Distributional Effects of Exclusive Dealing in Retail Real Estate

Camilla Schneier*

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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, most 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.

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

[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.

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 potential 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 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

[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.

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 is the first economics paper on these exclusive dealing contracts, with prior legal scholarship on their existence (Sturtevant (1959), Lundberg (1973)), whether they encumber development (Stubblefield (2019)), and whether contracts signed at exit are anticompetitive (Ziff and Jiang (2012), Leslie (2021), Kang (2022)). We collect data and study a non-standard constraint affecting consumer welfare and retailer locations, which parallels recent efforts to collect data and understand government-imposed constraints such as zoning and residential restrictive covenants (see for example Hughes and Turnbull (1996), Plotkin (2001), Glaeser and Gyourko (2022), Trounstine (2018)). This paper contributes demand-side estimates of retailer complementarities to understand the value of co-locating stores to consumers, particularly within

the shopping center, adding to literatures on consumers preferences for specific retailers (Ellickson et al. (2020), Cao et al. (2024)), trip-chaining and local spillovers (for demand side trip-chaining and multi-homing see Thomassen et al. (2017), Rhodes and Zhou (2019), Miyauchi et al. (2022), Relihan (2022), Oh and Seo (2023), for supply-side local spillovers see Qian et al. (2023), Knight (2023), Baum-Snow et al. (2024)), and shopping center externalities (Benjamin et al. (1992), Brueckner (1993), Konishi and Sandfort (2003), Burayidi and Yoo (2021), Evensen et al. (2024), Liu et al. (2024)). Leveraging detailed exclusive dealing contracts, we study how exclusive dealing contracts change the distribution of retailers, finding that exclusive dealing reduces food deserts, contributing to the literature concerned with the supply-side provision of food across different neighborhoods (Bitler and Haider (2011), Allcott et al. (2019), Handbury (2021)), grocery industry market structure (Ellickson (2006), Ellickson (2007), Jarmin et al. (2009)), and how chain retailers choose locations (Jia (2008), Holmes (2011), Vitorino (2012), Nishida (2015), Vitali (2022), Caoui et al. (2022), Beresteanu et al. (2024)). Our setting shows that exclusive dealing contracts should be considered alongside traditional factors like demand, agglomeration and scale, and government constraints in studying retailer location choice and consumer shopping behavior.[3]

This setting provides new opportunity to study exclusive dealing empirically. Due to difficulties obtaining detailed data from private exclusive dealing contracts, other work has devised empirical tests to detect foreclosure (Asker (2016)) and estimated structural models to compute willingness to pay at the company level (Chipty (2001), Sinkinson (2020), Lee (2013), Chen (2014), Nurski and Verboven (2016), Chen and Shieh (2016), Le (2024), Yuan (2025), more generally, see Lafontaine and Slade (2007) for a survey of the prior literature), and relied on descriptive evidence (Sass (2005), Ater (2015)) to study exclusive dealing within a single industry (e.g. hamburgurs, beers, and cable television).[4] The contracts studied here are complex, wide-ranging, and granular: they are employed by a wide range of retailers, limit products and retailers broadly, and vary across locations. In this paper, we leverage detailed exclusive dealing contracts to inform the geography and competitors in a market and estimate its effects on welfare and profitability in the (upstream) commercial real estate market and (downstream) product market.

The welfare effect of exclusive dealing is theoretically ambiguous.[5] In this setting, foot traffic

[3]For a long literature on grocery demand, see for example Bell et al. (1998), Smith (2004), Smith (2005), Mehta (2007), Song and Chintagunta (2007), Hartmann and Nair (2009), Smith and Øyvind Thomassen (2012), Mehta and Ma (2012a), Mehta and Ma (2012b), Ellickson and Misra (2012), Leung and Li (2021).

[4]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.

[5]The theoretical literature dates back to Posner (1976) and Bork (1978) who show that absent externalities, exclusive dealing is not anticompetitive. Following literature showed how exclusive dealing can be anticompetitive due to market faliures or externalities (see for example Marvel (1982), Hart et al. (1990), Rasmusen et al. (1991), Besanko and Perry (1993), Segal and Whinston (2000), Fumagalli and Motta (2006), Simpson and Wickelgren (2007), Asker and Bar-Isaac (2014)). Exclusive dealing is considered pro-competitive when (a) it increases efficiency,

externalities are the main cause for the observed explicit exclusive dealing contracts (Bernheim and Whinston (1998)). We find that these exclusive dealing contracts are largely procompetitive because the exclusive dealing contracts facilitate large retailer entry which improves the overall quality of the shopping mall (Klein and Murphy (1988)), but depends on consumer demand. In high-demand neighborhoods where we find evidence of foreclosure, landlords and large retailers benefit from excluding small retailers like dollar stores which would have otherwise entered (Aghion and Bolton (1987), Abito and Wright (2006)).

This paper also contributes the literature on non-competes. 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), Reinmuth and Rockall (2024)), in the U.S., the Federal Trade Commission proposed a rule banning non-competes for workers (Federal Trade Commission (2023)) which was later struck down. The types of exclusive dealing contracts studied here are non-competes at entry in land. The non-competes in this paper are somewhat similar to senior workers joining new firms on the condition that they have partial or total control over new hires (the senior person is the grocery store, the team are the co-locating stores in the shopping center), although in labor, the senior person will likely work with the new hire; in the grocery setting, the senior person and new hire will only interact through competition or consumer multi-homing. In retail real estate, the Canada Competition Bureau has begun investigating these exact exclusive dealing contracts in grocery, and this paper provides a framework to think through the policy effectiveness of regulating these contracts.[6]

2 Data

We collect data to build and estimate a model of retailer location choice, which depends on where retailers can enter and the profitability at each potential location. We collect data on the potential locations each retailer can enter, retailer entry and exit at each location, and details of real estate contracts, specifically the rental prices and any exclusive dealing restrictions. To estimate this potential profitability at each potential location, as well as estimate consumer welfare, we estimate demand using data from a panel of consumer purchases. The paper focuses on Chicago to benefit from Chicago's large variety in neighborhood income, neighborhood density, and retail environments.

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.

[6]Specifically, the Canada Competition Bureau has been investigating the anticompetitive effects of grocery stores limiting the sale of bread by nearby retailers.

Potential Locations: We establish the set of potential locations a retailer can enter and define each retailers' potential locations by their latitude and longitude. To do so, we use novel data from Build Central (formerly named Planned Grocery), a startup which collects and sells planned retail locations to retailers so that retailers know where they and their competitors can enter. This data includes new and existing builds. We observe the latitude, longitude, and square footage at each location. The observed square footage determines which retailers can feasibly enter and thus the set of potential locations is unique to each retailer. Importantly, we observe details of the timeline from initial proposal to completion: 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. The time span is 2015-2024. We supplement these data with data from Historical Supplemental Nutrition Assistance Program (SNAP) Retailer Locator Data and InfoGroup Historical Datafile to establish a longer time horizon (1990-present) and treat the set of potential locations that are eventually entered into as the consideration set.

Retailer locations, entry and exit: Store locations, entry, and exit dates are compiled from the SNAP Database and from Infogroup's Historical 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. 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.

Lease Characteristics: Lease characteristics are obtained from Compstak. 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. We observe variables such as location, rent, square footage, lease length, and tenant industry. For market prices, we use net effective rent, the total amount of rent owed from the tenant to the landlord per year per square foot, deflated in 2016 U.S. Dollars. For lease characteristics, we use lease length, square footage, location (latitude and longitude), tenant industry, and lease type to focus on retail leases. We report moments from the raw data in Table 15 and Figure 16. Since the data comes from a network of brokers, the data may be selected. To ensure that the data is representative, we compare the time series of the net effective rent to other sources. Specifically, we compare this data series to mean asking rents from CBRE, a global real estate services company and with median asking rents from CoStar from Brooks and Meltzer (2024) by replicating Appendix Figure 1 from Brooks and Meltzer (2024) with our data. Figure 15 shows a comparison of these three time series and shows similar trends and orders of magnitudes, despite using different definitions of rent.

Exclusive dealing: Exclusive dealing contracts are recorded to create a permanent record and ensure that future landlords and prospective tenants abide by the terms of the contract. Retailers and landlords are incentivized to report exclusive dealing contracts because third parties unaware

of these restrictions are not bound by them.[7]

Exclusive dealing contracts are scraped from the Cook County Clerk's Office Record of Deeds Search, which records, stores and maintains land records and other official documents. The website and documents are publicly searchable. From this website, we scraped every deed, lease memorandum, lease, memorandum, termination, correction, incorporation, and reinstatement. We obtained a pdf of the document as well as the relevant parties (called grantor and grantee), which are the landlord and tenant in a lease and the buyer and seller in a deed, as well as the address, date, and parcel pin number. We extract the contents of the contracts (pdfs) with Optical Character Recognition, which gives us the text of the pdf documents. This gives us the universe of relevant official documents in Cook County, IL from 1980-present. From this data we create two datasets.

From the type of document (e.g. lease or deed) as well as the party name (e.g. landlord or tenant, buyer or seller), we establish whether a retailer owns or rents a property. Retailers that own properties have an implicit exclusive dealing contracts on the properties they own, because they can choose who to rent to and who to sell to. Retailers on rented properties may or may not have an exclusive dealing contract on the property.

We create the dataset of exclusive dealing contracts by identifying sections of the recorded documents that include restrictions and extracting the relevant text. First, we read around 150 contracts manually and determine that (1) the contracts are standard and that (2) restrictions on use always include some combination of words "prohibited use", "restrictive covenant", "restriction", "exclusive use", "restrictions benefit" in the text, and (3) that there is often a designated section of the text dedicated to exclusive use or restrictions on the use of the property. Next, we confirmed with real estate professionals that these contracts tend to be standard and the method for identifying restrictions. We then extract the exclusive dealing contracts from the digitized document pdfs by (1) extracting the text that proceeds and follows the phrases "prohibited use", "restrictive covenant", "restriction", "exclusive use", and "restrictions benefit" (2) removing listed exceptions, which are specific retailers not subject to the restrictions (3) categorizing restrictions into types of retailers (such as grocery, drug, etc...). From this data, we learn the retailers and industries that use exclusive dealing, which properties have exclusive dealing restrictions, and the set of exclusive dealing restrictions and each property over time.

Panel on consumer purchases: Household preferences are determined by consumers' distaste for prices, distances, and complementarities of shopping at multiple retailers on the same trip. We use a detailed household-level panel from Numerator with household trips and store purchases to pin down the demand parameters. The panel spans 2017-2024 and covers a broad range of

[7] See, for example, a discussion by Baker McKenzie's digital library of legal content.

consumer purchases from a broad range of stores, including grocery, discount, dollar, convenience, and other stores. Numerator reports retailer characteristics (e.g. store identity, store latitude, store longitude, retailer name, store identifier), consumer characteristics (e.g. household zip code and demographics), and consumer purchase information (e.g. purchase amount, product quantity, product descriptions, brand description, day and time of purchase). With this data, we compute the set of retailers shopped at in each trip, distance traveled in each trip, and prices at the store. With the estimate household preferences, we compute expected retailer profitability at each potential location and consumer welfare for different outcomes of retailer entry.

Geographic definition of the (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).

Geographic definition of the (upstream) commercial real estate market: Markets are defined yearly in Chicago, are defined by large and non-overlapping geographical areas, and Figure 39 shows the potential locations color-coded by market across Chicago. The model is estimated with retailer data (store latitude, longitude, address, retailer name), household information (location and demographics from the ACS, demand parameters estimated from consumer panel data), the set of potential locations (latitude, longitude and square footage from each landlord), and rents (prices) and exclusive dealing contracts.

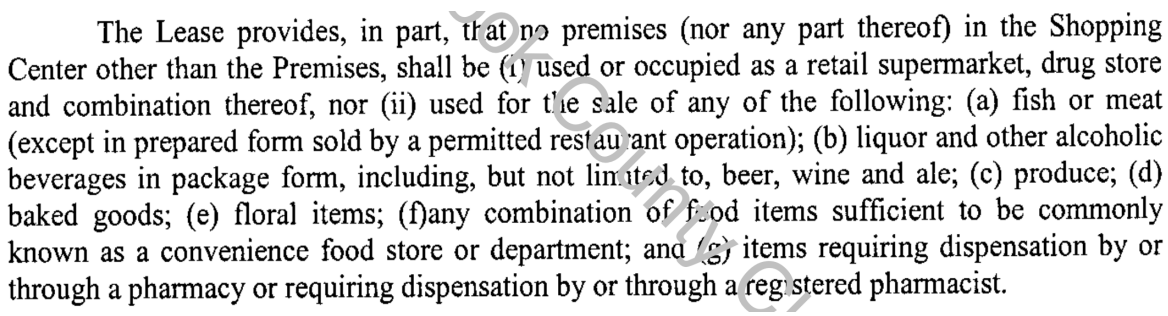
The potential locations, dataset of entry and exit, lease characteristics (including rent), and exclusive dealing restrictions, along with the expected retailer profitability estimated from consumer panel data, give us enough information to write down the full retailer location choice problem, landlord price setting problem, and consumer shopping decisions.

3 Stylized Facts about Exclusive Dealing

The exclusive dealing contracts 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: Example of an Exclusive Dealing Agreement



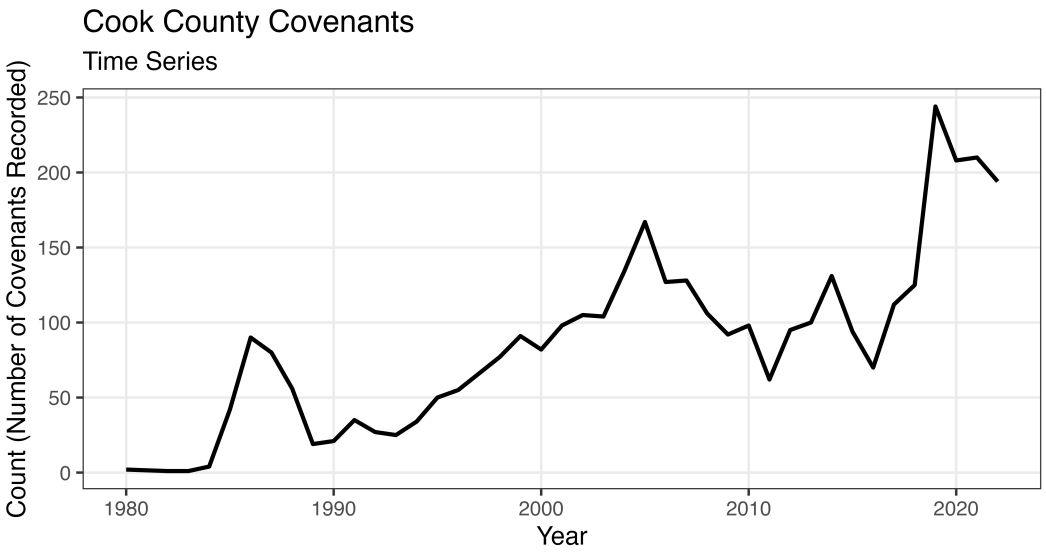
The Lease provides, in part, that no premises (nor any part thereof) in the Shopping Center other than the Premises, shall be (i) used or occupied as a retail supermarket, drug store and combination thereof, nor (ii) used for the sale of any of the following: (a) fish or meat (except in prepared form 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 Jewel Osco (whose parent company is Safeway) store in Chicago, 2001. The figure shows that at this location, Safeway's Jewel Osco and its landlord forbid the remaining portions of the shopping center for use as a grocer, drug store, liquor store, or convenience store.

We document several new empirical facts about exclusive dealing in retail real estate in Cook County, IL. First, we find that the practice is extensive and has been growing over time. Second, we describe the types of retailers that employ these contracts. Third, we characterize the contents of the provisions and the retailers blocked by them. Finally, we analyze the radius at which the contracts bind and their (observed) effect on prices. We report additional stylized facts showing that exclusive dealing is uncorrelated with demographic factors, the timing and additional details of the contracts in Appendix B.

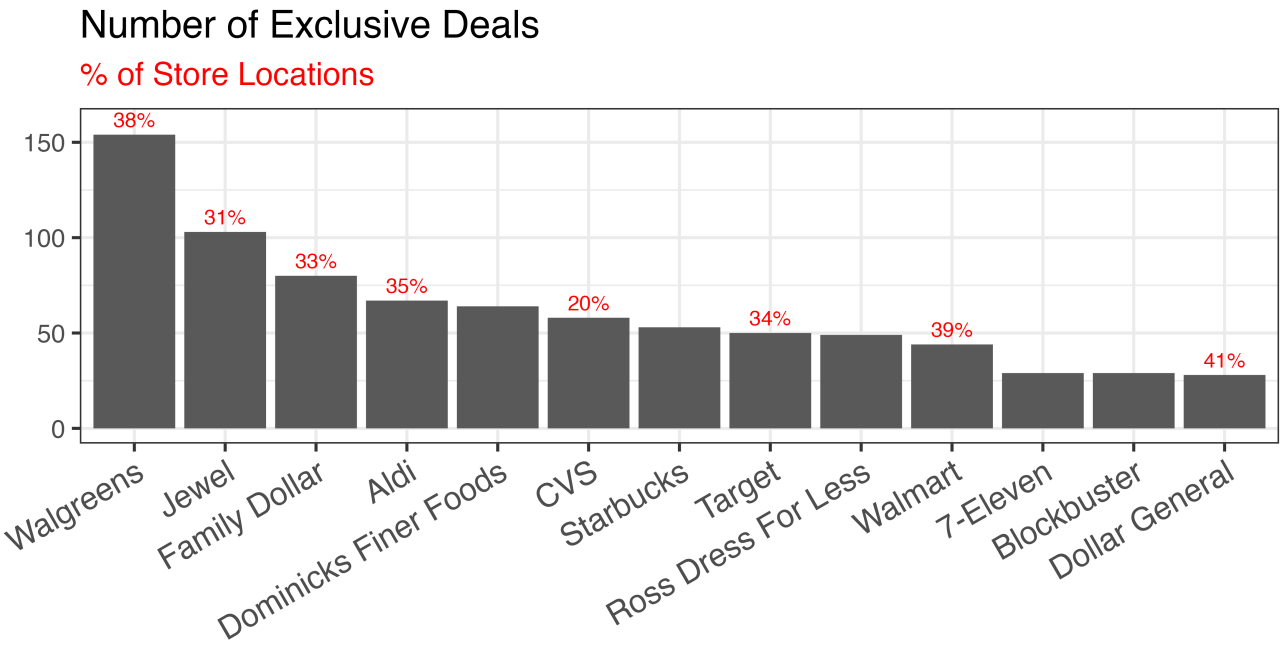
Fact 1 – Exclusive Dealing is Common and Increasing: Figure 2 shows that the number of exclusive dealing contracts has grown steadily since the 1990s, peaking in 2005 and 2019. The persistent and growing prevalence underscores the importance of understanding the effects of the contracts.

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.

Figure 3: Retailers with the Most Number of Exclusive Dealing Contracts



Source: Cook County Recorder Office. Time span 1980-2023. Figure plots the retailers with the most recorded exclusive dealing contracts. The gray bars indicate the number of addresses with an exclusive dealing agreement. The red text specify the fraction of leased locations with these exclusive dealing contracts (these are only listed for stores that accept SNAP benefits).

Fact 2 – Exclusive Dealing Contracts are Most Prevalent for Grocery, Discount and Drug Stores: Figure 3 shows the retailers with the most exclusive dealing contracts in total (in gray) and on leased locations (in red).[8] The most common industries are grocery stores, drug stores, discount stores, and dollar stores. These retailers mostly sell consumer packaged goods and relatively similar products to their direct competitors, while retailers that sell highly differentiated products do not use exclusive dealing contracts. This is consistent with retailers with low product differentiation benefiting more from higher spatial differentiation. As shown in red, we find that the extent to which stores have exclusive dealing contracts varies by location and retailer. In Appendix B, we show that variation in exclusive dealing contracts within retailers is uncorrelated with neighborhood demographics.

Focusing on grocery, Table 8 lists the grocery chain retailers that operate in Chicago with at least one exclusive dealing contract. Importantly, all the grocers with the highest market share use exclusive dealing contracts in their leases (e.g. Safeway's Jewel Osco and Alberston's Mariano's), and 48% of chain grocers have exclusive dealing contracts on premises (chains are defined as any retailer with more than four stores in the county). Table 9 shows the prevalence of exclusive dealing contracts in the grocery sector in Chicago. Of the 351 contracts that forbid retailers from selling groceries, 140 are found on grocery store locations, and the rest are found in similar industries such as discount stores and drug stores. Amongst rented grocery stores, exclusive dealing is particularly prevalent in low-income neighborhoods, suggesting that exclusive dealing may aid retailer entry.

Fact 3 – Retailers Blocked from Entering: The content of the contracts vary significantly across retailers and locations. Figure 12 shows the types of retail blocked by the largest grocery, big box, drug, and dollar stores. These contracts specify a limited square footage or total ban on specific products categories, which for the most part reflect the products sold by the blocking retailer. However, the contracts show significant asymmetry across retail locations and similar retailers. For example, Whole Foods blocks grocery products at all stores but blocks liquor at only 25% of stores, and, while both grocery stores sell liquor, Whole Foods limits liquor stores at many more locations than Safeway's Jewel Osco. This heterogeneity may indicate the retailer-specific and localized nature of competition in this market. Figure 13 shows the top 50 blocked categories for Whole Foods, Safeway's Jewel Osco, Aldi, Walmart, and Dollar General.[9] This broader list reveals a wide set of blocked product categories, reflecting direct competition (blocking retail and food), parking competition (blocking education and health services) and aesthetic curation (blocking garbage dumps, Marijuana, abortion centers, gun shops, etc...).

Fact 4 – Observationally, Exclusive Dealing Binds Locally: Consistent with the firm's presumed goal of limiting competition, retailers with exclusive dealing contracts have fewer competi-

[8] A more expansive retailer list is found in Figure 11.

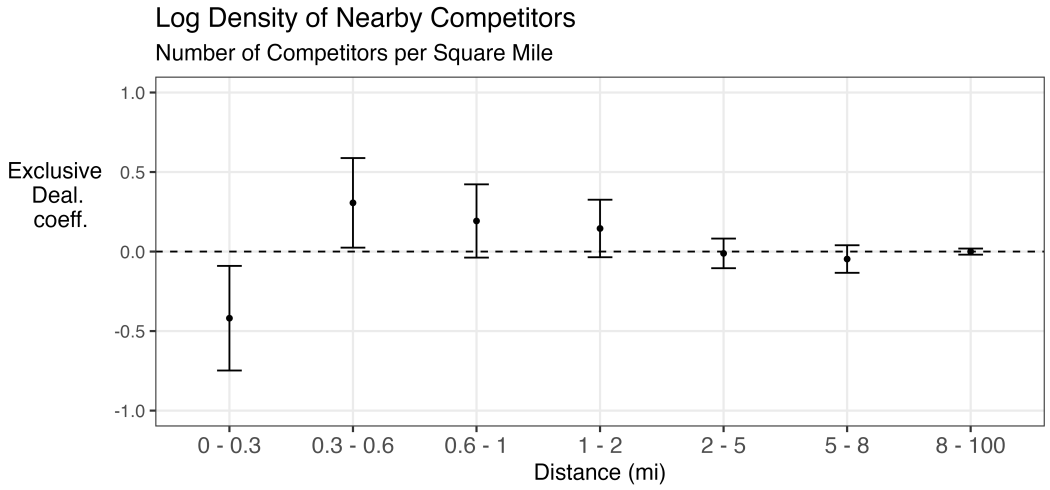
[9] Table 12 shows this asymmetric pattern for a wider set of retailers in the data.

tors nearby. Figure 4 plots the relationship between exclusive dealing and number of competitors at different radii, showing that stores with exclusive dealing agreements have fewer competitors nearby but more competitors farther away. This relationship is determined by a regression of the number of competitors surrounding a store on whether a store has an exclusive dealing contract,

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

where num $\text{stores}_{r(i)t}$ 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. Importantly, the regression includes retailer fixed effects which allow us to control for retailer quality and allows us to leverage the variation in contracts across retailers, retailer locations, and time.

Figure 4: 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.

As shown in Figure 4, grocery stores and big box stores with exclusive dealing contracts have fewer competitors within a .3 mile radius of the store, which is approximately the radius of the shopping center. The result reverses between .3 and .6 miles, and there are more competitors surrounding stores with exclusive dealing contracts. These results are consistent with the hypothesis that

exclusive dealing restricts competition by pushing competitors farther away. At a large radius, there is no difference between stores with and stores without exclusive dealing contracts. Tables 22 - 27 show the result is robust to similar specifications.

The shopping center radius (0-.3 miles) is economically significant both because of the importance of foot-traffic externalities within shopping centers (Benjamin et al. (1992), Brueckner (1993), Konishi and Sandfort (2003), Burayidi and Yoo (2021), Evensen et al. (2024), Liu et al. (2024)) and because spillovers across retailers are localized to a small radius (Qian et al. (2023), Knight (2023), Baum-Snow et al. (2024) also find a small radius of .2 miles). Without imposing assumptions, we find that exclusive dealing contracts bind at the relevant radius determined by prior research.

Additionally, we confirm that exclusive dealing in large part is intended to bind locally by looking at the radius directly specified by the contracts. Table 10 shows the fraction of exclusive dealing contracts which specify a nearby radius, a more distant radius, and the fraction of documents that do not specify the radius at which the contract binds – 86% of contracts specify a nearby radius. The radius specified by the contracts for grocery stores and big box stores is in large part restricted to the shopping center or properties near the grocery or big box store. When shopping centers are owned by a single landlord, exclusive dealing contracts give retailers some control over the tenant mix.

Fact 5 – Rental Prices are Higher with Exclusive Dealing: 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 when controlling for retailer. 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.

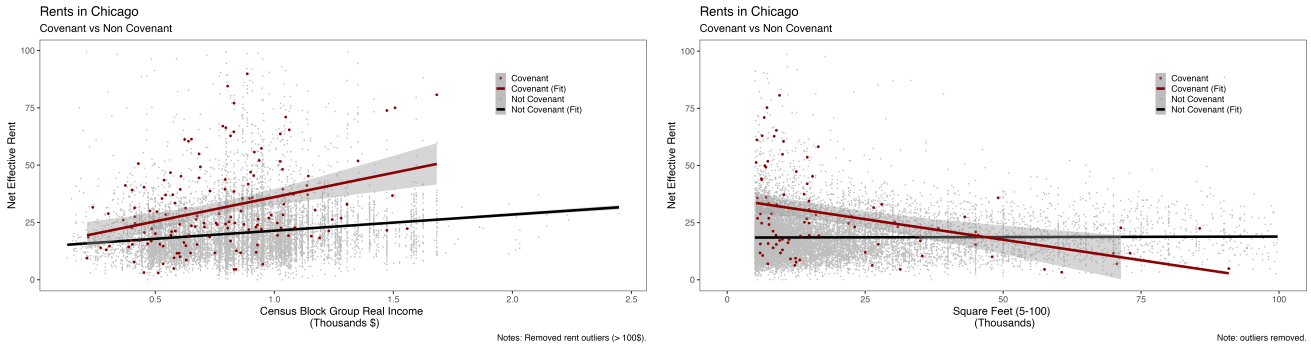
$$\log y_{ijt} = \alpha_0 + \gamma \text{exclusive deal}_{ijt} + \sum_k \beta_k \log x_{kjt} + zip_j + year_t + retailer_i + \epsilon_{ijt}$$

Table 19 shows that prices per square foot per year are 30% higher in properties with exclusive dealing, conditional on demographics and lease characteristics. Robustness checks which vary the demographics and lease characteristics included report estimates between 10% 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.[10]

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

Figure 5 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.

Figure 5: Rental Prices, Neighborhood Income, 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 this foot traffic externality, 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.

each year.

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 Model

Motivated by the stylized facts, we turn to a model to understand the role of exclusive dealing. In the model, prices and exclusive dealing contracts are endogenous and determined simultaneously in the commercial real estate market.

Agents:

Table 1: Most Frequented Retailers

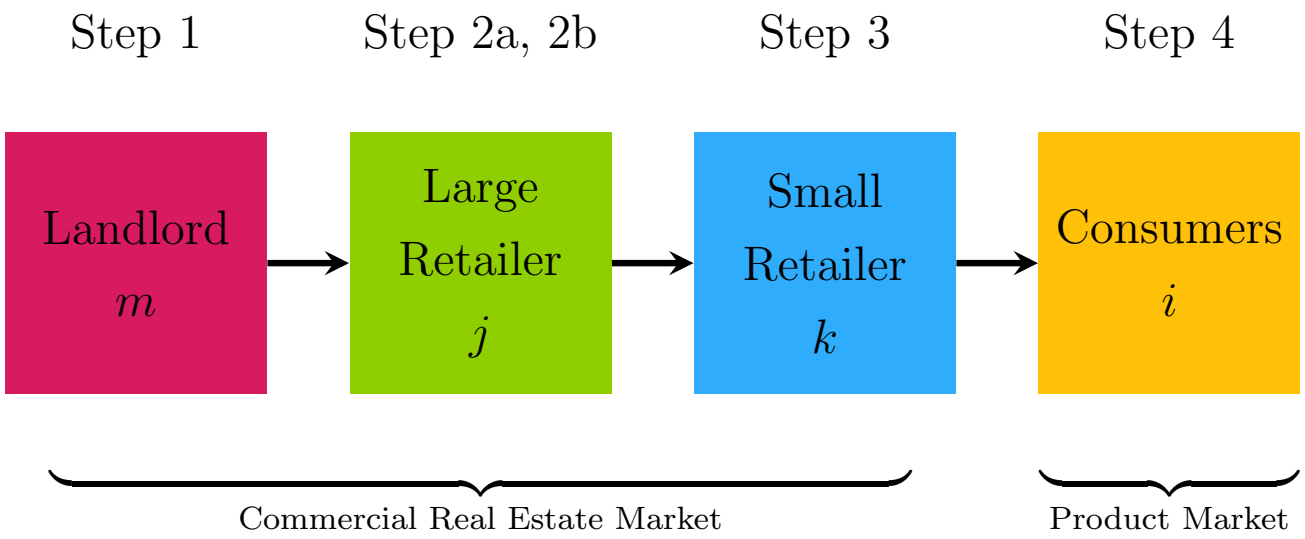
Retailer	Type	Size	Step (Timing)
Jewel Osco (Safeway)	Supermarket	Large	2a, 2b
Mariano's (Kroger)	Supermarket	Large	2a, 2b
Whole Foods	Supermarket	Large	2a, 2b
Aldi	Specialty	Large	2a, 2b
Food 4 Less (Kroger)	Specialty	Large	2a, 2b
Trader Joe's (Aldi)	Specialty	Large	2a, 2b
Costco	Big Box	Large	2a, 2b
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.

We consider the location choice problem of the stores most frequented by consumers, which are listed in Table 1. 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:

Figure 6: Model: Timing of Shopping Center



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 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 6, reflects this.

In step 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 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 step 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 step 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 step 4, given entry decisions, all retailers set prices in the product market, consumers shop, and the product market clears.

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 4.1 discuss the consumer problem, Section 4.2 discuss the firm problem in the product market, Section 4.3 discusses the retailer location choices, and Section 4.4 discusses the landlord price-setting problem. Additional details describing the data are Appendix C.4, and variable construction is discussed in Appendix C.2.

4.1 Consumer Demand for Retailers (Step 4)

We model household retail shopping choices at the level of aggregation of the exclusive dealing contracts. Households choose a maximum of two retailers to shop at in the same trip (ie, which retailers to shop at before returning home). Following McFadden (1978), Berry (1994), Berry et al. (1995), households make a discrete choice and receive indirect utility

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

where u_{ib}^{g} is the utility household i in income group g receives from shopping at one or two retailers $b \in \mathcal{B}$ (henceforth a bundle), 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 bundle complementarity, ξ_{bt} and u_{b} are demand shocks, 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.

Households choose a maximum of two retailers from the most frequented retailers shown in Table

1. These retailers include national chain grocers, discount stores, club stores, as well as categories of retailers such as drug stores, dollar stores, and liquor stores. In this list, "Other Food" represents any other food store that isn't one of the listed retailers or listed retailer categories and is interpreted as the "best" non-listed grocery store for each household (the same interpretation as in Cao et al. (2024)). "Other" represents any other non-food store that isn't one of the listed retailers or listed retail categories and is interpreted as the "best" other store to shop at. "Other" retailers comprise the outside good and the outside good utility is normalized to zero: $P_0^g = 0, \Gamma_0 = 0, -\alpha^g P_0^g + \Gamma_0 + \xi_0^g + u_0^g = 0$, and so all prices and complementarities are interpreted relative to the outside good.

Prices and distances take into account total prices paid and total distances traveled. When shopping at a single retailer, households pay for the retailer's good and travel from home to the retailer and back (home $\rightarrow$ retailer $\rightarrow$ home). When multi-homing, households pay for the goods at both retailers and travel to both retailers before returning home (home $\rightarrow$ retailer 1 $\rightarrow$ retailer 2 $\rightarrow$ home). In all cases, households take the shortest distance trip.[11]

We interpret Γ_b, ξ_b^g and u_b^g as aspects of bundle quality: Γ_b is fixed across markets, and ξ_b^g and u_b^g vary across markets. For multi-homing to be possible, households must receive additional utility to justify increased prices and distances of shopping at multiple stores together. We interpret and refer to this additional utility, Γ_b, as the complementarity between two retailers (as in Gentzkow (2007)). When shopping at a single retailer, we interpret Γ_b as static, observable retailer quality. Bundle quality can additionally fluctuate over time and across locations, and we refer to this time-varying quality as demand shocks $\xi_b^g + u_b$. These demand shocks can affect prices, and we interpret ξ_b^g as the portion of the demand shock correlated with prices and u_b^g as the portion of the demand shock uncorrelated with prices.

We allow preferences to vary with household demographics x_i, which include information such as education and unemployment status, and bundle characteristics y_b. We include demographic characteristics that may be correlated with value of time and thus might change the disutility of distance or nearby shopping. y_{bt} are whether stores are located nearby one another.

Finally, 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.

Multi-homing is common in the data. As shown in Figures 19 - 22, 40% of expenditure-weighted

[11] 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)).

trips are to multiple stores and 40% of expenditure-weighted trips to grocery stores include an additional retailer.

Multi-homing also changes the value of exclusive dealing contracts for 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. When limiting the entry of competitors, retailers mechanically increase the chances that complementary retailers will locate nearby. Complementary retailer co-location has two benefits for retailers: first, co-location of complementary stores lowers the total distance trip, raising the utility of the bundle can increase own demand, and second, complementarities can soften price competition within retailer pairs. Consumers benefit when the shorter-distance trip to complementary stores outweighs the welfare gains from price competition of (substitute) retailers.

Additionally, foreclosing on rival entry pushes competitors farther from certain consumers, which can further reduce entry and thus 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.

4.2 Product market supply (Step 4)

We assume retailers set prices in Bertrand competition to maximize profits. 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.[12] These marginal costs, mc_j^g, reference operating costs that can be adjusted after entry, such as wholesale prices of products and labor.

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

[12]The shares and full equilibrium are written in Appendix C.1.

retailer variable profits for small retailer k in location m are

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

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.

Price setting in the product market has two main simplifications: retailers set a unique price for each income group in each market. Simply put, a (1) household cannot find lower prices at a different location of the same retailer and (2) households in the same income group purchase the same good from each retailer. First, consistent with the findings that different income groups purchase different types of food (Handbury (2021), Allcott et al. (2019)), retailers set different prices (ie. provide a different good) to households in different income groups g. Second, an extant literature has documented that retailers set prices mostly uniformly for the same products across stores (DellaVigna and Gentzkow (2019), Hitsch et al. (2021), Adams and Williams (2019), Brecko et al. (2025)), and Butters et al. (2022) document how price increases due to cost shocks are local to the region where the cost shock occurred. 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. 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)).[13] 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. Third, consistent with the timing in the data, we assume that each retailer chooses prices to maximize profits once all locations are determined.

[13] 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 $\gamma^g d_{ib}$.

Prices are 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.

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

4.3 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.[14]

[14]The probability of winning entry is written in Appendix C.1.

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.[15] 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 profit comes 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.[16]

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 landlord misperception from the profitability of 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 captures landlord's and other retailer's misperception on the profitability of exclusive dealing for retailer j.[17]

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

[15] The probability the retailer chooses and then enters location m is written out in Appendix C.1.

[16] The probability the retailer chooses location m is written out in Appendix C.1.

[17] 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.

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 $E_{\boldsymbol{l}_{-j}}[\bar{\pi}_{jmE}]$.[18] 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. In the case of partially unobserved profits due to θ_j and ϵ_{jm}, 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)

[18] 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.

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.[19]

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, $\bar{\mathbb{P}}_{km}$.[20] 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 retailers, there is a positive "foot traffic externality" in retail.

[19] A long entry literature goes back to Hotelling (1929), Salop (1979), Bresnahan and Reiss (1990) and Bresnahan and Reiss (1991). This model incorporates agglomeration and business stealing aspects from the literature retailer chain location choice (Jia (2008), Holmes (2011), Vitorino (2012), Nishida (2015), Vitali (2022), Caoui et al. (2022)) and expiclitly models the commercial real estate market (Moszkowski and Stackman (2022)) but instead focuses on retailer co-location driven by bundle complementarities, a commercial real estate market with retailer location choice, landlord price setting, and exclusive dealing, and entry decisions at a granular level (latitude and longitude).

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

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.

4.4 Landlord problem (Stage 1)

Each landlord has a limited amount of space (square footage) at its 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 to maximize profits; 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.

5 Estimation and Identification

5.1 Product Market

We define a trip as the set of retailers a household shops at on a particular day assuming the shopper starts and ends at home. Since day and time of purchase is available, we know when households are likely shopping at multiple stores in the same trip (muli-homing).[21] Since we do not observe home locations, we impute them by placing households at center of their most likely census block group. We compute as the most probable census block group given household zip, education, ethnicity, unemployment status, income, as well 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, we compute closest distances between retailers and home, which gives a measure of store accessibility to home, computed as the crow flies. In Appendix C.2, we show this is an accurate measure of distance and discuss the data and variable construction used in estimation.

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

[21] We find that multi-homing is prevalent in this setting: 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 report descriptive statistics about multi-homing and the types of trips consumers take in Figure 19, Figure 20, Figure 21, and Figure 22. An emerging literature has highlighted the importance of trip-chaining in consumer shopping (Rhodes and Zhou (2019), Miyauchi et al. (2022), Relihan (2022),Oh and Seo (2023)).[22]

products common to all retailers in the market, following Atkin et al. (2018). 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. Prices of shopping at two retailers in the same trip is the sum of the prices, weighted by the expenditure shares for each retailer. Given that prices are often set at the retailer level, 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), Brecko et al. (2025)). Since prices are computed as a relative price index, marginal costs are also estimated in the same units.

Under the model assumptions and with the constructed data, the likelihood of households (i) choosing bundle b in county x year x bi-week t is

$$\mathcal{L}(b|\theta) = \prod_i \prod_b \underbrace{1\{b_i\}}_{i \text{ chooses } b} \underbrace{\frac{e^{\delta^g_{bt}+\lambda^g_{ibt}}}{\sum_{b'} e^{\delta^g_{b't}+\lambda^g_{ib't}}}}_{\text{prob. } i \text{ chooses } b} \tag{9}$$

where $\delta^g_{bt} = \alpha^g p^g_{bt} + \Gamma^g_b + \xi^g_{bt} + u^g_{bt}, \delta^g_{0t} = 0, \lambda^g_{ibt} = \gamma^g d_{ibt} + \gamma^g_1 d_{1ibt} + \Sigma_{ib} x_{it} y_{bt}$ and the average parameter δ^g_{bt} is measured relative to the average utility of the outside good $\delta^g_{0t} = 0$.

In a first step, the maximum likelihood estimator gives consistent estimates for $\delta^g_{bt}, \gamma^g, \gamma^g_1, \mathbf{\Sigma}$. Variation in household choices identifies the parameters. Loosely, distance and co-location parameters are identified from store entry and exit which change the distances between households and bundles over time. Additionally, cross-sectional variation from households in different zip codes and census block groups adds variation in household distances and which bundles have co-locating stores. For cross-sectional data to correctly identify these parameters, households preference for stores and distances must be be uncorrelated with where households choose to locate conditional on zip and household demographics. The average utility parameter δ^g_{bt} is identified off of variation in bundle popularity (measured as counts in the data) holding all other variables (such as distance) equal. The optimal δ^g_{bt} is chosen such that the model-implied shares match the observed shopping frequency in the data.

In a second step, under the assumptions of the model, an instrumental variables regression gives consistent estimates for α^g, Γ^g_b. The marginal disutility for prices is determined by the extent to which average bundle popularity drops as (instrumented) prices rise. The intuition for the price instrument is as follows: prices are determined by both demand and supply factors. Assuming demand shocks are local but cost shocks are shared nationally, the average price from the same retailer in other cities is a valid supply shifter (Hausman et al. (1994)). Since many prices are

set irrespective of location, we assume instrumenting for prices in this way will give consistent demand estimates (DellaVigna and Gentzkow (2019), Hitsch et al. (2021)). The complementarity parameters is determined by the average utility of the bundle partialling out the effect of prices and individual parameters. Further details are in Appendix C.3.

Results: Estimated parameters by income group are reported in Table 28. 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. 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.

Figure 37 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. Examples of consumers' least-preferred shopping combinations are two grocery stores (Safeway's Jewel Osco and Aldi), a grocery store with a drug store inside of it and a drug store (Safeway's Jewel Osco and drug stores), and a discount grocery and a dollar store (Aldi and dollar stores). The complementarities reflect product similarities across different retailers.

Figure 38 plots the fraction of addresses with exclusive dealing contracts overlayed with the complementarity estimates. Stores with positive complementarites are blocked less often, an example of which is Safeway vs liquor stores vs Whole Foods and Liquor Stores. This provides some validation that the competing retailers (substitutes) determined by exclusive dealing contracts are similar to the competing retailers (substitutes) determined by the demand estimates.

5.2 Retail Real Estate Market Parameters

In each market, we observe data on potential locations, retailer entry and exit, lease prices (rents) and exclusive dealing contracts. At each potential 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 7,[23] 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

[23]Grocery chain exit is rare: as shown in Figure 14, 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.

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.

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.

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

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

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

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

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 40- 41. 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.

6 Effects of Exclusive Dealing

6.1 Effect of Exclusive Dealing on Retailers and Landlords

With the estimated parameters, we simulate a counterfactual where landlords cannot explicitly contract on exclusivity. In this counterfactual, landlords now set a single price for each large retailer.

Counterfactual results show that exclusive dealing contracts encourage entry in Chicago. Table 2 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 limited supply with fewer shopping malls surrounded by many houses. 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 2: 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.

Relative to a world with explicit exclusive dealing, all major grocery stores reduce entry probabili-

ties. Table 3 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 5, 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. Smaller retailers 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.

Table 3: 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.

The percentage change in landlord profitability is shown in Table 4. The effects of a ban on exclusive dealing are heterogeneous across landlords, but most landlords benefit from 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 4: 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.

6.2 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

$$\mathbb{E}_{\epsilon_{ib}}[CV_i] = \frac{1}{I}\sum_i \left(\frac{1}{\alpha^g}\left[\ln\left(\sum_{b\in\mathcal{B}}\exp\left(u_{ib}(P_b^0, d_{ib}^0, \phi)\right)\right) - \ln\left(\sum_{b\in\mathcal{B}}\exp\left(u_{ib}(P_b^{cf}, d_{ib}^{cf}, \phi)\right)\right)\right]\right) \quad (10)$$

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. The compensating variation is measured in terms of relative prices.

Table 5: Consumer Welfare

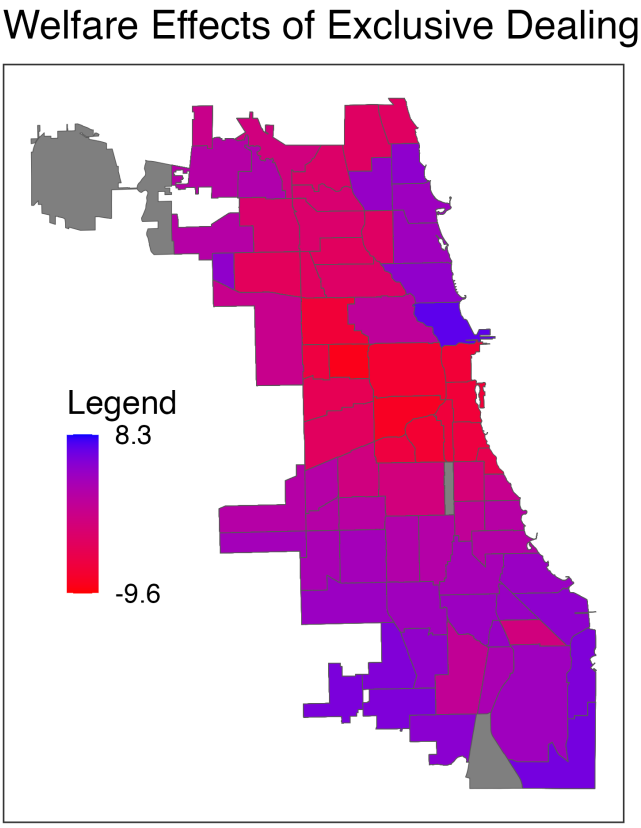
Geography	% Change in CV
CBD	.911
North Chicago	.799
Northwest Suburban	.555
North Suburban	-.330
West Cook County	-.645
South Chicago	-.754

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

Table 5 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

Figure 7: 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.

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 year; 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 7. 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 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.

7 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 stylized facts for how exclusive dealing is correlated with prices, retail density, and neighborhood demographics. To quantify its importance, 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 agree to an exclusive agreement. 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.

We find that exclusive dealing benefits most landlords, larger chain retailers, and consumers, while small chain retailers would benefit from an exclusive dealing ban. Relative to a counterfactual without exclusive dealing, landlords are able extract additional rents from retailers conditional on entry and increase the probability of retailer entry. Large retailers enter more locations and

block small competitors. Retailers that suffer the most from a ban on explicit exclusive dealing are those with landlords that have internalized shopping center externalities and set very low rents even when they can contract on exclusivity. Consumers benefit from exclusive dealing when the benefit from increased large retailer entry outweighs the higher prices and longer distances to smaller retailers like drug stores and dollar stores. We find that the welfare effects are heterogeneous across locations, and is most beneficial for consumers living in sparse retail environments.

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 and the landlord's ability to internalize foot traffic externalities in determining retailer entry and tenant mix.Third, this paper highlights the role of exclusive dealing in limiting the creation of food deserts.

References

Abito, Jose Miguel and Julian Wright, "Exclusive dealing with imperfect downstream competition," *International Journal of Industrial Organization*, 2006.

Adams, B. M. and K. R. Williams, "Zone Pricing in Retail Oligopoly," *American Economic Journal: Microeconomics*, 2019, *11* (1), 124–156.

Aghion, Philippe and Patrick Bolton, "Contracts as a Barrier to Entry," *The American Economic Review*, 1987, *77* (3), 388–401. Publisher: American Economic Association.

Allcott, Hunt, Rebecca Diamond, Jean-Pierre Dubé, Jessie Handbury, Ilya Rahkovsky, and Molly Schnell, "Food Deserts and the Causes of Nutritional Inequality," *The Quarterly Journal of Economics*, November 2019, *134* (4), 1793–1844.

Asker, John, "Diagnosing Foreclosure due to Exclusive Dealing: Diagnosing Foreclosure due to Exclusive Dealing," *The Journal of Industrial Economics*, September 2016, *64* (3), 375–410.

_ **and Heski Bar-Isaac**, "Raising Retailers' Profits: On Vertical Practices and the Exclusion of Rivals," *American Economic Review*, February 2014, *104* (2), 672–86.

Ater, Itai, "Vertical Foreclosure Using Exclusivity Clauses: Evidence from Shopping Malls," *Journal of Economics & Management Strategy*, 2015, *24* (3), 620–642.

Atkin, David, Benjamin Faber, and Marco Gonzalez-Navarro, "Retail Globalization and Household Welfare: Evidence from Mexico," *Journal of Political Economy*, 2018, *126* (1), 1–73.

Balasubramanian, Natarajan, Jin Woo Chang, Mariko Sakakibara, Jagadeesh Sivadasan, and Evan Starr, "Locked In? The Enforceability of Covenants Not to Compete and the Careers of High-Tech Workers," *Journal of Human Resources*, 2020. Published online before print.

Baum-Snow, Nathaniel, Nicolas Gendron-Carrier, and Ronni Pavan, "Local Productivity Spillovers," *American Economic Review*, apr 2024, *114* (4), 1030–1069.

Bell, David R., Teck-Hua Ho, and Christopher S. Tang, "Determining Where to Shop: Fixed and Variable Costs of Shopping," *Journal of Marketing Research*, 1998, *35* (3), 352–369.

Benjamin, John D., Glenn W. Boyle, and C. F. Sirmans, "Price Discrimination in Shopping Center Leases," *Journal of Urban Economics*, 1992, *32* (3), 299–317.

Beresteanu, Arie, Paul B. Ellickson, Sanjog Misra, and James C. Reeder, "The Dynamics of Retail Oligopoly," 2024. Working Paper; last updated March 2024; SSRN or working-paper format.

Bernheim, B. Douglas and Michael D. Whinston, "Exclusive Dealing," *Journal of Political Economy*, February 1998, *106* (1), 64–103.

Berry, Steven, James Levinsohn, and Ariel Pakes, "Automobile prices in market equilibrium," *Econometrica*, 1995, *63* (4), 841–890.

Berry, Steven T., "Estimating Discrete-Choice Models of Product Differentiation," *The RAND Journal of Economics*, 1994, *25* (2), 242–262. Accessed: 2024-11-21.

Besanko, David and Martin K. Perry, "Equilibrium Incentives for Exclusive Dealing in a Differentiated Products Oligopoly," *RAND Journal of Economics*, 1993, *24* (4), 646–667.

Bitler, Marianne and Steven J. Haider, "An economic view of food deserts in the united states," *Journal of Policy Analysis and Management*, December 2011, *30* (1), 153–176.

Bork, Robert H., *The Antitrust Paradox: A Policy at War with Itself*, New York: Basic Books, 1978.

Brecko, Kristina, Paul Ellickson, and Avery Haviv, "Dimensions of Retail Price Competition and Consumer Choice Constraints," May 2025. Working paper, dated May 7, 2025.

Bresnahan, Timothy F. and Peter C. Reiss, "Entry in Monopoly Markets," *The Review of Economic Studies*, October 1990, *57* (4), 531.

_ **and** _ , "Empirical models of discrete games," *Journal of Econometrics*, April 1991, *48* (1-2), 57–81.

Brooks, Leah and Rachel Meltzer, "Retail on the Ground and on the Books: Vacancies and the (mis)Match between Retail Activity and Regulated Land Use," *Journal of the American Planning Association*, May 2024. Conditionally accepted.

Brueckner, Jan K., "Inter-store Externalities and Space Allocation in Shopping Centers," *The Journal of Real Estate Finance and Economics*, 1993, *7* (1), 5–16.

Burayidi, Michael A. and Sanglim Yoo, "Shopping Malls: Predicting Who Lives, Who Dies, and Why?," *Journal of Urban Design*, 2021, pp. 60–81.

Butters, R. Andrew, Daniel W. Sacks, and Boyoung Seo, "How Do National Firms Respond to Local Cost Shocks?," *American Economic Review*, 2022, *112* (5), 1737–1772.

Callaway, Brantly and Pedro H.C. Sant'Anna, "Difference-in-Differences with multiple time periods," *Journal of Econometrics*, December 2021, *225* (2), 200–230.

Cao, Yue, Judith A. Chevalier, Jessie Handbury, Hayden Parsley, and Kevin R. Williams, "Distribuonal Impacts of the Changing Retail Landscape," April 2024. Accessed: 2024-10-31.

Caoui, El Hadi, Brett Hollenbeck, and Matthew Osborne, "The Impact of Dollar Store Expansion on Local Market Structure and Food Access," *SSRN Electronic Journal*, 2022.

Chen, Chia-Wen, "Estimating the Foreclosure Effect of Exclusive Dealing: Evidence from the Entry of Specialty Beer Producers," *International Journal of Industrial Organization*, November 2014, *37*, 47–64. International Journal of Industrial Organization.

_ **and Shiou Shieh**, "Does Exclusive Dealing Matter? Evidence from Distribution Contract Changes in the U.S. Beer Industry," *The Journal of Industrial Economics*, September 2016, *64* (3), 411–435. Symposium on Market Structure, Competition and Economic Outputs.

Chipty, Tasneem, "Vertical Integration, Market Foreclosure, and Consumer Welfare in the Cable Television Industry," *American Economic Review*, June 2001, *91* (3), 428–453.

DellaVigna, Stefano and Matthew Gentzkow, "Uniform Pricing in U.S. Retail Chains*," *The Quarterly Journal of Economics*, 06 2019, *134* (4), 2011–2084.

Ellickson, P. B. and S. Misra, "Enriching interactions: Incorporating outcome data into static discrete games," *Quantitative Marketing and Economics*, 2012, *10*, 1–26.

Ellickson, Paul B., "Quality competition in retailing: A structural analysis," *International Journal of Industrial Organization*, 2006, *24* (3), 521–540.

_ , "Does Sutton Apply to Supermarkets?," *RAND Journal of Economics*, 2007, *38* (1), 43–59.

_ **, Paul Grieco, and Oleksii Khvastunov**, "Measuring Competition in Spatial Retail," *RAND Journal of Economics*, 2020, *51* (1), 189–232. Preprint PDF available.

Evensen, Charlotte B., Frode Steen, and Simen A. Ulsaker, "Co-Location, Good, Bad, or Both: How do New Entries of Discount Variety Stores Affect Local Grocery Businesses?," *Journal of the European Economic Association*, aug 2024, *22* (4), 1798–1843. Published: 13 December 2023.

Federal Trade Commission, "Non-Compete Clause Rule," Technical Report, Federal Trade Commission 2023. Accessed: 2024-10-27.

Frerick, Austin, *Barons: Money, Power, and the Corruption of America's Food Industry*, Island Press, 2024.

Fumagalli, Chiara and Massimo Motta, "Exclusive Dealing and Entry, when Buyers Compete," *American Economic Review*, June 2006, *96* (3), 785–795.

Gentzkow, Matthew, "Valuing New Goods in a Model with Complementarity: Online Newspapers," *American Economic Review*, June 2007, *97* (3), 713–744.

Glaeser, Edward L. and Joseph Gyourko, "The Impact of Zoning on Housing Affordability," NBER Working Paper 8835, National Bureau of Economic Research March 2022. Last revised: August 24, 2022.

Gupta, Arpit, Vrinda Mittal, and Stijn Van Nieuwerburgh, "Work From Home and the Office Real Estate Apocalypse," 2022. SSRN Working Paper.

Gyourko, Joseph, "Understanding Commercial Real Estate: How Different from Housing Is It?," *The Journal of Portfolio Management*, 2009, *35* (5), 23–37.

Handbury, Jessie, "Are Poor Cities Cheap for Everyone? Non-Homotheticity and the Cost of Living Across U.S. Cities," *Econometrica*, 2021, *89* (6), 2679–2715.

Hart, Oliver et al., "Vertical Integration and Market Foreclosure," *Brookings Papers on Economic Activity. Microeconomics*, 1990, *1990*, 205–286. Accessed 7 Jan. 2025.

Hartmann, Wesley R. and Harikesh S. Nair, "Retail Competition and the Dynamics of Demand for Tied Goods," *Marketing Science*, September 2009, *28* (5), pp. 926–939.

Hausman, Jerry, Gregory Leonard, and J. Douglas Zona, "Competitive Analysis with Differenciated Products," *Annales d'Économie et de Statistique*, 1994, (34), 159–180.

Hitsch, Günter J., Ali Hortaçsu, and X Lin, "Prices and promotions in U.S. retail markets," *Quantitative Marketing and Economics*, 2021, *19*, 289–368.

Holmes, Thomas J., "The Diffusion of Wal-Mart and Economies of Density," *Econometrica*, Jan 2011, *79* (1), 253–302.

Hotelling, Harold, "Stability in Competition," *The Economic Journal*, 1929, *39* (153), 41–57. Accessed: 2024-11-16.

Jarmin, R. S., S. D. Klimek, and J. Miranda, "The role of retail chains: National, regional and industry results," in Timothy Dunne, J. Bradford Jensen, and Mark J. Roberts, eds., *Producer Dynamics: New Evidence from Micro Data*, University of Chicago Press, 2009, pp. 237–262.

Jia, Panle, "What Happens When Wal-Mart Comes to Town: An Empirical Analysis of the Discount Retailing Industry," *Econometrica*, 2008, *76* (6), 1263–1316.

Johnson, Matthew S., Kurt J. Lavetti, and Michael Lipsitz, "The Labor Market Effects of Legal Restrictions on Worker Mobility," Technical Report Working Paper 31929, National Bureau of Economic Research December 2023.

Jr., William T. Hughes and Geoffrey K. Turnbull, "Uncertain Neighborhood Effects and Restrictive Covenants," *Journal of Urban Economics*, March 1996, *39* (2), 160–172.

Kang, Karissa, "How to Stop Stop & Shop's Anti-Competitive Land-Acquisition Tactics," March 2022.

Klein, Benjamin and Kevin M. Murphy, "Vertical Restraints as Contract Enforcement Mechanisms," *The Journal of Law Economics*, 1988, *31* (2), 265–297.

Knight, Samsun, "Retail Demand Interdependence and Chain Store Closures," 2023.

Konishi, Hideo and Michael T. Sandfort, "Anchor Stores," *Journal of Urban Economics*, 2003, *53* (3), 413–435.

Krueger, Alan B. and Orley Ashenfelter, "Theory and Evidence on Employer Collusion in the Franchise Sector," *Journal of Human Resources*, 2022, *57* (S), S324–S348.

Lafontaine, Francine and Margaret Slade, "Vertical Integration and Firm Boundaries: The Evidence," *Journal of Economic Literature*, September 2007, *45* (3), 629–685.

Le, Quan, "Network Competition and Exclusive Contracts: Evidence from News Agencies," 2024.

Lee, Robin S., "Vertical Integration and Exclusivity in Platform and Two-Sided Markets," *American Economic Review*, December 2013, *103* (7), 2960–3000.

Leslie, Christopher, "Food Deserts and Antitrust Law," 2021.

Leung, Justin and Zhonglin Li, "Big-Box Store Expansion and Consumer Welfare," *SSRN Electronic Journal*, 2021.

Lipsitz, Michael and Evan Starr, "Low-Wage Workers and the Enforceability of Noncompete Agreements," *Management Science*, 2022, *68* (1), 143–170.

Liu, Crocker H., Stuart S. Rosenthal, and William C. Strange, "The Vertical City: Rent Gradients, Spatial Structure, and Agglomeration Economies," *Journal of Urban Economics*, 2018, *106*, 101–122.

_ , _ , and _ , "Agglomeration Economies and the Built Environment: Evidence from Specialized Buildings and Anchor Tenants," *Journal of Urban Economics*, jul 2024, *142*, 103655. Received: 26 November 2022, Revised: 24 February 2024, Available online: 21 May 2024, Version of Record: 21 May 2024.

Lundberg, Wilford, "Restrictive Covenants and Land Use Control: Private Zoning," *Montana Law Review*, 1973, *34*, 199.

Marvel, Howard P., "Exclusive Dealing," *Journal of Law and Economics*, 1982, *25* (1), 1–25.

McFadden, D., "Modeling the Choice of Residential Location," *Transportation Research Record*, 1978, *672*, 72–77.

Mehta, Nitin, "Investigating Consumers' Purchase Incidence and Brand Choice Decisions Across Multiple Product Categories: A Theoretical and Empirical Analysis," *Marketing Science*, 2007, *26* (2), 196–217.

_ **and Yu Ma**, "A Multicategory Model of Consumers' Purchase Incidence, Quantity, and Brand Choice Decisions: Methodological Issues and Implications on Promotional Decisions," *Journal of Marketing Research*, 2012, *49* (4), 435–451.

_ **and** _ , "A Multicategory Model of Consumers' Purchase Incidence, Quantity, and Brand Choice Decisions: Methodological Issues and Implications on Promotional Decisions," *Journal of Marketing Research*, August 2012, *49* (4), 435–451.

Miyauchi, Yuhei, Kentaro Nakajima, and Stephen J Redding, "Consumption Access and Agglomeration: Evidence from Smartphone Data," 2022.

Moszkowski, Erica and Daniel Stackman, "Option Value and Storefront Vacancy in New York City," 2022.

Nishida, Mitsukuni, "Estimating a Model of Strategic Network Choice: The Convenience-Store Industry in Okinawa," *Marketing Science*, January 2015, *34* (1), 20–38.

Nurski, Laura and Frank Verboven, "Exclusive Dealing as a Barrier to Entry? Evidence from Automobiles," *The Review of Economic Studies*, 01 2016, *83* (3), 1156–1188.

Oh, Ryungha and Jaeeun Seo, "What Causes Agglomeration of Services? Theory and Evidence from Seoul," 2023.

Plotkin, Wendy, "Hemmed in: The Struggle against Racial Restrictive Covenants and Deed Restrictions in Post-WWII Chicago," *Journal of the Illinois State Historical Society*, 2001, *94* (1), 39–69. Race and Housing in Post WWII Chicago (Spring 2001).

Posner, Richard A., *Antitrust Law: An Economic Perspective*, Chicago: University of Chicago Press, 1976.

Qian, Franklin, Qianyang Zhang, and Xiang Zhang, "Identifying Agglomeration Spillovers: Evidence from Grocery Store Openings," 2023.

Rasmusen, Eric B., J. Mark Ramseyer, and John S. Wiley, "Naked Exclusion," *The American Economic Review*, 1991, *81* (5), 1137–1145.

Reinmuth, Kate and Emma Rockall, "Innovation through Inventor Mobility: Evidence from Non-Compete Agreements," December 2024.

Relihan, Lindsay E., "Is online retail killing coffee shops? Estimating the winners and losers of online retail using customer transaction microdata," March 2022, (dp1836).

Rhodes, Andrew and Jidong Zhou, "Consumer Search and Retail Market Structure," *Management Science*, June 2019, *65* (6), 2607–2623.

Salop, Steven C., "Monopolistic Competition with Outside Goods," *The Bell Journal of Economics*, 1979, *10* (1), 141–156.

Sass, T. R., "The Competitive Effects of Exclusive Dealing: Evidence From the U.S. Beer Industry," *International Journal of Industrial Organization*, 2005, *23*, 203–225.

Segal, Ilya R. and Michael D. Whinston, "Naked Exclusion: Comment," *American Economic Review*, March 2000, *90* (1), 296–309.

Seim, Katja, "An empirical model of firm entry with endogenous product-type choices," *The RAND Journal of Economics*, September 2006, *37* (3), 619–640.

Shi, Liyan, "Optimal Regulation of Noncompete Contracts," *Econometrica*, March 2023, *91* (2), 425–463.

Simpson, John and Abraham L. Wickelgren, "Naked Exclusion, Efficient Breach, and Downstream Competition," *American Economic Review*, September 2007, *97* (4), 1305–1320.

Sinkinson, Michael, "Pricing and Entry Incentives with Exclusive Contracts: Evidence from Smartphones," January 2014 2020. Available at SSRN: https://ssrn.com/abstract=2391745 or http://dx.doi.org/10.2139/ssrn.2391745.

Smith, H., "Store Characteristics and Retail Oligopoly," *RAND Journal of Economics*, 2005. Forthcoming.

Smith, Howard, "Supermarket Choice and Supermarket Competition in Market Equilibrium," *The Review of Economic Studies*, 01 2004, *71* (1), 235–263.

_ **and Øyvind Thomassen**, "Multi-category demand and supermarket pricing," *International Journal of Industrial Organization*, 2012, *30* (3), 309–314. Selected Papers, European Association for Research in Industrial Economics 38th Annual Conference, Stockholm, Sweden, September 1-3, 2011.

Song, Inseong and Pradeep K. Chintagunta, "A Discrete–Continuous Model for Multicategory Purchase Behavior of Households," *Journal of Marketing Research*, 2007, *44* (4), 595–612.

Stackman, Daniel and Erica Moszkowski, "Bleaker on Broadway: The Contractual Origins of High-Rent Urban Blight," 2023.

Stanton, Richard and Nancy Wallace, "An Empirical Test of a Contingent Claims Lease Valuation Model," *Journal of Real Estate Research*, 2009, *31* (1), 1–26.

Stroebel, Johannes and Joseph Vavra, "House Prices, Local Demand, and Retail Prices," *Journal of Political Economy*, 2019, *127* (3), 1391–1436.

Stubblefield, Jo Anne, "The Impact of Private Covenants and Equitable Servitudes on Commercial Development and Redevelopment," *UIC John Marshall Law Review*, 2019, *52*, 783.

Sturtevant, Peter J., "Restrictive Covenants in Shopping Center Leases," *New York University Law Review*, 1959, *34*, 940.

Trounstine, Jessica, *Segregation by Design: Local Politics and Inequality in American Cities*, New York: Cambridge University Press, 2018.

Vitali, Anna, "Consumer Search and Firm Location: Theory and Evidence from the Garment Sector in Uganda," 2022.

Vitorino, Maria Ana, "Empirical Entry Games with Complementarities: An Application to the Shopping Center Industry," *Journal of Marketing Research*, April 2012, *49* (2), 175–191.

Young, Samuel G., "Noncompete Clauses, Job Mobility, and Job Quality: Evidence from a Low-Earning Noncompete Ban in Austria," March 2024. 70 pages, posted on SSRN.

Yuan, Yihao, "Exclusive Contracts in the Video Streaming Market," May 2025. Working paper, dated May 25, 2025.

Ziff, Bruce and Ken Jiang, "Scorched Earth: The Use of Restrictive Covenants to Stifle Competition," *WYAJ*, October 2012, *30* (2), 1–N.

Øyvind Thomassen, Howard Smith, Stephan Seiler, and Pasquale Schiraldi, "Multi-Category Competition and Market Power: A Model of Supermarket Pricing," *American Economic Review*, August 2017, *107* (8), 2308–2351.

Appendix

A Exclusive Dealing In Retail Real Estate

The content of the restrictive covenants vary greatly across contracts in terms of the retailers blocked, timing, and radius. The language of the exclusive dealing contracts vary from naming the retailers blocked from entering (as shown in Figure 43), to naming a narrow set of industries (as shown in Figure 44), to naming a broad set of industries (as shown in Figure 42). In each case, the contents of the exclusive dealing contract reflect – at least in part – the retailer' perceived competition. For example, Figure 42 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 43), to while the lease is in effect (as shown in Figure 42), to many years after the retailer has left the premises (as shown in Figure 44). The radius varies as well, from the exact premises of the store (as shown in Figure 44), to the shopping center (as shown in Figure 42), to specifying a radius (as shown in Figure 43, which specifies a 1 mile radius wherever the landlord or an affiliate owns property).

Challenges to these contracts 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[24]. 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[25]. Given that food access is a priority for policymakers, it is important to understand

[24]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 44), 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)*).

[25]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

how retailers sort into locations.[26]

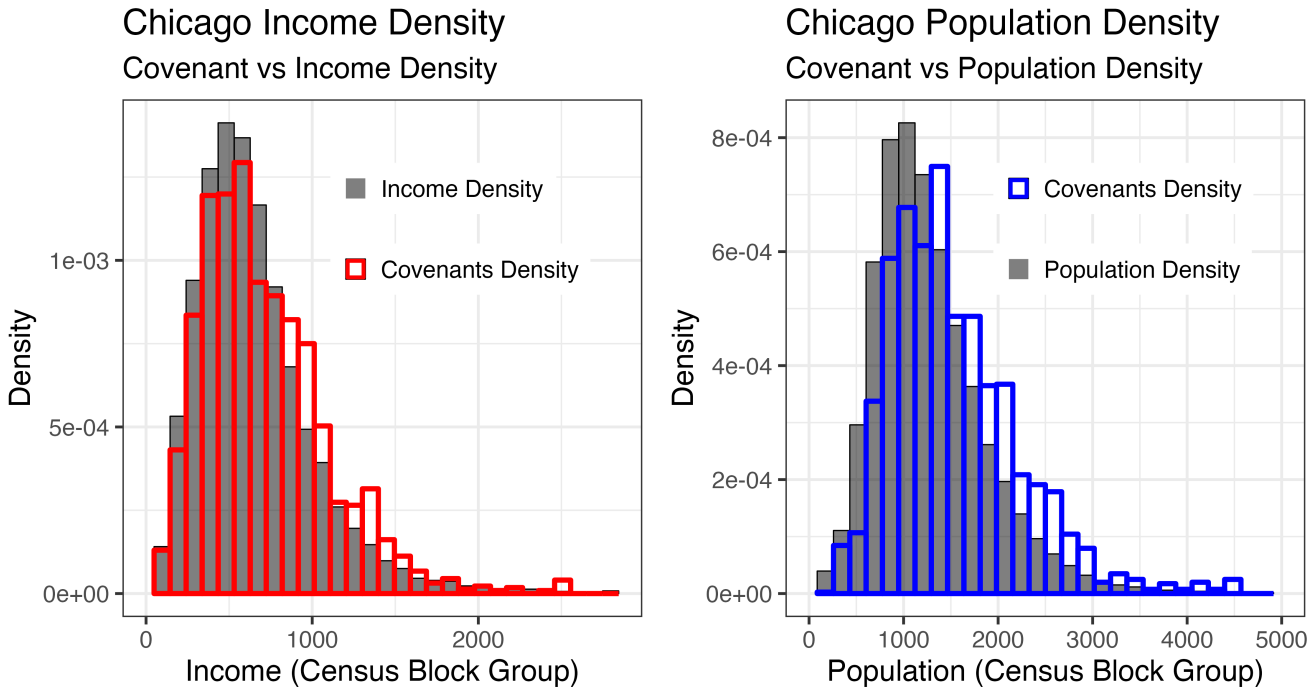
negotiation, a measure was passed that bans restrictive covenants put in place on larger (greater than 7500 square feet) when a retailer leaves the community.

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

B Stylized Facts Appendix

Fact 6 – Exclusive Dealing is Uncorrelated with Neighborhood Demographics: Figure 8 shows that exclusive dealing contracts exist in poor and wealthy neighborhoods, as well as low-density and high-density population neighborhoods. Exclusive dealing contracts tend to exist in slightly higher-income and more population-dense neighborhoods. This fact is further confirmed by observing that the locations of exclusive dealing contracts are scattered across Chicago and do not appear to be significantly geographically selected.

Figure 8: Exclusive Dealing Contracts (Covenants), 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 in red (left) and blue (right).

In fact, exclusive dealing contracts are not observably selected into particular neighborhoods based on demographic features. Table 17-18 show regressions 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

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

where excl. deal is a binary indicator that is one if a (tract,year) has a contract i with an exclusive dealing contract and zero otherwise. Exclusive dealing in a (tract,year) is then regressed on demographic factors in the census tract, including variables such as 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 tract fixed effects, and year fixed effects. Since exclusive dealing is present throughout Cook County, Chicago, no clear trends emerge.

Fact 7 – Timing: Most contracts are signed upon entry (57%), as show in Table 11. These are typically signed between a retailer leasing a property and the landlord that owns additional land parcels. Exclusive dealing contracts that are recorder after the retailer enters a location ("during") are re-leases. Exclusive dealing contract signed as the retailer leaves the property ("exit") are rare (8% or affecting 20 in grocery and big box store in Cook County since the 1980s). For this reason, the analysis focuses on the entry decisions of retailers.

Details from Manually-Read Contracts: Tables 13 and 14 show details of the contracts. These details are produced by manually reading a subset (196) of the restrictive covenants and exclusive use contracts for grocery chains in Cook county and documenting patterns observed in the data. This manually collected data illustrates the range of contracts and the types of documents the contracts can be found in.

Own vs Lease: Exclusive dealing is found in both rented and purchased properties. For rented properties, the landlord covenants to not rent to certain retailers. For purchased properties, the buyer covenants to not rent to certain retailers for a certain number of years after the sale. Amongst purchased properties within this manual subset, the retailer is imposing restrictions on 30 properties, and buying 8 properties with restrictions. As is the case with the full dataset, the majority of agreements are rented (e.g. in Memorandum instead of Deeds in Table 6), are signed within three years of the grocery store entering the property (i.e. "Entry Timing"), and the restriction only applies locally (i.e. Property or Adjacent Property).

Radius: When the restriction specifies a distance, the distance is small (e.g. the median is .5 miles in the manually recorded data). As a result, the model focuses on the retailer entry decisions on rented properties, and on the effects of exclusive dealing contracts on the local tenant mix.

Fact 8 – Grocery Exit and 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.[27] 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.

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).

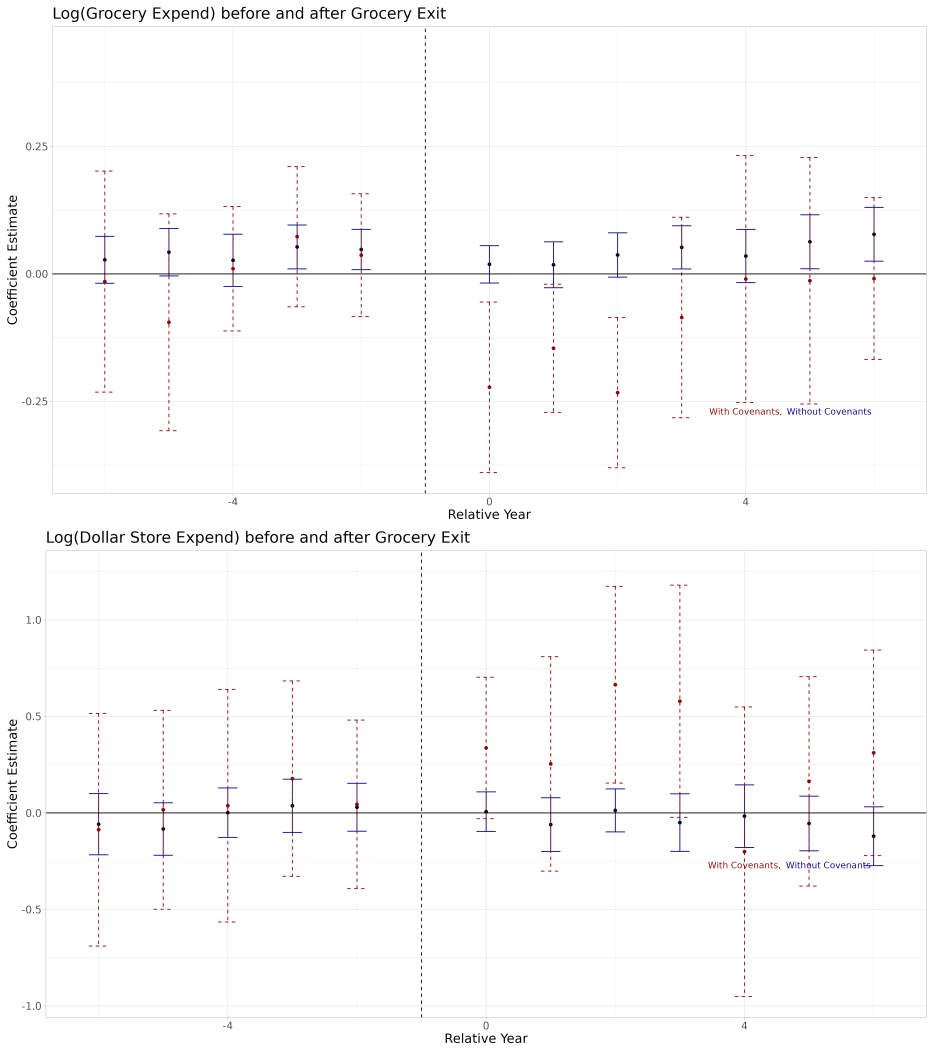
The results are shown in Figure 9, which shows consumer outcomes for household grocery expenditure and household dollar store expenditure. We present separate event studies by exclusive dealing status of the exiting grocer.

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.

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.

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

Figure 9: 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 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.

C Model and Estimation

C.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 1 set a unique price for each income group g taking into account total shares and marginal costs. For example, Safeway sets prices $p_{safeway}^g$ 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.

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

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

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

Or, alternatively

$$\mathbb{P}\left(\begin{pmatrix} A_{\boldsymbol{l}_j} + \sum_a B_{\boldsymbol{l}_j a} E_a \\ A_{\boldsymbol{l}_j} + \sum_a B_{\boldsymbol{l}_j a} E_a \\ \dots \\ A_{\boldsymbol{l}_j} + \sum_a B_{\boldsymbol{l}_j a} E_a \end{pmatrix} - \begin{pmatrix} A_1 + \sum B_{1a} E_a \\ A_2 + \sum B_{2a} E_a \\ \dots \\ A_L + \sum_a B_{La} E_a \end{pmatrix} \geq \begin{pmatrix} 0 \\ 0 \\ \dots \\ 0 \end{pmatrix}\right) \tag{11}$$

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 11. 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

$$E_{\boldsymbol{l}_j}[\pi_m^{small}(a_j)] = \prod_j \left(\sum_{\boldsymbol{l}_j} \mathbb{P}_{j\boldsymbol{l}_j} \right) \pi_m^{small}(\boldsymbol{l}_j) \tag{12}$$

$$= \prod_j \left(\sum_{\tilde{a}} \mathbb{P}_{jm\tilde{a}} \right) \pi_m^{small}(\tilde{\boldsymbol{a}}_j) \tag{13}$$

$$= \sum_{\rho} \mathbb{P}_{\rho} \pi_m^{small}(\rho) \tag{14}$$

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 12, 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.

C.2 Variable Construction and Discussion

C.2.1 Product Market (Step 4)

Markets: A market is defined as a county x year x bi-week x income group. The assumption is that prices p_{bt}^g and demand shocks ξ_{bt}^g in county x year x bi-week t for income group g vary across retailers j and therefore across bundles b. Households are categorized in three income groups according to numerator.

Choices: Given the decision to shop, consumers choose to shop at one of the 136 bundle options from the most frequented 15 stores, an outside option, or a two-store combination of these retailers. The outside option is any non-food store shopped at that and is interpreted as the most-preferred other store a consumer could shop at.

Prices: We compute a price index for each retailer in each market. We aggregate from household bar code purchases to a price index assuming that household preferences follow a Stone price index (Atkin et al. (2018)). The retailer price index p_{jt}^g is computed as the retailer fixed effects in a regression of expenditure-weighted purchased bar code (unit) prices on bar code fixed effects and retailer fixed effects. The price index reflects the relative prices of a retailer in a market holding product quality and product size fixed. In the data, the bar codes are ITEM IDs in the Numerator data set and unit prices are computed by dividing the price of the good by the number of ounces in that good. The price index regression is run separately for each market. Bundle prices of two retailers is the sum of the prices, weighted by the expenditure shares for each retailer (expenditure shares are fixed across the whole sample).

Price Instrument: The price instrument is computed as the average retailer price index for the same retailer in other counties in that year x biweek (Hausman et al. (1994)).

Household Locations: Household locations are placed at the center of their most likely census block group (CBG) using household zip code and demographic information. First, household ZCTA is established using a ZCTA-zip5 crosswalk. Next, household are assigned a probability of living in a census block group condition on their ZCTA, using the ZCTA-to-Block Group allocation factor from the Missouri Census Data Center. Each household is thus has a probability of living in each census block group that overlaps with its zip code. Next, this probability is updated using household characteristics and demographic data from the ACS. Given the household's demographic information, we compute the probability that a household with that demographic feature lives in a certain census block group among the set of block groups it potentially lives in. The original household probability is treated as a prior and updated using Bayes rule with probabilities computed from the ACS. We assigned a household to its most likely census block

group, after incorporating the information from the household demographic characteristics and ACS.

Retailer Locations: We compute two measures of retailer locations. First, we have direct data on store locations (latitude and longitude) from Numerator. Second, we compute a measure of "retailer access", or the closest stores to the center of the census block group.

Distances: Distances are computed as the shortest distance trip from home as the crow flies. For trips to one retailer we compute distances as a trip from home $\rightarrow$ retailer $\rightarrow$ home. For trips to two retailers we compute distances as: home $\rightarrow$ retailer 1 $\rightarrow$ retailer 2 $\rightarrow$ home.

We find that this is the relevant measure of distance for retailers and policymakers. First, retailers reportedly measure catchment areas by drawing a radius around a potential stores location, and determine the population and local retail competition. This suggests that when forecasting future demand, retailers measure distance from consumer homes ss opposed to other consumer locations. Second, policymakers who care about food access also measure distances from consumers' homes to food-providing retailers.

Further, we find that this is a relevant measure of distance in the data. First, we find that consumers shop close to home, and shown in Figure 17, and so access to home is both the accurate and relevant. Second, in Figure 17 we show similar distances between homes and retailers (computed using the store latitude and longitude provided in the data) and the imputed distance between homes and retailers (computed using the closest store to home), with a maximum difference of .111 miles as the crow flies. Third, in Figure 18, we show the correlation between as crow flies distances, which are measured in miles, and OSRM travel times, which are measured in car-driving minutes and find that they are highly correlated but in different numeric units.

Demographics: Demographic characteristics are reported for each household and year. Household preferences are allowed to vary by household income, education, unemployment status, and ethnicity. Preferences for bundles, distances, prices, and shopping at nearby stores are allowed to vary with individual household demographic characteristics.

C.3 Identification

C.3.1 Product Market (Step 4)

With our consumer panel data, the likelihood of households (i) choosing bundle b in county x year x bi-week t is

$$\mathcal{L}(b|\theta) = \prod_i \prod_b \underbrace{1\{b_i\}}_{i \text{ chooses } b} \underbrace{\frac{e^{\delta^g_{bt}+\lambda^g_{ibt}}}{\sum_{b'} e^{\delta^g_{b't}+\lambda^g_{ib't}}}}_{\text{prob. } i \text{ chooses } b}$$

where δ^g_{bt} is the average utility a household in income group g receives from shopping at retailers b in the same day (henceforth bundle b) in the household's county in year and bi-week t (henceforth market t). The average utility of the outside good is set to zero, $\delta_{0t} = 0$, and the remaining average utilities are relative to the outside good.

Average utility is composed of a price element, a bundle fixed effect, and two error terms

$$\delta^g_{bt} = \alpha^g p^g_{bt} + \Gamma^g_b + \xi^g_{bt} + u^g_{bt}$$

where α^g is the marginal disutility of a higher relative price index (henceforth prices) for income group g, Γ^g_b is the utility for bundle b. We interpret Γ^g_b as the quality of a bundle. When b corresponds to multiple stores, households must receive additional utility for shopping at these stores together during the same day (henceforth trip chaining) to justify the increased prices and distances. When households shop at multiple stores, we interpret Γ^g_b as the complementarity between two retailers in b (henceforth Γ^g_b is referred to as a complementarity, and own-complementarity is retailer quality). ξ^g_{bt} is the common demand shock for that bundle in that time period. For example, a trend might increase the demand for goods at a particular set of retailers b and might cause higher utility for a particular bundle in that time period. Demand shocks are likely correlated with prices. Let ξ^g_{bt} represent the portion of the demand shock correlated with prices and let u^g_{bt} is the portion of the demand shock uncorrelated with prices. For example, road closures near retailers b may temporarily decrease demand for bundle b in market t.

We interpret the average utility, price index and complementarity relative to the outside good, so that

$$\delta^g_{0b} = 0$$
$$p^g_{0t} = 0$$
$$\Gamma^g_{0t} = 0$$

The individual term λ^g_{ibt} depends on total distances traveled, whether the stores are nearby, and

interactions between household demographics and bundle characteristics

$$\lambda^g_{ibt} = \gamma^g d_{ibt} + \gamma^g_1 d_{1ibt} + \Sigma_{ib} x_{it} y_{bt}$$

where γ^g is the marginal disutility of distance for income group g. Here, distance is defined as either as-the-crow-flies distance in miles for the total distance trip, or as the OSRM-computed travel time distance in minutes when driving a car. γ_1 is the utility from shopping at stores that are located close together, either within .2 miles (as the crow flies) or within a 5 minute drive (travel time). x_{it} are household demographics such as education and unemployment status. We include demographic characteristics that may be correlated with value of time and thus might change the disutility of distance or nearby shopping. y_{bt} are whether stores are nearby.

The log-likelihood of observing the data under the model is

$$\log \mathcal{L}(b) = \sum_i \left(\delta^g_{b^* t} + \lambda^g_{ib^* t} - \log \left(\sum_{b'} e^{\delta^g_{b't} + \lambda^g_{ib't}} \right) \right)$$

where household i chooses bundle b^*.

The derivative with respect to the average parameter δ^g_{bt} is

$$\begin{aligned} \frac{d \log \mathcal{L}(b)}{d \delta^g_{bt}} &= C(b, b^*) - \sum_i \frac{e^{\delta^g_{bt} + \lambda^g_{ibt}}}{\sum_{b'} e^{\delta^g_{b't} + \lambda^g_{ib't}}} \\ &= C(b, b^*) - \sum_i \underbrace{s_{ibt}}_{\text{prob. } i \text{ chooses } b} \end{aligned}$$

where $C(b, b^*)$ is the count or the number of households that choose b (where $b^* = b$) and s_{ibt} are the model-implied probability that household i chooses bundle b in market t (henceforth shares).

At optimum, $\frac{d \log \mathcal{L}(b)}{d \delta^g_{bt}} \equiv 0$ and market-level bundle are equal to counts, or $\frac{1}{I} \sum_i s_{ibt} = \frac{1}{I} C(b, b^*)$.

The element of the gradient corresponding to δ^g_{bt} is $\frac{1}{I} \left(C(b, b^*) - \sum_i s_{ibt} \right)$.

The derivative with respect individual-specific parameters λ^g_{ibt} are

$$\frac{d \log \mathcal{L}(b)}{d\gamma^g} = \sum_i \left(d_{ib^*t} - \sum_{b'} \frac{d_{ib't} e^{\delta^g_{b't} + \lambda^g_{ib't}}}{\sum_{b'} e^{\delta^g_{b't} + \lambda^g_{ib't}}} \right)$$
$$= \underbrace{\sum_i d_{ib^*t}}_{\text{tot. dist. actually traveled}} - \underbrace{\sum_i \sum_{b'} d_{ib't} s_{ib't}}_{\text{share-weighted tot. dist.}}$$

At optimum, the distance that is actually traveled should reflect the predicted distance traveled by the model, which is the share-weighted distance a household travels to each bundle. Variation in household distances to bundles identifies the marginal disutility for distance. As distances increase for consumers, the decreases in the model-implied probability of shopping at the bundle determines the disutility.

The element of the gradient corresponding to γ^g is $\frac{1}{I}\left(\sum_i d_{ib^*t} - \sum_i \sum_{b'} d_{ib't} s_{ib't}\right)$.

$$\frac{d \log \mathcal{L}(b)}{d\gamma^g_1} = \underbrace{\frac{1}{I}\sum_i d_{1ib^*t}}_{\text{fraction of trips to nearby stores}} - \underbrace{\frac{1}{I}\sum_i \sum_{b'} d_{1ib't} s_{ib't}}_{\text{share-weighted trips to nearby stores}}$$

For shopping to nearby stores, γ^g_1 is be chosen to match the fraction of trips to nearby stores with the model-implied fraction of trips to nearby stores. Variation in co-locating stores, e.g. due to changes within a shopping center or differences in shopping centers across space, identifies the marginal utility for shopping at nearby stores, or the value of the shopping center holding fixed the total distance trip.

The element of the gradient corresponding to γ^g_1 is $\frac{1}{I}\left(\sum_i d_{1ib^*t} - \sum_i \sum_{b'} d_{1ib't} s_{ib't}\right)$.

$$\frac{d \log \mathcal{L}(b)}{d\Sigma_{lm}} = \frac{1}{I}\sum_i x_{it} y_{bt} 1\{i = l, b^* = m\} - \frac{1}{I}\sum_i s_{imt} x_{it} 1\{i = l\}$$

where l is a household characteristic (e.g. college-education) and m is a particular bundle.

The element of the gradient corresponding to Σ_{lm} is $\frac{1}{I}\left(\sum_i x_{it} y_{mt} 1\{i = l, b^* = m\} - \sum_i s_{imt} x_{it} 1\{i = l\}\right)$.

In a first step, the maximum likelihood estimator gives consistent estimates for $\delta^g_{bt}, \gamma^g, \gamma^g_1, \mathbf{\Sigma}$.

Variation across household choices identifies the parameters. Distance parameters are identified by within-household changes in choice set, as distances change when retailer enter and exit the sample. This within-household variation identifies both the marginal disutility of a longer trip, γ^b, and the utility of shopping at nearby stores, $\gamma_1^b, \mathbf{\Sigma}$. Additionally, cross-section variation across households further identifies the disutility for distance. The assumption required for cross-sectional variation to correctly identify the distance parameters is that households preferences for stores and distances are uncorrelated with where households are located conditional on household demographics and household zip code (we further condition on household zip code). The average utility parameter δ_{bt}^g is identified off of variation in bundle popularity (measured as counts in the data) holding all other variables (such as distance) equal. The optimal δ_{bt}^g is chosen such that the model-implied shares match the observed shopping frequency in the data.

Disutility for distance is decomposed into a zip-code specific fixed effect and a residual distaste for distance, partially out any household-zip effects.

$$\underbrace{\hat{\gamma}_{bt}^g d_{ibt}}_{\substack{\text{disutility attributed} \\ \text{to dist.}}} = \underbrace{\sigma_i}_{\text{zip FE}} + \underbrace{\tilde{\gamma}_{bt}^g d_{ibt}}_{\text{est. net of zip FE}} + \tilde{\epsilon}_{ibt}$$

where σ_i is a zip code fixed effect. If household select into the zip code or if retailers select next to households in particular zip codes, σ_i should explain a significant portion of the variation in distance and the remaining residual $\tilde{\gamma}_{bt}^g d_{ibt}$ should be small.

In a second step, an instrumental variables regression gives consistent estimates for α^g, Γ_b^g. The instrument that isolates supply-side price shifts identifies the demand parameters. The disutility of prices is identified from variation between instrumented prices and average bundle popularity. The marginal disutility for prices is determined by the extent to which average bundle popularity drops as (instrumented) prices rise. The instrument here is the average price of the same retailer in other markets, assuming that cost shocks are common to all markets (given that retailers set prices more uniformly) while demand shocks are unique to each market and uncorrelated with national demand (Hausman et al. (1994)). The complementarity parameters is determined by the average utility of the bundle partialing out the effect of prices and individual parameters.

With estimated parameters $\hat{\delta}_{bt}^g, \hat{\alpha}^g p_{bt}^g, \hat{\Gamma}_{bt}^g$, we compute the biweekly demand shock, ξ_{bt}^g as

$$\xi_{bt}^g = \hat{\delta}_{bt}^g - \hat{\alpha}^g p_{bt}^g - \hat{\Gamma}_{bt}^g$$

With these parameters estimated, we compute marginal costs for each retailer x income group x county x year x biweek:

$$mc_{jt}^{g} = p_{jt}^{g} - \left[\frac{\partial s_{jt}^{g}}{\partial p_{jt}^{g}}\right]^{-1} s_{jt}^{g} + \frac{\partial s_{jt}^{g}}{\partial p_{jt}^{g}}$$

C.4 Descriptive Statistics

C.4.1 Product market (Step 4)

Table 6 shows summary statistics of trips in the data. The first column shows the retailers in the demand estimation. The second column counts the number of visits to each retailer (trips). The third column counts the total expenditure at that retailer. The fourth and fifth column rank the retailers by expenditure and and visits. The data shows that the majority of the market share is spent at the inside good, and the market is dominated by Big Box stores like Walmart and Target and by popular grocery stores like Jewel Osco (Safeway).

Table 6: Trips to Each Retailer

Retailer	Counts (Total)	Expend (Total)	Counts (Fraction)	Expend (Fraction)
Walmart	221886	12641556.62	0.14	0.18
Target	175570	9454001.43	0.11	0.13
Jewel Osco	192179	7818518.36	0.12	0.11
Costco	59331	6602305.32	0.04	0.09
Other	191448	6476655.52	0.12	0.09
Drug	230634	5287421.61	0.14	0.07
Other Food	122336	4393988.07	0.07	0.06
Aldi	96170	3998455.58	0.06	0.06
Mariano's	83842	3850563.52	0.05	0.05
Sam's Club	30950	3227499.07	0.02	0.04
Meijer	31445	1904166.68	0.02	0.03
Dollar	111165	1546703.80	0.07	0.02
Whole Foods	33775	1521076.70	0.02	0.02
Trader Joe's	28471	1130818.71	0.02	0.02
Food 4 Less	25629	1093974.88	0.02	0.01
Liquor	13936	593054.73	0.01	0.01

Source: Numerator, Chicago, 2017-2019. The table represents a descriptive statistic from the data used in demand estimation. Each count is a unique visit to a retailer. The total number of visits and expenditure to each retailer is reported.

D Figures

Figure 10: Numerator Definitions

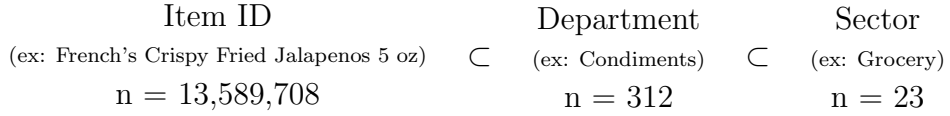
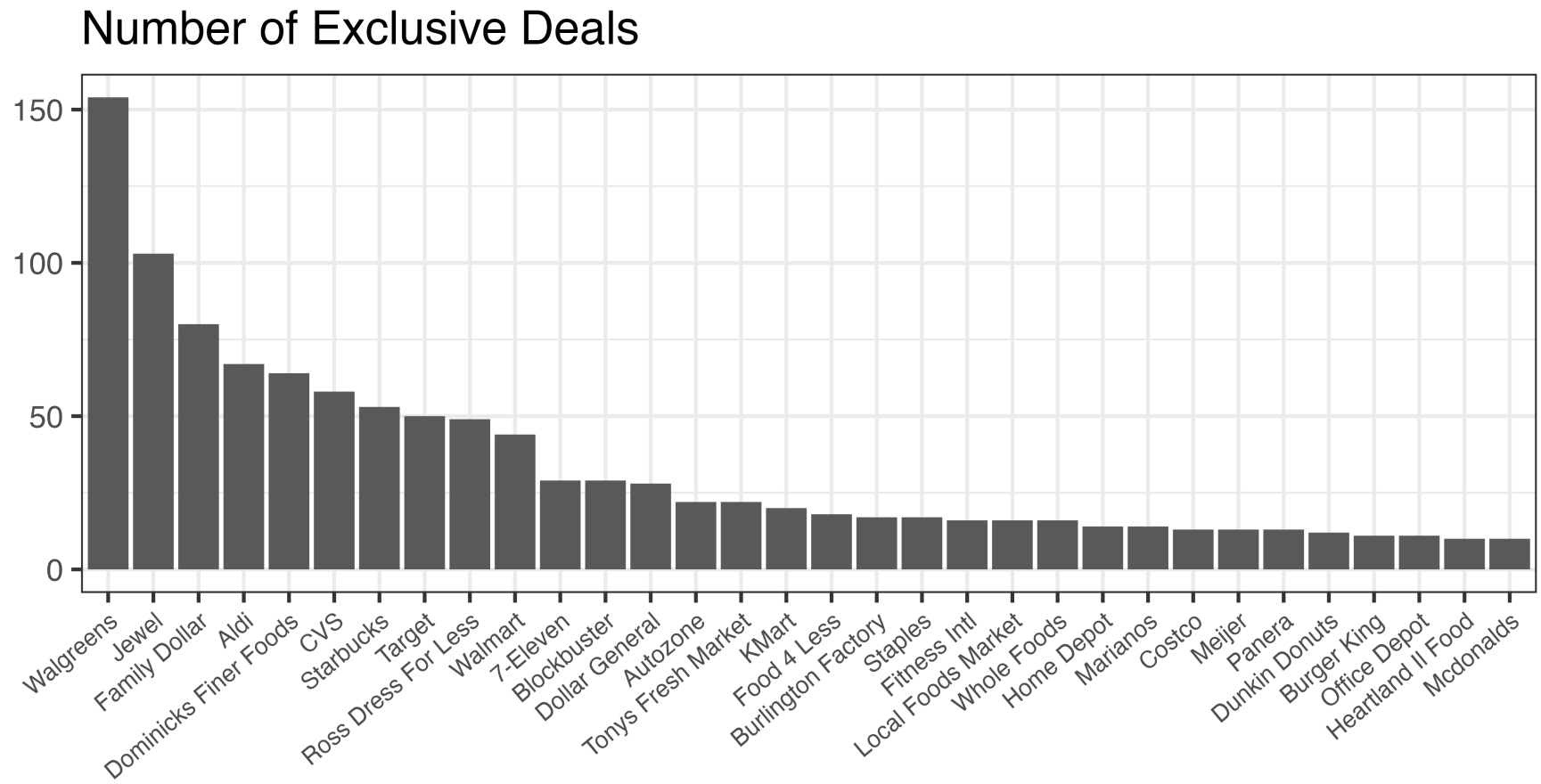


Figure shows three of the levels of aggregation in the Numerator data. This figure follows a similar figure in Handbury (2021). On a trip, a consumer purchases a set of individual items recorded at the barcode level, called Item ID's, that comprise the individual's basket of purchases for that trip. Numerator data classifies items in to several categories, broader and broader categories. Figure 10 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 sectors, such as grocery and home goods.

Figure 11: Retailers with Exclusive Dealing Contracts

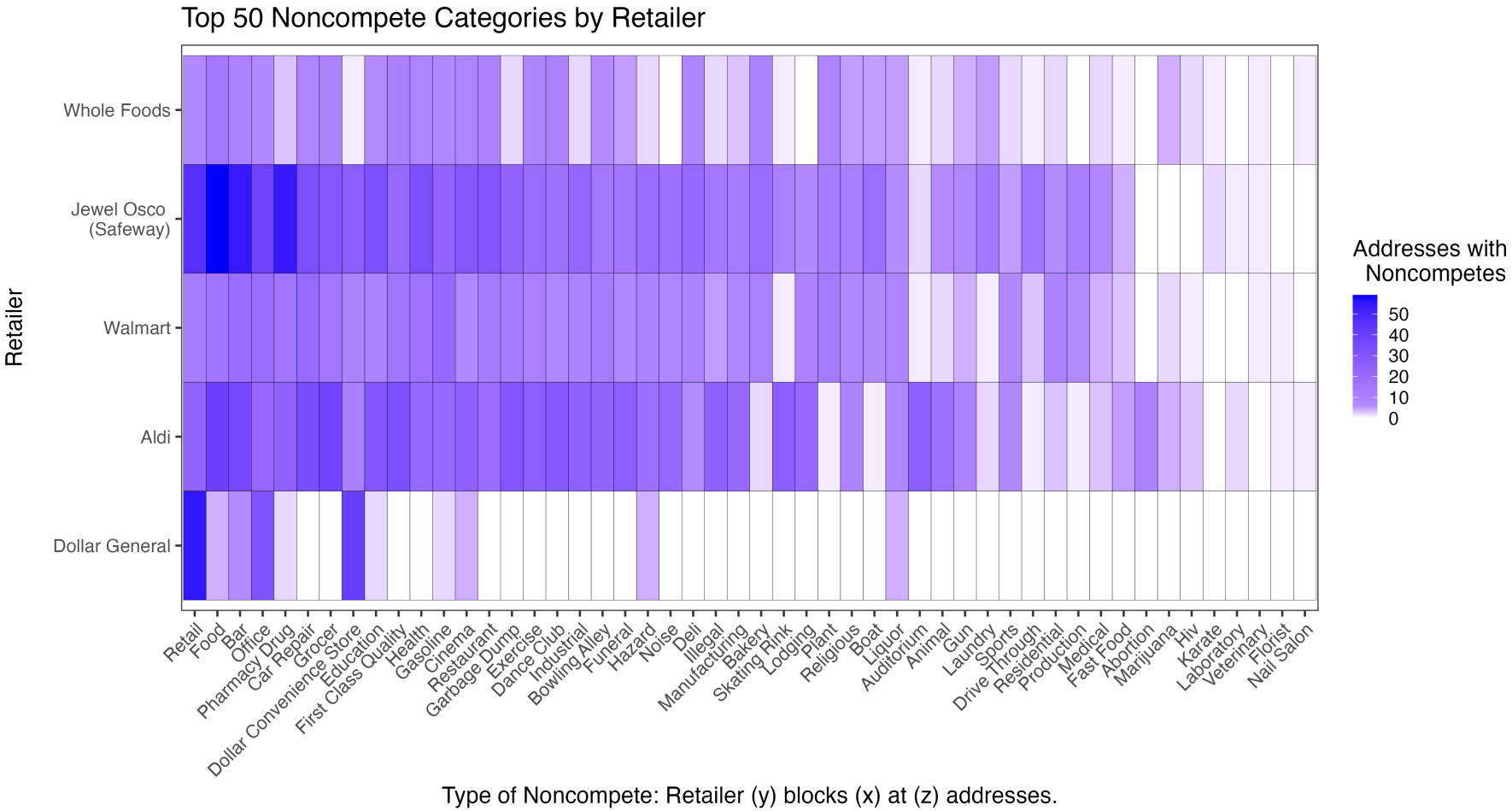


Source: Cook County Recorder Office. Figure plots the top retailers by exclusive dealing contracts use recorded at the Cook County Recorder office. Time span 1980-2023.

Figure 12: Contents of Exclusive Dealing Contracts Across Select Retailers and Restrictions

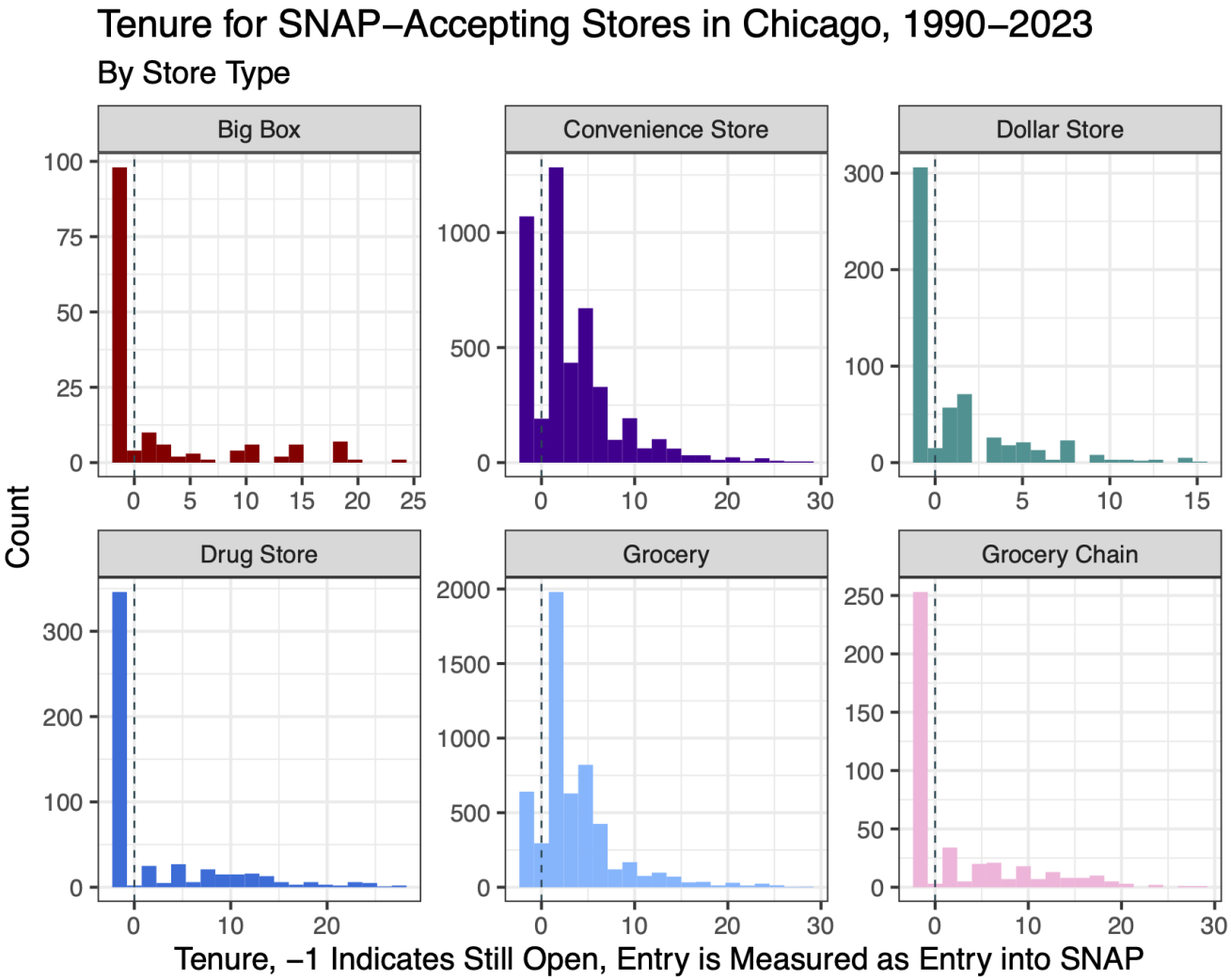
Source: Cook County Recorder Office. Figure shows the details of the exclusive dealing contracts for nine retailers: Jewel Osco (Safeway), Whole Foods (Amazon), Aldi, Walmart, Walgreens, CVS, Target, Dollar General and Family Dollar. The plot shows the fraction of addresses where each retailer has blocked a certain type of retailer: dollar stores and convenience stores (in light blue), grocery stores (in blue), liquor stores (in red), and pharmacy or drug stores (in purple).

Figure 13: Contents of the Exclusive Dealing Contracts Across Select Retailers



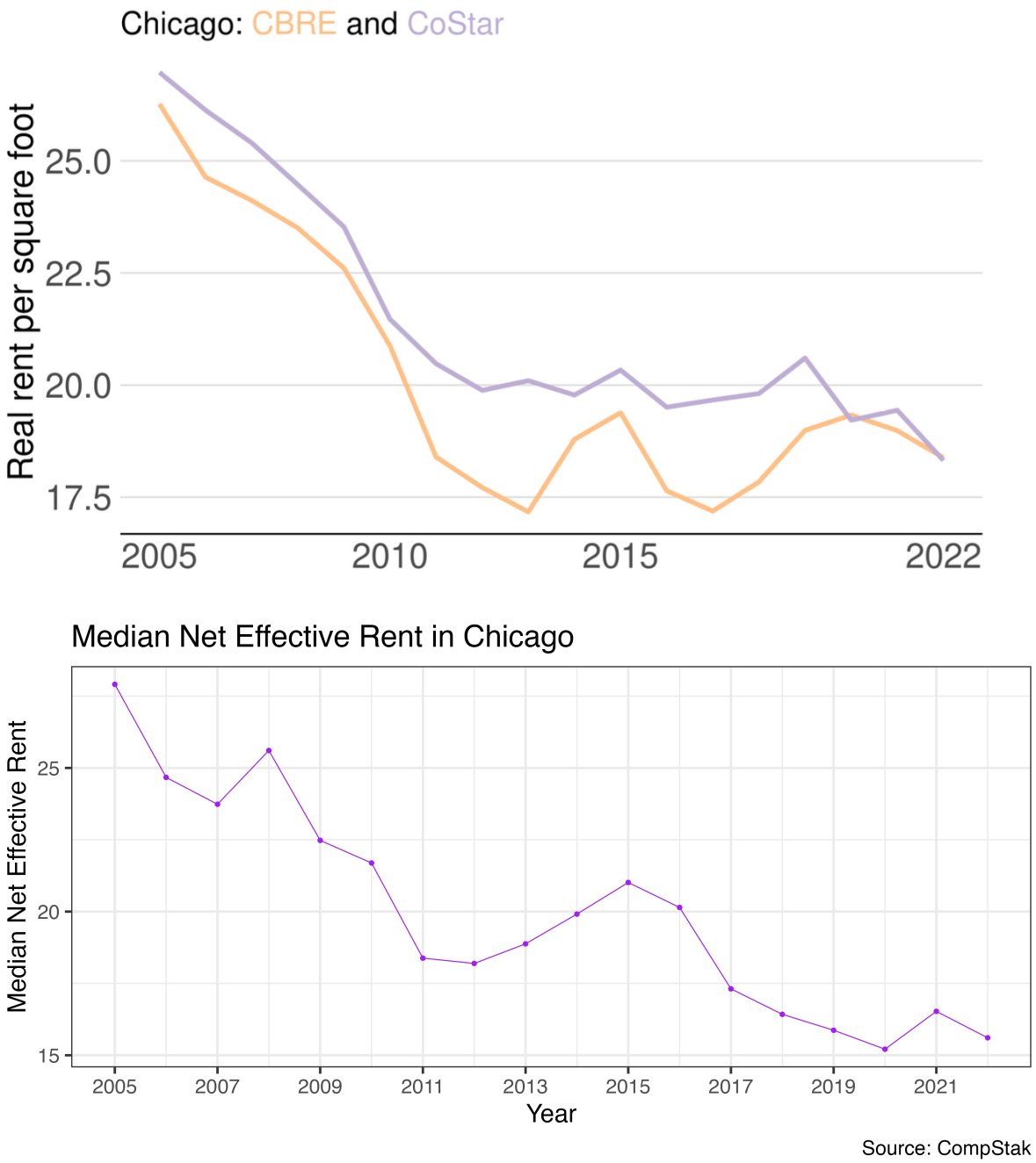
Source: Cook County Recorder Office. Figure shows the top 50 categories of restrictions (non-competes) for Whole Foods (Amazon), Jewel Osco (Safeway), Walmart, Aldi, and Dollar General. The retailers are chosen to show a mix of retailers at different price points. The color intensity shows the number of addresses that impose a particular restriction. For example Jewel Osco blocks food retailers at over fifty addresses and does not block nail salons at any address. The top fifty restrictions (noncompetes) can be classified into direct competition (retail, food), competition for parking spots (education, health), and curation of the aesthetics of the shopping center (garbage dump, gun, abortion, Marijuana, etc...).

Figure 14: Exit is Rare for Big Box Stores, Chain Drug Stores, and Chain Grocery Stores: Number of Years a Retailer Stays Open by Store Type



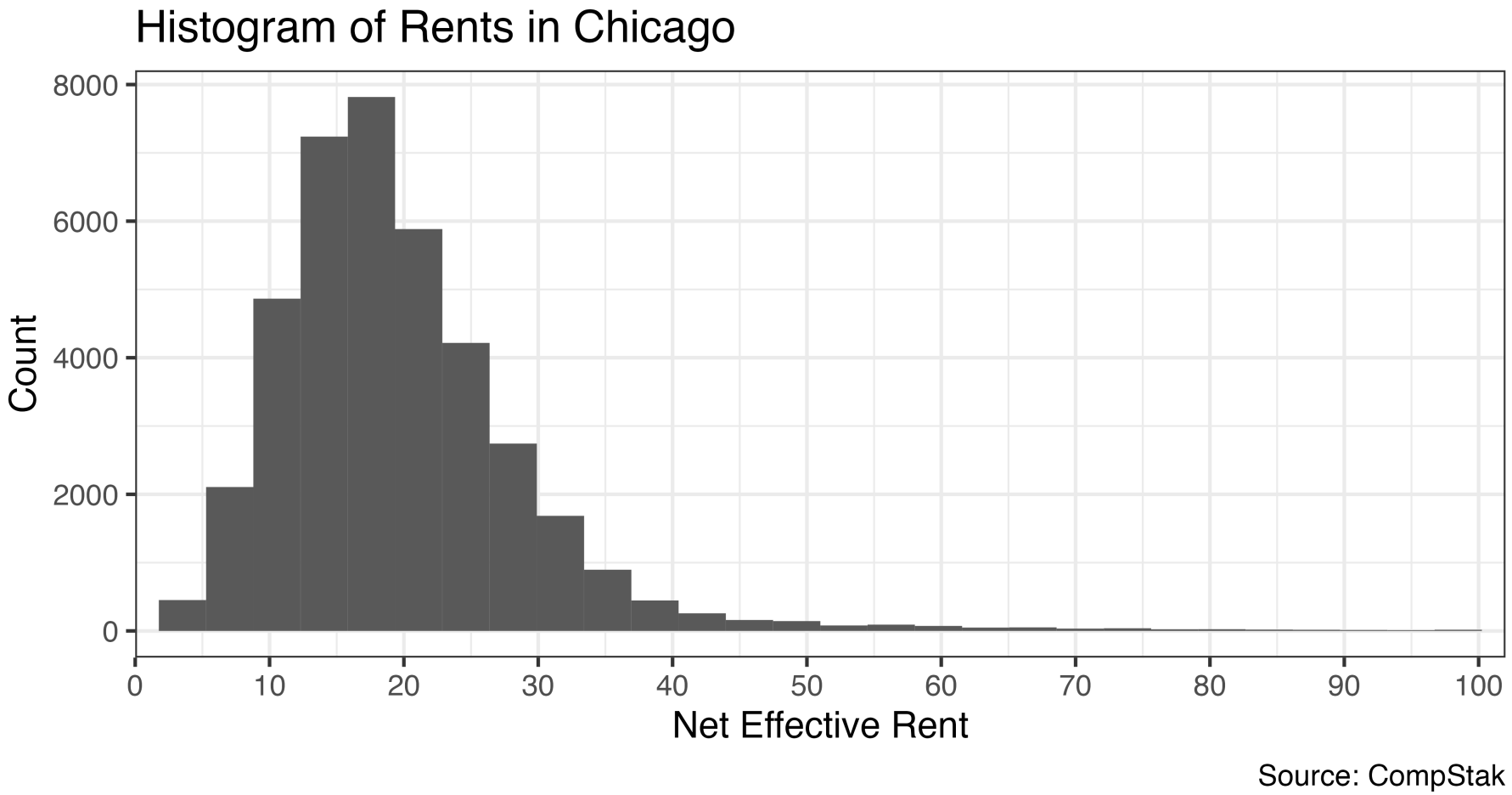
Source: SNAP Retailer Database. Figure plots the number of years each store stays open by store type. At $x = -1$ is the mass of stores that has not yet closed. At $x > 0$ number of years open for stores that have closed. The plot shows that exit is rare for big box stores, chain drug stores (drug stores), and chain grocery stores.

Figure 15: Time Series of Rental Prices



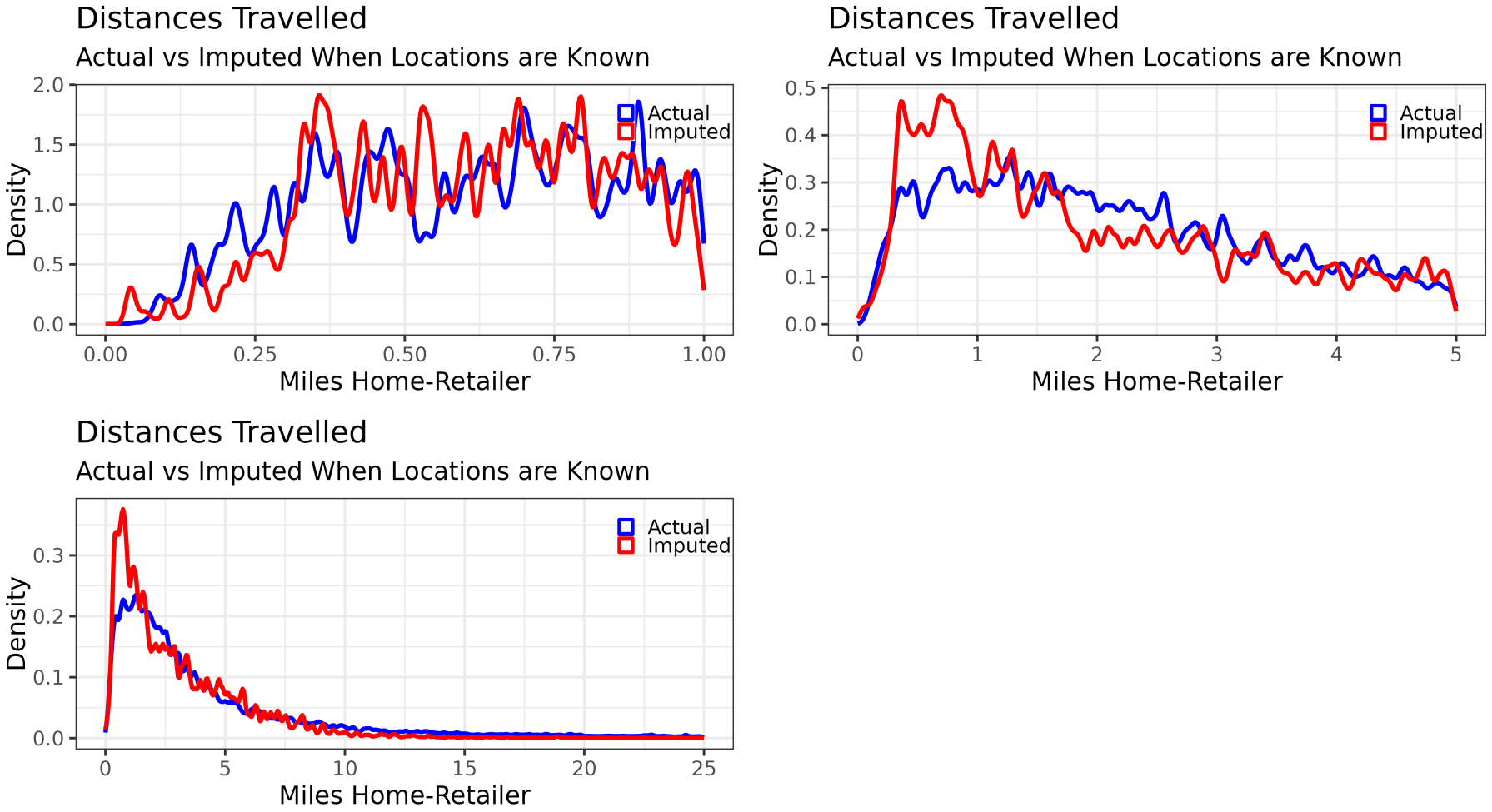
Notes: Top: Appendix Figure 1 from Brooks and Meltzer (2024) which shows median CoStar rents per square foot (largely asking rent, but in some cases effective or starting rent) in orange and CBRE mean retail gross asking rent per square foot in purple. CoStar is the data source used by Brooks and Meltzer (2024), and CBRE is a global real estate services company that collects data on retail leases. The data is in 2022 dollars. The levels are different between CoStar and CBRE likely use different sources or definitions of asking rent (Brooks and Meltzer (2024)). Bottom: Median net effective rents in Chicago over time in CompStak data used in this paper. The data is in 2022 dollars. This measure is different than the asking rent (top) and is measured as net effective rent (the total rent owed to the landlord per year per square foot).

Figure 16: Rental Prices in the Data



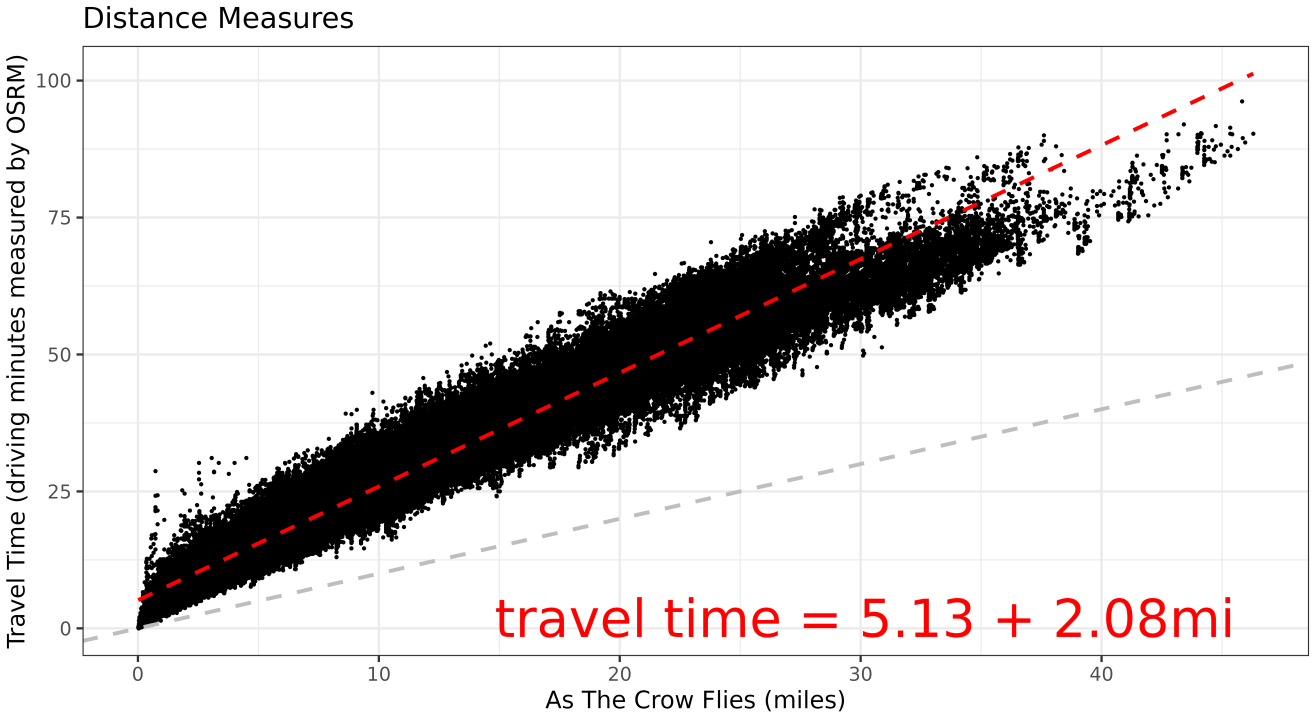
Source: Compstak. Histogram of rental prices in the Compstak data. Rents are computed as net effective rent, the total amount owed to the landlord per square foot per year, in 2016 USD.

Figure 17: Comparing Observed and Imputed Distances Traveled to Retailers



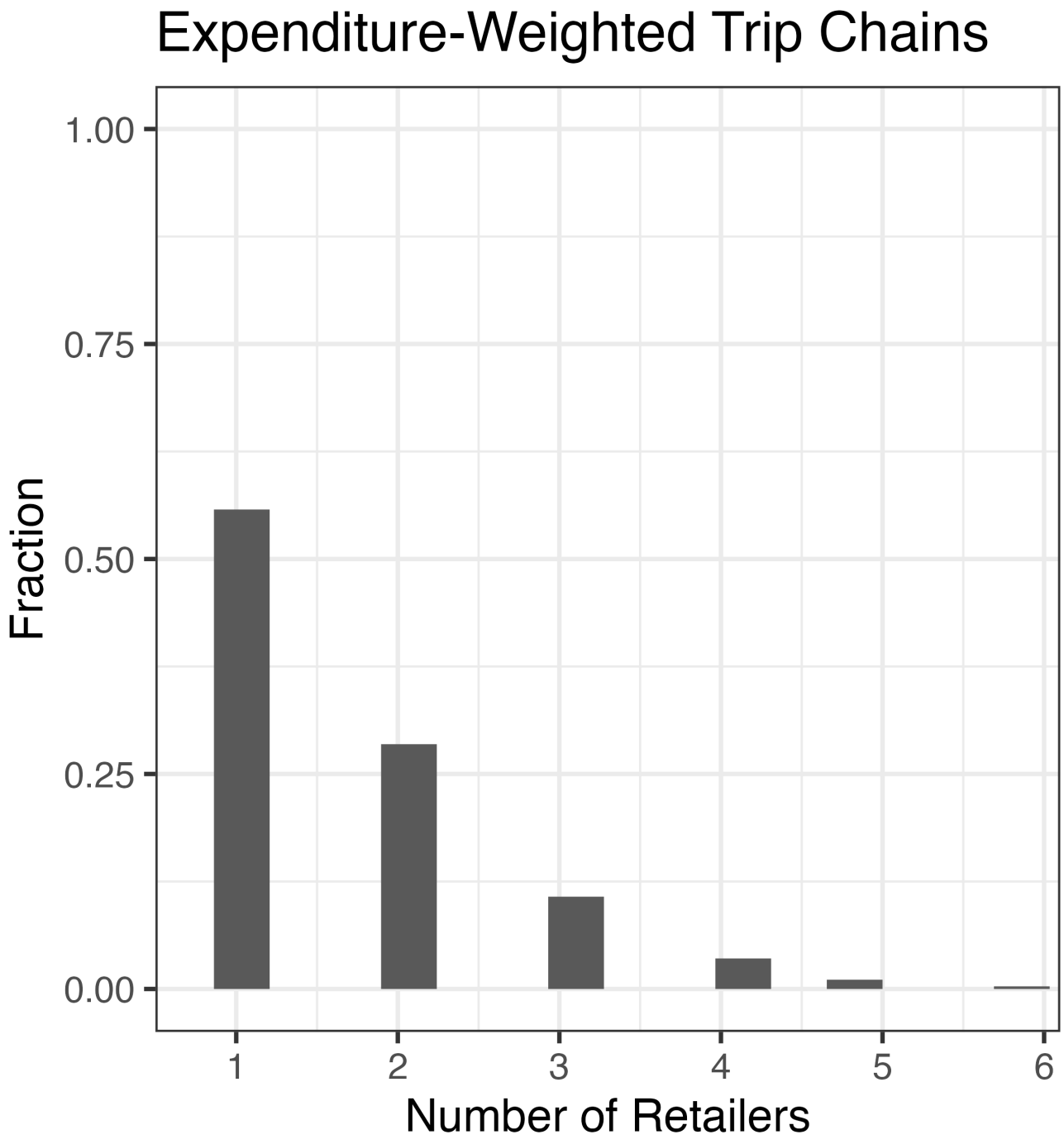
Source: Numerator. Comparison of actual distances traveled versus imputed distance traveled when the data on store locations are available for distances between (a) 0-1 miles, (b) 0-5 miles and (c) 0-25 miles. This tests whether consumers are shopping at stores close to home. The Kolmogorov–Smirnov test to determine whether the distributions (imputed and observed) are the same, finding a D = 0.111 and a p-value $< 2.2e-16$. The distance, D, indicates that the maximum distance in as-the-crow-flies miles between the actual and imputed distributions is 0.111 miles.

Figure 18: Distances and Travel Times are Correlated



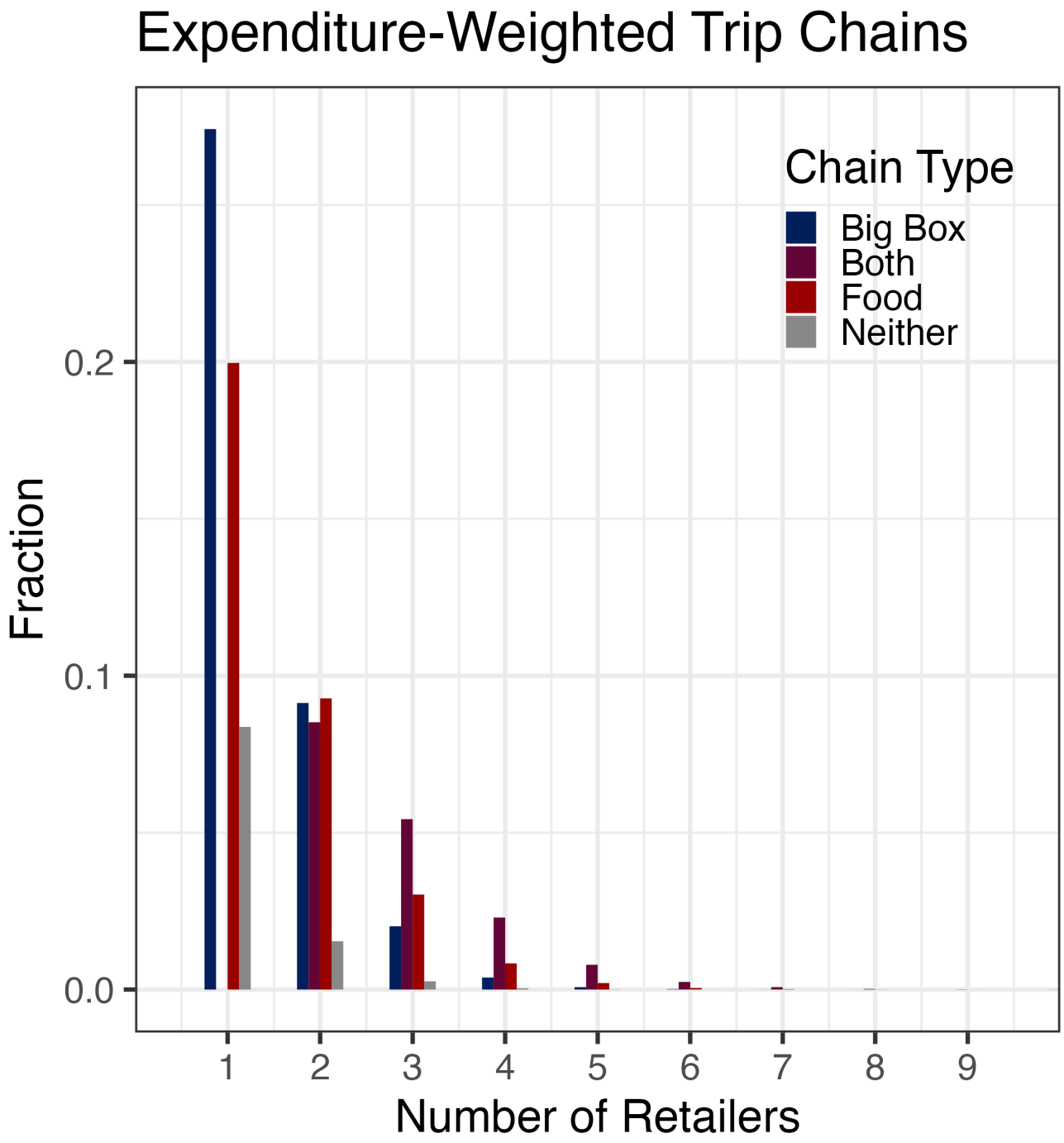
Source: Numerator, Chicago, 2017-2019. Figure shows total trip distance in miles and total travel time. Distances are measured in miles and travel times are measured in minutes in the car as reported by OSRM. The red dashed line reports the best fit, and the grey line reports the 45 degree line where travel times and distances are the same.

Figure 19: Multi-Homing: Histogram of Number of Retailers Shopped at Per Trip



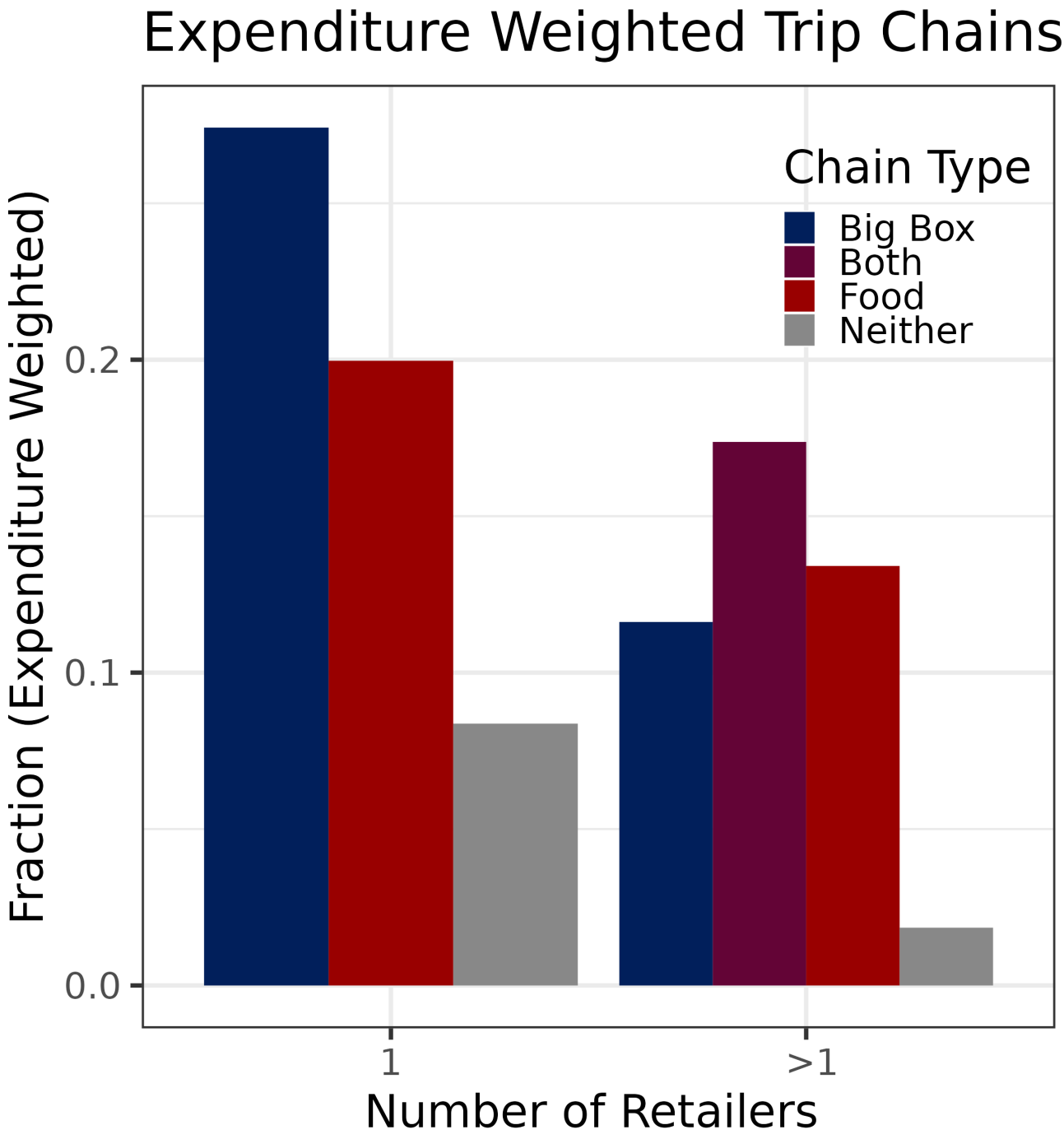
Source: Numerator, Chicago, 2017-2019. Figure shows prevalence of multi-homing or shopping at more than one store in the same day.

Figure 20: Multi-Homing: Histogram of Number of Retailers Shopped at Per Trip by Store Type



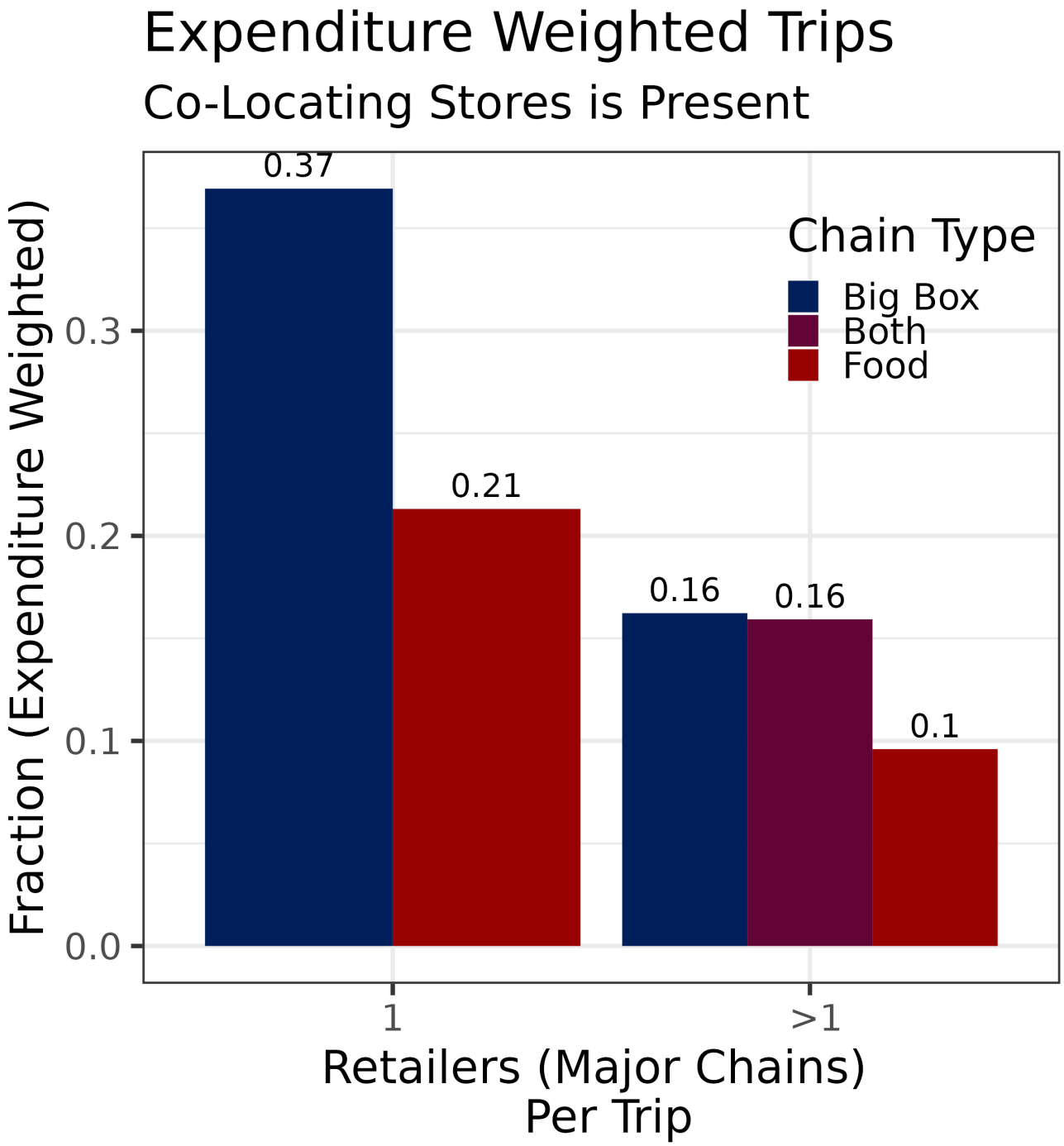
Source: Numerator, Chicago, 2017-2019. Figure shows prevalence of multi-homing or shopping at more than one store in the same day, broken down into store type categories.

Figure 21: Multi-Homing



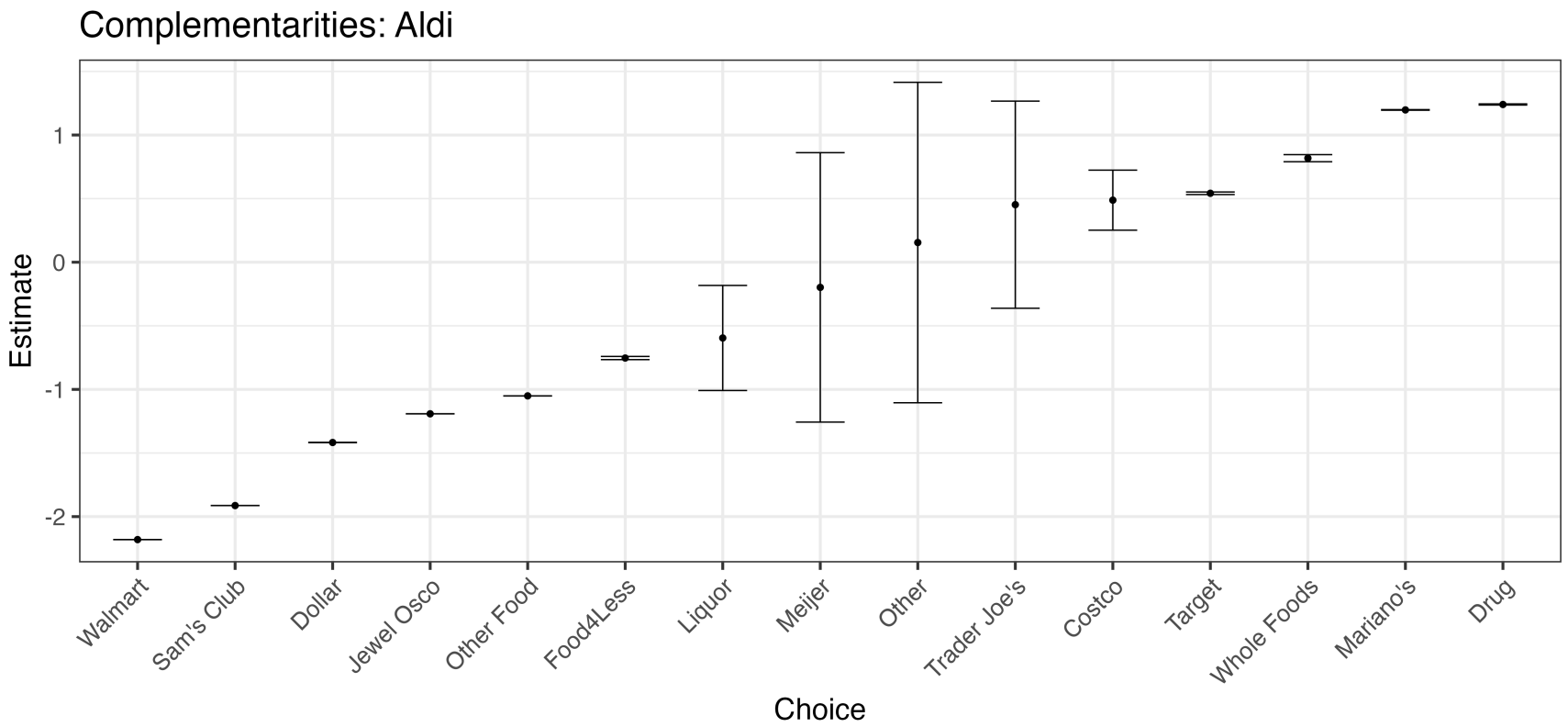
Source: Numerator, Chicago, 2017-2019. Figure shows prevalence of multi-homing or shopping at more than one store in the same day, broken down into store type categories.

Figure 22: Multi-Homing with Large Retail Chains when Co-Locating Stores Are Present



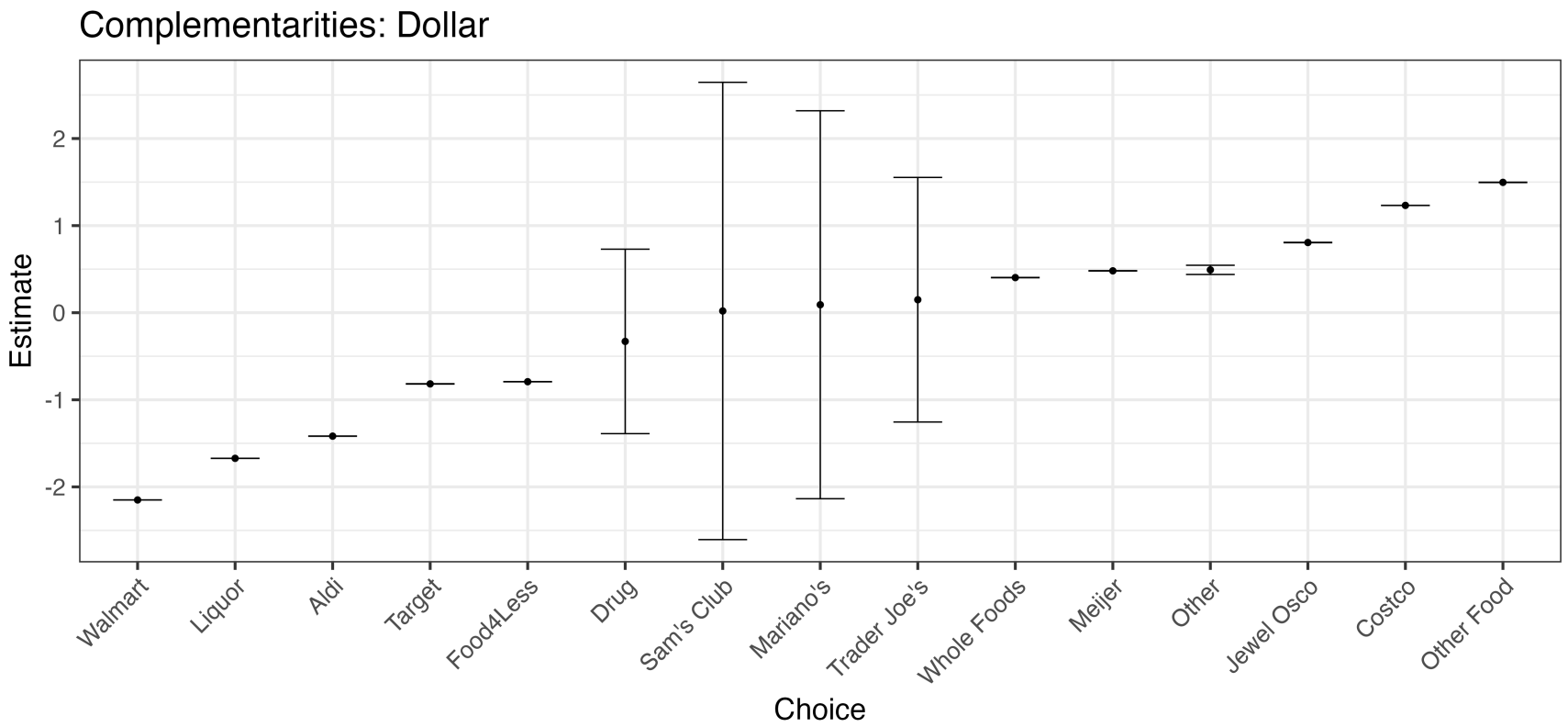
Source: Numerator, Chicago, 2017-2019. Figure shows number of retailers per trip conditional on (1) a household shops at a large grocery or big box store (2) another store is present within .2 miles of the large grocery store or big box store. We call this second store present a co-locating store. Therefore, 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 23: Complementarities



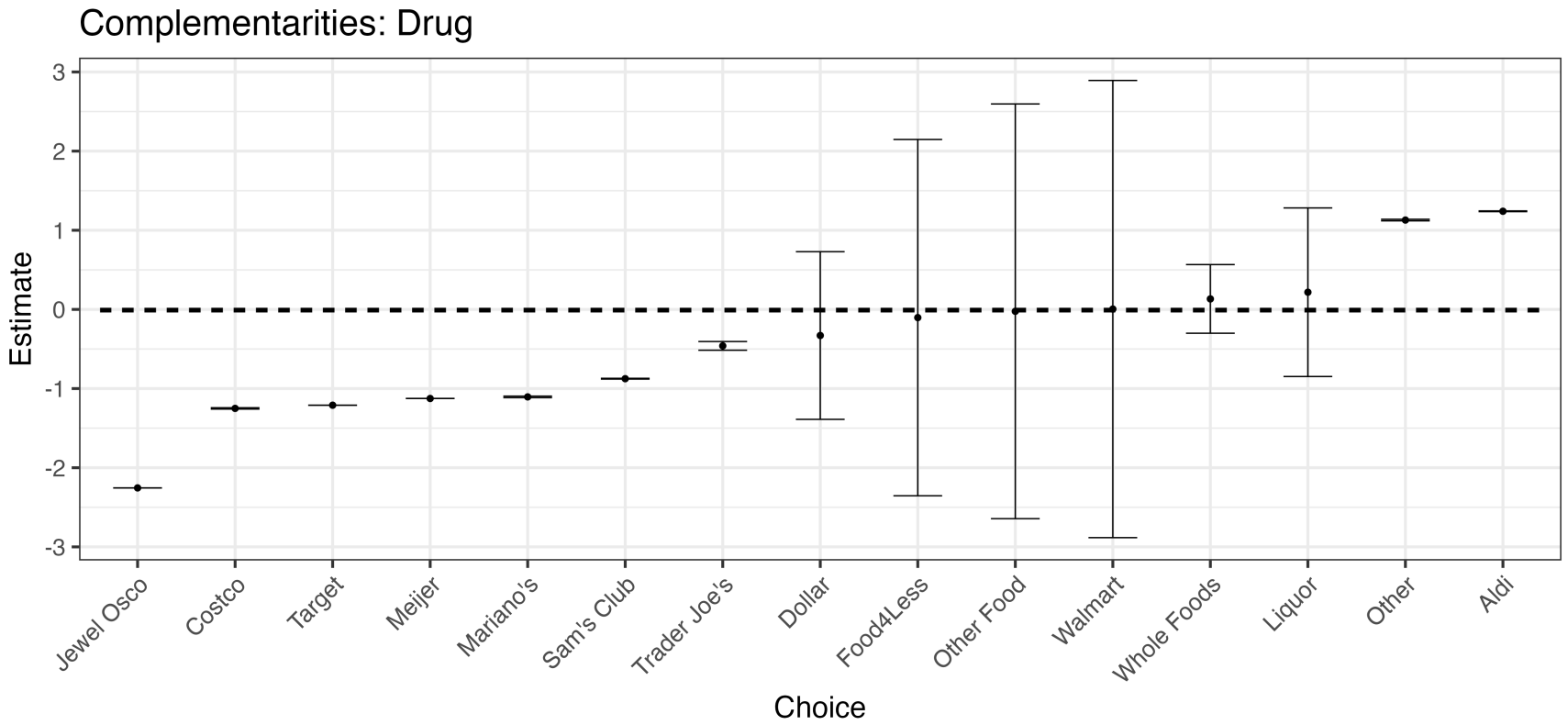
Notes: Estimates of complementarities across retailers.

Figure 24: Complementarities



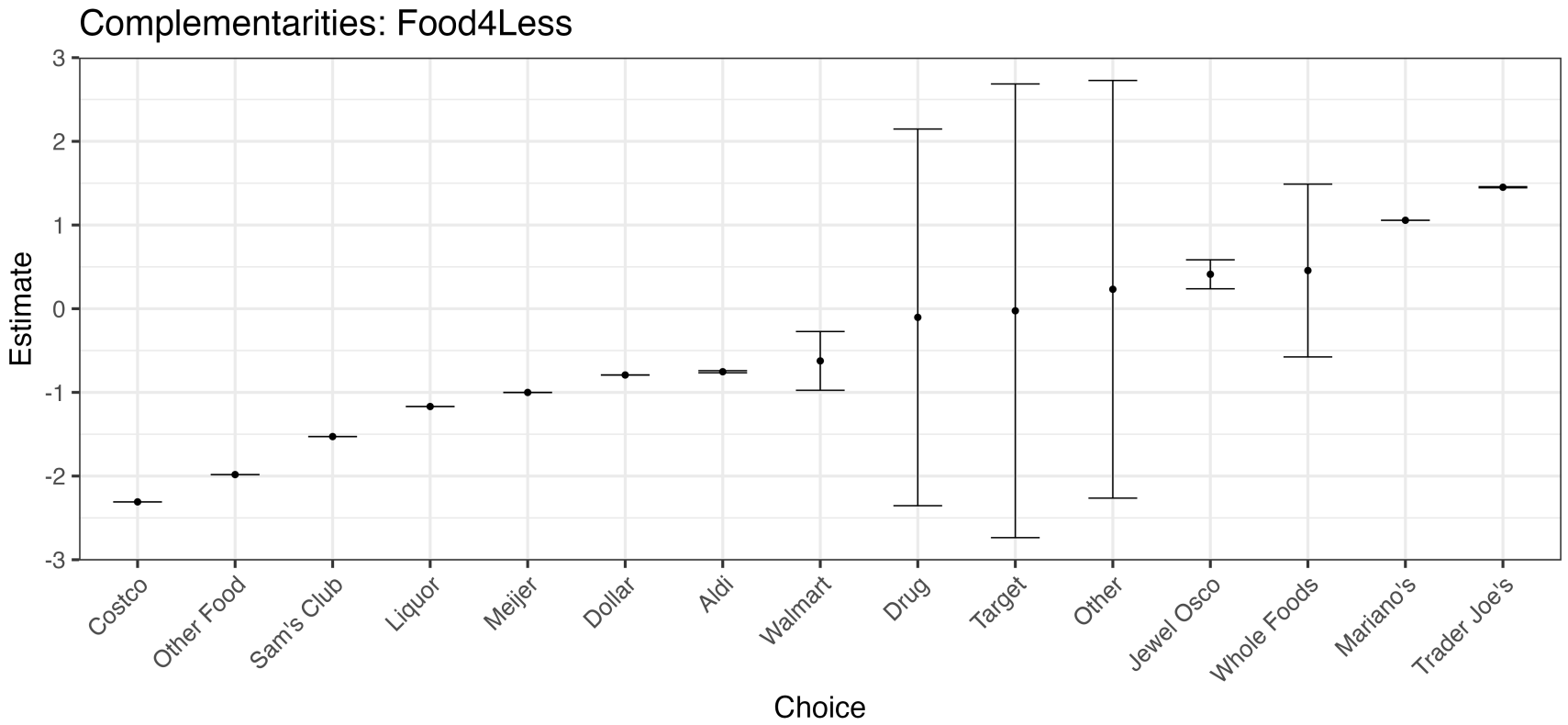
Notes: Estimates of complementarities across retailers.

Figure 25: Complementarities



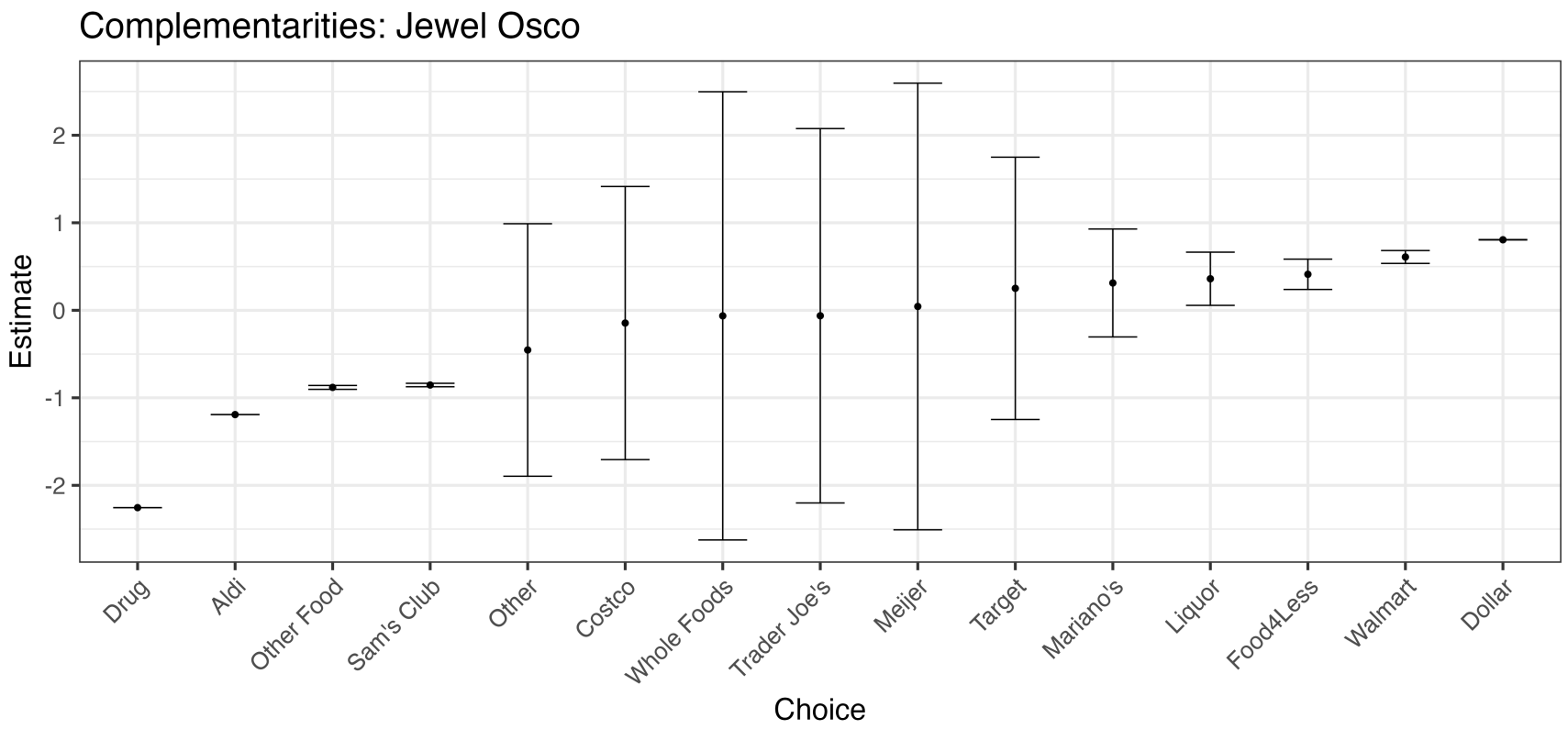
Notes: Estimates of complementarities across retailers.

Figure 26: Complementarities



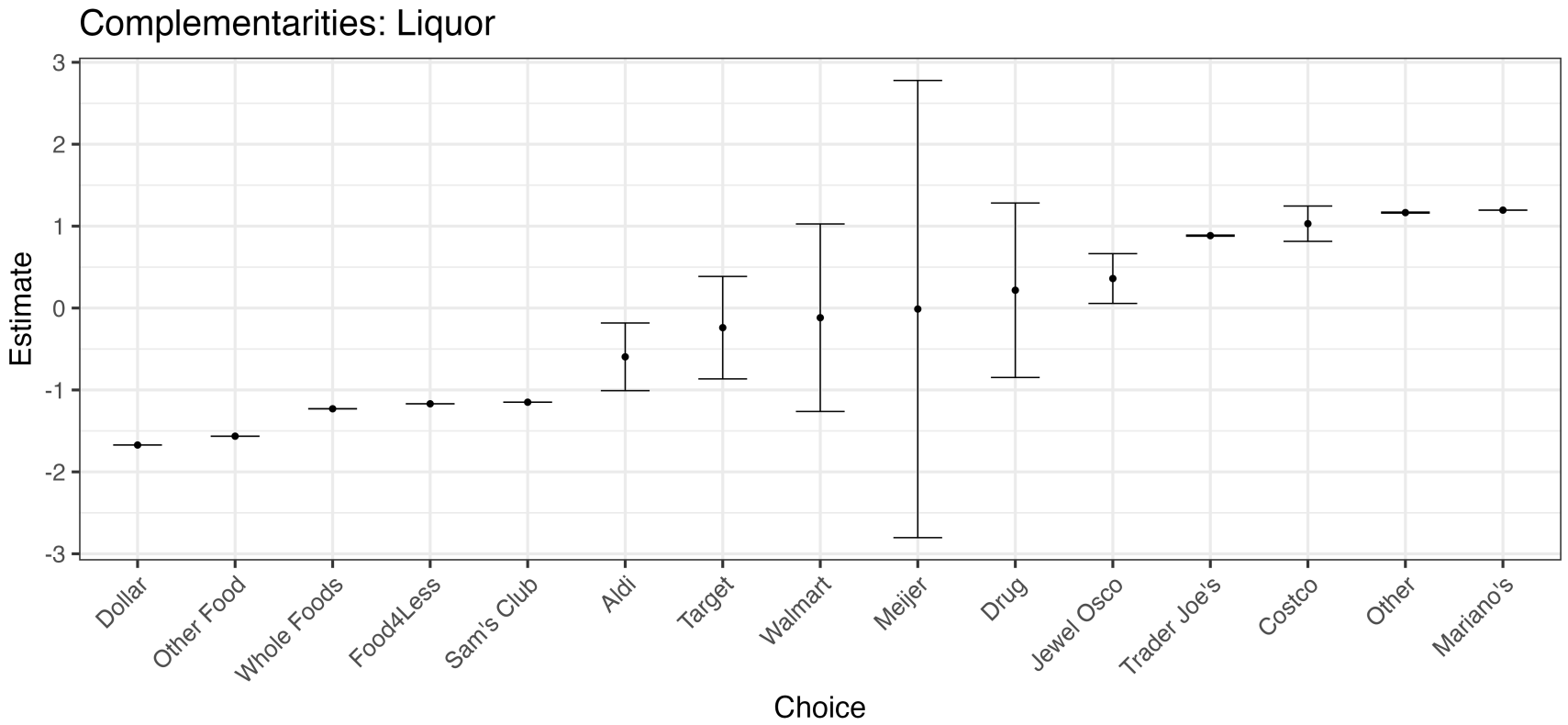
Notes: Estimates of complementarities across retailers.

Figure 27: Complementarities



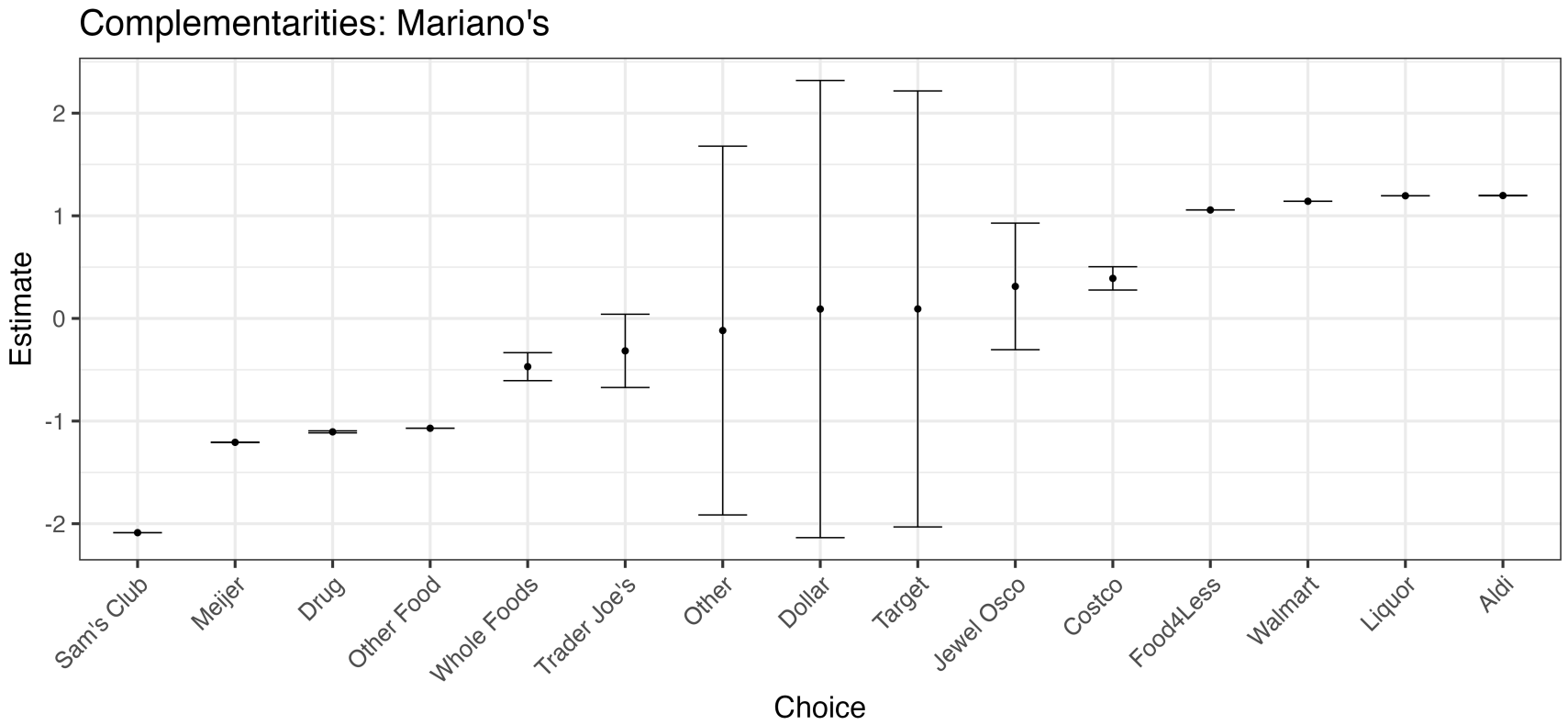
Notes: Estimates of complementarities across retailers.

Figure 28: Complementarities



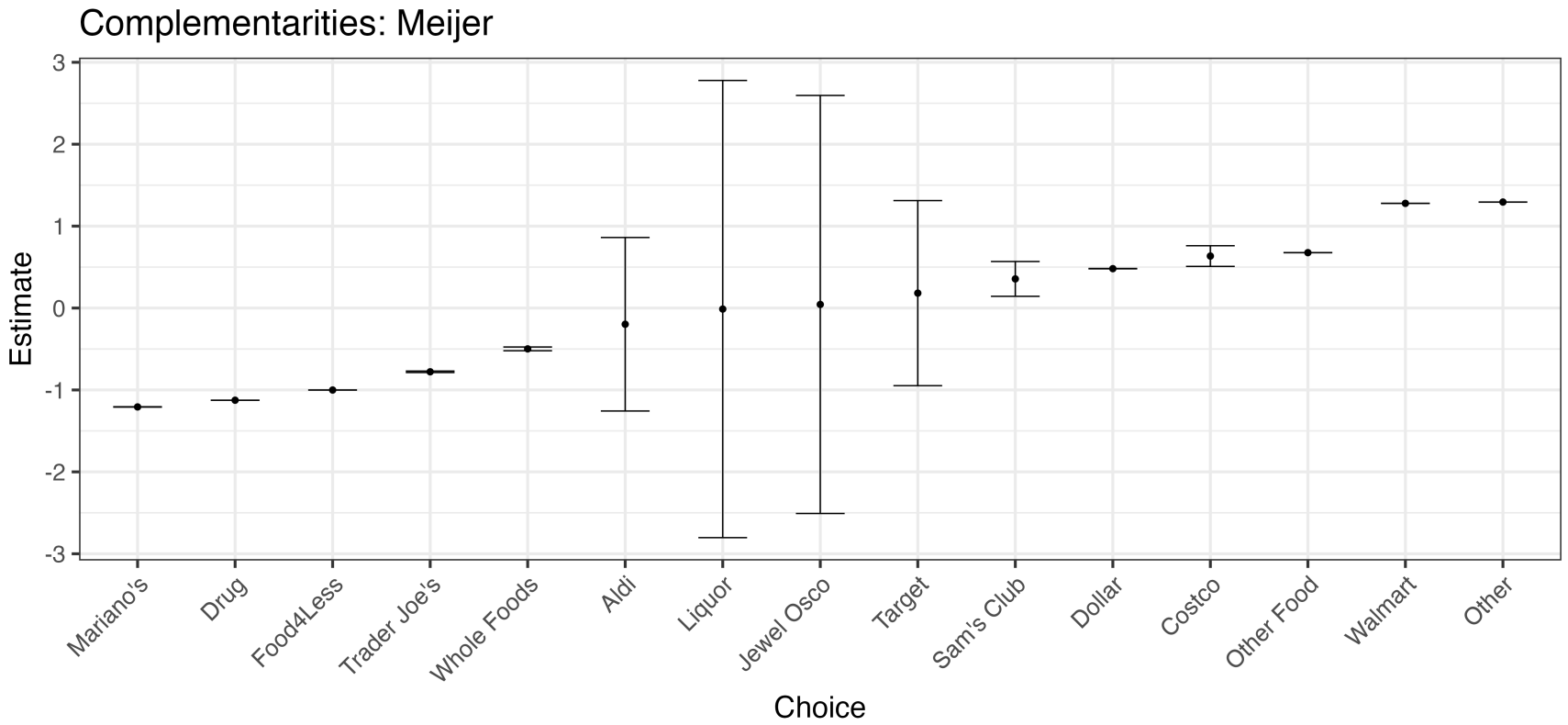
Notes: Estimates of complementarities across retailers.

Figure 29: Complementarities



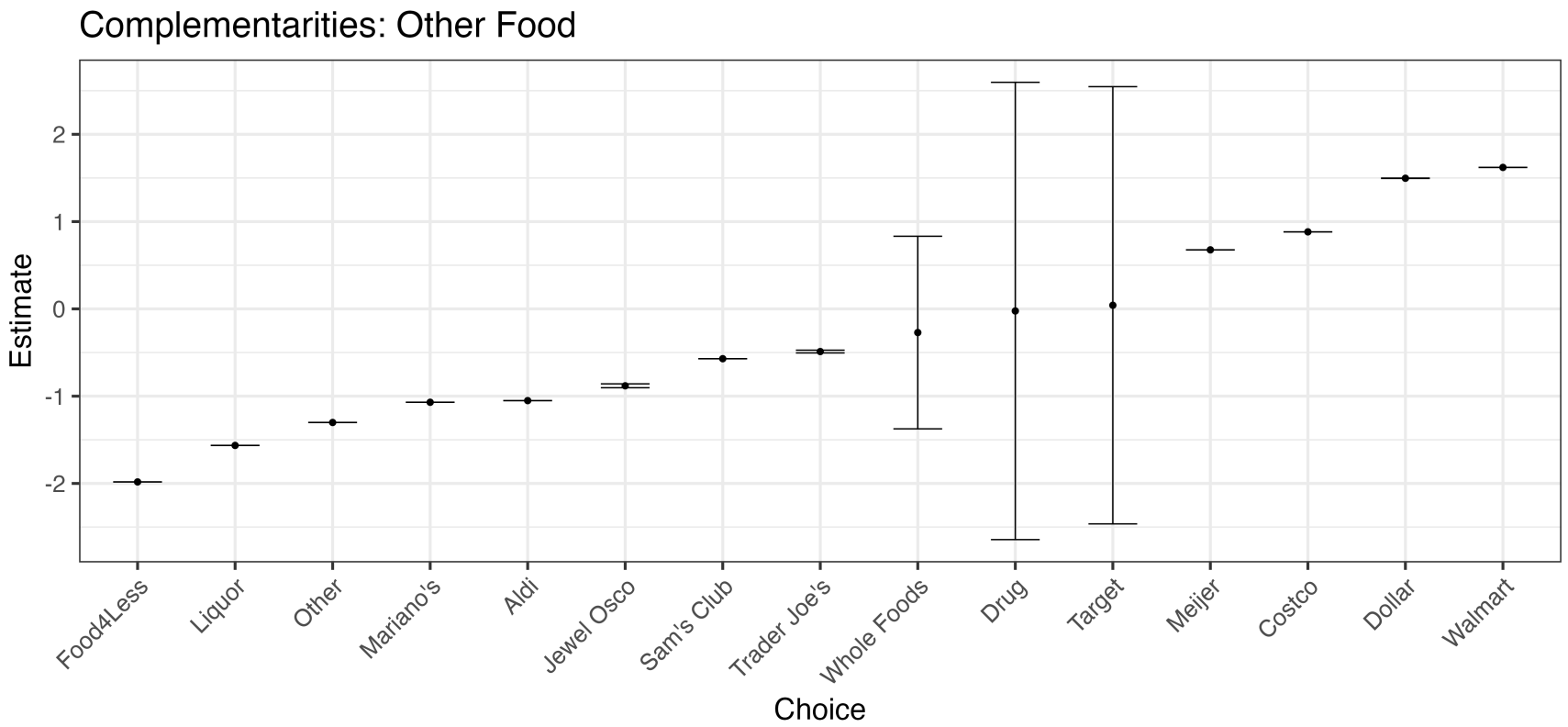
Notes: Estimates of complementarities across retailers.

Figure 30: Complementarities



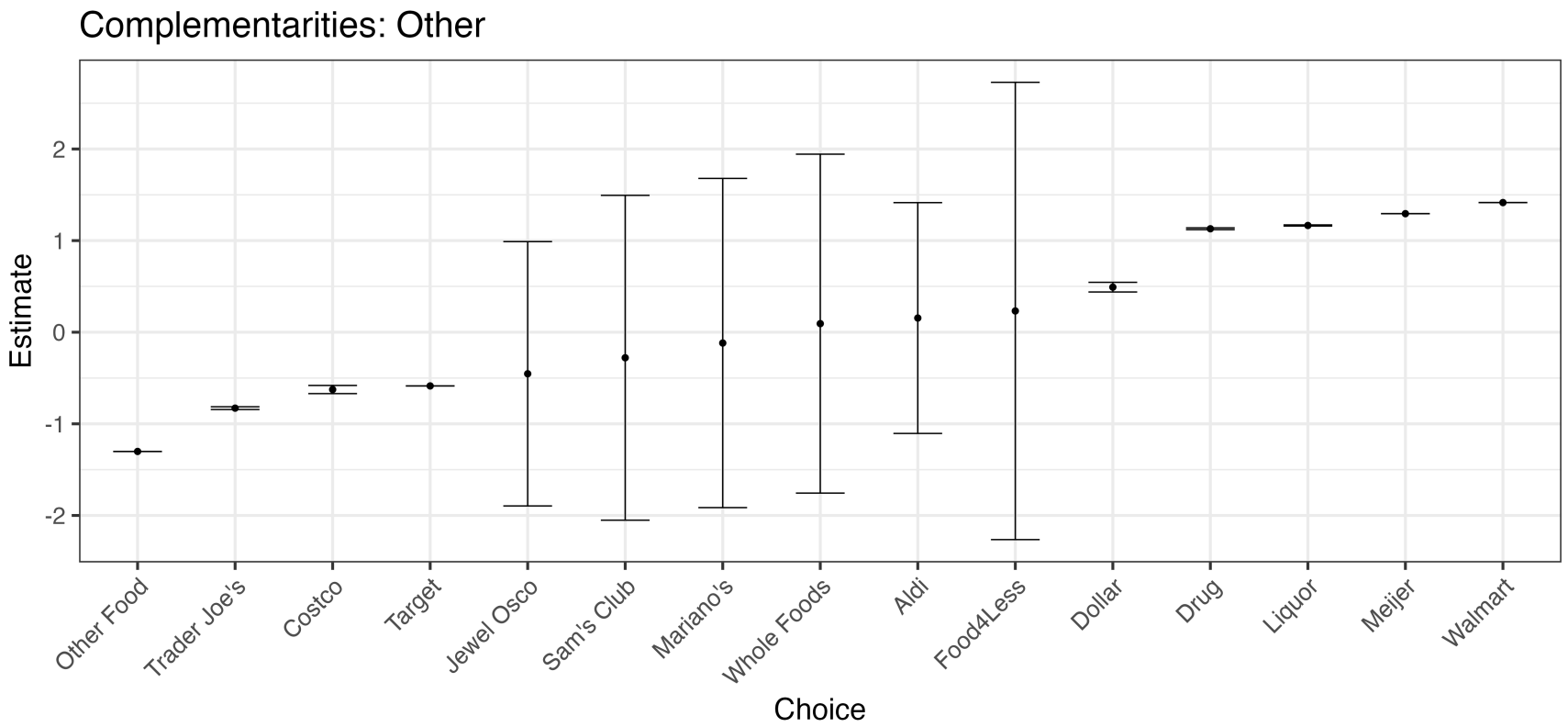
Notes: Estimates of complementarities across retailers.

Figure 31: Complementarities



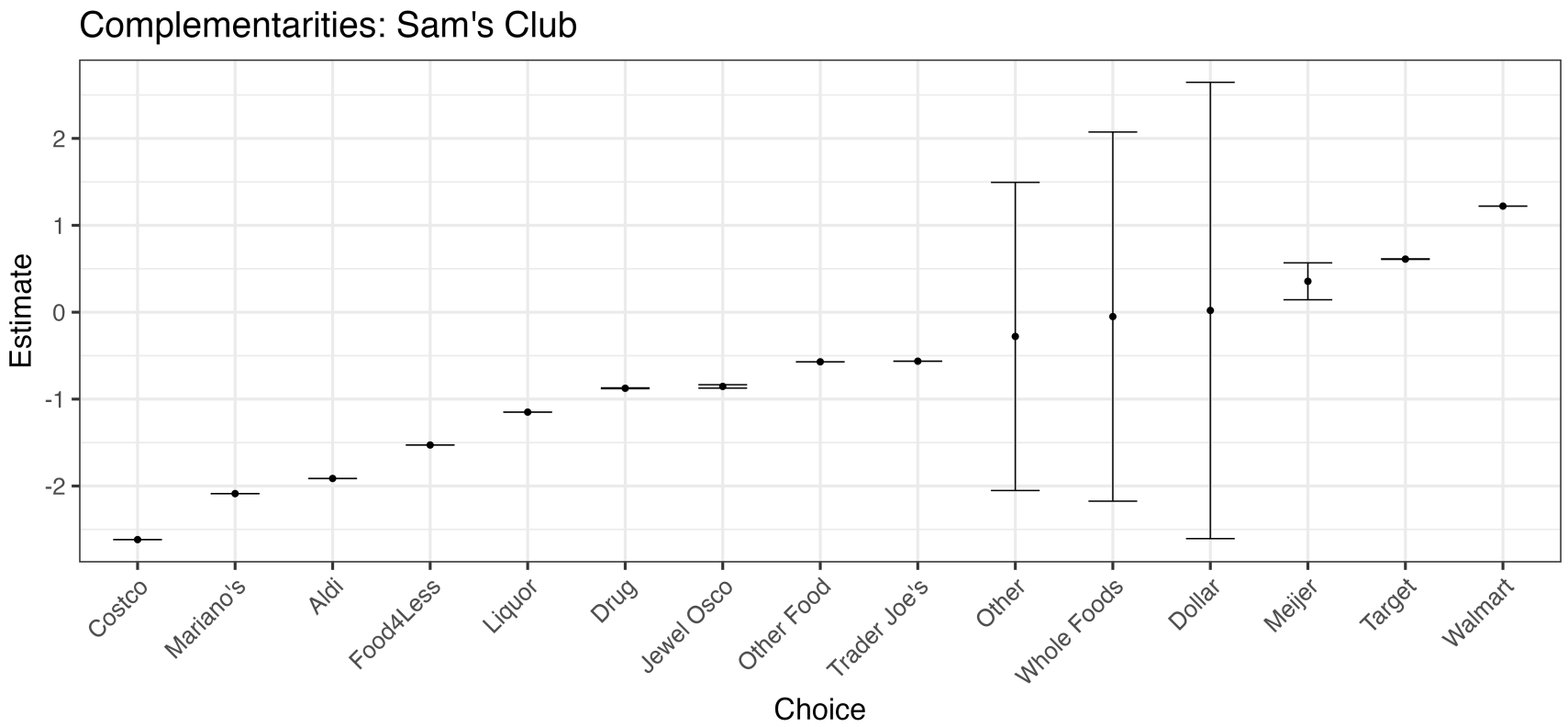
Notes: Estimates of complementarities across retailers.

Figure 32: Complementarities



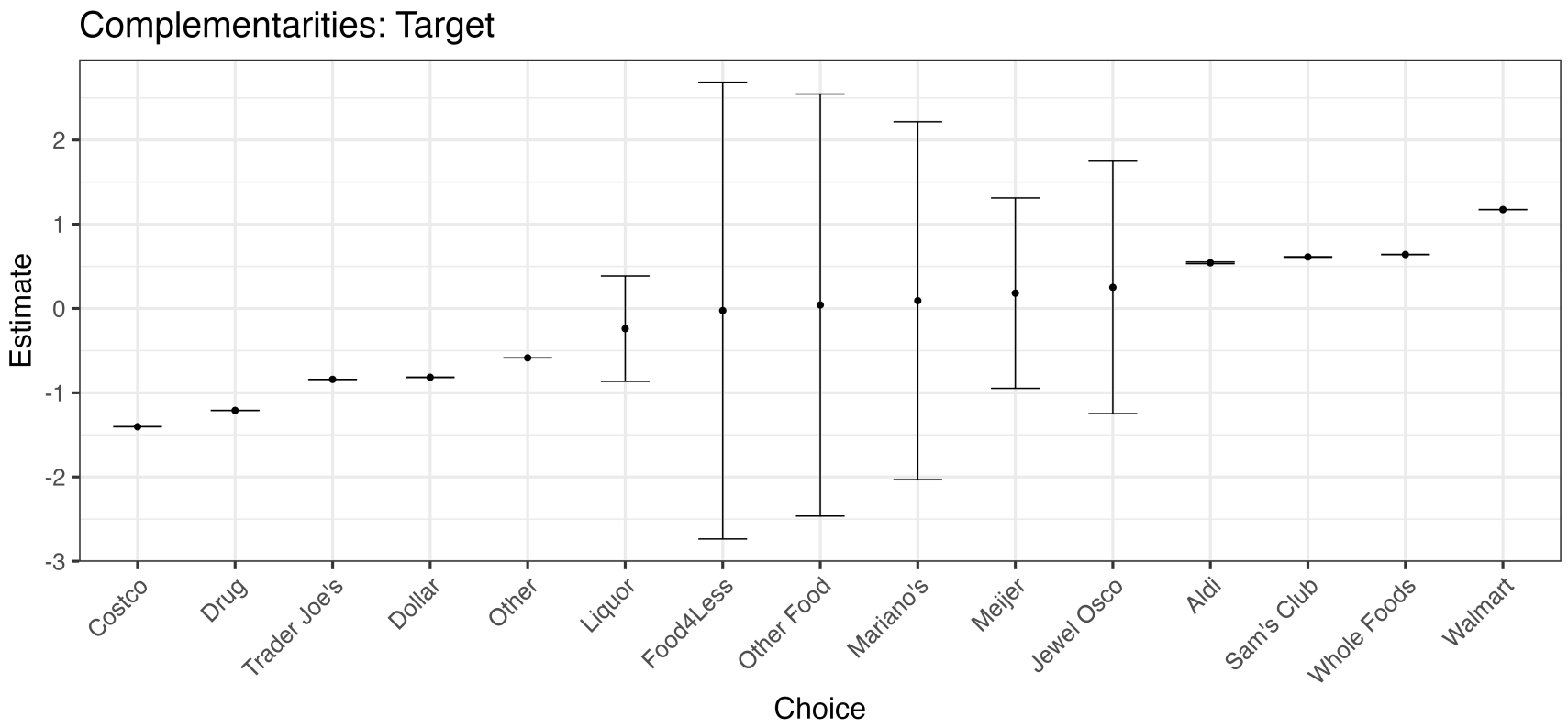
Notes: Estimates of complementarities across retailers.

Figure 33: Complementarities



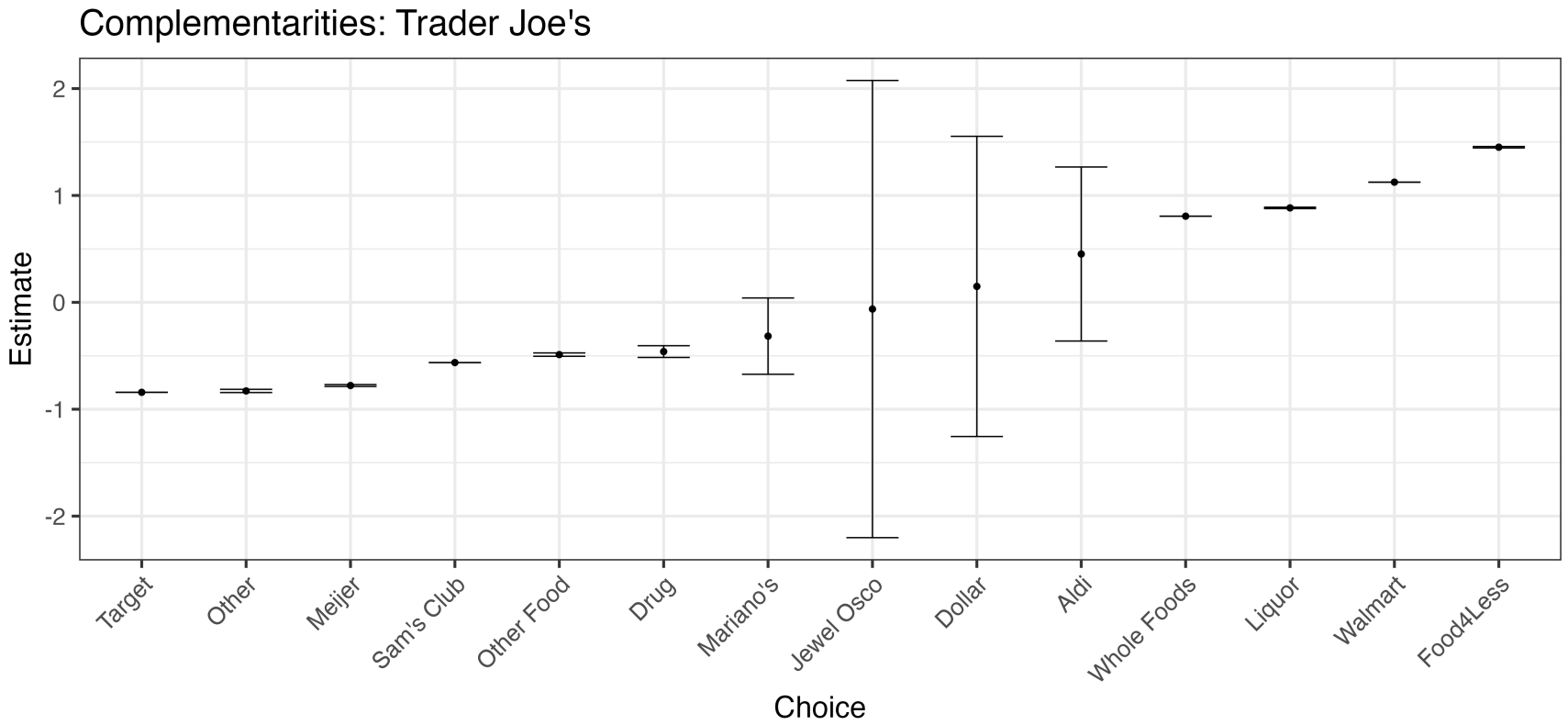
Notes: Estimates of complementarities across retailers.

Figure 34: Complementarities



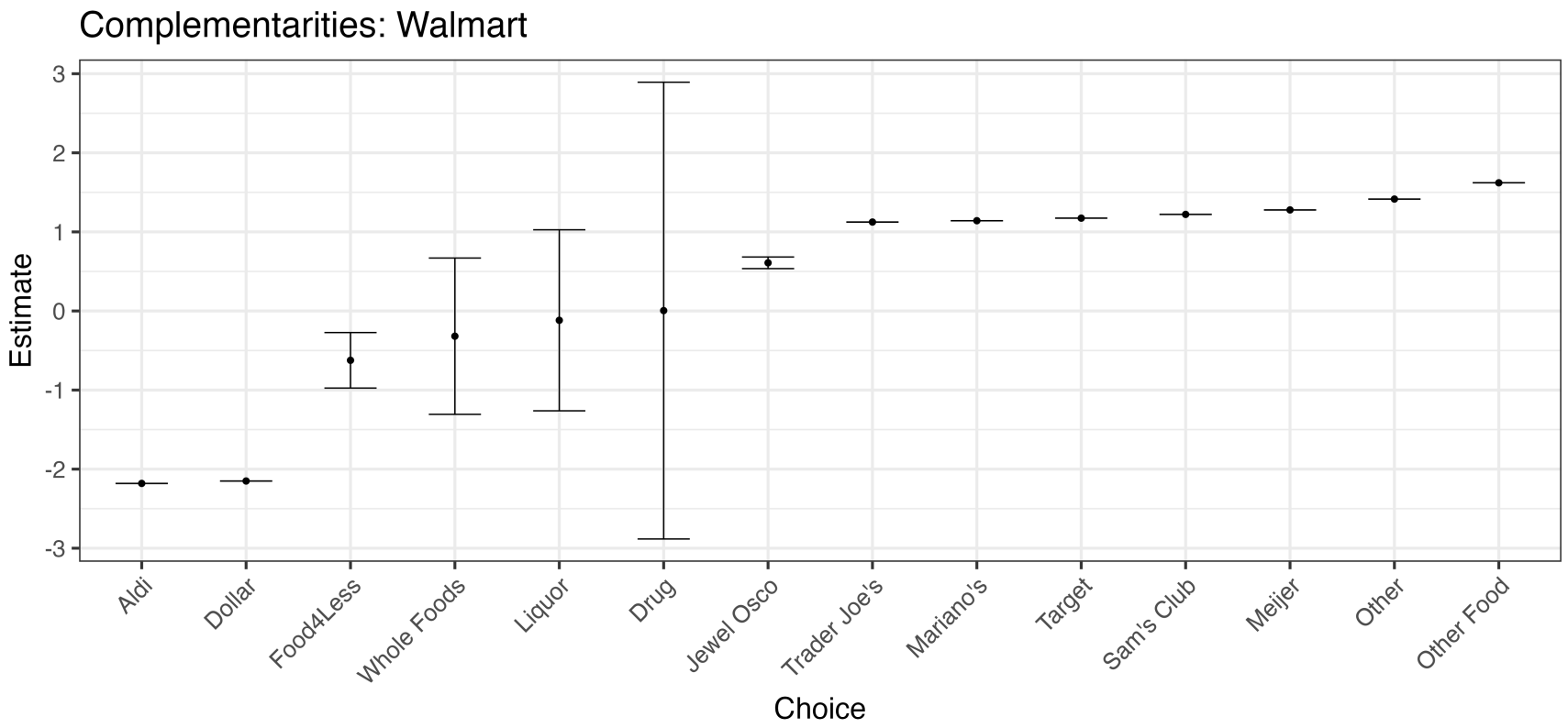
Notes: Estimates of complementarities across retailers.

Figure 35: Complementarities



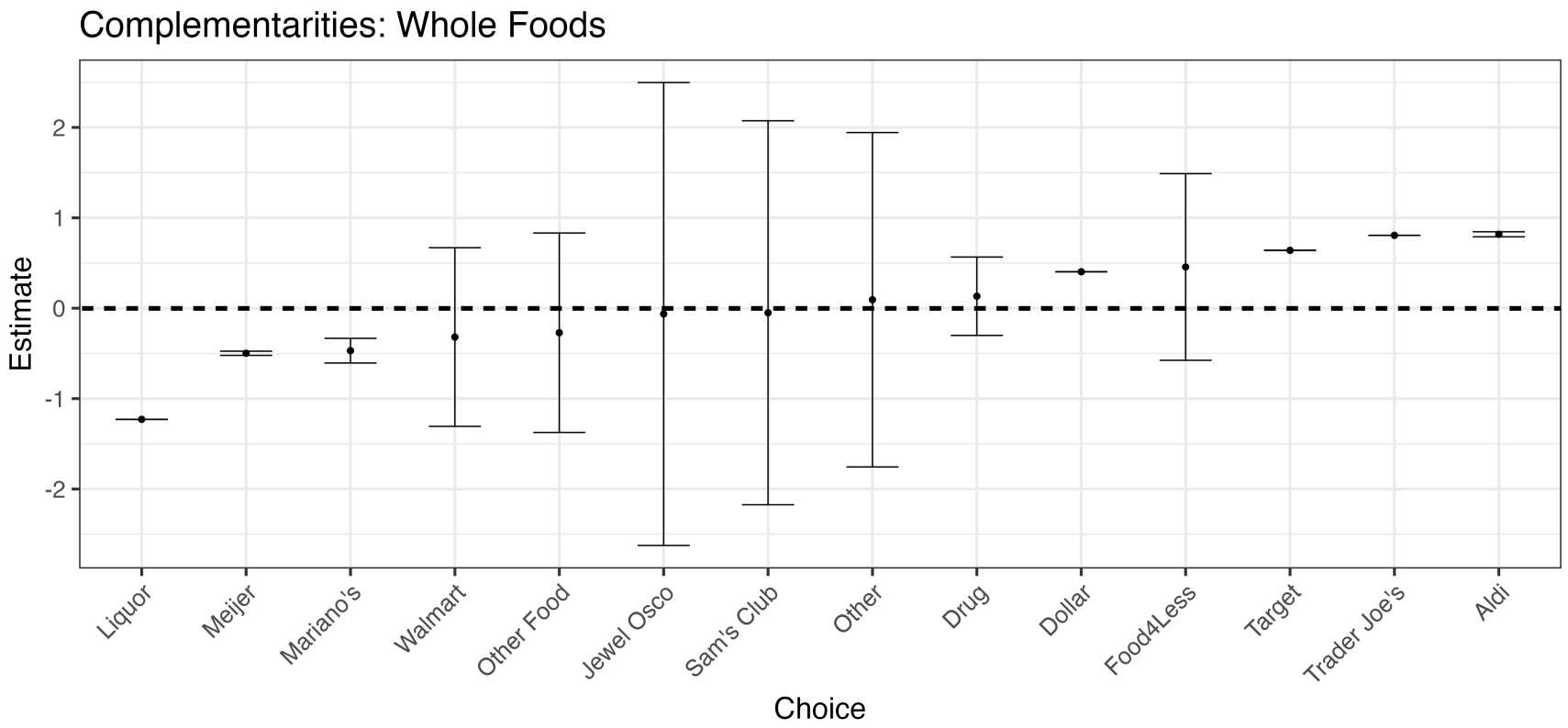
Notes: Estimates of complementarities across retailers.

Figure 36: Complementarities



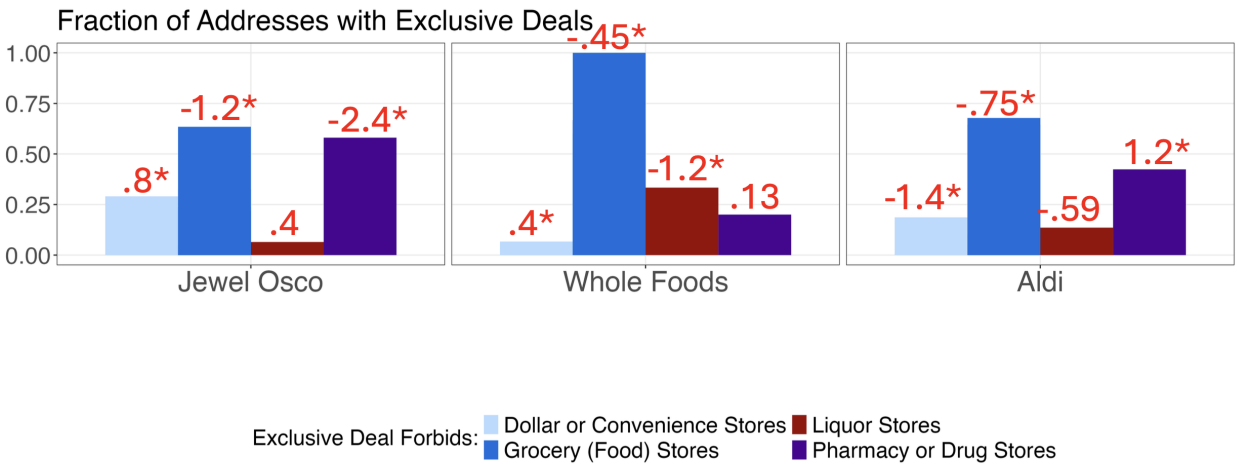
Notes: Estimates of complementarities across retailers.

Figure 37: Complementarities



Notes: Estimates of complementarities across retailers.

Figure 38: 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 39: 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.

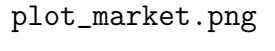
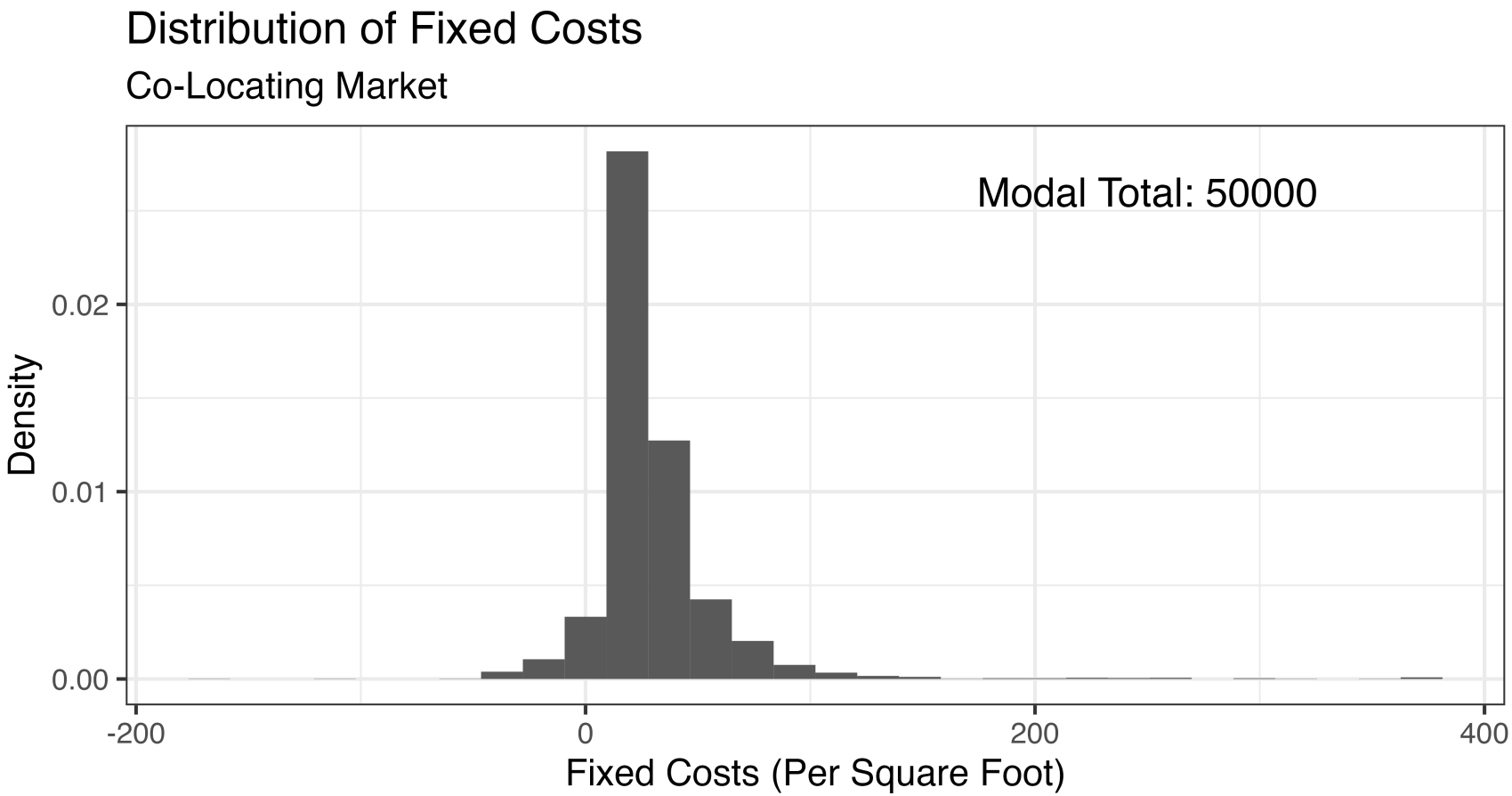
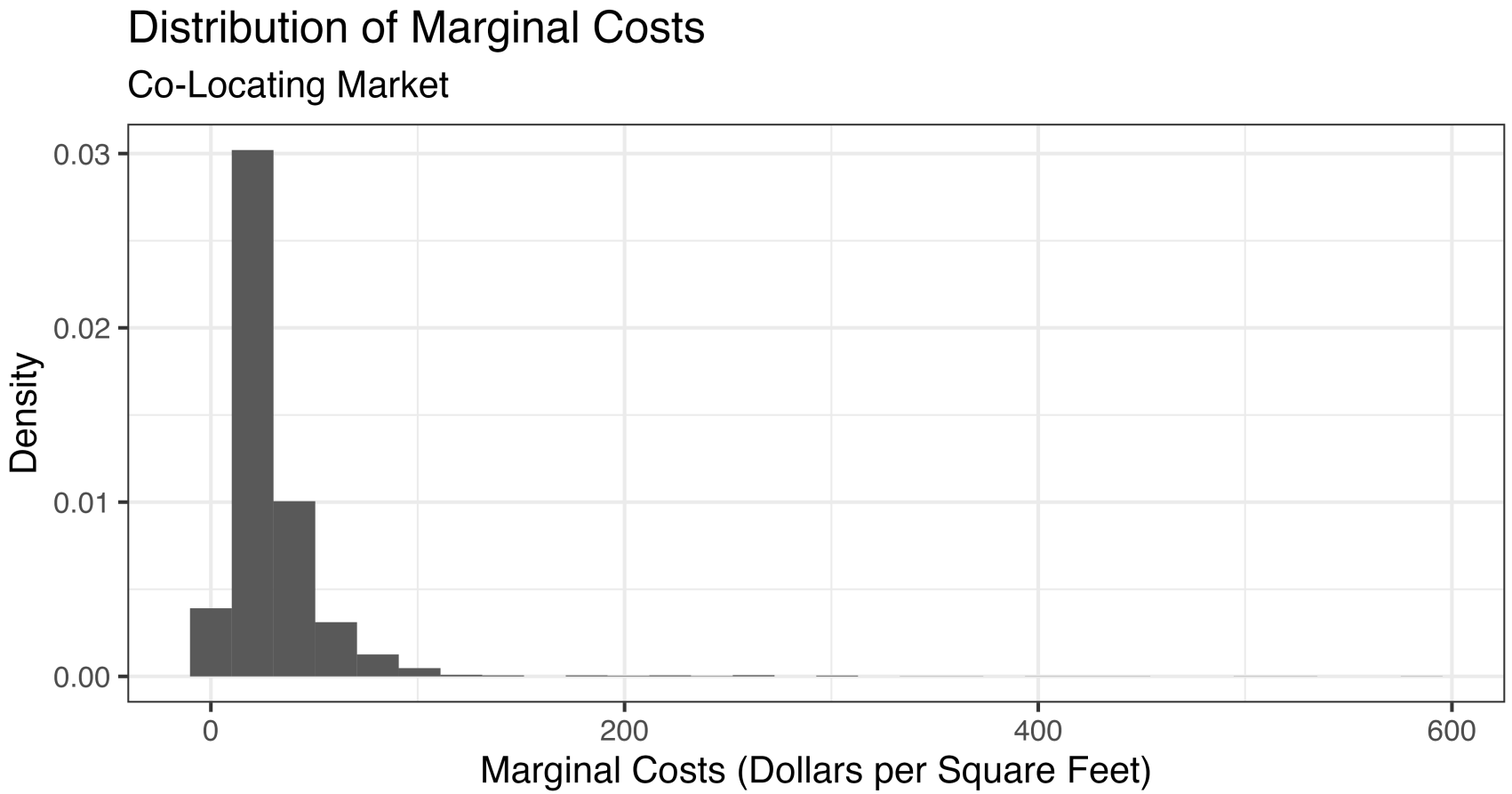


Figure 40: Fixed Costs, Co-Locating Market



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

Figure 41: Marginal Costs, Co-Locating Market



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

E Tables

Table 7: 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 8: 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 9: Prevalence of Exclusive Dealing in the Grocery Industry

	Total	*Total on a Grocer Location*	*Fraction on a Grocer Location*
Exclusive Dealing Contracts Blocking Grocers	351	140	0.40
	Total	*Total with Contracts*	*Fraction with Contracts*
Grocery Chains (Retailers)	23	12	0.52
Grocery Chain Stores	389	110	0.28
Fraction of Grocery Chain Stores with Exclusive Dealing by Neighborhood Income	*Rank*	*All Chains*	*Most-Frequented Chains*
Lowest Income Rank	1	.58	.71
	2	.34	.36
	3	.42	.50
Highest Income Rank	4	.63	.61

Notes: Table reports the prevalence of exclusive dealing contracts among grocery chains. The first block (row 1) reports the total number of locations with exclusive dealing contracts that block the sale of groceries. The first column (row 1 column 1) reports the total number of contracts at unique addresses that prohibit or limit the sale of groceries, the second column (row 1 column 2) enumerates the number of grocery stores that employ such contracts, and the third column (row 1 column 3) enumerates the fraction of grocery stores that employ such contracts. The second block shows the number of grocery chain retailers that have exclusive dealing contracts at at least one property, by chain (row 2) and by store (row 3). The grocery chains operating in Chicago are defined as retailers that have had at least 5 different store locations between 1990 and 2023 in Cook County, IL. The third block shows the fraction of rented grocery chain stores in low, middle, and high income neighborhoods that have exclusive dealing contracts. Most stores in low-income neighborhood (income rank 1 in row 4) have exclusive dealing contracts associated with the property. *Source:* Cook County Recorder Office and SNAP database.

Table 10: Summary of Radius Restrictions for Grocery and Big Box Stores

Radius Type	Count	Fraction
Adjacent Property or Shopping Center	140	.86
Radius (mi)	12	.08
Unknown	10	.06

Notes: Source: Cook County Recorder and SNAP. The table first subsets to grocery stores and big box store locations in Cook County that are (a) rented and have (b) an exclusive dealing contract. This table characterizes whether or not there is a particular radius at which the contract binds. Documents that specify the restriction holds on adjacent, nearby, or the shopping center are counted in the "Adjacent Property or Shopping Center" radius type; restrictions that specify a radius in miles or kilometers are counted in "Radius (mi)" and documents that specify an exclusive use clause or a restrictive covenant but do not provide details are categorized as "Unknown."

Table 11: Summary of Timing Restrictions for Grocery and Big Box Stores

Description of Retailer and Contract	Total	Fraction
Chain Grocery and Big Box Stores	647	
Chain Grocery and Big Box Stores with Exclusive Dealing Contracts	234	0.36
Entry	134	0.57
During including Re-Leases	99	0.42
Exit	20	0.09

Notes: Source: Cook County Recorder and SNAP. The table first subsets to grocery stores and big box store locations in Cook County that have an exclusive dealing contract. The total number is thus the total number of grocery chain and big box stores with exclusive dealing contracts (Row 1). Retailers can write exclusive dealing contracts with landlords of nearby property when the retailer enters ("entry"), while the retailer is on the property ("during"), and when the retailer exits the property ("exit"). Documents signed during tenure include releases.

Table 12: Blocking Patterns of Retailers with Most Exclusive Dealing Agreements

Retailer	Locations	Abortion	Bakery	Bowling Alley	Car Repair	Cinema	Dance Club	Deli	Convenience or Dollar Store	Drive Through	Exercise	Fast Food	Florist	Food	Grocer	Hair Salon	Karate	Liquor	Marijuana	Nail Salon	Drug	Restaurant	Retail	Shoe Repair	Skating Rink	Sports	Veterinary
Walgreens	154	0	1	57	87	58	15	3	14	6	53	11	0	102	8	5	0	4	8	1	145	60	18	0	65	4	3
Jewel Osco (Safeway)	103	0	19	15	33	30	17	21	27	16	20	4	0	66	33	0	2	7	0	0	53	33	47	1	10	5	1
Family Dollar	80	0	0	1	9	1	1	0	66	0	2	0	0	4	1	0	0	1	0	0	0	1	36	0	0	0	0
Aldi	67	10	2	24	36	26	29	6	11	1	27	5	1	43	40	1	0	8	4	1	26	20	24	1	27	7	0
Dominicks Finer Foods	64	0	5	20	27	9	14	10	7	3	24	11	0	54	36	1	0	27	0	0	33	27	23	0	22	1	0
CVS	58	0	1	8	21	9	2	2	23	3	4	0	0	20	4	0	0	3	1	0	38	3	22	0	8	1	0
Ross Dress For Less	56	0	2	34	53	15	33	2	10	0	37	0	0	3	9	0	0	3	0	1	2	18	24	0	41	23	31
Dollar General	55	0	0	0	0	4	0	0	41	0	0	0	0	4	0	0	0	4	0	0	2	0	55	0	0	0	0
Starbucks	53	0	2	2	5	3	2	1	4	23	4	3	0	15	11	0	0	39	0	0	3	41	49	0	2	0	1
Target	50	0	3	13	17	11	12	3	15	5	10	4	0	13	5	0	0	3	3	0	11	18	18	1	12	5	11
Walmart	44	0	11	13	24	9	8	10	11	3	11	3	1	19	16	0	0	9	2	0	17	14	14	0	1	8	1
Blockbuster	43	0	4	30	37	38	36	2	2	0	33	2	0	12	4	0	19	4	0	0	2	34	40	0	35	0	0
Autozone	36	0	0	17	31	20	21	0	2	0	12	0	0	1	19	0	0	0	0	0	19	13	8	0	18	0	0
7-Eleven	32	0	2	0	1	1	0	5	19	0	0	0	0	20	21	0	0	21	0	0	1	8	23	0	0	1	0
Marianos	26	0	17	2	5	8	0	17	4	2	2	2	2	21	26	0	0	21	0	0	8	10	22	0	2	0	0
Tonys Fresh Market	22	0	0	1	4	1	0	0	3	0	1	0	0	2	0	0	0	0	0	0	0	2	2	0	0	0	0
Kmart	20	0	0	1	6	1	1	0	4	1	4	0	0	6	5	0	0	2	0	0	6	3	13	0	1	1	0
Burlington Coat Factory	19	11	2	16	16	14	7	2	5	0	16	0	0	15	9	0	2	4	11	2	10	15	9	0	11	3	1
Food 4 Less	18	0	5	3	9	5	5	4	2	2	5	3	0	10	11	0	0	6	0	0	8	4	7	0	7	1	1
Staples	17	0	0	11	14	1	12	0	0	0	12	1	0	10	2	0	0	0	0	0	1	13	6	0	9	11	0
Fitness Intl	16	0	0	1	6	1	12	0	2	0	15	0	0	16	1	0	1	0	1	0	2	10	5	2	0	11	0
Whole Foods	16	0	10	6	9	9	10	9	1	1	9	1	0	16	10	0	1	5	4	1	3	10	7	0	1	2	1
Home Depot	14	0	1	3	7	4	4	1	4	4	4	1	0	4	3	0	0	1	0	0	2	4	10	1	3	1	0
Costco	13	0	0	3	6	3	3	1	4	4	3	2	0	6	4	0	0	2	0	0	1	5	7	0	2	0	1
Meijer	13	0	4	6	9	5	1	2	5	1	3	0	0	6	7	0	0	6	1	0	5	3	7	0	4	0	4
Panera	13	0	5	0	0	0	0	7	0	1	2	1	0	5	2	0	0	0	0	0	0	8	4	0	0	0	0
Dunkin Donuts	12	0	11	1	8	1	1	7	3	1	1	1	0	3	9	0	0	0	0	0	1	11	10	0	1	0	0
Burger King	11	0	0	1	1	1	1	0	0	0	0	1	0	10	0	0	0	0	0	0	1	11	0	0	1	0	0
Gas Depot	11	0	0	0	3	0	0	0	3	0	2	0	0	4	0	0	0	0	0	0	0	0	3	0	0	0	0
Office Depot	11	0	0	9	11	8	8	0	0	0	10	0	0	0	0	0	6	1	0	0	0	1	1	0	10	10	0
McDonalds	10	0	1	0	1	0	0	4	1	0	0	1	0	5	1	0	0	1	0	0	1	4	2	0	0	0	0
Blazin Wings	9	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	1	0	0	0	8	3	0	0	2	0
Delray Farms	9	0	0	0	3	0	0	0	4	0	2	0	0	6	4	0	0	0	0	0	2	1	2	0	0	0	0
Supervalu	9	0	4	3	5	4	4	4	2	0	1	1	0	8	4	0	0	5	0	0	4	2	1	0	0	3	4
Chick-Fil-A	7	0	0	2	5	2	2	0	1	0	2	0	0	5	0	0	0	1	3	0	3	4	1	0	1	1	0
Petsmart	7	0	0	6	7	6	1	0	1	5	5	1	0	7	1	0	1	1	0	0	1	5	1	0	6	2	6
Gordon Food Service Store	6	0	0	3	3	3	3	1	2	0	2	1	0	5	1	0	0	0	0	0	2	4	2	0	3	0	0
Hobby Lobby Stores	6	4	0	3	6	6	1	0	1	0	2	0	0	1	3	0	0	6	5	0	2	1	5	0	0	4	0
HomeGoods	6	0	0	4	2	6	6	0	0	0	0	0	0	5	2	0	0	2	3	1	2	2	6	0	6	5	0
Kohls	6	0	1	3	4	3	3	1	1	2	3	1	0	3	0	0	0	1	1	0	3	3	1	0	3	0	1
Trader Joes	6	0	3	3	4	3	2	4	1	0	3	1	0	5	5	3	3	3	2	2	3	4	3	0	3	0	0
Dicks Sporting Goods	5	0	0	1	0	2	0	0	0	0	1	0	0	2	0	1	0	0	0	1	0	1	1	0	0	4	0
Lou Malnatis Pizzeria	5	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	3	3	0	0	1	0
Menard	5	0	1	0	0	1	0	1	0	0	1	0	0	3	2	0	0	1	0	0	0	0	3	0	0	0	0
Moran Foods	5	0	3	0	0	0	1	3	1	0	1	0	0	5	3	0	0	0	0	0	0	0	0	0	0	0	0
Wendys	5	0	0	0	0	0	0	1	0	0	1	1	0	2	0	0	0	0	0	0	0	4	0	0	0	0	0
Borders	4	0	2	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	0	0	0	0
Raising Canes Restaurants	4	0	0	0	1	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	4	0	0	0	0	0
Save A Lot	4	0	3	0	0	0	1	3	0	0	1	0	0	4	3	0	0	0	0	0	0	0	0	0	0	0	0
Sears	4	0	0	0	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	3	0	0	0	0
Shoe Carnival	4	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	4	0	1	1	0

Notes: Source: Cook County Recorder.Table shows the retailers with the most number of exclusive dealing contracts by locations in Cook County. Retailers are ranked by the most number of locations with exclusive dealing contracts, denoted by the "Locations" column. The remaining columns enumerate the number of locations that block a specific type of retailer or storefront. For example, the first column "Grocer" indicates the number of retailer locations that block grocery stores, or the number of retailer locations that put restrictions on the extent to which groceries can be sold on nearby properties.

Table 13: 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
Document 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
Timing	→	Entry	94	0.48
		During Lease	74	0.38
		Exit	13	0.07
		Not Grocery	15	0.08

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 14: 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 15: Summary statistics of the rental data

Rents (Dollars/sqft/month)	
Mean Rents	20.01
Minimum	0.00
5th percentile	8.07
25th percentile	13.65
Median	18.08
75th percentile	23.81
95th percentile	35.31
Maximum	585.37

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

Table 16: 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 17: Regression of Exclusive Dealing Status on Demographics

	Has Exclusive Balance			
	(1)	(2)	(3)	(4)
log(Real Income)	0.0196**	-0.0068	0.0027	-0.0087
	(0.0086)	(0.0061)	(0.0054)	(0.0214)
Share Unemployed	0.0559	-0.0203	0.0020	-0.0770
	(0.0518)	(0.0506)	(0.0513)	(0.1332)
Share Black	-0.0164	0.0309**	0.0221	0.0482*
	(0.0610)	(0.0143)	(0.0136)	(0.0292)
Share White	0.0376	0.0469**	0.0135	0.0375
	(0.0523)	(0.0215)	(0.0170)	(0.0379)
Share Hispanic	0.0237	0.0340***	0.0213*	0.0812
	(0.0213)	(0.0095)	(0.0106)	(0.0834)
Share Asian	0.0173	0.0953***	0.0469**	0.0130
	(0.0552)	(0.0266)	(0.0216)	(0.0580)
Poverty		-0.0657**	-0.0035	0.0425
		(0.0268)	(0.0264)	(0.0706)
Share Travel 30-60min		5.6×10^{-6}	-3.92×10^{-5}***	7.26×10^{-6}
		(5.1×10^{-6})	(1.15×10^{-5})	(2.16×10^{-5})
Share Age 25-60		-0.0343	-0.0173	0.0035
		(0.0219)	(0.0231)	(0.0746)
Share College		0.0094	0.0352	-0.0217
		(0.0486)	(0.0470)	(0.0823)
Housing Rent		2.28×10^{-5}		
		(1.39×10^{-5})		
Housing Vacant		0.0001***	2.91×10^{-5}	-8.66×10^{-6}
		(3.44×10^{-5})	(2.77×10^{-5})	(6.47×10^{-5})
Share Women			-0.3167	-0.6338
			(0.2853)	(0.4698)
Share Travel Less 30 min			2.65×10^{-5}***	5.28×10^{-5}***
			(5.9×10^{-6})	(1.54×10^{-5})
Share Travel 60-90 min			-9.59×10^{-6}	0.0001**
			(3.42×10^{-5})	(4.61×10^{-5})
log(Housing Rent)			0.0081	0.0433***
			(0.0079)	(0.0166)
Housing Occupied			2.02×10^{-5}**	-3.28×10^{-5}*
			(8.14×10^{-6})	(1.7×10^{-5})
Standard-Errors		year		IID
Observations	16,268	16,267	16,242	1,351
R^2	0.11131	0.02839	0.03232	0.03974
Year fixed effects	✓	✓	✓	✓
Tract fixed effects	✓			

Notes: Table regresses presence of an exclusive dealing contract on demographic characteristics. The demographic characteristics vary across the columns. Each observation is a (year,tract,has exclusive), where has exclusive is 1 if there is a new contract with an exclusive use clause in that (year,tract). All demographics are included as a lagged term from the previous year. *Sources:* ACS 2009-2023, Census 1990, 2000, SNAP, Cook County Recorder Office.

Table 18: Robustness: Regression of Exclusive Dealing Status on Demographics

	Has Exclusive	Has Exclusive (Exact)		Has Exclusive	
			Balance		
	(1)	(2)	(3)	(4)	(5)
log(Real Income)	0.0128	0.0037	0.0158	-0.0070	-0.0075
	(0.0095)	(0.0090)	(0.0102)	(0.0067)	(0.0070)
log(Pop Density)	-0.0018	-0.0008	-0.0030	0.0003	0.0005
	(0.0020)	(0.0010)	(0.0020)	(0.0005)	(0.0006)
Share Unemployed	0.0301	0.0076	0.0299	-0.0086	-0.0101
	(0.0400)	(0.0316)	(0.0399)	(0.0244)	(0.0234)
Share Black	-0.0114	-0.0491	0.0177	-0.0115	-0.0015
	(0.0703)	(0.0465)	(0.0742)	(0.0179)	(0.0138)
Share White	-0.0187	-0.0352	0.0104	-0.0109	
	(0.0400)	(0.0219)	(0.0403)	(0.0191)	
Share Hispanic	0.0255	-0.0105	0.0437	-0.0030	0.0060
	(0.0263)	(0.0130)	(0.0278)	(0.0132)	(0.0135)
Share Asian	0.0502	-0.0437	0.0620	-0.0030	
	(0.0608)	(0.0487)	(0.0618)	(0.0226)	
Share Travel 30-60min	-0.1319	-0.1244		4.1×10^{-6}	4.16×10^{-6}
	(5,114.6)	(3,280.2)		(1.11×10^{-5})	(1.01×10^{-5})
Poverty			-0.0592	-0.0363	-0.0351
			(10,107.4)	(0.0335)	(0.0314)
Share Women				-0.2782	-0.3032
				(0.8581)	(0.8818)
Share Age 25-60				0.0196	0.0226
				(0.0187)	(0.0172)
Share College				0.0272	0.0198
				(0.0380)	(0.0355)
Share Travel Less 30 min				-3.41×10^{-6}	-3.53×10^{-6}
				(3.62×10^{-6})	(3.4×10^{-6})
Share Travel 60-90 min				-6.54×10^{-6}	
				(2.02×10^{-5})	
log(Housing Rent)				-0.0062	-0.0071*
				(0.0038)	(0.0033)
Housing Vacant				-3.59×10^{-5}	-3.27×10^{-5}
				(2.51×10^{-5})	(2.48×10^{-5})
Housing Occupied				1.56×10^{-6}	1.34×10^{-6}
				(2.35×10^{-6})	(2.82×10^{-6})
Standard-Errors		year start		submarket	
Observations	10,647	10,647	10,647	8,948	8,948
R^2	0.24585	0.23673	0.27906	0.06428	0.06417
Year fixed effects	✓	✓	✓	✓	✓
Tract fixed effects	✓	✓	✓		
Space type fixed effects			✓	✓	✓
Submarket fixed effects				✓	✓
Building class fixed effects				✓	✓

Notes: Table regresses presence of an exclusive dealing contract on demographic characteristics. The demographic characteristics vary across the columns. Column 2 restricts to cases where the exclusive use contract is exactly matched to a property with a rental contract in CompStak (i.e. the latitude and longitude from the lease characteristics data from CompStak is within 16 meters of the latitude and longitude from the exclusive use contract from the county recorder). Each observation is a (year,tract,has exclusive), where has exclusive is 1 if there is a new contract with an exclusive use clause in that (year,tract). The dataset subsets to (years,tracts) where we have rental data from CompStak. All demographics are included as a lagged term from the previous year. *Sources:* ACS 2009-2023, Census 1990, 2000, SNAP, Cook County Recorder Office.

Table 19: Hedonic Price Regression

	log(Net Effective Rent)						
	Hedonics						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Has Exclusive	0.3723***	0.3138***	0.3012***	0.3387***	0.3361***	0.3155***	0.2459***
	(0.0469)	(0.0472)	(0.0467)	(0.0540)	(0.0408)	(0.0404)	(0.0100)
log(Real Income)		-0.0004	0.0027	-0.0125	0.0178	0.0137	2.681***
		(0.0873)	(0.0810)	(0.0789)	(0.0274)	(0.0295)	(0.0464)
log(Transaction Sqft)			-0.0723***			-0.0799***	
			(0.0064)			(0.0063)	
log(Lease Term)			0.0770***			0.0923***	
			(0.0066)			(0.0043)	
log(Pop Density)				0.0450*	0.0391***	0.0307**	0.2644***
				(0.0228)	(0.0103)	(0.0104)	(0.0055)
Share Unemployed				0.3978	0.6385**	0.7341***	15.69***
				(0.2264)	(0.2161)	(0.2141)	(0.2508)
Share Black				-0.6897**	-0.1059	-0.1911**	
				(0.3017)	(0.0716)	(0.0803)	
Share Hispanic				0.0253	-0.2506	-0.2916*	
				(0.2429)	(0.1453)	(0.1466)	
Observations	28,627	14,373	14,340	11,908	11,908	11,885	24
R^2	0.14403	0.27648	0.29891	0.29698	0.19983	0.23132	0.99500
Year Lease Starts FE	✓	✓	✓	✓	✓	✓	✓
Zip code FE	✓				✓	✓	
Tract FE		✓	✓	✓			
Store Name FE							✓

Notes: Table regresses log(net effective rent) on exclusive dealing, other lease characteristics, and demographics. Each column includes further controls. Column (1) regresses rents on only exclusivity. Column (2) additionally controls for tract income of the store. Column (3) includes controls for lease characteristics. Columns (4-5) include controls for time-varying demographics. Column (6) controls for both lease characteristics and demographics. Column (7) subsets to grocery stores and big box stores, and controls for the identity of the retailer. Column (8) includes interaction terms between exclusive dealing and demographics. All demographics are included as a lagged term from the previous year. *Sources:* ACS 2009-present, Census 1990, 2000, SNAP, Cook County Recorder Office, and Compstak.

Table 20: Robustness: Hedonic Price Regression

	log(Net Effective Rent)							
	Hedonics							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Has Exclusive	0.3723***	0.3153***	0.3077***	0.2744***	0.2438***	0.2292***	0.1949**	-0.7444
	(0.0469)	(0.0373)	(0.0370)	(0.0636)	(0.0620)	(0.0596)	(0.0855)	(0.6954)
log(Real Income)		0.0971**	0.0995**	-0.1204	-0.0083	-0.0222	2.317***	0.0669**
		(0.0379)	(0.0376)	(0.0815)	(0.0441)	(0.0425)	(0.6767)	(0.0249)
log(Transaction Sqft)			-0.0722***			-0.0894***		-0.0538***
			(0.0057)			(0.0058)		(0.0053)
log(Lease Term)			0.0636***			0.0869***		
			(0.0078)			(0.0108)		
log(Pop Density)				0.0431**	0.0564***	0.0482***	0.2177**	
				(0.0177)	(0.0130)	(0.0108)	(0.0760)	
Share Unemployed				0.1424	0.3495*	0.3701*	13.94***	0.0374
				(0.1893)	(0.1723)	(0.1853)	(3.834)	(0.2287)
Share Black				-0.7733***	-0.1177	-0.1745		
				(0.2001)	(0.1168)	(0.1178)		
Share Hispanic				0.0804	-0.1135	-0.1289*		
				(0.0942)	(0.0670)	(0.0690)		
Poverty					0.6169**	0.6192**		
					(0.2846)	(0.2803)		
Share Women					2.981	3.590*		
					(2.427)	(2.086)		
Share Age 25-60					0.5548***	0.5924***		
					(0.1898)	(0.1814)		
Share College					0.7424***	0.5382**		
					(0.2251)	(0.2211)		
Share Travel Time to Work < 30 min					-6.14×10^{-6}	9.93×10^{-6}		
					(3.6×10^{-5})	(3.42×10^{-5})		
Share Travel Time to Work 30-60 min					-0.0001**	-0.0002***		
					(5.36×10^{-5})	(5.33×10^{-5})		
Share Vacant					1.175	1.516*		
					(0.7822)	(0.8036)		
log(Housing Tenure)					0.0877	0.1008		
					(0.0897)	(0.0880)		
log(Housing Own Value)					0.0264	0.0390		
					(0.0406)	(0.0357)		
log(Housing Rent)					0.0815**	0.0882**		
					(0.0392)	(0.0385)		
Housing Vacant					-0.0005	-0.0007		
					(0.0004)	(0.0004)		
Has Exclusive × log(Real Income)								0.2616***
								(0.0668)
Has Exclusive × log(Transaction Sqft)								-0.0780*
								(0.0442)
Observations	28,627	20,668	20,631	8,228	8,228	8,207	34	19,331
R^2	0.14403	0.25208	0.27383	0.39148	0.29505	0.33066	0.98401	0.19617
Year Start fixed effects	✓	✓	✓	✓	✓	✓	✓	✓
Zip Code fixed effects	✓				✓	✓		✓
Tract fixed effects		✓	✓	✓				
Store name fixed effects							✓	

Notes: Table regresses log(net effective rent) on exclusive dealing, other lease characteristics, and demographics. Each column includes further controls. Column (1) regresses rents on only exclusivity. Column (2) additionally controls for tract income of the store. Column (3) includes controls for lease characteristics. Columns (4-5) include controls for time-varying demographics. Column (6) controls for both lease characteristics and demographics. Column (7) subsets to grocery stores and big box stores, and controls for the identity of the retailer. Column (8) includes interaction terms between exclusive dealing and demographics. All demographics are included as a lagged term from the previous year. ACS values are imputed from previous years when the data is unavailable. *Sources:* ACS 2009-present, Census 1990, 2000, SNAP, Cook County Recorder Office, and Compstak.

Table 21: Robustness: Hedonic Price Regression

	log(Net Effective Rent)							
	Hedonics							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Has Exclusive	0.1019**	0.0689	0.0869*	0.2744***	0.1263**	0.1357**	0.1949**	-0.2487
	(0.0488)	(0.0452)	(0.0438)	(0.0636)	(0.0596)	(0.0571)	(0.0855)	(0.7082)
log(Real Income)		0.1064***	0.1080***	-0.1204	-0.0187	-0.0292	2.317***	0.0710***
		(0.0345)	(0.0348)	(0.0815)	(0.0415)	(0.0405)	(0.6767)	(0.0253)
log(Transaction Sqft)			-0.0593***			-0.0845***		-0.0502***
			(0.0053)			(0.0063)		(0.0056)
log(Lease Term)			0.0356***			0.0675***		
			(0.0052)			(0.0109)		
log(Pop Density)				0.0431**	0.0454***	0.0391***	0.2177**	
				(0.0177)	(0.0106)	(0.0088)	(0.0760)	
Share Unemployed				0.1424	0.3889**	0.4152**	13.94***	0.1412
				(0.1893)	(0.1770)	(0.1885)	(3.834)	(0.2332)
Share Black				-0.7733***	-0.1412	-0.1969*		
				(0.2001)	(0.1004)	(0.1050)		
Share Hispanic				0.0804	-0.0838	-0.1066		
				(0.0942)	(0.0692)	(0.0709)		
Poverty					0.6107*	0.6191*		
					(0.3151)	(0.3085)		
Share Women					1.482	2.280		
					(1.990)	(1.757)		
Share Age 25-60					0.5600***	0.5976***		
					(0.1869)	(0.1823)		
Share College					0.8446***	0.6248***		
					(0.2159)	(0.2123)		
Share Travel Time to Work <30min					-1.59×10^{-6}	1.52×10^{-5}		
					(3.25×10^{-5})	(3.17×10^{-5})		
Share Travel Time to Work 30-60min					-0.0002***	-0.0002***		
					(5.59×10^{-5})	(5.61×10^{-5})		
Share Vacant					1.311*	1.656**		
					(0.7255)	(0.7668)		
log(Housing Tenure)					0.1188	0.1297		
					(0.0867)	(0.0867)		
log(Housing Own Value)					0.0182	0.0303		
					(0.0402)	(0.0355)		
log(Housing Rent)					0.0733*	0.0830**		
					(0.0384)	(0.0378)		
Housing Vacant					-0.0006	-0.0008*		
					(0.0004)	(0.0004)		
Has Exclusive × log(Real Income)								0.1558**
								(0.0699)
Has Exclusive × log(Transaction Sqft)								-0.0809*
								(0.0444)
Observations	28,627	20,668	20,631	8,228	8,228	8,207	34	19,331
R^2	0.19330	0.29667	0.31097	0.39148	0.31270	0.34334	0.98401	0.24075
Year Start Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓
Zip Code Fixed Effects	✓				✓	✓		✓
Space Type Fixed Effects	✓	✓	✓		✓	✓		✓
Tract Fixed Effects		✓	✓	✓				
Store Name Fixed Effects							✓	

Notes: Table regresses log(net effective rent) on exclusive dealing, other lease characteristics, and demographics. Each column includes further controls. Column (1) regresses rents on only exclusivity. Column (2) additionally controls for tract income of the store. Column (3) includes controls for lease characteristics. Columns (4-5) include controls for time-varying demographics. Column (6) controls for both lease characteristics and demographics. Column (7) subsets to grocery stores and big box stores, and controls for the identity of the retailer. Column (8) includes interaction terms between exclusive dealing and demographics. All demographics are included as a lagged term from the previous year. ACS values are imputed from previous years when the data is unavailable. This robustness check additionally controls for space type. *Sources:* ACS 2009-present, Census 1990, 2000, SNAP, Cook County Recorder Office, and Compstak.

Table 22: 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 23: 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 24: 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 25: 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 26: 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 27: 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.

Table 28: Price and Distance Demand Estimates

Variable	Estimates by Income Group		
	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.

F Examples of Exclusive Dealing

Figure 42: 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.

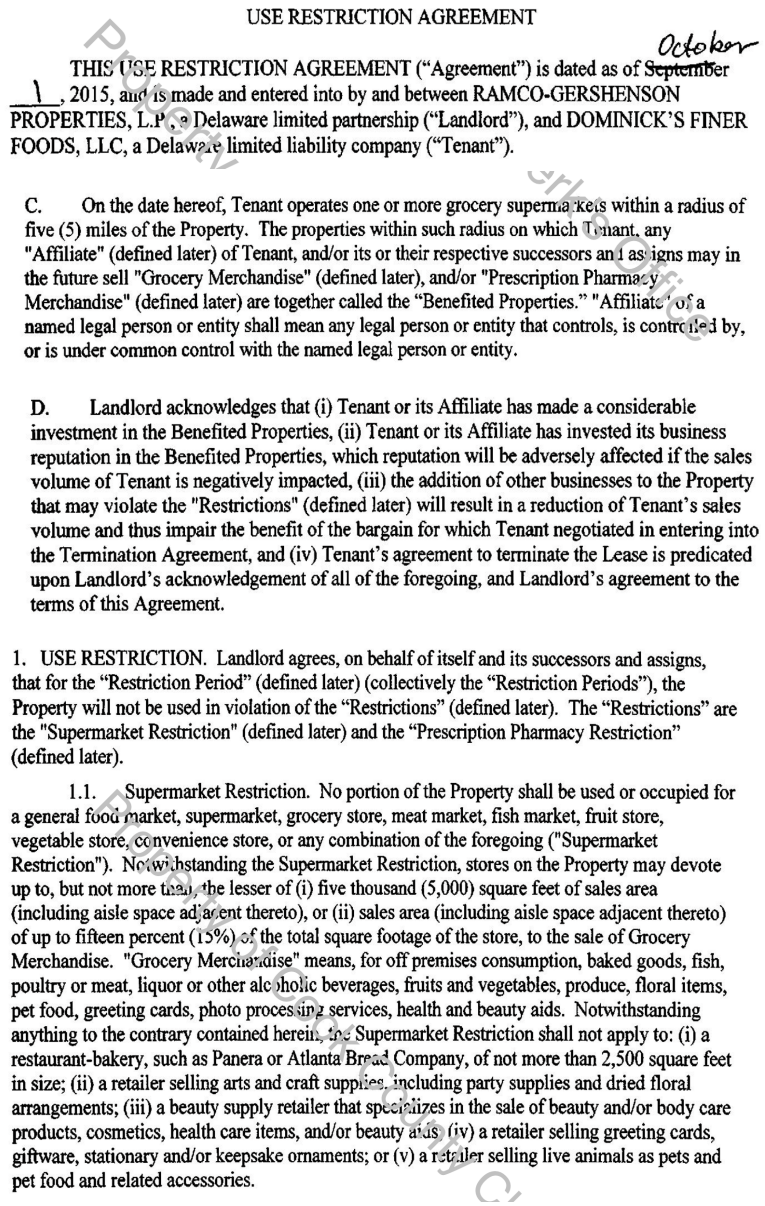
Figure 43: Restrictive Covenant in a Dollar General Lease Memorandum

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 44: 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").