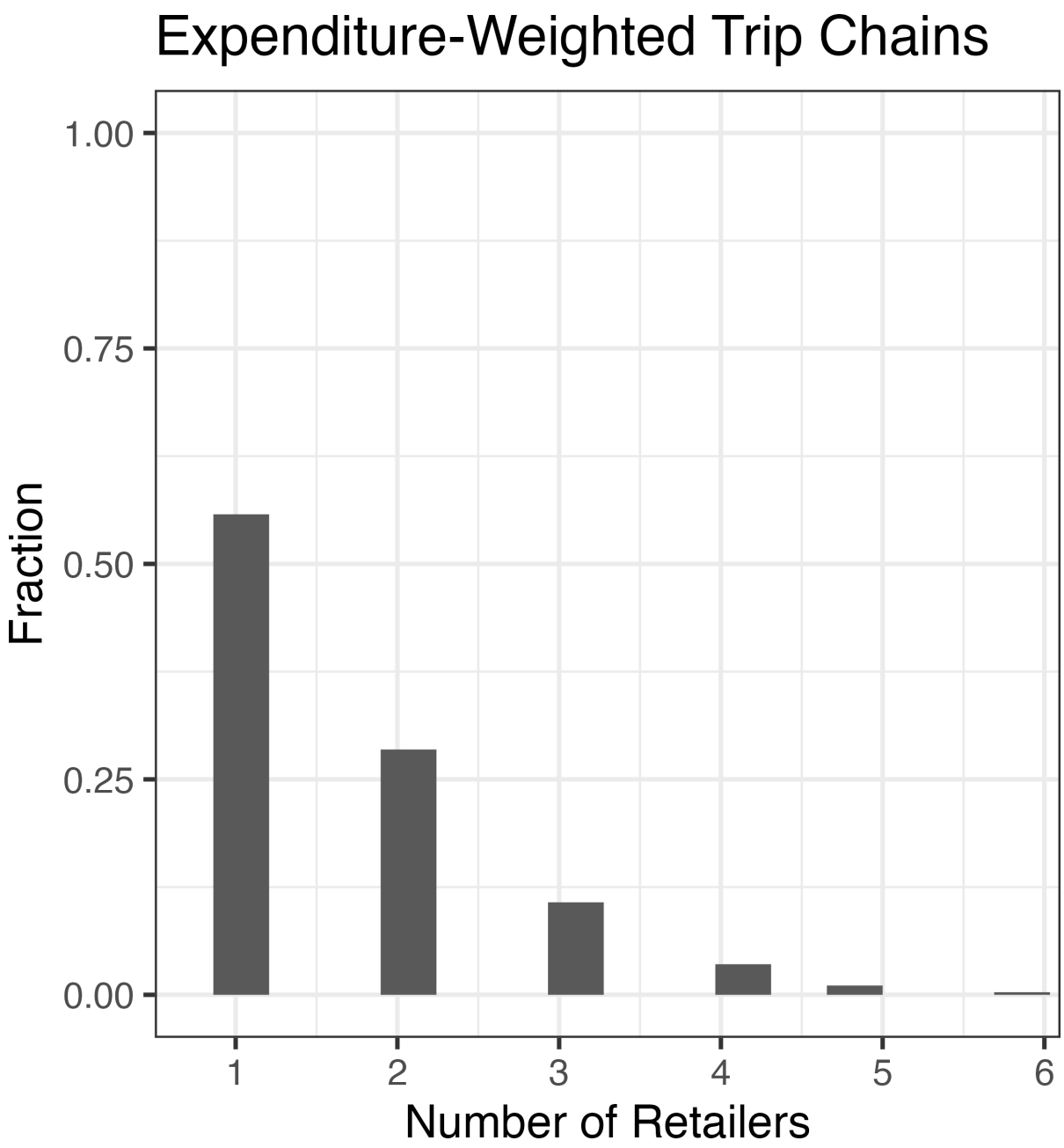
Source: Compstak. Histogram of rental prices in the Compstak data.

Figure 21: Comparing Observed and Imputed Distances Traveled to Retailers



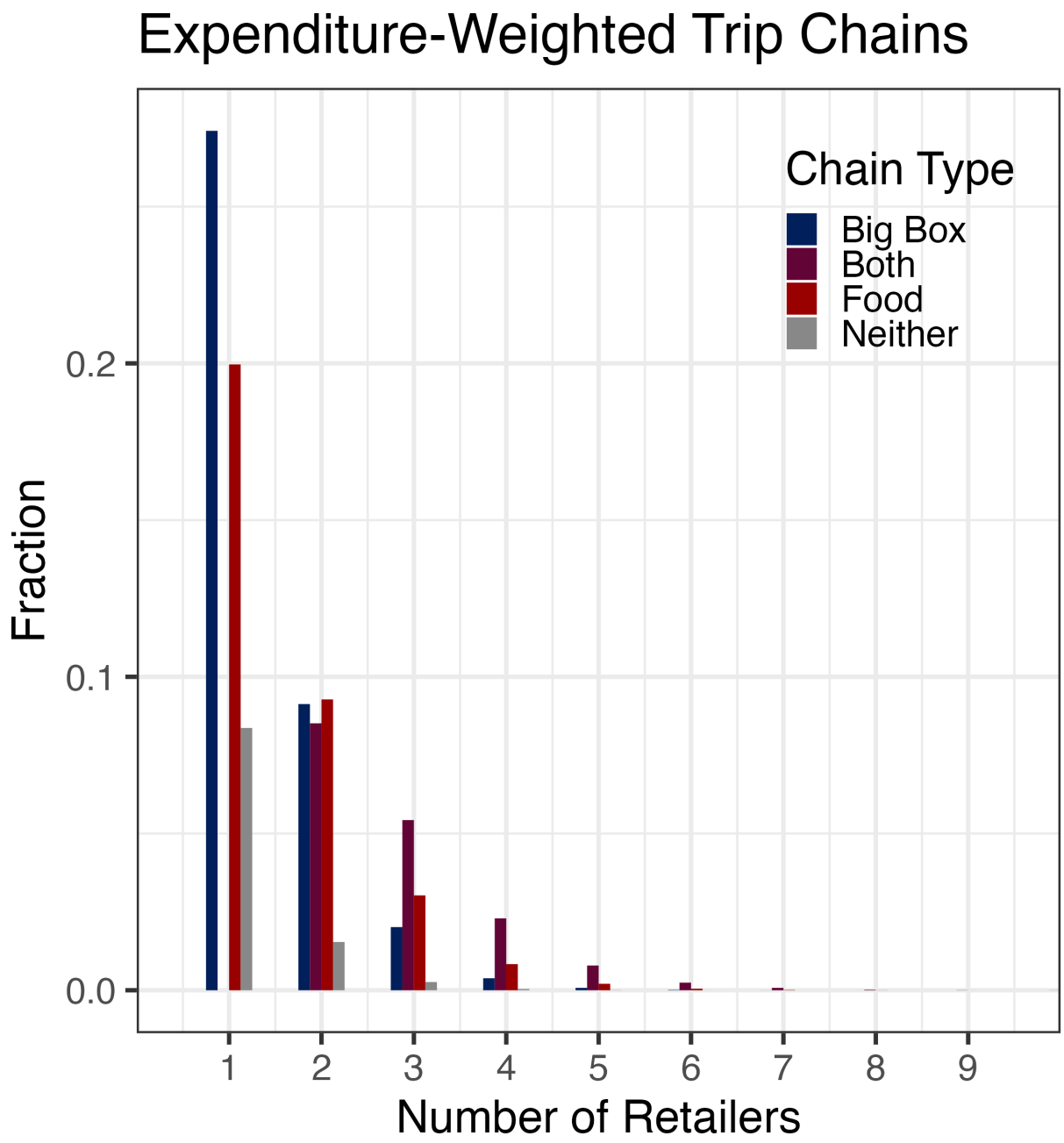
Source: Numerator. Comparison of actual distances traveled versus imputed distance traveled when the data on store locations are missing for distances between (a) 0-1 miles, (b) 0-5 miles and (c) 0-25 miles. When the store location is not available, the distance is imputed by assuming the consumer goes to the closest retailer location from home. In each case, distributions fail the Kolmogorov–Smirnov test to determine whether the distributions are the same.

Figure 22: Multi-Homing: Histogram of Number of Retailers Shopped at Per Trip



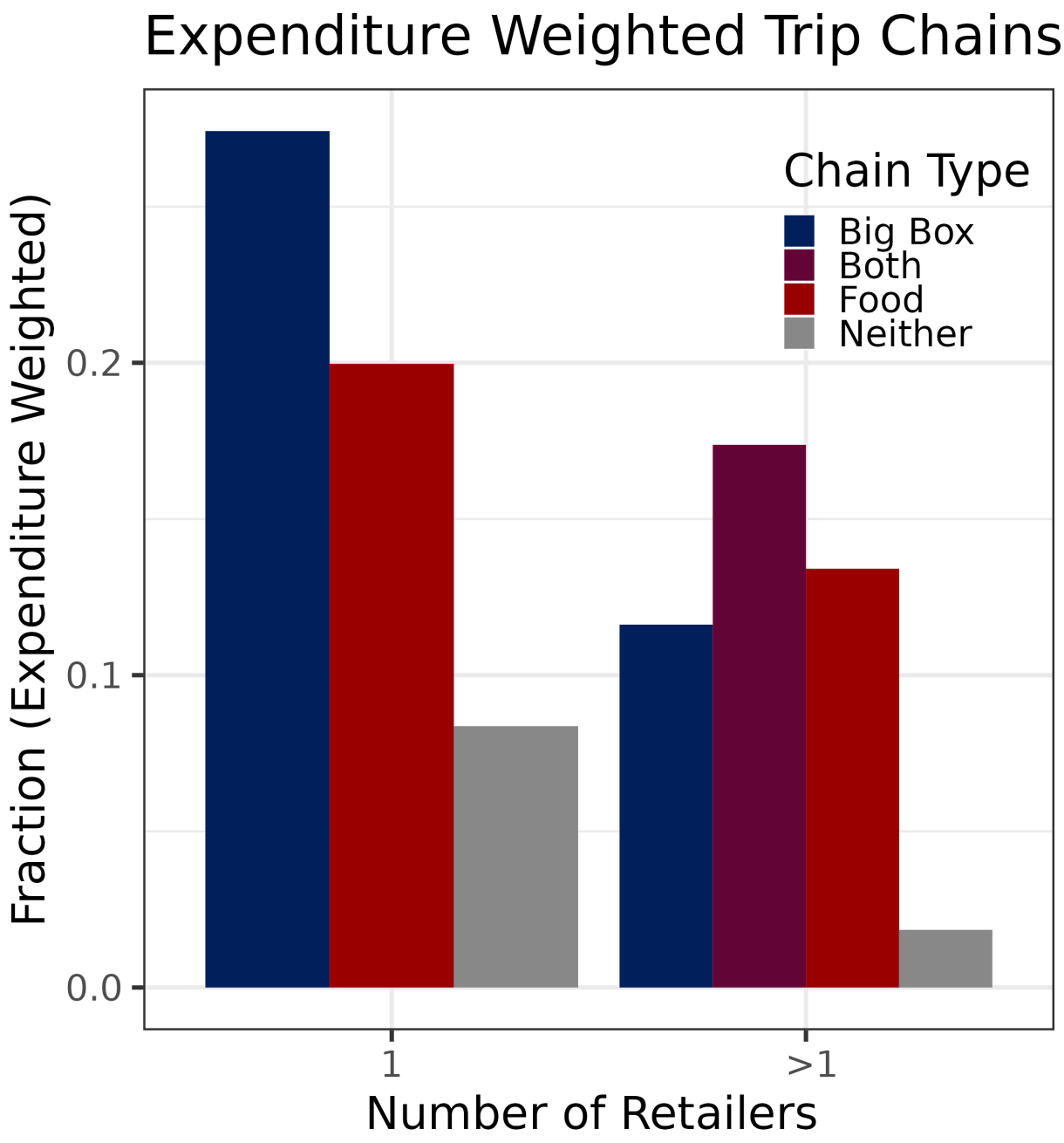
Source: Numerator. Figure shows prevalence of multi-homing or shopping at more than one store in the same day.

Figure 23: Multi-Homing: Histogram of Number of Retailers Shopped at Per Trip by Store Type



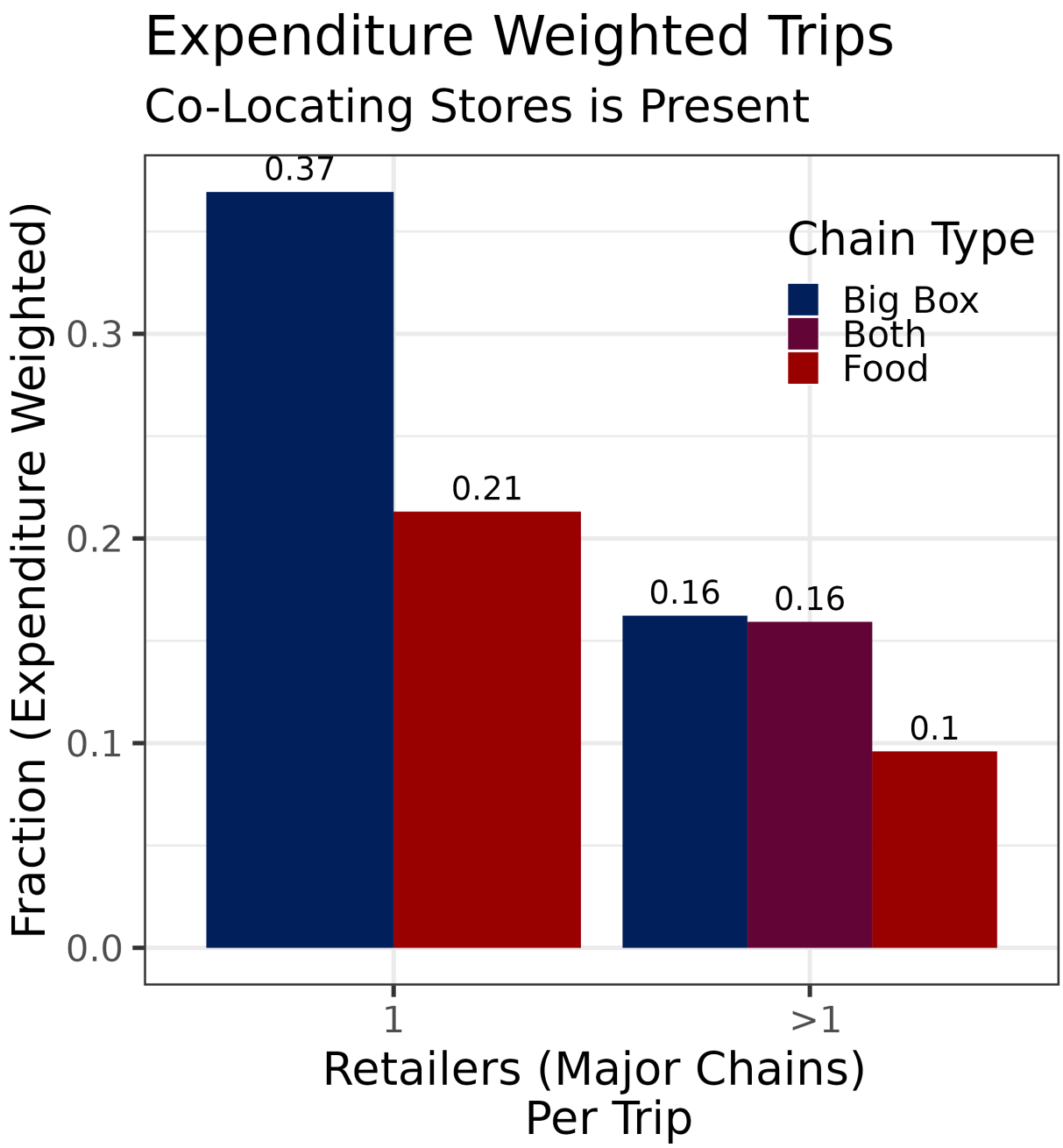
Source: Numerator. Figure shows prevalence of multi-homing or shopping at more than one store in the same day, broken down into store type categories.

Figure 24: Multi-Homing



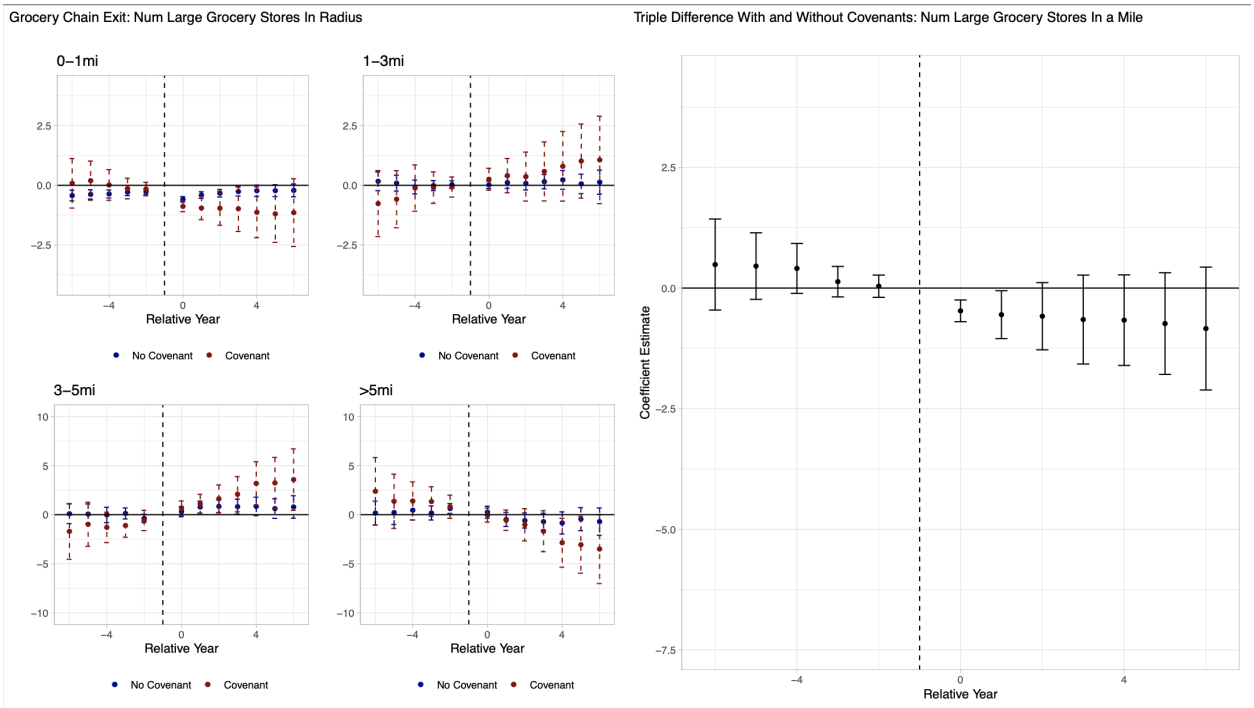
Source: Numerator. Figure shows prevalence of multi-homing or shopping at more than one store in the same day, broken down into store type categories.

Figure 25: Multi-Homing with Large Retail Chains when Co-Locating Stores Are Present



Source: Numerator. Figure shows number of retailers per trip conditional on (1) a household shops at a large grocery or big box store (2) another store is present within .2 miles of the large grocery store or big box store. We call this second store present a co-locating store. Therefore, this plot shows the frequency of trips to a single store versus multiple stores when it is easy for the household to shop at a second store.

Figure 26: Number of Grocers

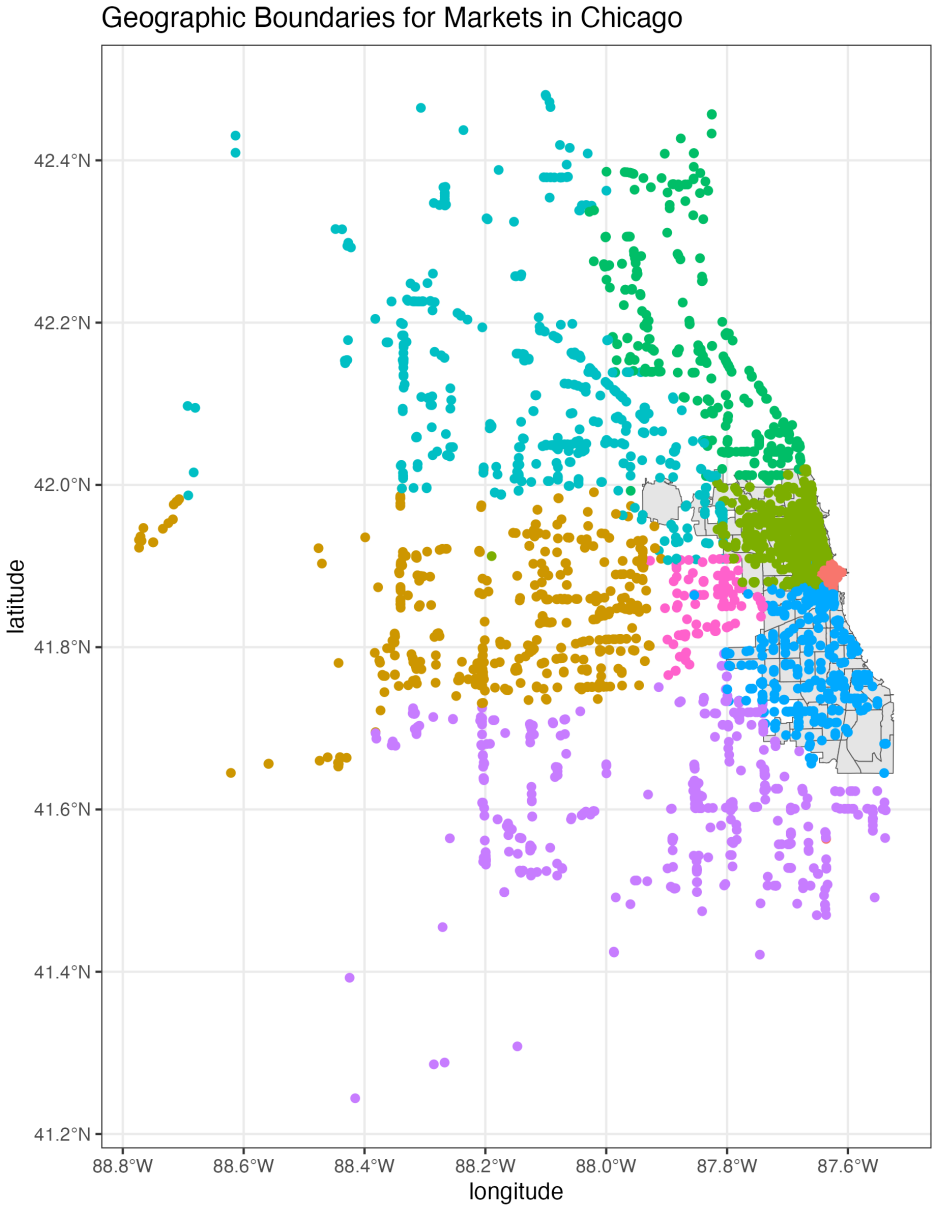


Notes: Figure shows an event study regression where the event is grocery exit and the outcome is grocery count, by exclusive dealing status. The grocer did not have an exclusive dealing contract (blue) and did have an exclusive dealing contract (red). The control group are chain stores that also exit in Cook county, but those that do not enter with a exclusive dealing. The left hand size specification is $y_{r(i)t} = \sum_{k=-T,k\neq 1}^{T} \delta_k D_{it} + zip_i + year_t + \epsilon_{it}$. The right hand size specification is $y_{r(i)t} = \sum_{k=-T,k\neq 1}^{T} \beta_k \text{excl. deal}_i D_{it} + \text{excl. deal}_i + zip_i + year_t + \text{excl. deal}_i year_t + \text{excl. deal}_i zip_i + zip_i year_t + \epsilon_{it}$.

Figure 27: Exclusive Dealing Contracts and Demand Estimate Complementarites

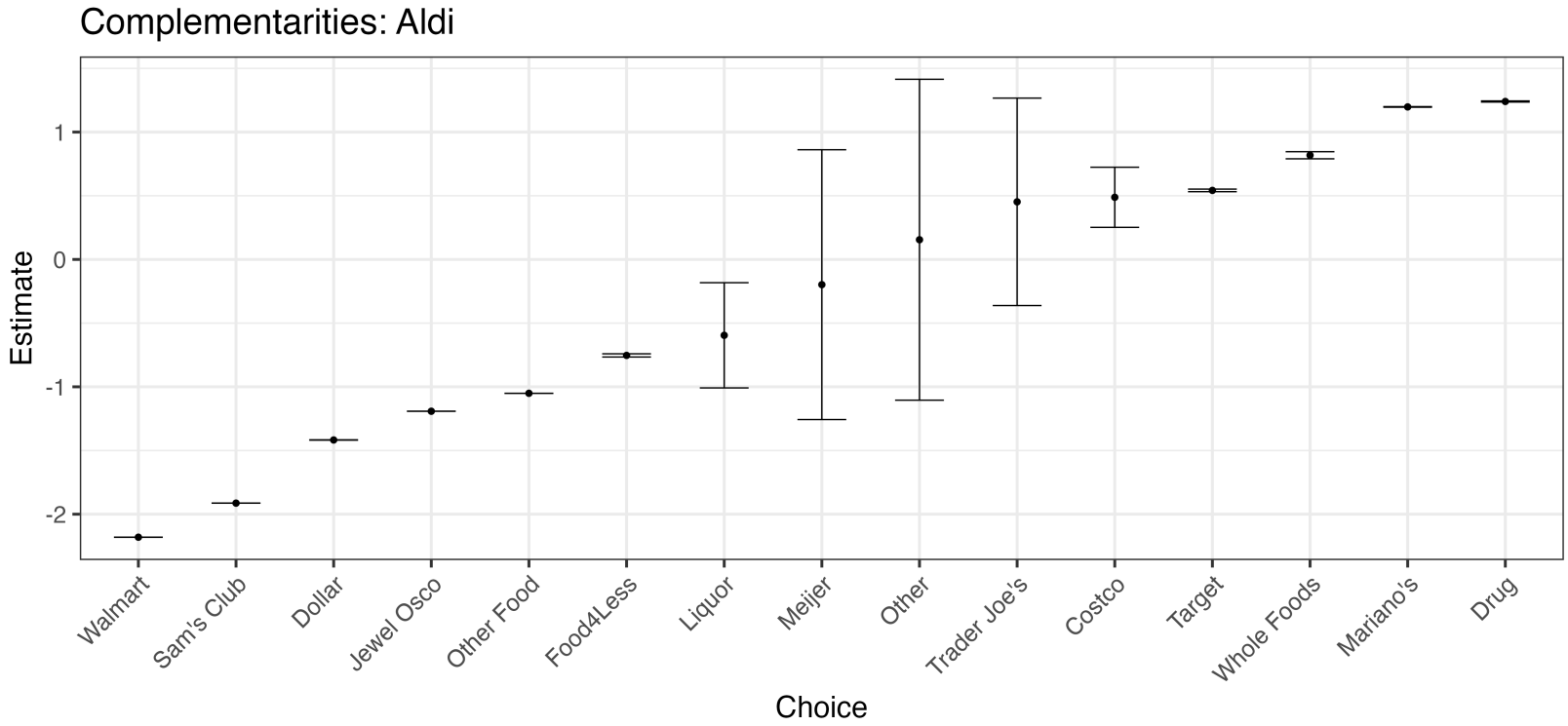
Source: Numerator and Cook County Recorder of deeds. Figure overlays blocking patterns from exclusive dealing contract and product demand estimates.

Figure 28: Markets in Chicago: Available Retailer Locations 2000-present



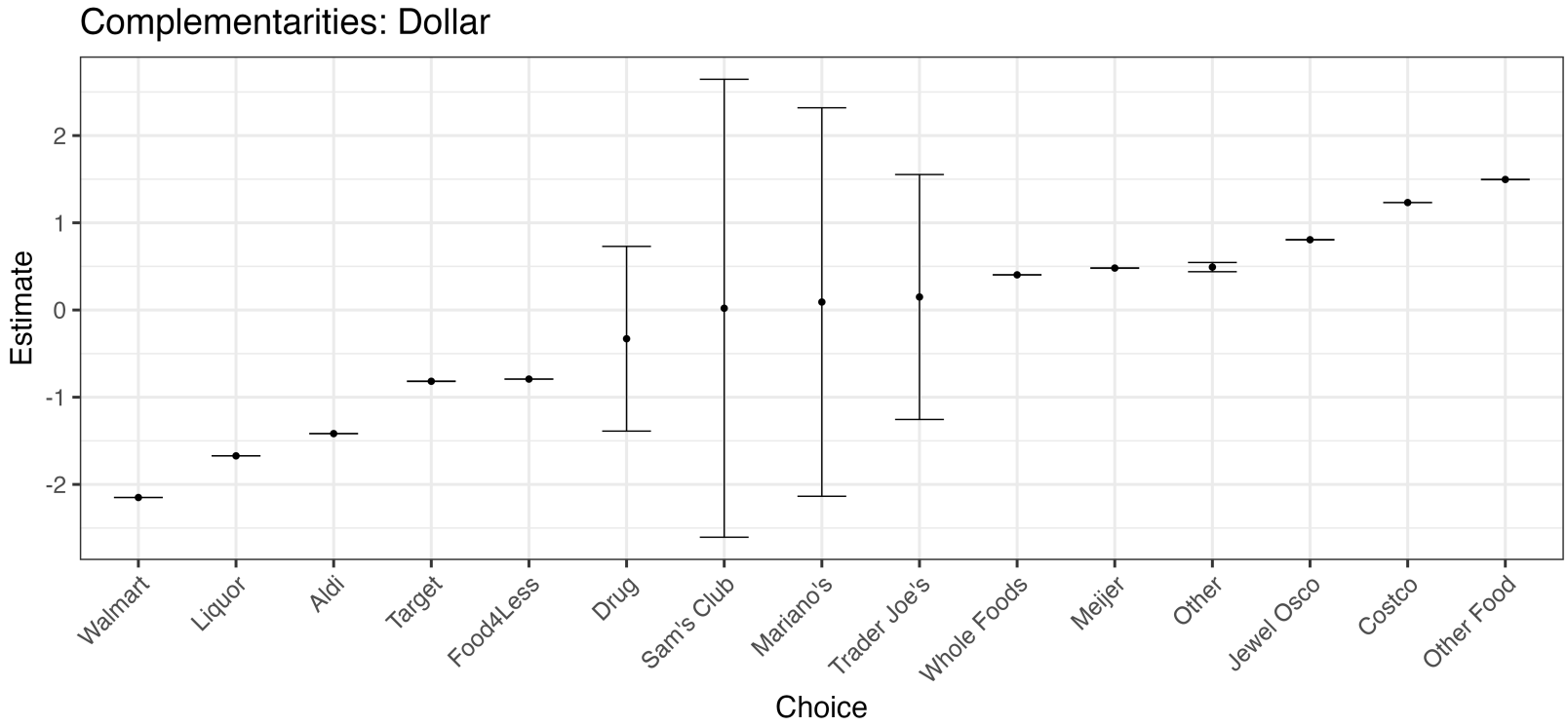
Source: Compstak. Data shows the total potential locations for all retailers (retailers and co-locating stores) in the analysis. The potential locations are colored by different markets. The boundaries are defined to minimize the probability a consumer shops across boundaries, from data and conversations industry professionals.

Figure 29: Complementarities



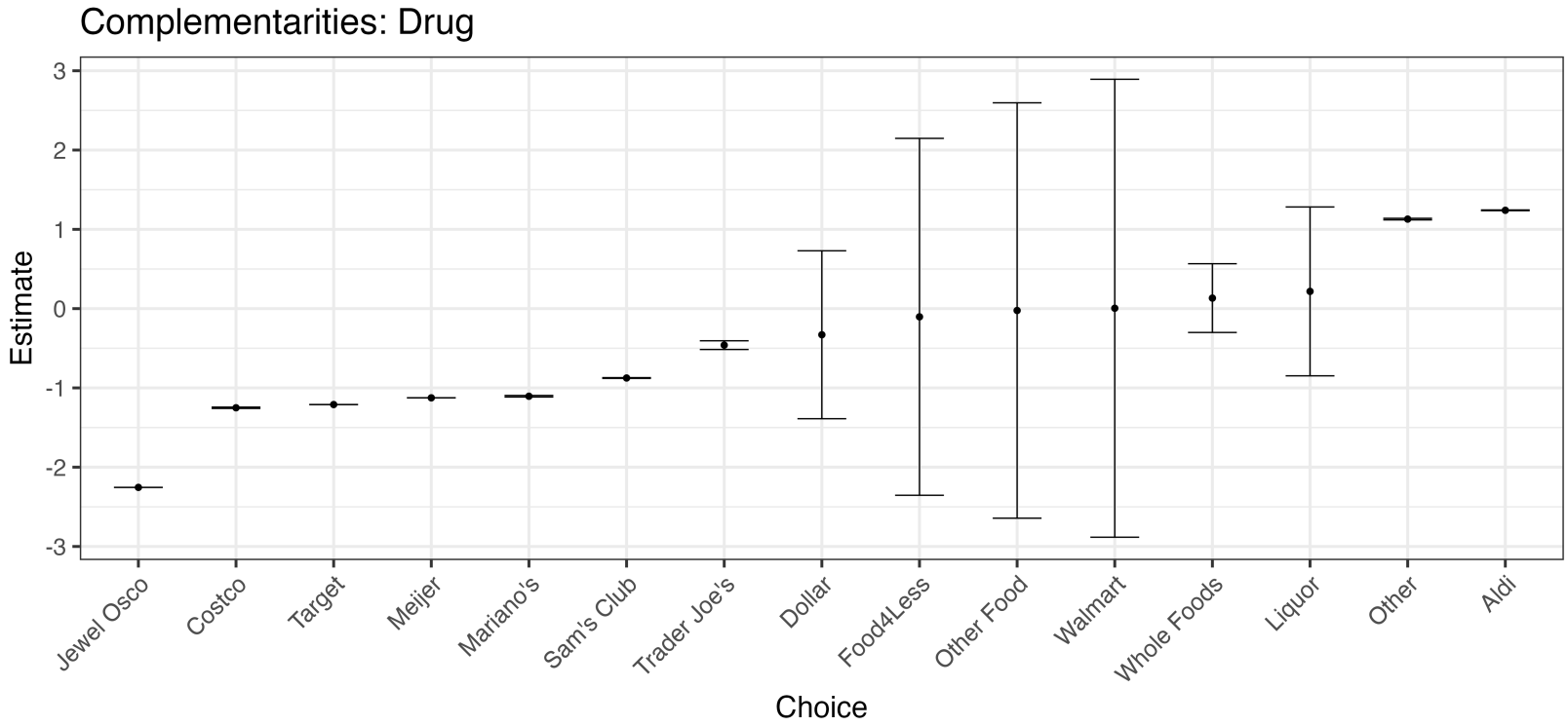
Notes: Estimates of complementarities across retailers.

Figure 30: Complementarities



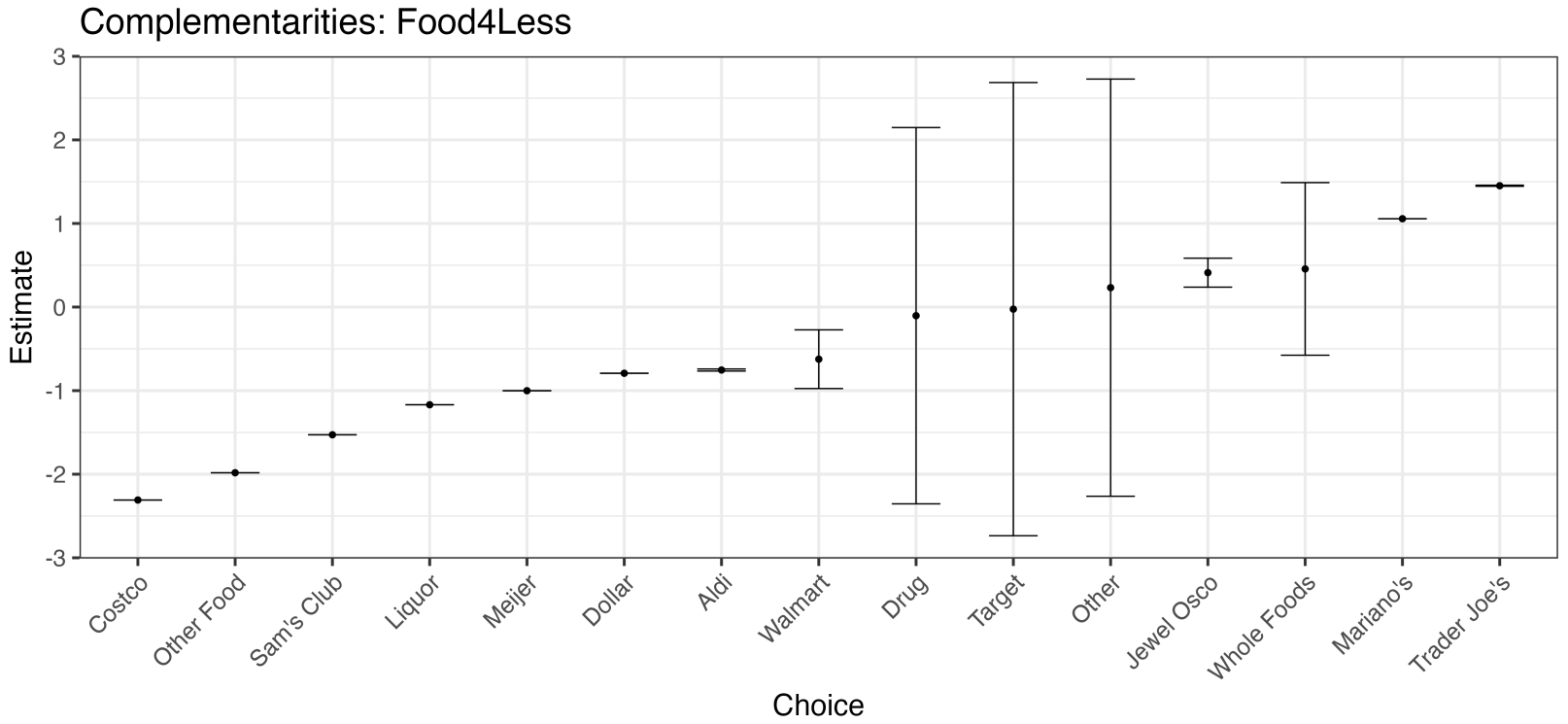
Notes: Estimates of complementarities across retailers.

Figure 31: Complementarities



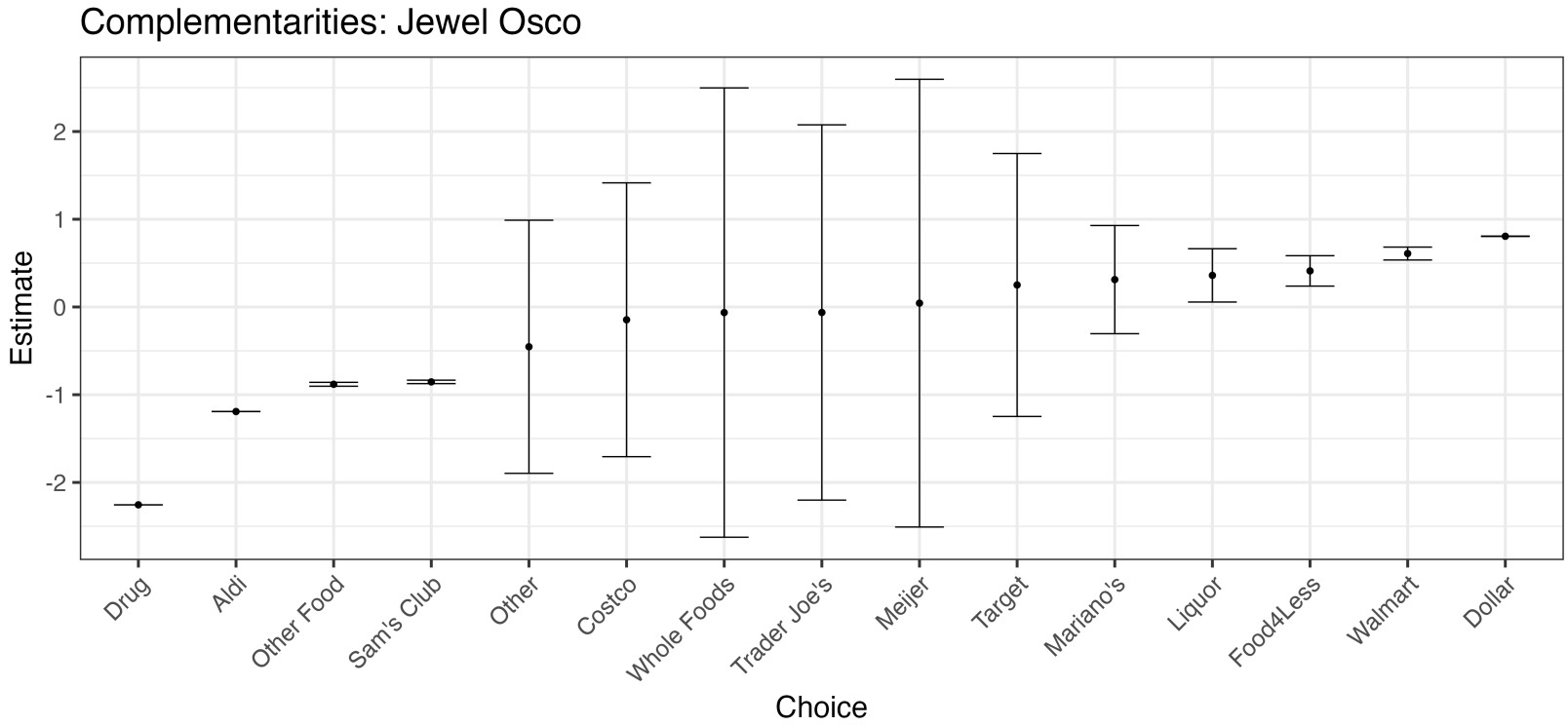
Notes: Estimates of complementarities across retailers.

Figure 32: Complementarities



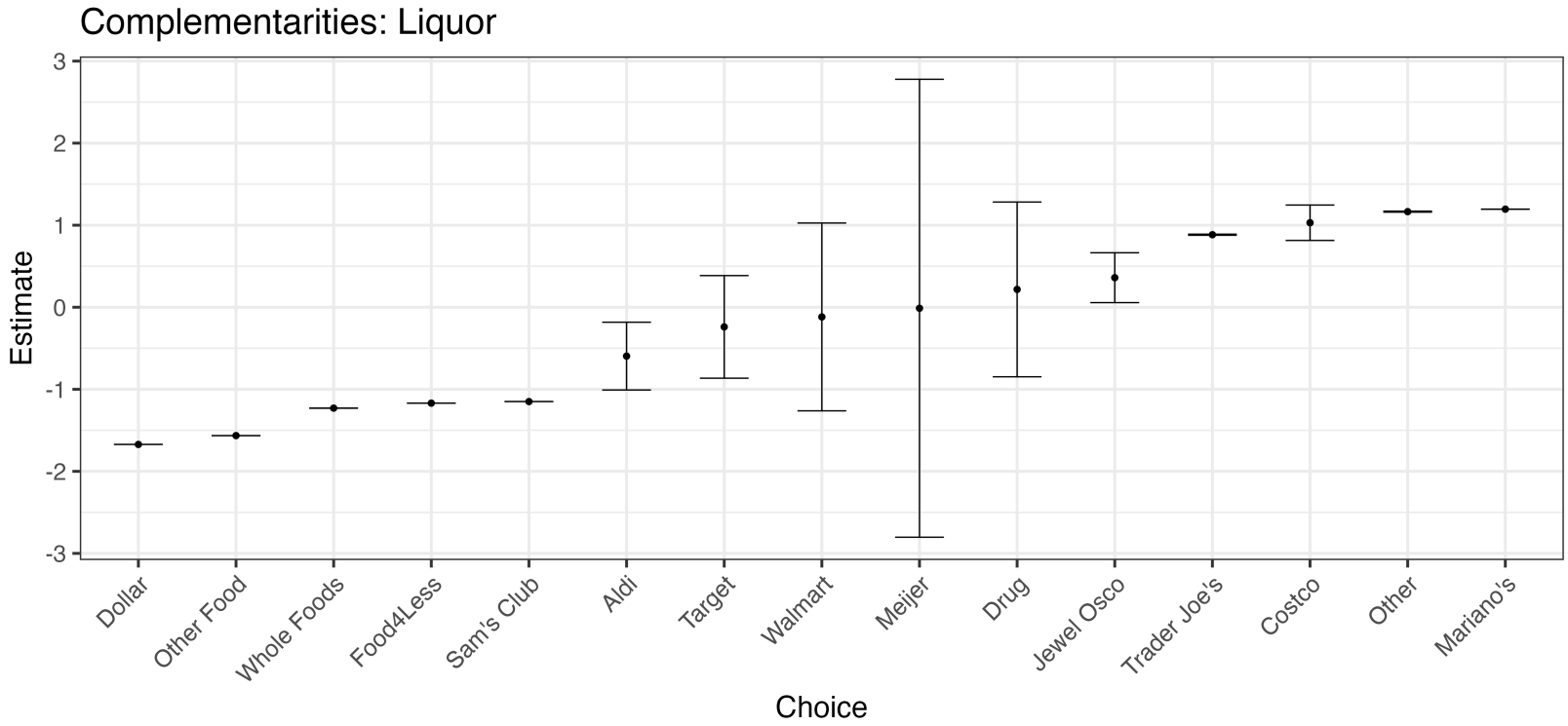
Notes: Estimates of complementarities across retailers.

Figure 33: Complementarities



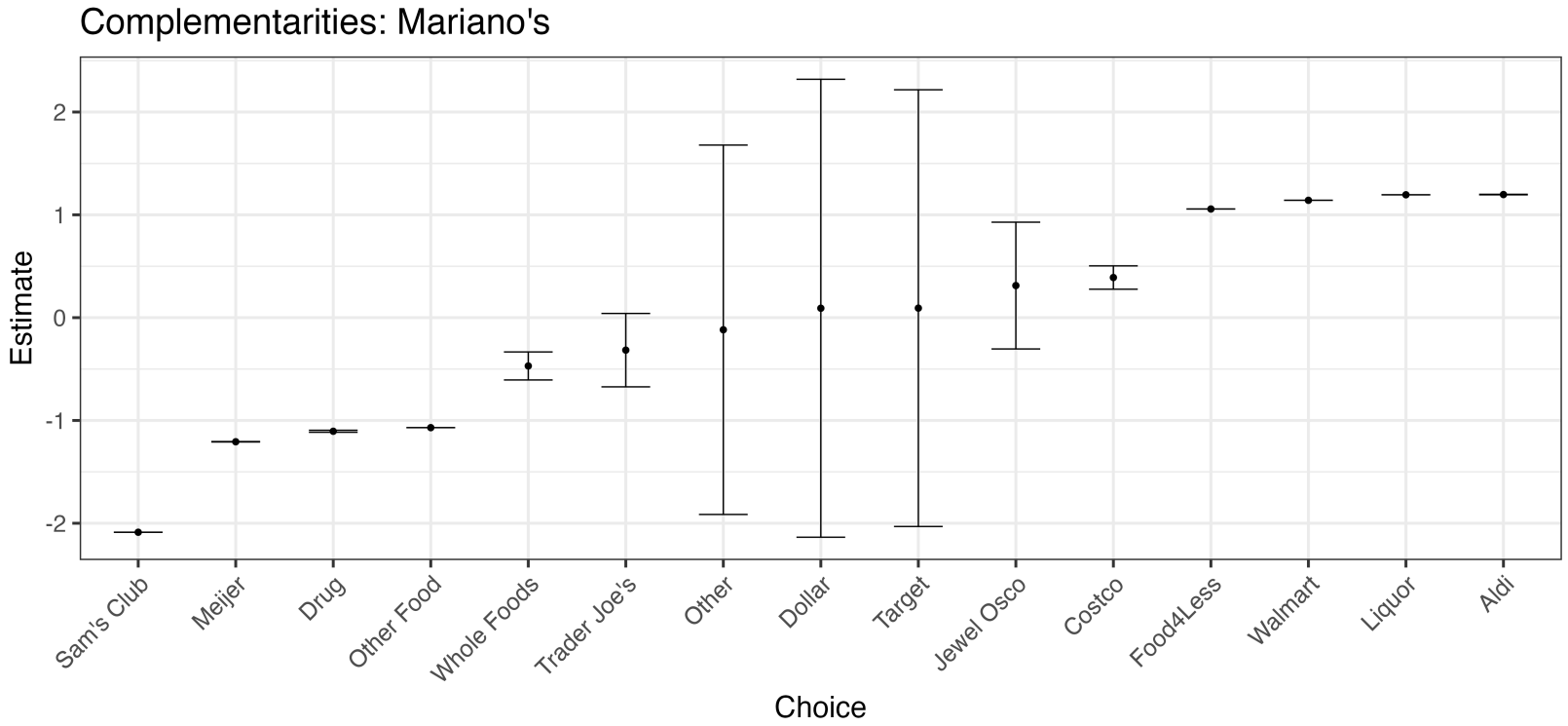
Notes: Estimates of complementarities across retailers.

Figure 34: Complementarities



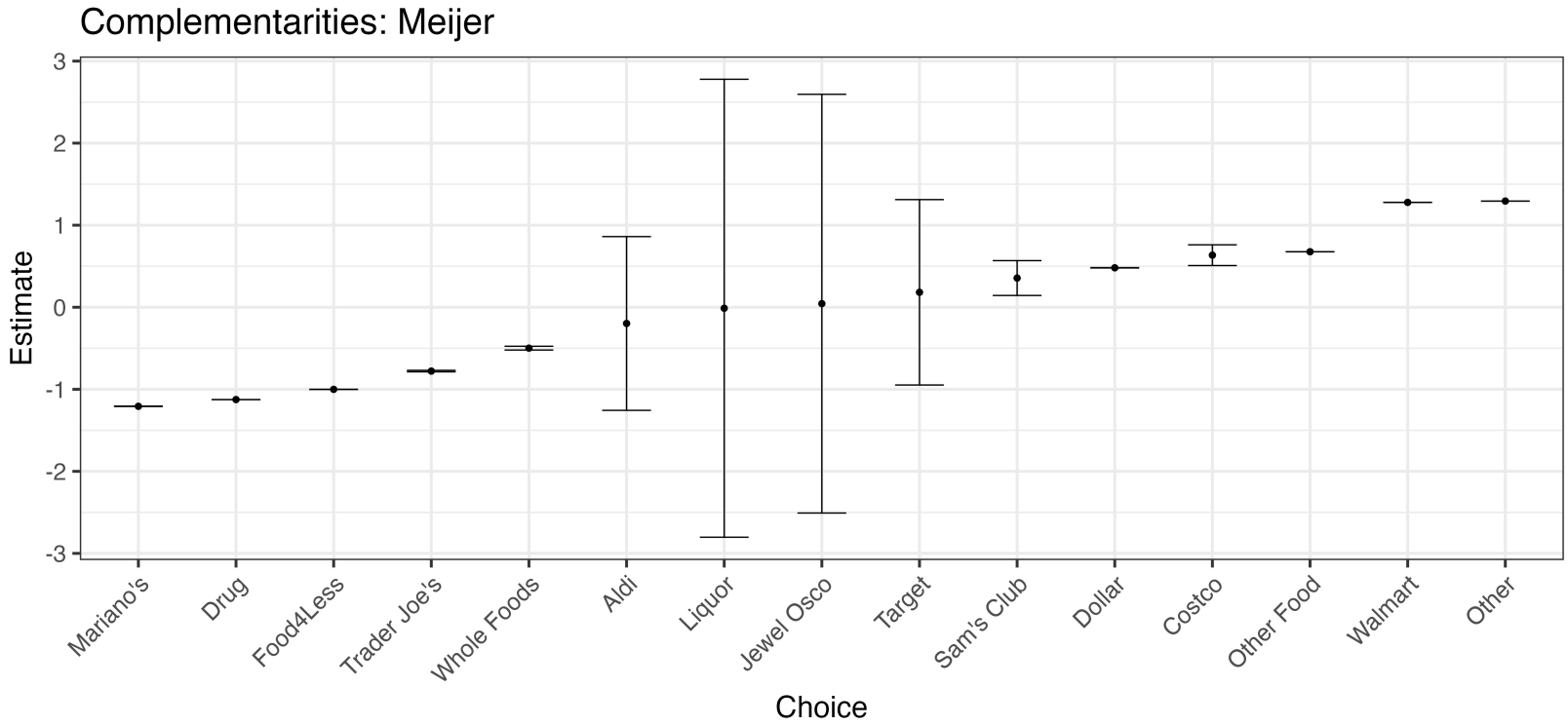
Notes: Estimates of complementarities across retailers.

Figure 35: Complementarities



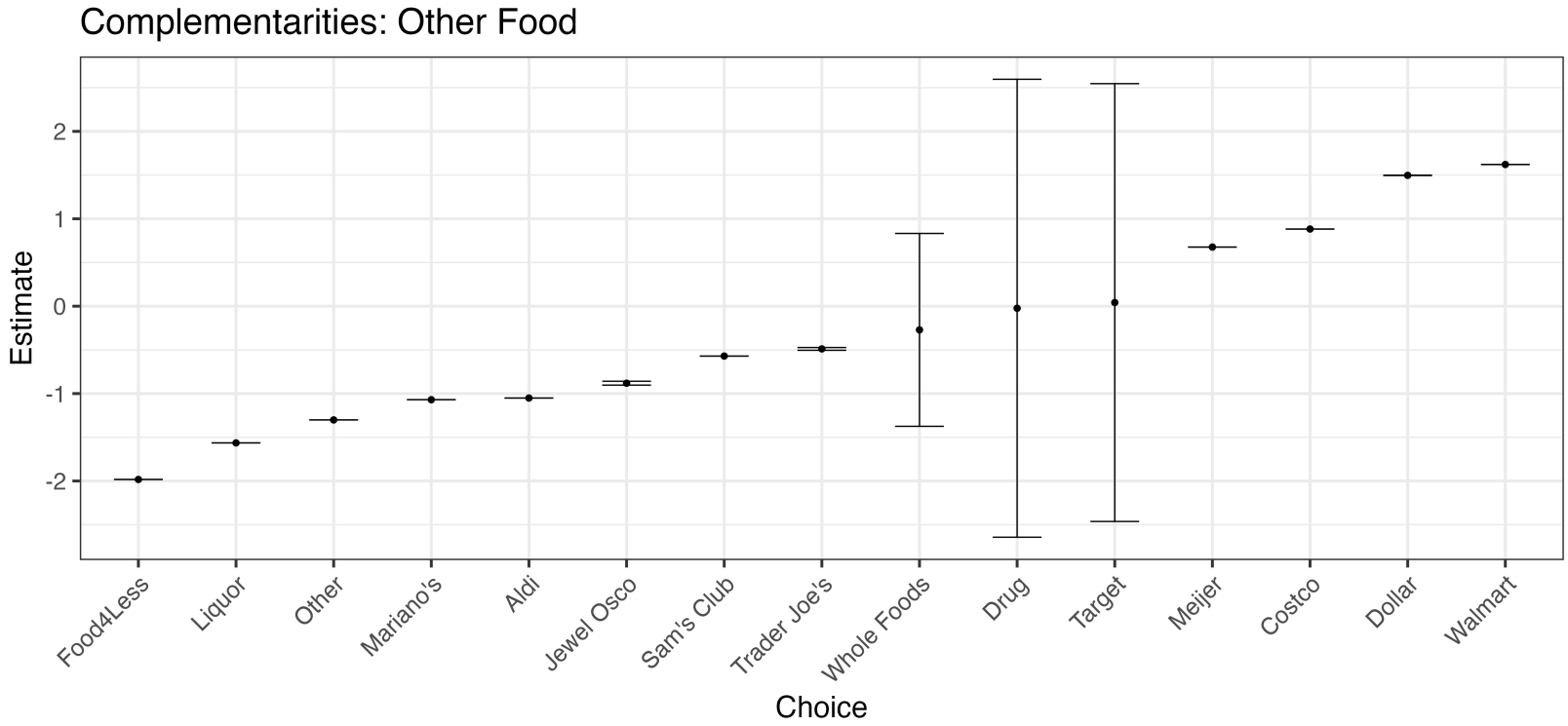
Notes: Estimates of complementarities across retailers.

Figure 36: Complementarities



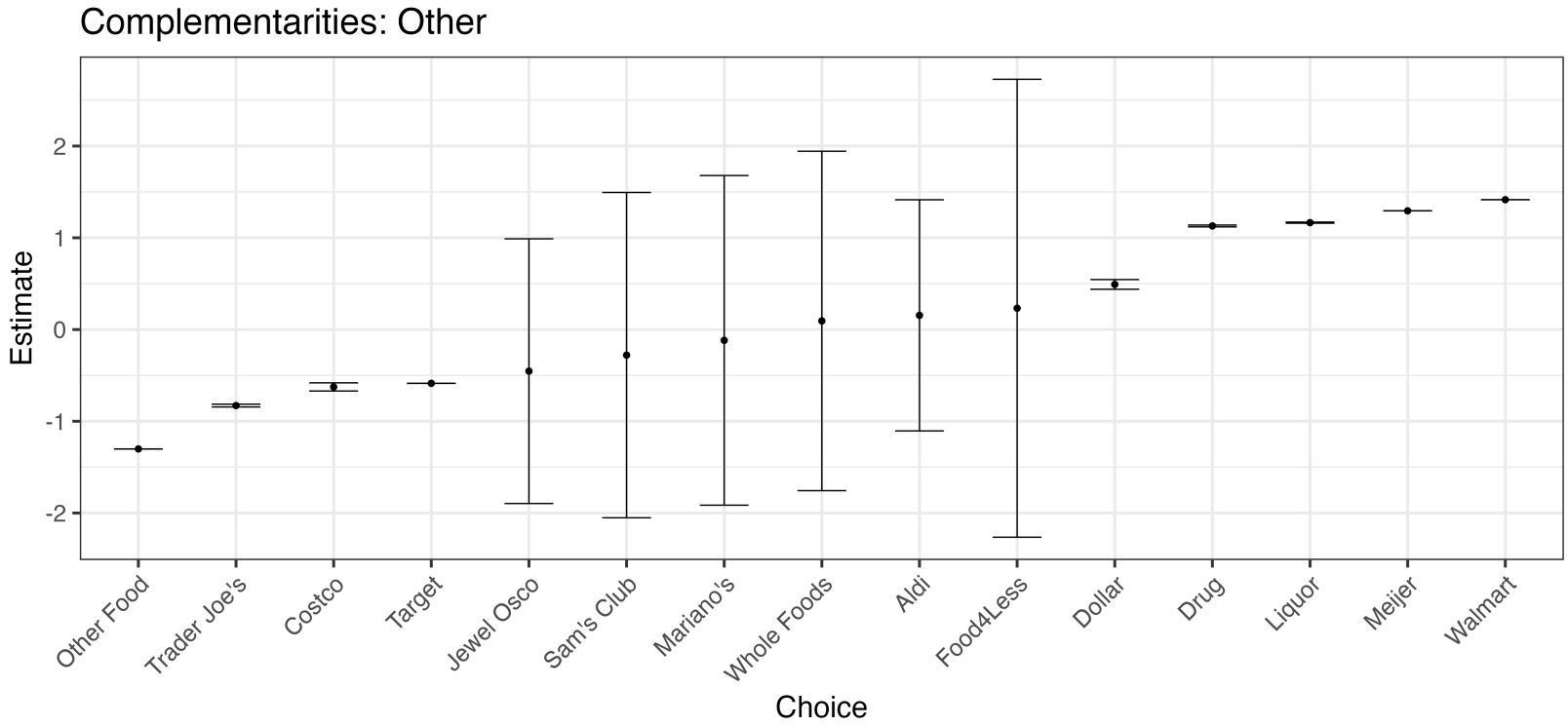
Notes: Estimates of complementarities across retailers.

Figure 37: Complementarities



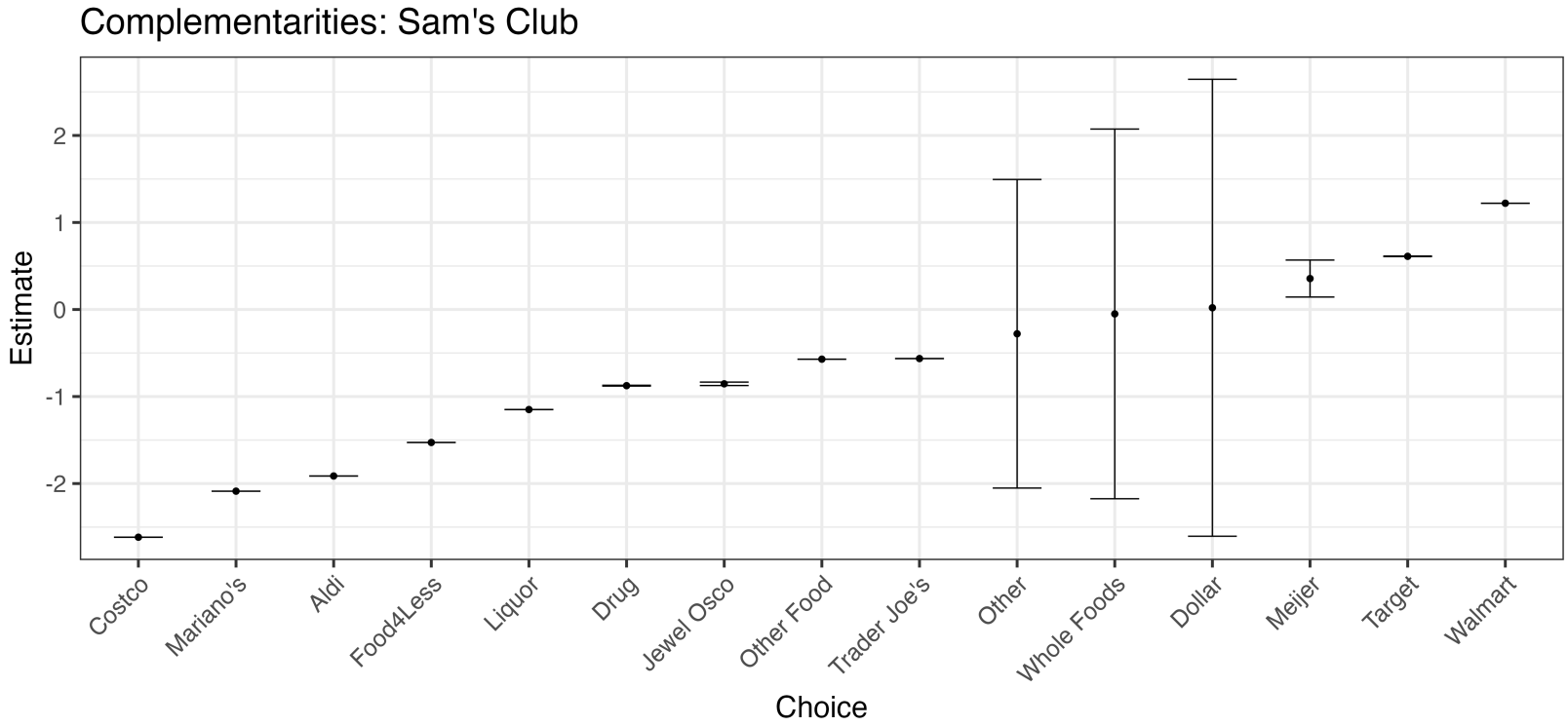
Notes: Estimates of complementarities across retailers.

Figure 38: Complementarities



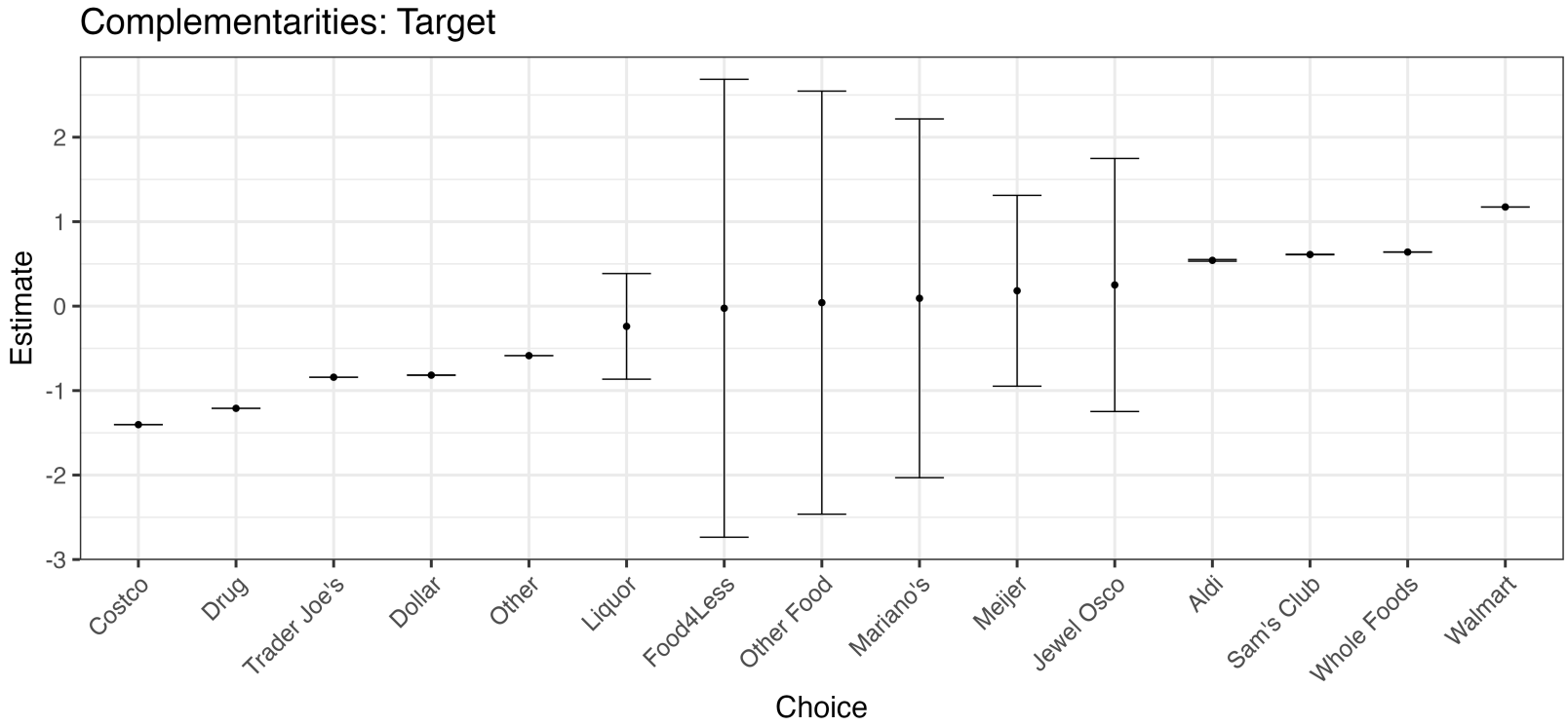
Notes: Estimates of complementarities across retailers.

Figure 39: Complementarities



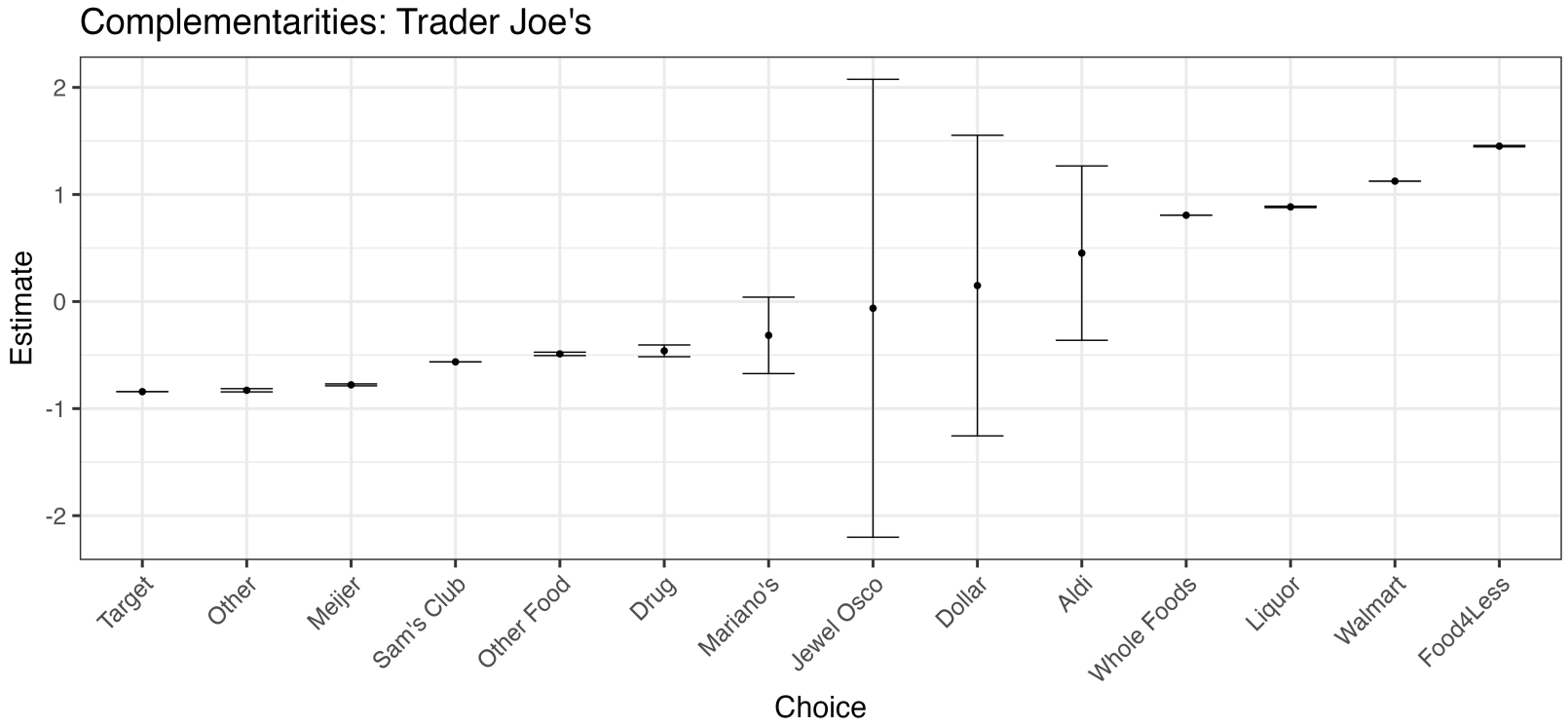
Notes: Estimates of complementarities across retailers.

Figure 40: Complementarities



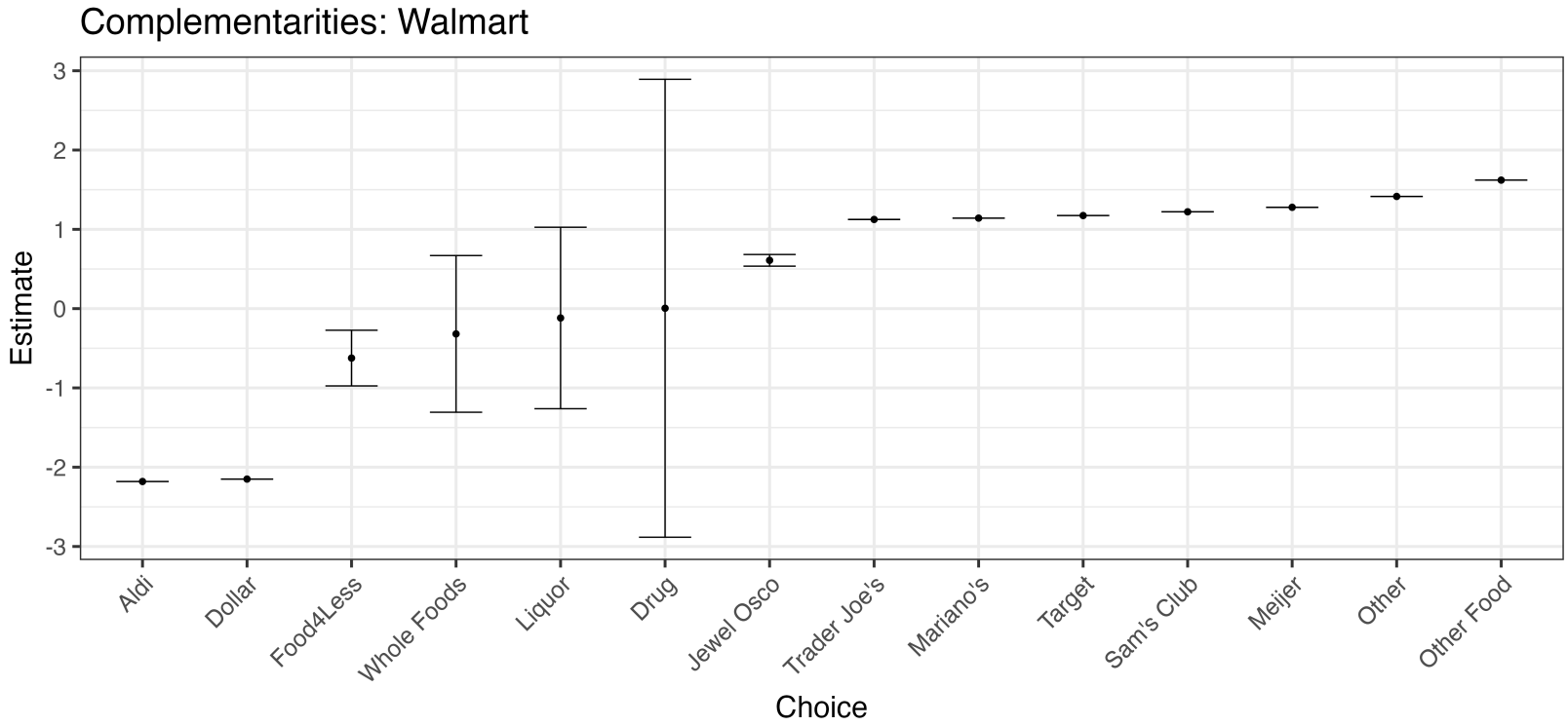
Notes: Estimates of complementarities across retailers.

Figure 41: Complementarities



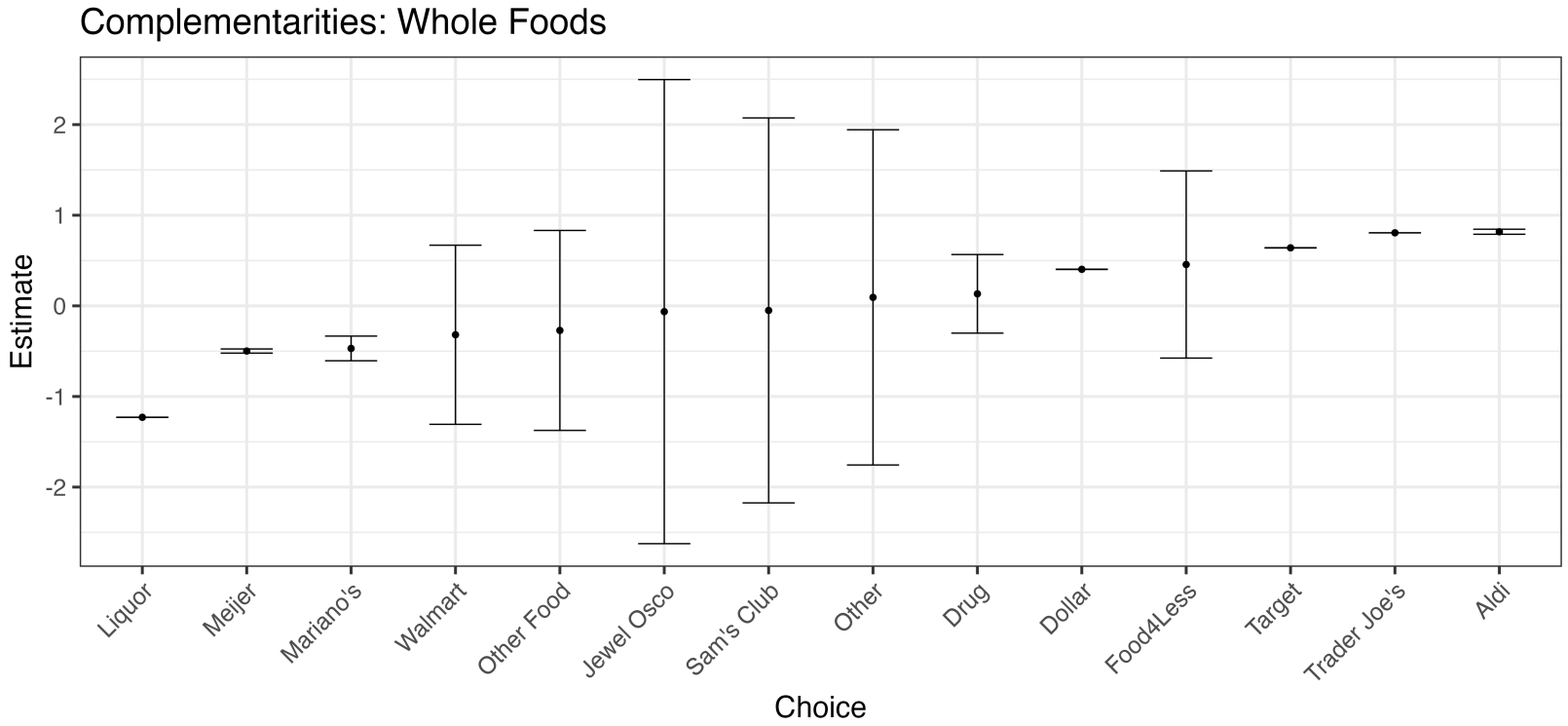
Notes: Estimates of complementarities across retailers.

Figure 42: Complementarities



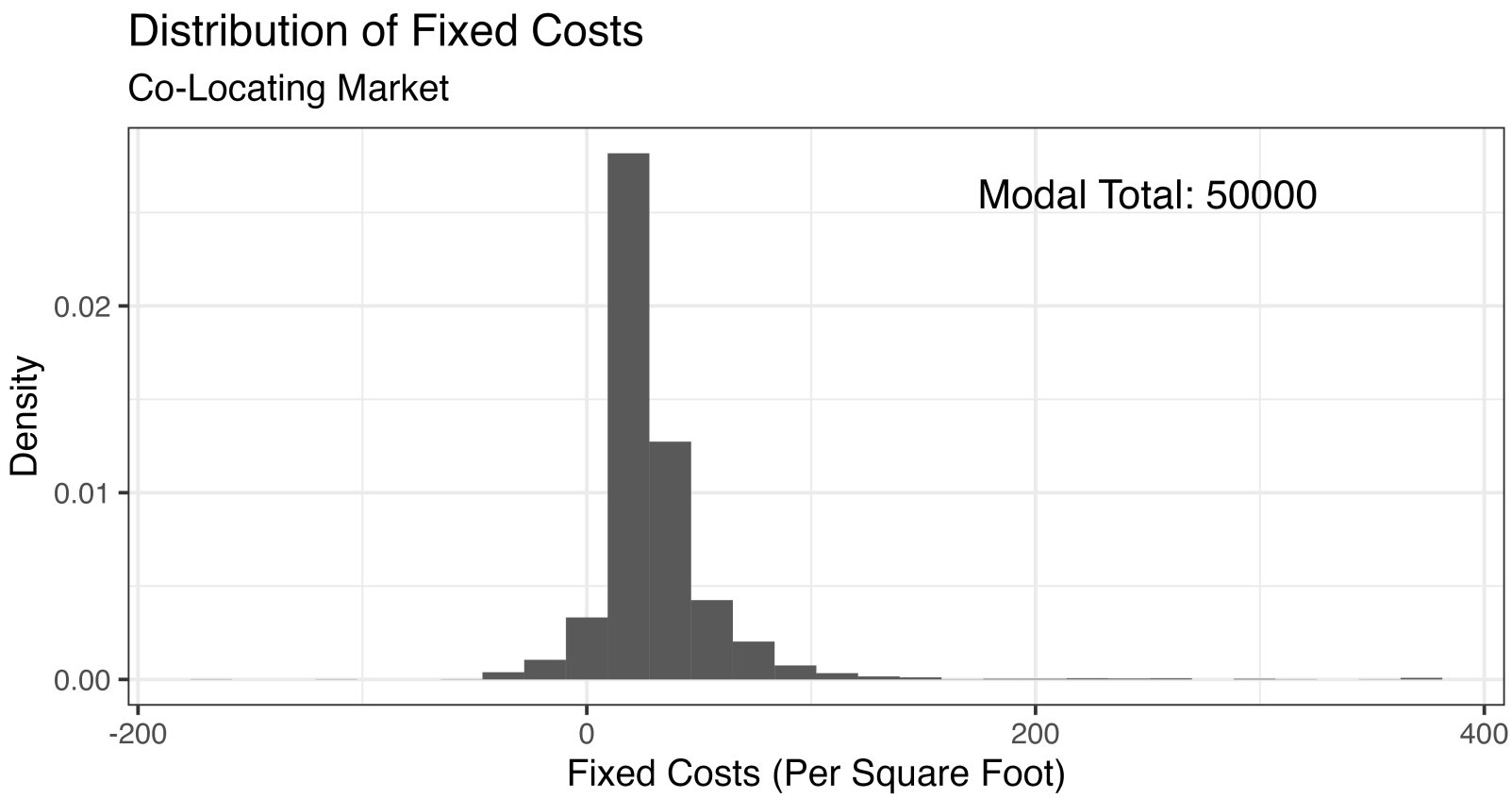
Notes: Estimates of complementarities across retailers.

Figure 43: Complementarities



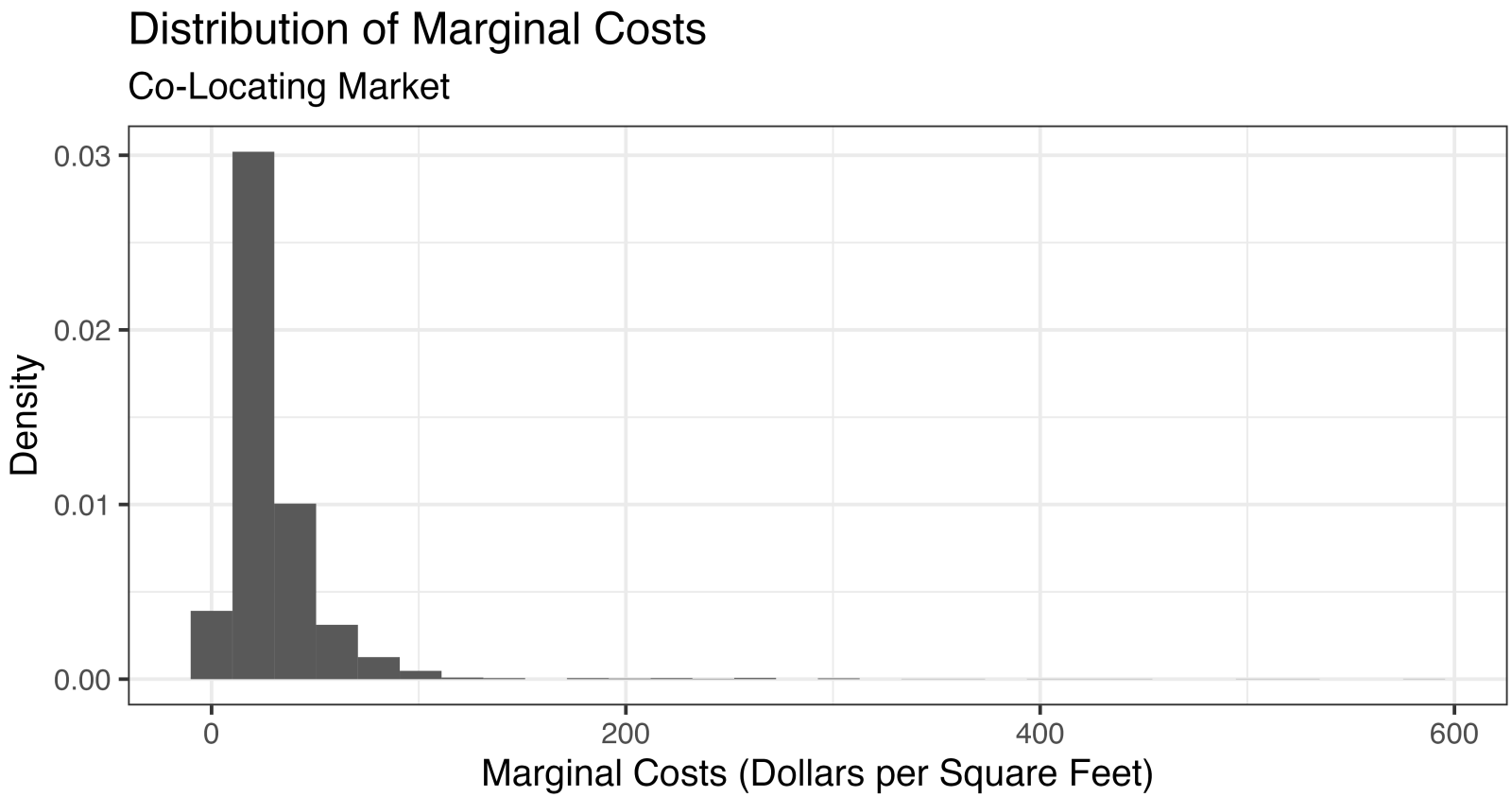
Notes: Estimates of complementarities across retailers.

Figure 44: Fixed Costs, Co-Locating Market



Notes: Estimates of the fixed costs of entry in the co-locating market.

Figure 45: Marginal Costs, Co-Locating Market



Notes: Estimates of landlord marginal costs for co-locating stores.

D Tables

Table 8: Most Frequented Retailers by Size and Parent Company

Parent	**Retailer**	**Size**
Amazon	Whole Foods	Large
Safeway	Jewel Osco	Large
Kroger	Mariano's (Kroger)	Large
Kroger	Food 4 Less	Large
Aldi	Aldi	Medium
Aldi	Trader Joe's	Medium
Costco	Costco	Very Large
Meijer	Meijer	Very Large
Walmart	Sam's Club	Very Large
Walmart	Walmart	Very Large
Target	Target	Large
	Drug Store	Medium / Small
	Dollar	Medium / Small
	Liquor	Small
	Other Food	Medium / Small
	All Other	Medium / Small

Notes The retailers (and parent company, if retailers share a common parent company) included in the analysis are those with the largest market share and most frequent trips. Retailers and potential locations are categorized into coarse location size groups.

Table 9: Chicago Grocery Chains with Exclusive Dealing Contracts

Aldi	Jewel Osco (Safeway)	Trader Joe's
Delray Farms	Mariano's (Kroger)	Whole Foods
Dominicks Finer Foods (Safeway)	Meijer	
Food 4 Less (Kroger)	Save a Lot	
Gordon Food Service Store	Tony's Fresh Market	

Notes: Table reports retailers in Chicago which have exclusive contracts. Data is for Cook County, IL. Data comes from the Cook County office recorder and the SNAP database.

Table 10: Subset of Exclusive Dealing Data

			Num	*Frac*
Total	→		196	
Own/Lease	→	Own	64	0.33
		Lease	131	0.67
Buy/Sell	→	Buy	8	0.21
		Sell	30	0.79
Type	→	Deed	28	0.19
		Agreement	27	0.19
		Memorandum	77	0.53
		Restriction	11	0.08
		Termination	2	0.01
Grocery Grantor	→	Yes	80	0.5
		No	72	0.54
Covenant Timing	→	Enter	94	0.48
		During	74	0.38
		Exit	13	0.07
		Not Grocery	15	0.08

Table 11: Exclusive Dealing Observed in Chicago

Notes: Source: Cook County Recorder and SNAP. Subsetting to 196 grocery covenants in Chicago, and characterizing the restrictions. The majority of the covenants from leasing agreements between a landlord and a grocery store tenant, the majority of which are entry covenants (half of the covenants overall are entry covenants). Amongst the covenants for properties that are owned by the grocery store, 80% are established when the property is sold: after the grocery store presence is gone from that specific location (whether there was a grocery store to begin with is unclear). These covenants are found in a variety of legal documents: lease memoranda, deeds, agreements, restrictions, easements, and terminations.

Table 12: Exclusive Dealing Observed in Chicago: Subset of Data

			Num	*Frac*
Total	→		196	
Text Length	→	Short	72	0.39
		Long	113	0.61
Radius	→	Property	104	0.58
		Adjacent Property	44	0.25
		Miles (median 0.5)	30	0.17
Duration After	→	Years (median 8)	62	0.46
		No	72	0.54
Covenant Timing	→	Enter	94	0.48
		During	74	0.38
		Exit	13	0.07
		Not Grocery	15	0.08

Notes: Source: Cook County Recorder. Detail of the extent to which the covenants might restrict competition. Covenants that are longer restrict more store types, and constitutes 60% of the observed covenants. Shorter covenants typically only block the same store type. Next, the covenant can bind at a variety of different radii: the property (typically the shopping center), within a certain mile radius (the median is .5), and the adjacent property. The vast majority of covenants bind at that specific shopping center. Finally, covenants can last even when a grocery store is not present at that location. The median duration is 8 years, and 62 explicitly detail a duration after exit.

Table 13: Summary statistics of the rental data

Rents (Dollars/sqft/month)	
Mean Rents	20.02
5th percentile	8.10
25th percentile	13.65
Median	18.07
75th percentile	23.80
95th percentile	35.32

Notes: Source: Compstak. Summary statistics of the rental data.

Table 14: Household Shopping

Number of Grocers a Household Shops at

Variable	Quantile				
	5th	25th	Median	75th	90th
All	1	1	3	6	14
More than 5 times in a year	1	1	2	4	6
More than 10 times in a year	1	1	2	3	5
More than 15 times in a year	1	1	2	3	5

Notes: Source: Numerator. Number of grocers households shop at.

Table 15: Regression of Exclusive Dealing Status on Demographics

	Exclusive Dealing Balance (1)
log(Real Income)	0.0153
	(0.0466)
log(Pop Density)	-0.0017
	(0.0067)
Share Unemployed	0.0242
	(0.0622)
Poverty	-0.0703
	(227,876.7)
Share Women	0.0062
	(5,607.7)
Share Black	-0.1409
	(0.2889)
Share White	0.0046
	(0.0819)
Share Hispanic	-0.0267
	(0.0321)
Share Asian	-0.0054
	(0.1143)
Share Travel Less 30	-0.0002
	(1,097.3)
Share Travel 30 to 60	0.0039
	(4,216.7)
Share Travel 60 to 90	-0.0007
	(1,174.7)
log(Housing Rent)	0.0005
	(5,496.0)
Housing Occupied	3.28×10^{-6}
	(21.19)
Housing Vacant	-0.0010
	(2,878.2)
Observations	6,252
R^2	0.96883
submarket fixed effects	✓
year start fixed effects	✓
tract fixed effects	✓
space type fixed effects	✓
building class fixed effects	✓
tenant id fixed effects	✓

Source ACS 2009-2023, Census 1990, 2000, SNAP, Cook County Recorder Office, and Compstak.

Table 16: Hedonic Price Regression

	log(Net Effective Rent)
	OLS
Exclusive Dealing	0.3221***
	(0.0811)
1{Grocer}	0.0458
	(0.0533)
log(Transaction Sqft)	-0.0579***
	(0.0072)
log(Lease Term)	0.0008
	(0.0186)
log(Real Income)	-0.0823
	(0.0480)
log(Pop Density)	0.0402*
	(0.0179)
Share Unemployed	0.1379*
	(0.0705)
Poverty	0.4996
	(489,924.0)
Share Women	-1.331
	(304,593.8)
Share Black	-0.4683
	(0.4032)
Share White	0.3861
	(0.3181)
Share Hispanic	0.3058*
	(0.1410)
Share Asian	0.4250
	(0.3330)
Share Advanced Degree	0.1095
	(2,976.9)
Share Travel Time to Work: $<$ 30 mins	-0.0474
	(4,862.6)
Share Travel Time to Work: 30-60 mins	5.43×10^{-7}
	(0.0037)
Housing Occupied	0.1405
	(15,739.9)
1{Covenant} 1{Grocer}	-0.4604
	(0.5900)
Observations	6,478
R^2	0.41514
Fixed Effects	
Submarket	✓
Year Start	✓
Tract	✓
Space Type	✓
Building Class	✓

Source ACS 2009-present, Census 1990, 2000, SNAP, Cook County Recorder Office, and Compstak.

Table 17: Log Density of Nearby Competitors with Chain Fixed Effects

	log(density)						
	0 - .3 mi	.3 - .6 mi	.6 - 1 mi	1 - 2 mi	2 - 5 mi	5 - 8 mi	8 - all mi
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
exclusive dealing	-0.3724**	0.3715***	0.2130*	0.2127**	0.0272	-0.0081	0.0397
	(0.1566)	(0.1375)	(0.1241)	(0.0915)	(0.0625)	(0.0567)	(0.0408)
Observations	2,172	2,193	2,583	3,079	3,180	3,180	3,180
R^2	0.69880	0.67632	0.76780	0.84330	0.85209	0.82288	0.44236
zip5 fixed effects	✓	✓	✓	✓	✓	✓	✓
year open fixed effects	✓	✓	✓	✓	✓	✓	✓
store name fixed effects	✓	✓	✓	✓	✓	✓	✓

Notes: Table reports coefficients and 95% confidence interval from regression of number of competitors per square mile on whether or not the store has an exclusive deal, with year, zip5, and retailer fixed effects. We only use grocery chains and big box stores. Competitors are defined as grocery, big box, and drug stores. Data is based on the exclusive deal data from the Cook County recorder office and the retailer location, entry, and exit comes from the SNAP data.

Table 18: Log Density of Nearby Competitors without Chain Fixed Effects

	log(density)						
	0 - .3 mi	.3 - .6 mi	.6 - 1 mi	1 - 2 mi	2 - 5 mi	5 - 8 mi	8 - all mi
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
exclusive dealing	-0.3275***	0.4067***	0.1254	0.0483	0.0262	-0.0375	0.0113
	(0.1110)	(0.1249)	(0.1654)	(0.0875)	(0.0579)	(0.0473)	(0.0338)
Observations	2,172	2,193	2,583	3,079	3,180	3,180	3,180
R^2	0.65640	0.63287	0.74549	0.83430	0.84872	0.81915	0.43479
zip5 fixed effects	✓	✓	✓	✓	✓	✓	✓
year open fixed effects	✓	✓	✓	✓	✓	✓	✓

Notes: Table reports coefficients and 95% confidence interval from regression of number of competitors per square mile on whether or not the store has an exclusive deal, with year and zip5 fixed effects. We only use grocery chains and big box stores. Competitors are defined as grocery, big box, and drug stores. Data is based on the exclusive deal data from the Cook County recorder office and the retailer location, entry, and exit comes from the SNAP data.

Table 19: Density of Nearby Competitors with Chain Fixed Effects

	log(density)						
	0 - .3 mi	.3 - .6 mi	.6 - 1 mi	1 - 2 mi	2 - 5 mi	5 - 8 mi	8 - all mi
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
exclusive dealing	-0.3724**	0.3715***	0.2130*	0.2127**	0.0272	-0.0081	0.0397
	(0.1566)	(0.1375)	(0.1241)	(0.0915)	(0.0625)	(0.0567)	(0.0408)
Observations	2,172	2,193	2,583	3,079	3,180	3,180	3,180
R^2	0.69880	0.67632	0.76780	0.84330	0.85209	0.82288	0.44236
zip5 fixed effects	✓	✓	✓	✓	✓	✓	✓
year open fixed effects	✓	✓	✓	✓	✓	✓	✓
store name fixed effects	✓	✓	✓	✓	✓	✓	✓

Notes: Table reports coefficients and 95% confidence interval from regression of number of competitors per square mile on whether or not the store has an exclusive deal, with year, zip5, and retailer fixed effects. We only use grocery chains and big box stores. Competitors are defined as grocery, big box, and drug stores. Data is based on the exclusive deal data from the Cook County recorder office and the retailer location, entry, and exit comes from the SNAP data.

Table 20: Density of Nearby Competitors without Chain Fixed Effects

	log(density)						
	0 - .3 mi	.3 - .6 mi	.6 - 1 mi	1 - 2 mi	2 - 5 mi	5 - 8 mi	8 - all mi
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
exclusive dealing	-0.3275***	0.4067***	0.1254	0.0483	0.0262	-0.0375	0.0113
	(0.1110)	(0.1249)	(0.1654)	(0.0875)	(0.0579)	(0.0473)	(0.0338)
Observations	2,172	2,193	2,583	3,079	3,180	3,180	3,180
R^2	0.65640	0.63287	0.74549	0.83430	0.84872	0.81915	0.43479
zip5 fixed effects	✓	✓	✓	✓	✓	✓	✓
year open fixed effects	✓	✓	✓	✓	✓	✓	✓

Notes: Table reports coefficients and 95% confidence interval from regression of number of competitors per square mile on whether or not the store has an exclusive deal, with year and zip5 fixed effects. We only use grocery chains and big box stores. Competitors are defined as grocery, big box, and drug stores. Data is based on the exclusive deal data from the Cook County recorder office and the retailer location, entry, and exit comes from the SNAP data.

Table 21: Count of Nearby Competitors without Chain Fixed Effects

	count						
	0 - .3 mi	.3 - .6 mi	.6 - 1 mi	1 - 2 mi	2 - 5 mi	5 - 8 mi	8 - all mi
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
exclusive dealing	-0.9220**	1.627***	1.047	3.772	7.509	1.428	-15.15
	(0.4291)	(0.5723)	(1.206)	(3.119)	(12.69)	(13.76)	(24.61)
Observations	2,172	2,193	2,583	3,079	3,180	3,180	3,180
R^2	0.83004	0.79461	0.83180	0.88401	0.91325	0.92687	0.97402
zip5 fixed effects	✓	✓	✓	✓	✓	✓	✓
year open fixed effects	✓	✓	✓	✓	✓	✓	✓
store name fixed effects	✓	✓	✓	✓	✓	✓	✓
year fixed effects	✓	✓	✓	✓	✓	✓	✓

Notes: Table reports coefficients and 95% confidence interval from regression of number of competitors per square mile on whether or not the store has an exclusive deal, with year and zip5 fixed effects. We only use grocery chains and big box stores. Competitors are defined as grocery, big box, and drug stores. Data is based on the exclusive deal data from the Cook County recorder office and the retailer location, entry, and exit comes from the SNAP data.

Table 22: Count of Nearby Competitors without Chain Fixed Effects

	count						
	0 - .3 mi	.3 - .6 mi	.6 - 1 mi	1 - 2 mi	2 - 5 mi	5 - 8 mi	8 - all mi
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
exclusive dealing	-0.6423**	1.836***	1.091	3.582	10.67	4.365	-4.368
	(0.2760)	(0.6577)	(1.400)	(3.691)	(13.56)	(18.01)	(36.33)
Observations	2,172	2,193	2,583	3,079	3,180	3,180	3,180
R^2	0.71599	0.65015	0.70456	0.77524	0.78962	0.75074	0.45939
zip5 fixed effects	✓	✓	✓	✓	✓	✓	✓
year open fixed effects	✓	✓	✓	✓	✓	✓	✓

Notes: Table reports coefficients and 95% confidence interval from regression of number of competitors per square mile on whether or not the store has an exclusive deal, with year and zip5 fixed effects. We only use grocery chains and big box stores. Competitors are defined as grocery, big box, and drug stores. Data is based on the exclusive deal data from the Cook County recorder office and the retailer location, entry, and exit comes from the SNAP data.