Distributional Effects of Exclusive Dealing in Retail Real Estate

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Abstract

We study the welfare implications of exclusive dealing in the US retail sector. Using a novel dataset, we document widespread use of exclusive dealing contracts that exclude local entry by rival stores. Public officials increasingly critique such practices as anti-competitive. At the same time, the extant literature on exclusive dealing has also shown that these contracts can stimulate entry into otherwise under-served markets. Descriptive analysis suggests that stores with exclusive dealing contracts face fewer competitors and higher prices. Yet, almost all major grocers in under-served neighborhoods have exclusive dealing contracts, suggesting they might encourage entry in low-demand settings. We use a structural approach to measure the counterfactual impact of a ban on exclusive dealing. We estimate a model of household-level store choices that accounts for price sensitivity, distance sensitivity, and potential complementarities across retailers. Upstream, we estimate a static entry game between retailers and landlords that accounts for downstream variable profits and information asymmetry between retailers and landlords. Results show that exclusive dealing benefits most landlords, large retailers, as well as households living in sparse retail environments. Furthermore, 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 which 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, several U.S. cities have attempted to limit exclusive dealing contracts.[1]

The economic impact of exclusive dealing contracts on market outcomes and welfare are 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 studied its use primarily 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, the entry of a large retailer (eg a grocer) can facilitate the entry of smaller retailers (eg an optometry shop), even competitors (Brueckner (1993) and Konishi and Sandfort (2003)). 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 the "potential" retail locations, including already developed and planned locations. We also manually collect the complete set of retail real estate contracts, allowing us to determine where and when exclusive dealing has been implemented. We combine these two

[1] Both Chicago and Washington DC have limited exclusive dealing.

new databases with Numerator data tracking households' retail store choices and shopping behavior.

We first 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. Stores with exclusive dealing contracts tend to face fewer local competitors, even after controlling for chain. At face value these facts suggest that, as believed by public officials, exclusive dealing contracts are anti-competitive.

Next, 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.

Our descriptive findings suggest that exclusive dealing contracts may indeed have harmful effects on consumers. However, the analysis does not consider the counterfactual impact of exclusive dealing contracts in under-served markets and the potential to mitigate food deserts, which suggests that exclusive dealing may help some consumers. 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 one another's costs and 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 need to estimate key parame-

ters in our model – distance sensitivity, price sensitivity, and store complementarities in the downstream (consumer product) market and fixed costs, marginal costs, and the information asymmetry parameters in the upstream (commercial real estate) market. We recover parameters in the commercial real estate jointly using a simulated methods of moments estimator, using variation in retailers choices, choice set, and expected variable profits. Using microdata on household trips (including multi-homing trips), we estimate household preferences that vary with observable characteristics.[2] We identify distance sensitivity using within-zip-code variation of distance to avoid self-selection of households into markets with a more favorable retailer presence. We identify price sensitivity using an instrumental variable approach and exploit the fact that retailers' marginal costs are likely correlated across markets, but demand shocks for such retailers are likely not. We restrict the definition of cross-retailer complementarities to multi-homing and identify complementarities across retailers from the fixed effects of this regression, instrumenting for cost shocks to the correlation in taste across retailers.

The estimated downstream demand parameters highlight substantial heterogeneity in complementarities across retailers. Our descriptive evidence suggests the exclusive dealing contracts are highly asymmetric across retailers, with some retailers blocking a wide variety of stores while other retailers in the same industry narrowly blocking close competitors. Without imposing this asymmetry in the model, the predicted demand effect from an entrant, based on the demand estimates, correlates well with which retailer types are blocked in the exclusive dealing contracts, providing external validity to the model and the observed patterns.

Armed with our estimated parameters, we move onto counterfactual simulations where we simulate a ban on exclusive dealing. 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 are heterogeneous and vary by consumer income and by neighborhood, which some consumers in the North areas of Chicago benefiting from lower prices and 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 largest retailers (big box stores) would suffer both the greatest profit losses and the largest decrease in probability of entry. The large

[2]Multi-homing is when a household shops at multiple retailers on the same trip.

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. Most landlords profits decline after a ban on exclusive dealing, indicating that they are able to extract additional surplus from an exclusive dealing contract.

Related literature This paper contributes to the literature on exclusive dealing, grocery demand, and commercial real estate.

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

Second, our comprehensive database on retail contracts allows us to analyze the impact of exclusive dealing *empirically*. In contrast, past work has had to infer the nature of contracts indirectly. To overcome this problem, other papers have instead developed empirical tests to diagnose foreclosure (Asker (2016)), and estimated product market demand to determine both whether exclusive dealing is profitable and firms' willingness to pay (Nurski and Verboven (2016), Sinkinson (2020)). The contracts observed in retail real estate allow us to fully specify the retailer choice problem and distinguish when the exclusive dealing is explicitly contracted on, which is important for policymakers who seek to use regulation of (explicit)

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

contracts to change firm actions.[4] In addition, the exclusive dealing contracts documented here are heterogeneous and broad – the contracts vary within retailer, across retailers, and across space. Prior empirical work has focused on exclusive dealing contracts in narrow markets such as beer, hamburgers, and cable television (see Lafontaine and Slade (2007) for a survey of the empirical literature, as well as Chipty (2001), Sass (2005), Lee (2013), Ater (2015), Nurski and Verboven (2016), Asker (2016), Le (2024)).[5] In contrast, in my setting, exclusive dealing contracts affect the location of every single retailer in Chicago, affecting a wide subset of services.

This paper also builds on a long literature on estimating demand for retailers, particularly grocery stores and novel retail formats (like Walmart). This paper brings novel evidence of which stores retailers' view as competition (a "revealed preference/profitability" approach to profitability). This work builds on a long literature in retail on grocery demand (Bell et al. (1998), Smith (2004), Mehta (2007), Song and Chintagunta (2007), Hartmann and Nair (2009), Smith and Øyvind Thomassen (2012), Mehta and Ma (2012a), Ellickson et al. (2012), Thomassen et al. (2017), Handbury (2021), Leung and Li (2021), Mehta and Ma (2012b)), as well as interest in food access and food deserts (Bitler and Haider (2011), Allcott et al. (2019)). Relative to the existing literature, this paper endogenizes the retailer location choice by incorporating data on real estate prices, exclusive dealing contracts, and potential locations in the estimation. Additionally, this paper uses data on store locations to estimate household preferences for specific retailer as well as household's distaste for travel. Cao et al. (2024) also estimate preferences for specific retailers, and measures preference heterogeneity, while this paper focuses on multi-homing and complementarities across stores.

Additionally, this paper also contributes to and expands the policy discussion on non-competes. In the United States, the Federal Trade Commission issued a rule banning non-competes in labor (Federal Trade Commission (2023)), following a nascent but growing literature on non-competes in labor economics (Balasubramanian et al. (2020), Krueger and Ashenfelter (2022), Lipsitz and Starr (2022), Shi (2023), Johnson et al. (2023), Young (2024)). Exclusive dealing in commercial real estate is a type of non-compete in a different factor input – land – and may be subject to similar scrutiny from policymakers. This paper determines the welfare effects of exclusive dealing in land, and provides a model that can

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

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

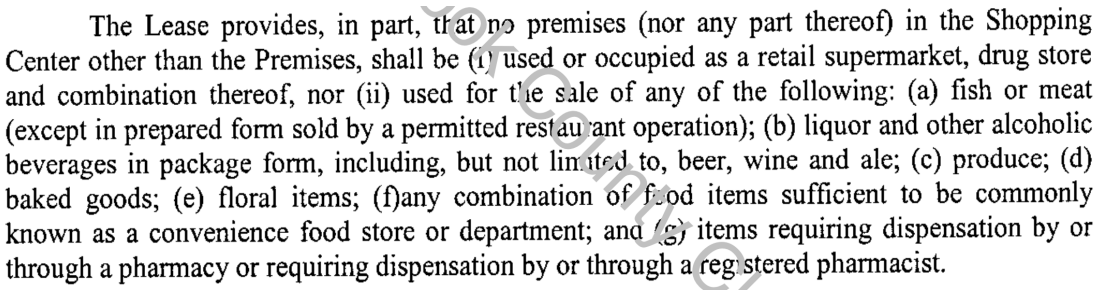
be used to estimate when exclusive dealing is procompetitive or anticompetitive in other settings.

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

2 Exclusive Dealing In Retail Real Estate

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

Figure 1: Restrictive Covenant in a Safeway Lease Memorandum



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

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

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

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

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

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

understand how retailers sort into locations.[8]

3 Data

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

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

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

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

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

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

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

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

Lease Characteristics: Lease characteristics are obtained from Compstak. We observe variables such as rent, square footage, tenant industry, location, and duration of the lease. CompStak gathers its data from a network of brokers who report lease characteristics for the properties they rent to in exchange for characteristics of the leases for nearby properties, so that they can infer market prices and lease characteristics. As a result, the data is selected based on the group of brokers. To ensure that the data is representative, we compare moments in the data to industry reports on rents and lease characteristics. We compare moments in the data with 15 and find that the data is representative. In figure Figure 17 and Table 15, we plot a histogram of (CPI-deflated) net effective rents over our time period and provide summary statistics about the rental data.

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

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

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

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

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

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

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

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

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

Upstream Commercial Real Estate Market Markets are defined yearly in Chicago, are defined by large and non-overlapping geographical areas, and Figure 23 shows the potential locations color-coded by market across Chicago.

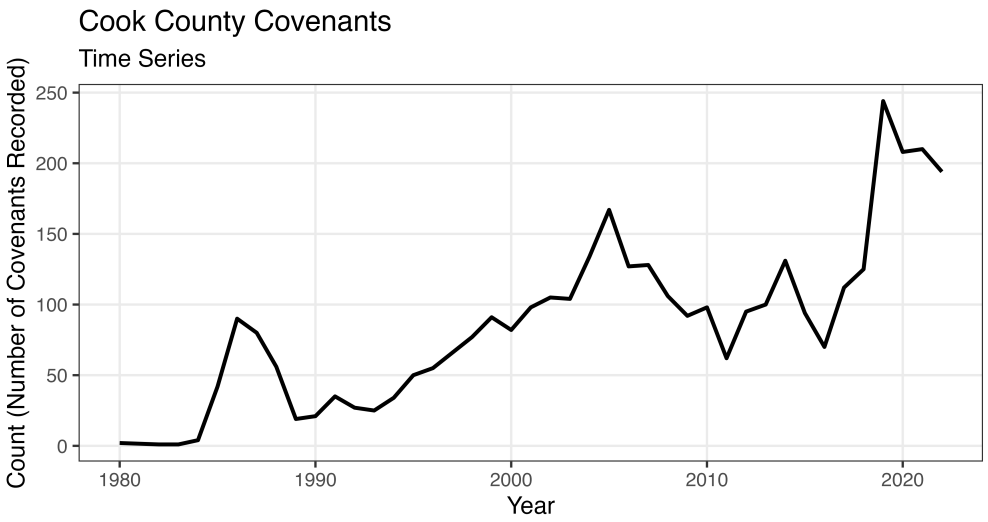
4 Stylized Facts

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

4.1 Exclusive Dealing is Common and Increasing

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

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



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

Table 1 shows the prevalence of exclusive dealing contracts in the grocery sector in Chicago. Of the 371 contracts that forbid retailers from selling groceries, 154 are found on grocery store locations, and the rest are found in similar industries such as discount stores and drug stores. Table 11 lists the grocery chain retailers that operate in Chicago with at least one exclusive dealing contract. Importantly, all of grocers with the highest market share use exclusive dealing contracts in their leases (e.g. Safeway and Alberston), and 30% of chain grocers have exclusive dealing contracts on premises (defined as any grocer retailer with more than four stores in the county). We conclude that exclusive dealing contracts are common, particularly in the leases of large national grocery chains.

Within grocery, the content of the contracts vary significantly. Figures 12 and 13 show the asymmetry in exclusive dealing across retail locations within the same retailer, across retail locations, and across industries. All stores block their direct competitors: grocery stores block other grocers, drug stores block other drug stores, and dollar stores block other dollar store. However, across industries, there is more variation. For example, Whole Foods blocks liquor stores far more frequently than Safeway or Aldi and Safeway blocks dollar stores more frequently than Whole Foods or Aldi. We interpret this as indication that sensitivity competition is highly specific to each retailer and retailer location.

Table 1: Prevalence of Exclusive Dealing in the Grocery Industry

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

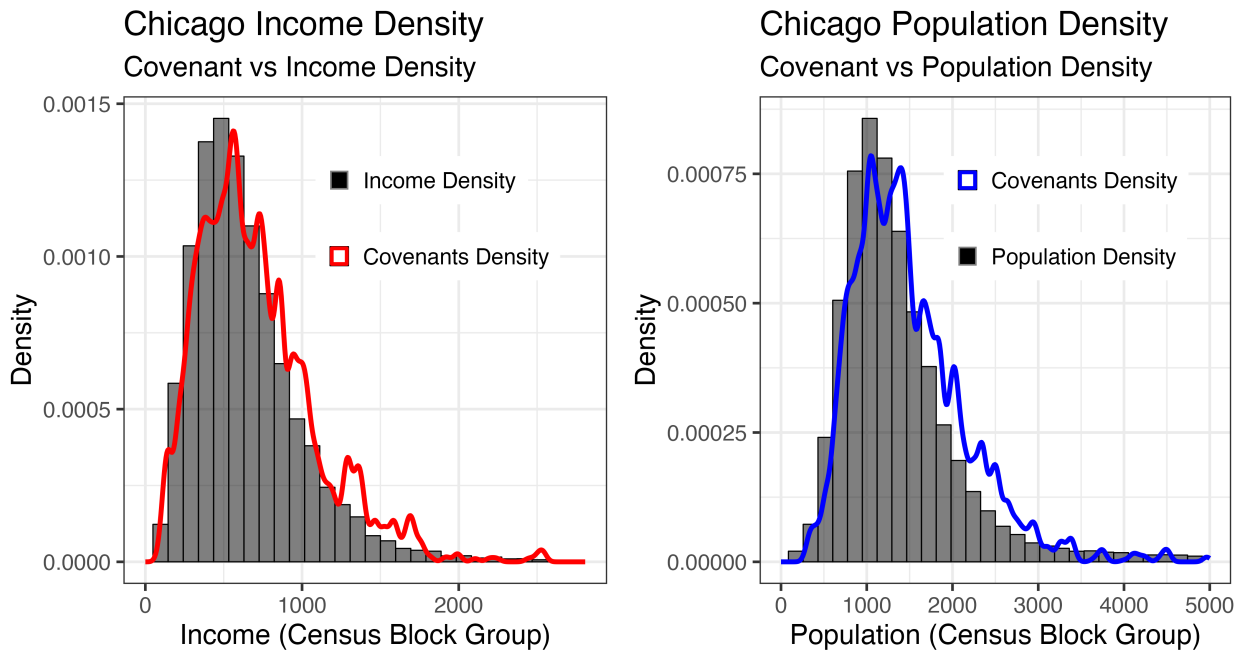
Source: Cook County Recorder Office and SNAP database. Table reports prevalence of exclusive dealing contracts among grocery chains.

Beyond grocery, Figure 10 and Figure 11 show the retailers with the most number of contracts, and the fraction of the retailers' locations with exclusive dealing contracts. These figures show the breadth of retailers that employ these contracts, and that the most common store types are grocery stores, drug stores, discount stores, and dollar stores. Missing are industries that sell highly differentiated products. The industries that have exclusive dealing contracts are industries with relatively low product differentiation, that sell similar products as their direct competitors.

Figure 10 also shows that the prevalence of exclusive dealing locations is heterogeneous across retailers. For example, while some retailers have exclusive dealing contracts on almost all locations, others have such contracts on only half of their properties (Target, Safeway, and Dollar General have exclusive dealing contracts on 90% of their properties, while Aldi, CVS, and Walgreens have exclusive dealing contracts on half their properties).

4.2 Neighborhood Demographics

Figure 3: Exclusive Dealing Contracts, Income and Population Density



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

Figure 3 shows that exclusive dealing contracts exist in poor and wealthy neighborhoods, as well as low-density and high-density population neighborhoods. In fact, exclusive dealing contracts are not observably selected into particular neighborhoods based on demographic features. Table 17 shows a regression of exclusive dealing status on neighborhood demographics or socioeconomic status, and finds that exclusive dealing status is uncorrelated with neighborhood demographic characteristics. Specifically, Table 18 shows a regression of

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

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

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

4.3 Rental Prices

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

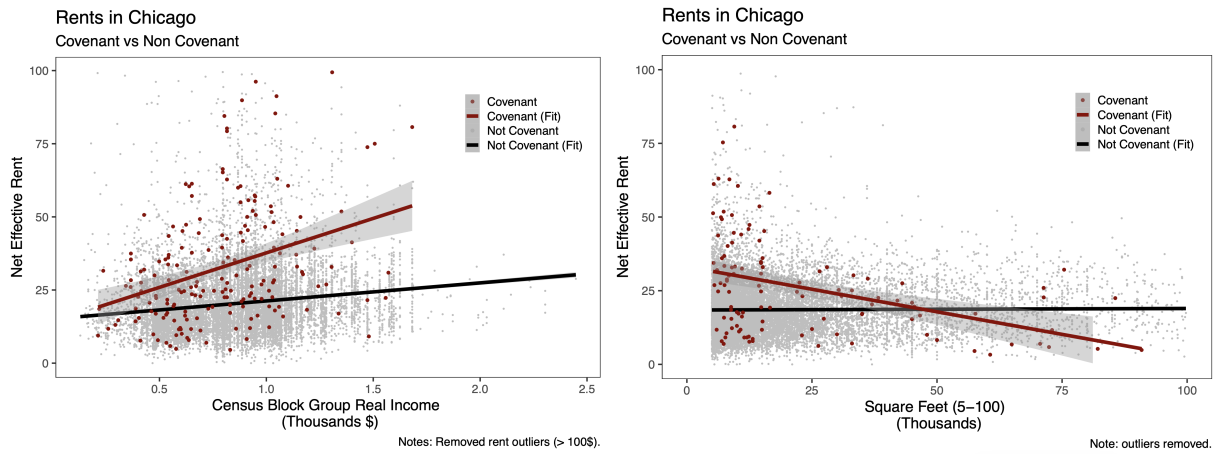
$$\log y_{ijt} = \alpha_0 + \gamma \text{exclusive deal}_{ijt} + \sum_k \beta_k \log x_{kjt} + zip_j + year_t + retailer_i + \epsilon_{ijt}$$

Table 18 shows that prices per square foot per year are 30% higher in properties with exclusive dealing, conditional on covariates. Robustness checks which vary the covariates included report estimates between 20% and 40%. The regressions indicate that the average lease prices would be 4$ higher per square foot per year for an exclusive dealing; for a typical grocery store, this translates to an additional 120,0000$ per year for a lease with such a contract, or approximately .24% of average annual revenue.[11]

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

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

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



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

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

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

4.4 Density of Nearby Competitors

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

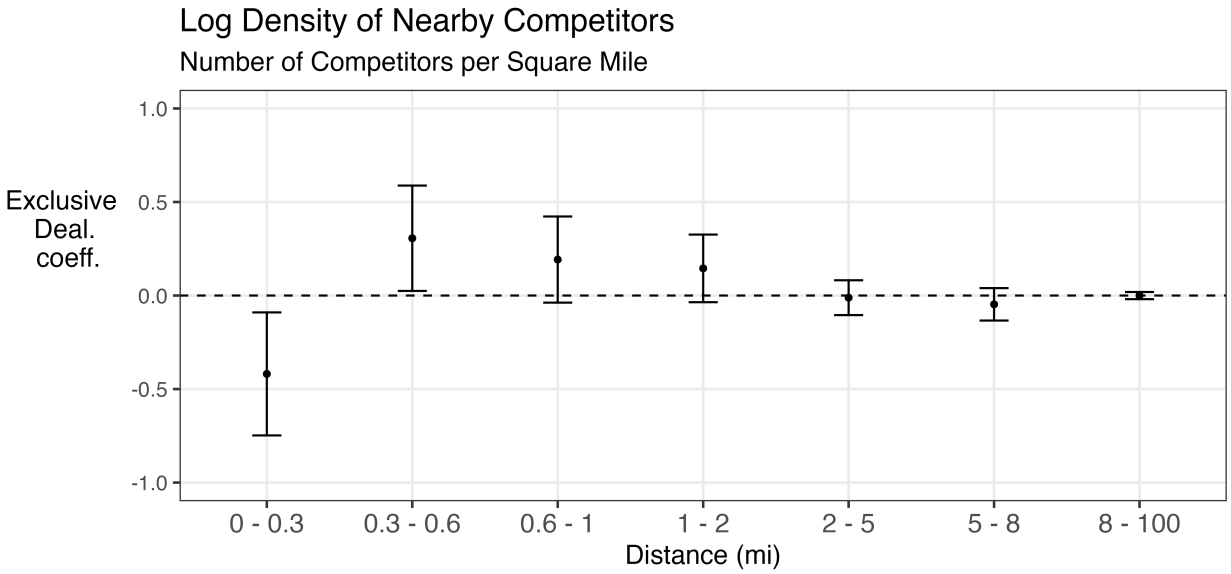
$$num\ stores_{r(i)t} = \beta exclusive\ deal_i + \sigma_i + \lambda_t + retailer_i + \epsilon_{it}$$

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

The results in Figure 5 show that in the closest vicinity to the property – 0 to .3 mi –, grocery stores with exclusive dealing contracts are surrounded by fewer competitors. This 0-.3 mile radius is important both because it is the radius of a typical shopping mall and also because it is the radius at which the trip chaining literature has documented spillovers across stores (Qian et al. (2023), Knight (2023)). At a larger radius, expanding to 0-1 mile, the effect goes away: there are similar number of competitors. As a result, between .3 and .6 mile, the result reverses and there are more competitors surrounding stores with exclusive dealing contracts. These results are consistent with the hypothesis that the covenant restrict competitions by pushing competitors farther away. At a large radius, there is no difference between stores with and stores without exclusive dealing contracts. Tables 19 - 24 in the

appendix show the full specification results.

Figure 5: Log Density of Nearby Competitors



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

4.5 Event Study with Consumer Expenditures

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

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

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

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

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

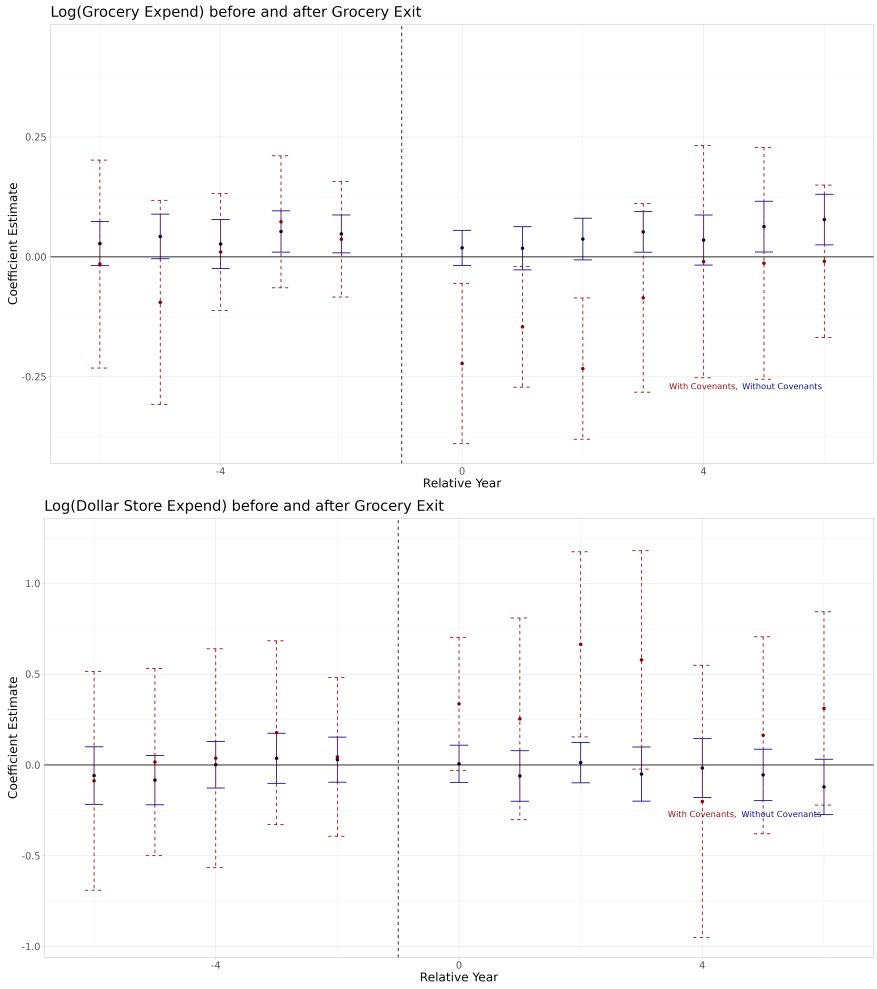
The panel is balanced by restricting to household that appear two quarters before and after the event, and to households that eventually experience a grocery exit; as a result, the control group is the not-yet-treated group and the event study is estimated using heterogeneity-robust estimators developed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

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

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

Exploring the underlying market structure, we show the effect of a grocery exit on total grocery count within 0-1mi, 1-3mi, and 3-5mi in Figure 21. Grocers without exclusive dealing contracts are replaced by another grocer within a mile, and have no correlation with grocery entry and exit farther away. Grocers with exclusive dealing are replaced by grocers 1-3 miles away, and a the mile within the old grocer stays vacant for at least six years after the exit. The difference in consumer expenditure outcomes between exits with contracts and exit without contracts is likely driven by the replacement grocer (with no contracts) and the lack of replacement (with contracts).

Figure 6: Consumer Expenditure Following Grocery Exit.



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

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

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

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

5 Model

The stylized facts show evidence that exclusive dealing contracts bind and have significant impacts on retailers, landlords and consumers. To evaluate the effect of exclusive dealing for all of Chicago, we conduct a counterfactual analysis where exclusive dealing is banned. Because the counterfactual affects all locations and all retailers, this comparison is ill-suited to reduced form analysis. We therefore answer the empirical question as to the effects of exclusive dealing through the lens of an empirical IO model.

Because large retailer facilitates co-locating 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)). The timing reflects this.

Timing:

In stage 1, each landlord posts two prices per retailer: a base price and a price for an exclusive contract. Landlord g offers retailer j contracts $a \in \{\text{exclusive}, \text{non-exclusive}\}$ at rental price r_{jma}. An exclusive dealing contract blocks all the competitors at a specific location, and the set of retailers blocked by exclusive contracts are determined separately for each location and for each retailer.

In stage 2, each retailer chooses locations and contracts. Entry is simultaneous and retailers form beliefs over the other retailer's strategies. We focus on Bayesian Nash equilibra: retailers take landlord's prices as given but form beliefs over other retailer entry strategies.

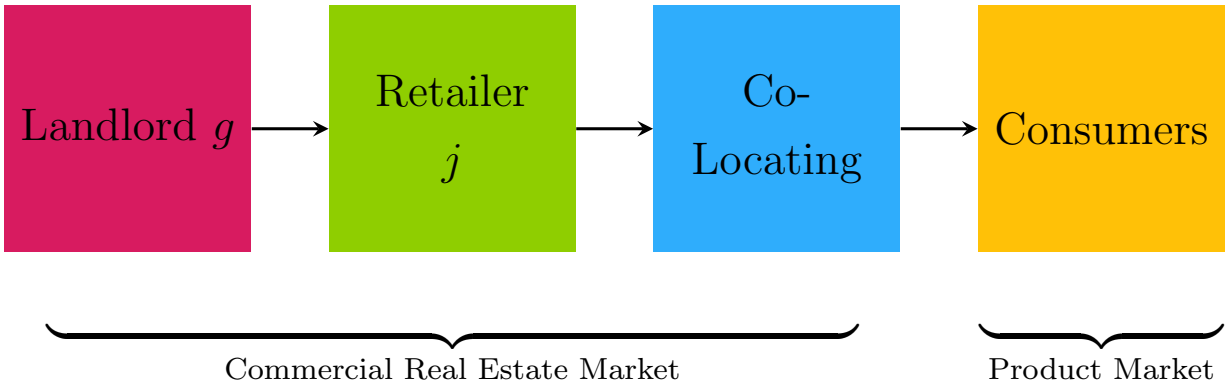
In stage 3, the final locations of retailers are determined. In the case of size or contract conflicts, the retailer paying the highest rent for each landlord enters.

In stage 4, given retailer entry, landlords set prices for co-locating retailers and the co-locating retailers enter. Exclusive dealing does not exist in this market. The equilibrium is

again Bayesian Nash.

In stage 5, given entry decisions, retailers set prices in the product market, consumers shop, and the product market clears.

Figure 7: Model Timing



Notes: The commercial real estate market clears in two steps. First, the landlord rents to the retailer, next the landlord rents to co-locating stores. Given entry in the commercial real estate market, the retailers set prices in the product market, consumer shops for good, and the product market clears.

Agents:

Following the timing, we categorize the retailers into large retailers that enter first and smaller (often co-locating) retailers that enter next. We consider the location choice problem of the retailers most frequented by consumers, which are listed in Table 2. These retailers include the big box stores and large grocers such as Costco, Walmart, Safeway, and Kroger. For certain store types, consumer travel to the store type frequently but not to any particular retailer frequently. We group these retailers into categories: other food, drug stores, dollar stores, and liquor stores. For example, other food represents the independent grocers which attract the business of some local households.

The model is estimated in reverse order.

Table 2: Most Frequented Retailers

Retailer	Type	Timing of Entry
Jewel Osco (Safeway)	Supermarket	Retailer (Stage 2)
Mariano's (Kroger)	Supermarket	Retailer (Stage 2)
Whole Foods	Supermarket	Retailer (Stage 2)
Aldi	Specialty	Retailer (Stage 2)
Food 4 Less (Kroger)	Specialty	Retailer (Stage 2)
Trader Joe's (Aldi)	Specialty	Retailer (Stage 2)
Costco	Big Box	Retailer (Stage 2)
Meijer	Big Box	Retailer(Stage 2)
Sam's Club (Walmart)	Big Box	Retailer (Stage 2)
Target	Big Box	Retailer (Stage 2)
Walmart	Big Box	Retailer (Stage 2)
Drug	Drug Store	Co-Locating (Stage 4)
Dollar	Dollar Store	Co-Locating (Stage 4)
Liquor	Liquor	Co-Locating (Stage 4)
Other Food	Other Food	Co-Locating (Stage 4)
All Other	Outside Good	Both (Stage 2 and 4)

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.

5.1 Consumer Demand for Retailers

We model the product market at the level of aggregation of the exclusive dealing contracts, the retailer level. We follow McFadden (1978), Berry (1994), Berry et al. (1995), where household make a discrete choice over groups of stores given by

$$u_{ib}^{g} = -\alpha^{g} P_{b}^{g} + \gamma^{g} d_{ib} + \Gamma_{b} + \xi_{b}^{g} + \sum_{k,l} \sigma_{kl}^{g} X_{k(b)} y_{l(i)} + \epsilon_{ib} \tag{1}$$

where u_{ib}^{g} is the utility household i in income group g receives from shopping at the retailers $b \in \mathcal{B}$ in market t, P_{bt}^{g} is the total price paid, d_{ib} is the total distance traveled, Γ_b is the complementarity (following Gentzkow (2007)), ξ_{bt} is market-level unobserved demand shock, σ_{kl}^{g} captures the effect of the interaction between household demographic characteristics $y_{l(i)}$ and retailer characteristics $X_{k(b)}$, and ϵ_{ib} is a household idiosyncratic preference for retailers

b in market t. For example, ϵ_{ib} may represent daily preferences for a specific meal, which require a set of ingredients across retailers.

The products, listed in Table 2, are the retailers with the largest market shares and most consumer trips: national chain grocers, discount stores, club stores, as well as categories of retailers such as drug stores, dollar stores, and liquor stores. The remaining stores comprise the outside group.[13]

Consumer preferences for prices, distance, retailers, and retailer complementarities determine the effects of exclusive dealing. As consumers multi-home, high relative complementarity across retailers can soften price competition within retail pairs. Consumers that multi-home travel to multiple retailers in the same trip, saving on distance costs.[14] With regard to exclusive dealing, as γ^g becomes more negative, the distaste for distance becomes more salient, exclusive dealing becomes more effective, and the value of exclusivity to the retailer increases. Complementarities are moderated by distance in the sense that as the distance between the retailer changes, the preferences for consumers products change as well.

Consumer preferences are heterogeneous across demographics and retailer characteristics, as captured by $\sum_{kl} \sigma_{kl} X_{k(b)y_{l(i)}}$. Each household has an idiosyncratic preference for a product (a group of retailers), ϵ_{ib}, modeled by an additive product-specific Type 1 Extreme Value shock. The shock represents the day-of preference for a specific set of stores, and represents an idiosyncratic preference for a specific set of retailers on that day, or idiosyncratic shocks that change the set of retailers shopped.

5.2 Product market supply

Retailers set prices in the downstream market once all the locations are determined. Retailers are profit maximizing, sell a composite good, and prices are set in Bertrand competition. The model captures two important features of the grocery market: retailers set uniform prices (DellaVigna and Gentzkow (2019), Hitsch et al. (2021)) and price indices vary across the income distribution even within the same CBSA (Handbury (2021)). To model this in a parsimonious way and to keep the supply consistent with the demand, we assume that

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

[14]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)).

retailers set different prices (price indices) for each income group g (high, medium, and low income groups) but that the price indices and good offerings are the same in each retailer location conditional on the income group g.[15] Therefore, a chain retailer chooses three prices for all of its retailer locations in each market: a price for the high income group, a price for the medium income group, and a price for the low income group

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

Then retailers prices are determined by the first order conditions of the profit maximization, and this conduct assumption allows us to determine the retailers' marginal costs.

$$p_{jt}^g = mc_{jt}^g + \left[\frac{\partial s_{jt}^g}{\partial p_{jt}^g}\right]^{-1} s_{jt}^g - \frac{\partial s_{jt}^g}{\partial p_{jt}^g} \tag{3}$$

When a retailer adds a location it increases shares (and thus profits) by lowering distances a customer travels, but new locations steal business from existing locations because each retailer location generates less revenue, attracts fewer customers, and has to pay rent and fixed costs of entry.[16] Each category is treated as a single retailer as well.

[15] 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 retailers and lower priced retailers in different locations. Also, grocers sell a wider variety of similar products at different prices to discriminate across consumers. In the model, this is approximated as three separate prices for different income groups at each retailer.

[16] For completeness, we write out the shares explicitly: retailer j's share of the market is sum over all shares of multi-homing trips with retailer j, $b \in j$, summed over the shares from all households in the market. Since each household shops at the retailer closest to home, the distance for each household is the shortest distance between retailer and home. Market indices are suppressed for clarity.

$$s_j = \underbrace{\sum_i \omega_i}_{\text{hhlds}} \underbrace{\sum_{j'=1}^{J}}_{\text{retailers}} \underbrace{\frac{e^{-\alpha(P_j+P_{j'})+\xi_{jj'}+\Gamma_{jj'}+\gamma d_{ijj'}+\sum \sigma X_{jj'} y_i}}{1+\sum_{j,j'} e^{-\alpha(P_j+P_{j'})+\xi_{jj'}+\Gamma_{jj'}+\gamma d_{ijj'}+\sum \sigma X_{jj'} y_i}}}_{\substack{\text{share b } jj' \text{ for hh } i \\ j' \text{ index is dropped for } j'=j}} \tag{4}$$

5.3 Co-Locating Retailer Entry

The co-locating retailers are the smaller stores in the demand estimation: other food, drug stores, liquor stores, dollar stores, and other stores. Entry of small retailers occurs after the entry of large retailers. Here, landlords set a single price for all tenants, there is no exclusive dealing, and when multiple stores 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, which are stores in each category (other food, drug store, dollar store, liquor store, and other), choose locations. Each co-locating 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

$$\max_m \bar{\mathbb{P}}_{km}\Big(E[\bar{\pi}_{km}] - r^{co}_m - F^{co}_m + \epsilon_{km} - \epsilon_{k0} \Big)$$

where expected profits conditional on entry depend on expected variable profits, $E[\pi^{var}_k]$, the rents, r^{co}_m, and the fixed cost of entry, F^{co}_m. The variable profits are the expected profits in the product market, which depend on the entry decisions of other retailers. Specifically, the variable profits are

$$E[\bar{\pi}_{km}] = \sum_{\boldsymbol{l}_{-k} \in \mathcal{L}_{-k}/\{m\}} \mathbb{P}(\boldsymbol{l}_{-k}) \Bigg(\sum_i \underbrace{\omega_i 1\{d_{ik} = \min_{\tilde{k}} d_{i\tilde{k}}\}}_{\text{hh w/ k in choice set}} \underbrace{s^*_{ik}\big(d(\boldsymbol{l}_{-k}), x, y; \phi\big)}_{\text{prob. hh } i \text{ picks k}} \Bigg) \Big(p^*_{g(i)kt}\big(d(\boldsymbol{l}_{-k}), x, y; \phi\big) - mc_{g(i)kt} \Big)$$

where variable profits are determined by the location of the other retailers, $d(\boldsymbol{l_{-k}})$, demographics, y, and demand parameters, $\phi = \{\alpha, \gamma, \Gamma, \xi\}$, and own marginal costs. The prices that are set in the downstream product market will instead be set at the category level. A co-locating store k is only in household i's choice set if it the closest store in that store category to the household, $1\{d_{ik} = \min_{\tilde{k}} d_{i\tilde{k}}\}$.

One assumption in the model is that entry decisions of small co-locating firms are made at the store level, while demand parameters (and thus prices and marginal costs) are estimated

at the category level. This creates an inconsistency, as demand is estimated at the category level, but entry decisions are made at the store level (e.g., multiple drugstores may enter without sharing profits). The assumption is made to estimate demand.

Co-locating firms internalize that they might not enter, and when choosing location balance that it is harder to enter a more popular location, captured by $\bar{\mathbb{P}}_{km}$), with the expected profits conditional on entering, captured by $E[\bar{\pi}_{km}] - r_m^{co} - F_m^{co} + \epsilon_{km} - \epsilon_{k0}$.[17]

The equilibrium is Bayes Nash, and is determined by the probability of location choice and the landlord prices. Landlords set prices in the co-locating market that balance the probability of entry, s_m, with revenues given entry, $p_m^{co} - mc_{mc}^{co}$. The landlord's profits from the co-locating market are

$$\max_{r^{co}} \underbrace{\left(s_m^{drug} + s_m^{dollar} + s_m^{\text{other food}} + s_m^{other}\right)\left(p_m^{co} - mc_m^{co}\right)}_{\pi_l^{co}}$$

An exclusive dealing contract which forbids a type of retailer from entering a location limits the choice set of the retailer and therefore is not considered by the landlord as a potential entrant.

5.4 Retailer Entry

In the commercial real estate market, landlords set prices for contracts and then retailers simultaneously choose locations and contracts. If there are conflicts – if an exclusive dealing contract forbids another retailer from entering or there are size constraints – the highest-paying retailer enters. If the retailer loses the contract, it loses its opportunity to enter that year. When choosing locations, retailers consider rental prices, fixed costs of entry, the expected variable profits from the product market (from the new and possibly existing locations), and the probability of other retailer choices. A retailer j chooses across landlords m and contracts a to maximize

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

$$\max_{m,a} \quad E[\bar{\pi}_{jma}(\boldsymbol{l}_{-j})] - \bar{\mathbb{P}}_{mja}(r_{jma} + F_m - \theta_j 1\{excl.\ deal\}_{jma} + \epsilon_{jm}) + (1 - \bar{\mathbb{P}}_{mja})\epsilon_{j0} \qquad (5)$$

where $E[\bar{\pi}_{jma}(\boldsymbol{l}_{-j})]$ are the expected variable profits in the product market, $\boldsymbol{l_{-j}}$ are the other retailers entry strategies, $\bar{\mathbb{P}}_{mja}$ is the probability the retailer wins entry given that it tries to enter, r_{jma} are the rents paid to landlord m for entering with contract a, F_m is the fixed cost of entry, θ_j is the additional profitability of an exclusive dealing contract, and ϵ_{jm} is the retailer-location idiosyncratic match.[18]

The retailer expected profits from the product market depend on the retailer entry decisions, existing locations, the simultaneous entry decisions of all other retailers, and the future decisions of co-locating retailers. A retailer that does not win entry still receives revenues from preexisting locations. Variable profits can then be written as $E[\bar{\pi}_{jma}(\boldsymbol{l}_{-j})] = \prod_{j' \neq j} \left(\sum_{l'_j=(m',a')} \mathbb{P}(l'_{j'}) \bar{\mathbb{P}}(l'_{j'}) \right) \pi_{jma}(\boldsymbol{l}'_{j'})$.[19] In this way, entry shortens the distance to some consumers but steals business across locations.

Because there can be conflicts, the probability of choosing a location is not the same as the probability of entry. The retailers internalize the probability of a conflict, or that they will not enter in that location or in that market in that time period.[20] When a retailer does not enter, it collects variable profits from possible existing locations as well as the idiosyncratic shock from the outside good.

Industry professionals cite information asymmetry as a reason exclusive dealing exists in retail real estate: the landlord does not know the retailer's profits. We model information

[18] The probability of winning entry is the probability that a higher-paying competitor that would block entry does not enter. Let (j', a') be the set of retailers and contracts such that $r_{jma} < r_{j'ma'}$ and (j, a) is blocked by a size restriction or exclusive dealing contract. Then $\bar{\mathbb{P}}_{jma} = 1 - \prod_{(j',a')} \mathbb{P}_{j'ma'}$.

[19] Written differently, this is $E[\bar{\pi}_{jma}] = \sum_{\rho} \mathbb{P}(\rho) s^*_j(\rho)(p^*_j(\rho) - mc_j)$ where ρ are each of the combinations possibly initial choice combinations, $\prod_{j' \neq j} (\sum_{l=(m,a) \in \mathcal{L}_j} \mathbb{P}_{jl})$.

[20] The probability the retailer then chooses strategy profile $\boldsymbol{l}_j$ is the multivariate normal distribution evaluated at $\boldsymbol{x} = \boldsymbol{0}$ with mean $\boldsymbol{\mu}_{\boldsymbol{l}_j}$ and variance-covariance matrix $\boldsymbol{\Sigma}_j$ where

$$\boldsymbol{\mu}_{\boldsymbol{l}_j} = \Omega^{\boldsymbol{l}_j} \left(E[\bar{\pi}_j(\boldsymbol{l}_j)] - \sum_{m \in \boldsymbol{l}_j} \bar{\mathbb{P}}_{mja}(r_{jma} + F_m - \theta_{ja}) \right)$$

$$\boldsymbol{\Sigma}^{\boldsymbol{l}_j}_{ii'} = \sum_{l,l',m} \Omega^{\boldsymbol{l}_j}_{il} \underbrace{\bar{\mathbb{P}}_{jma}(\boldsymbol{l_j})}_{\substack{\text{L x M} \\ \text{prob. firm j wins} \\ \text{m with choice } a}} \Omega^{\boldsymbol{l}_j}_{i'l'} \underbrace{\bar{\mathbb{P}}_{jma}(\boldsymbol{l'_j})}_{\substack{\text{L x M} \\ \text{prob. firm j wins} \\ \text{m with choice } a}}$$

and

asymmetry from two sources: location, ϵ_{jm}, and competition θ_j. The landlord does not know the idiosyncratic profitability of its location for each retailer, ϵ_{jm}. ϵ_{jm} captures elements such as layout or square footage but whose effect on profitability are only known to the retailer. Also, the landlord cannot measure the effect of competitor entry on the retailers' profit. θ_j represents the additional expected profits for retailer j for guaranteeing exclusivity at that location. While the realizations of ϵ_{jm} and θ_j are unknown to the landlord, the landlord does know the distribution $\epsilon_{jm} \sim N(0,1)$ and $\theta_j \sim N(\mu_\theta, \sigma_\theta^2)$. The econometrician must estimate μ_θ and σ_θ^2.

An exclusive dealing agreement affects a retailer's competitors (both large and small retailers) in two ways. First, the retailer pushes its competitor away from certain consumers and towards other consumers. Second, exclusive dealing increases the total trip distance for multi-homing trips between that retailer and its competitor. Like in the data, the exclusive dealing contracts are heterogeneous across retailers and locations. We discuss the determination of which retailers are subject to the exclusive dealing agreement (i.e., which retailers are considered competitors) in the estimation.

The retailer balances the benefits and costs when choosing whether or not to select an exclusive dealing contract. Specifically, the retailer balances higher prices of an exclusive dealing contract with the benefit of increased profitability from restricting retailer entry, increased profitability from restricting co-locating retailer entry, and a higher probability of winning entry if the retailer purchases a more expensive 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) that have been determined important in a long literature in industrial organization on retailer entry and location choice (e.g. Hotelling (1929), Salop (1979), Bresnahan and Reiss (1990), Bresnahan and Reiss (1991), Seim (2006), Jia (2008), Vitorino (2012), Nishida (2015), Caoui et al. (2022)).

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

5.5 Landlord problem

Each landlord m sets two prices – an exclusive and a baseline/common price for each retailer j: r_{jma}. The landlord balances the probability of a retailer approaching (attempting to enter) with revenue once the retailer approaches

$$\max_{r_{jma}} \sum_{j,a} \underbrace{\bar{\mathbb{P}}_{jma}}_{\text{prob. win}} \underbrace{\mathbb{P}_{jma}}_{\text{prob. approach}} (\underbrace{r_{jma} - mc_m}_{\text{retailer}} + \underbrace{\pi_m^{co}(a_j)}_{\text{co-locating}}) + \underbrace{\left(1 - \sum_{j,a} \bar{\mathbb{P}}_{jmat} \mathbb{P}_{jmat}\right) \pi_m^{co}(O)}_{\text{profits without retailer entry}}$$

where the landlord's profit are the probability-weighted sum of the profits from each retailer entering successfully with contract $a \in \{\text{Baseline,Exclusive}\}$. The profit depends on the probability retailer j approaches and wins entry with contract a, $\mathbb{P}_{jma}\bar{\mathbb{P}}_{jma}$, rents, r_{jma}, marginal costs, mc_m, expected profits from the co-locating market, $\pi_m^{co}(a_j)$ which depend on whether or the retailer enters, doesn't enter, or enters with an exclusive dealing contract. If no retailer enters, the landlord rents to the co-locating market without a large retailer present and collects $\pi_m^{co}(O)$, where O indicates that no retailer entry. When determining prices for an exclusive dealing contract, the landlord balances the expected gains from the retailer market with the expected losses from the co-locating retailer market.

The landlord has incentives to maximize demand to its properties (often a shopping center), and seeks complementary retailers to enter to property. In a full information setting, the landlord can tell the combination of retailers that maximize total surplus and offer rents accordingly. Absent information on retailer profitability, the exclusive dealing contract can increase the probability of a retailer entering. Explicitly pricing the exclusive deal mitigates some of the information asymmetry. On the other hand, if the landlord limits which co-locating retailers can enter, it might be hard to find additional retailers. When setting prices, the landlord balances a higher probability of retailer entry and a higher price from the restrictive covenants with the lower probability of attracting a high-paying co-locating store.

Thus the full Bayes 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.

6 Estimation and Identification

6.1 Estimation and Identification Demand Parameters

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

The likelihood of observing bundle b under the specified preferences is

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

$$\underbrace{\delta_{bt}^m}_{\text{mean util.}} = -\alpha P_{bt}^m + \Gamma_b + \xi_{bt} + u_{ibt}$$

The parameters important for exclusive dealing are price sensitivity, distance sensitivity, and retailer complementarity, α^m, γ^m, and Γ_b. Parameters are identified from variation in observable characteristics and trip frequency. Prices are likely correlated with unobservable retailer quality and market demand shocks that bias estimates upwards. Following **?**, we instrument prices with the average prices of goods in other markets. The intuition for the validity of this instrument is that prices in other markets picks up common retailer costs across markets but does not reflect unobserved demand shocks.

Distances are measured as the total length of the trip: home and back when the household shops at a single retailer, and home - store 1 - store 2 - home when the household stops at two retailers. Like prices, distances are also endogenous: households choose locations based on amenities and retailers choose locations based on where households are located. We address the distance endogeneity by controlling for household zip5. The identifying assumption is that household location within a zip code is as-good-as random and variation in household locations within the household zip code identifies the distaste for distance.[21] Specifically, limited supply of housing and the location distribution of other amenities will cause households to locate across the zip code, regardless of their preference for groceries or

[21] As robustness, we control for Chicago area instead of distance, a broader measure that controls for the neighborhood.

other specific retailers in the demand estimation.

The complementarity term, Γ_b is defined as the additional utility of shopping at two stores together in the same day, or as the additional utility of making a single trip to both stores (controlling for total trip distance). The higher the value of Γ_b, the greater the complementarity between two retailers relative to the outside good. Complementarties are identified as the bundle fixed effects in the regression of average preference for a bundle on instrumented prices.[22]

One challenges with identifying the complementarity term is that the complementarity term may be identifying preference for shopping in a shopping center or that tastes are correlated across nearby retailers: that shopping at one retailer leads to shopping at another retailer. To control for this form of endogeneity, we directly control for whether retailers are co-located. The identifying assumption is that spillovers across retailers are in large part local (the literature finds that spillover are between 0-.2 miles, roughly the shopping mall distance). Additionally, controlling for co-locating stores controls for preferences for shopping at a shopping center.[23]

6.2 Product Market Estimates

Price and distance estimates are reported in Table 3. Results from the estimation show disutility for prices and distance, and that low-income consumers are the most elastic with respect to price and high-income consumers are the most inelastic with respect to price. The price coefficient is interpreted as the disutility of a 1% increase in retail prices. Estimates for distance are salient: 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.

[22]To identify complementarities and not correlated tastes, following Gentzkow (2007), can use variation in instrumented prices. As the price of one good changes, bundle shares will change if there are true complementarites and not if shopping together is instead driven by correlated tastes.

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

Table 3: Price and Distance Demand Estimates

Variable	Estimates		
	Low Income Group	Middle Income Group	High Income Group
α^m (price)	-1.569^{***}	-1.262^{***}	-1.001^{***}
	(0.156)	(0.325)	(0.248)
γ^m (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.

Table 4 reports some of the complementarity terms, Γ_b, showing a large heterogeneity in complementarities across retailers. Estimate which are more negative indicate that the two goods are relatively large substitutes, or the least preferred combinations for consumers. For example, consumers' least preferred shopping combination is Safeway and drug stores together, likely because Safeway has its own pharmacy and sells almost all products available at the drug store. Similarly, consumers are less likely to shop at Safeway and Aldi together, two grocers, or at dollar stores and Aldi together. Consumers are relatively more likely to shop at Safeway and dollar stores together, or at drug stores and Aldi together.

Table 4: Select Demand Estimates from Cross-Store Complementarities

Retailer	Safeway (Jewel Osco)	Aldi	Drug	Dollar	Liquor
Safeway (Jewel Osco)		-1.2^*	-2.3^*	$.8^*$	.4
Aldi	-1.2^*		1.2^*	-1.4^*	$-.6$
Drug	-2.3^*	1.2^*		$-.3$	.2
Dollar	$.8^*$	-1.4^*	$-.3$		-1.7^*
Liquor	.4	$-.6$	.2	-1.7^*	

Table 5: *Source:* Numerator. Table shows estimates for cross store complementarities relative to the outside good. Current standard errors mark as significant at the 5% level

Both the retail demand estimates and the exclusive dealing contracts show significant heterogeneity across firms. With the retail demand estimates, we can compute variable profits and therefore the retailers' value of displacing competitors. We can then test whether the

exclusive dealing contracts are more likely to block retailer substitutes.

Figure 22 shows an example of how the more consumers dislike shopping at stores together, the greater the greater the fraction of exclusive dealing contracts. The figure plots the fraction of addresses with exclusive dealing contracts overlayed with the complementarity estimates. In general, the more consumers dislike shopping at the stores together, the greater the fraction of retailer locations blocked. For example, Safeway (Jewel Osco), Whole Foods, and Aldi all block grocers. Stores with positive complementarites are blocked less often, an example of which is Safeway vs liquor stores vs Whole Foods and Liquor Stores. One exception is Aldi, which blocks drug stores in the sense that it blocks any drug store that dedicates a certain square footage to food.

6.3 Commercial Real Estate Market

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

In each market, we observe data on potential locations, retailer entry and exit, lease prices (rents) and exclusive dealing contracts. At each potential new location we observe square footage and the possibility for co-locating firms. In the data, there are typically between zero and five potential locations in each market. We observe retailer entry, retailer exit, parent company and retailer sizes, the later of which allows us to construct the retailer's choice set. We assume that parent companies can make entry and exit decisions for any brands of retailers they own; we consider the location choice at the parent level. We group retailers from the demand estimation by their size and ownership in Table 10,[24] and use the size and ownership to guide where the retailers can enter and which parent company chooses locations. Additionally, we assume that there are other retailers – other and outside food – and include them as other potential entrants in the market. These other retailers are less frequently shopped at. From the demand estimates, we compute the expected profitability of each possible combination of locations.

[24]Grocery chain exit is rare: as shown in Figure 16, 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.

Next, an exclusive dealing contract is defined as a contract that blocks all retailers that reduces expected profits in that location, taking to account all existing locations but no future locations. In detail, the set of retailers blocked by an exclusive dealing contract from retailer j at location m is determined as follows: (1) variable profits for retailer j are computed assuming retailer j enters location m and taking all other existing locations as given. (2) variable profits for retailer j are computed if another retailer were to enter the property nearby. We consider all other retailers except the outside good and stores that are too big to locate at this location, or retailer $j' \in \mathcal{J}/\{\text{outside} \cup j'' : q_{q''}^{sqft} > q_m^{sqft}\}$ were to enter location m alongside retailer j. (3) If the variable profits in (1) are lower than the variable profits in (2), then that retailer is blocked by an exclusive dealing contract. Thus, exclusive deal includes the other retailers that would decrease retailer j's profits at that location.

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. 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 24- 25. 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 10$ per square foot per year. For the average retailer which pays around 20% in rent for each square foot and year, the exclusivity contract increases profits by 15% of rent.

7 Effects of Exclusive Dealing

7.1 Effect of Exclusive Dealing on Retailers and Landlords

With the estimated parameters, we compute counterfactual prices and entry probabilities limiting the landlords to set one price. We recompute the equilibrium separately for each market.

Counterfactual results show that exclusive dealing contracts encourage entry in Chicago. Table 6 shows the difference in entry probabilities for retailers in each geographic area, averaged over retailers and over years. The results show that in all areas except West Cook County, exclusive dealing increases the probability of entry for (large) retailers. The effect is most pronounced in the poorest and least population dense market, South Chicago, where probability of entry goes from 10% to 0% without exclusive dealing. The interpretation is that exclusive dealing contracts are necessary to ensure entry in the most under-served markets. Suburban areas see the second largest drop in probability of entry in the counterfactual without exclusive dealing. This is likely explained by the retail environment of suburban neighborhoods: suburban areas tend to have a few shopping malls surrounded by many houses, and when the shopping mall is often owned by a single landlord, there are relatively few locations. Without the exclusive contract, the probability of competitor entry decreases the probability of retailers entering in the first place. Finally, the central business district (CBD) and North Chicago have the lowest difference in entry without exclusive dealing. These neighborhoods are dense both in terms of retail and population, and retail often exists in stand alone locations. As a result, the exclusive dealing contracts were least effective in these neighborhoods, and so the difference is relatively small.

Following entry, all major grocery stores reduce entry probabilities in each market. Table 7 shows difference in entry probabilities (computed in percentage points) and difference in profits (computed in percent) for each major retailer and each major co-locating store industry. Big Box stores Costco and Walmart have both a large loss in profits and also decrease the probability of entry substantially. The retailers' change in entry strategy is not able to offset the loss in profits from competing retailers entering nearby. In fact, in the case of large retailers such as big box stores – Costco, Walmart, Target –, the landlord is already likely internalizing the spillovers to nearby stores. Since, as shown in Figure 4, big box store rents are already quite low (relative to marginal costs) for in the observed equilibrium, a counterfactual without exclusive dealing results in fewer big box stores and

Table 6: Entry Probabilities by Geography for 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.

fewer profits. The decline in profits is likely due to the fact that the landlord cannot commit to an implicit exclusive dealing contract. In contrast, retailers like Jewel Osco (Safeway), Mariano's (Kroger), and Aldi, are able on average to change retail entry strategies to mitigate the loss in profits. These grocers enter less and change which locations they enter in response to the exclusive dealing ban. Co-locating stores see have slightly higher profits and increase their probability of entry when exclusive dealing is banned. These retailers benefit from a counterfactual world where landlords cannot contract on exclusivity. The intuition is that in locations where retailers enter, the co-locating stores will enter as well. In locations where retailers no longer enter, there still may be some demand for the smaller and cheaper co-locating stores.

The percentage change in landlord profitability is shown in Table 8. 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.

7.2 Effect of Exclusive Dealing on Consumers

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

Table 7: 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.

Table 8: Counterfactual Profitability For Landlords (Percent)

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

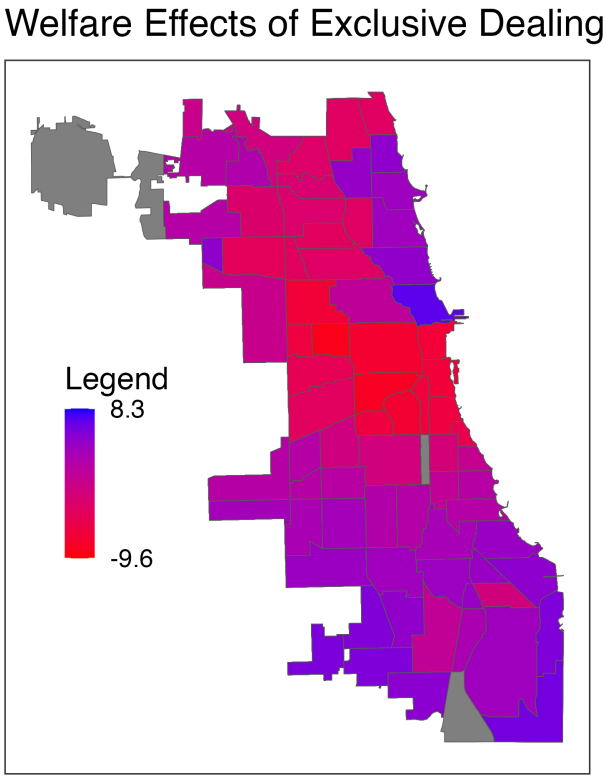
Notes: Counterfactual: average percent change in profits for landlords, averaged across each markets. Table shows Counterfactual - Observed.

$$\mathbb{E}_{\epsilon_{ib}}\left[CV_i\right] = \frac{1}{I}\sum_i \left(\frac{1}{\alpha^m}\left[\ln\left(\sum_{b\in\mathcal{B}}\exp\left(u_{ib}(P_b^0, d_{ib}^0, \phi)\right)\right) - \ln\left(\sum_{b\in\mathcal{B}}\exp\left(u_{ib}(P_b^{cf}, d_{ib}^{cf}, \phi)\right)\right)\right]\right) \tag{6}$$

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

Table 9 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.

Figure 8: Gain in Consumer Welfare From Exclusive Dealing



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

Table 9: 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.

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

We show the long run effects of an exclusive dealing ban across Chicago in Figure 8. Variation in the consumer welfare is a result of variation in the distances to retailers, prices that change for each income group, and consumer demographics. The effects vary within and across neighborhoods, with the most negative effects of exclusive dealing in Chicago in wealthier areas around the downtown, and the most positive effects of exclusive dealing in South Chicago, an undeserved area. Key to the effect is that in South Chicago, there is essentially no entry and there is some exit, which eventually leads to food deserts. In a back-of-the-envelope calculation, we find that the percentage of people living in food deserts would increase by 10-15 percentage points as a result of a total long-run ban on exclusive dealing.

8 Conclusion

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

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

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

This paper makes three conceptual points that are relevant for policy. First, the paper studies a type of non-compete in the land market, highlighting the heterogeneous effects on welfare and profitability. Second, the paper contributes to the policy debate on government intervention in local retail markets, in particular, government intervention which attempts to increase food access for under-served households or pay retailers to encourage entry to

revitalize a neighborhood. This paper highlights the role of the landlord, in particular, that the landlord already internalizes some of the benefits and spillovers of retailer entry. Third, this paper highlights the role of exclusive dealing in limiting the creation of food deserts.

References

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.

Bayer, Patrick, Fernando Ferreira, and Robert McMillan, "A Unified Framework for Measuring Preferences for Schools and Neighborhoods," *Journal of Political Economy*, 2007, *115* (4), 588–638.

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.

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.

_ , _ , and _ , "Differentiated products demand systems from a combination of micro and macro data: The new car market," *Journal of Political Economy*, 2004, *112* (1), 68–105.

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.

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.

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.

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.

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, Paul B., Sanjog Misra, and Harikesh S. Nair, "Repositioning Dynamics and Pricing Strategy," *Journal of Marketing Research*, 2012, *49* (6), 750–772.

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.

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.

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.

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

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

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.

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.

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.

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.

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, 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.

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.

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.

9 Figures

Figure 9: Numerator Definitions

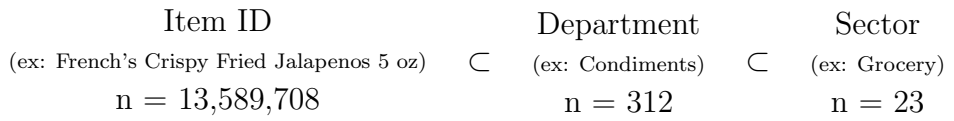
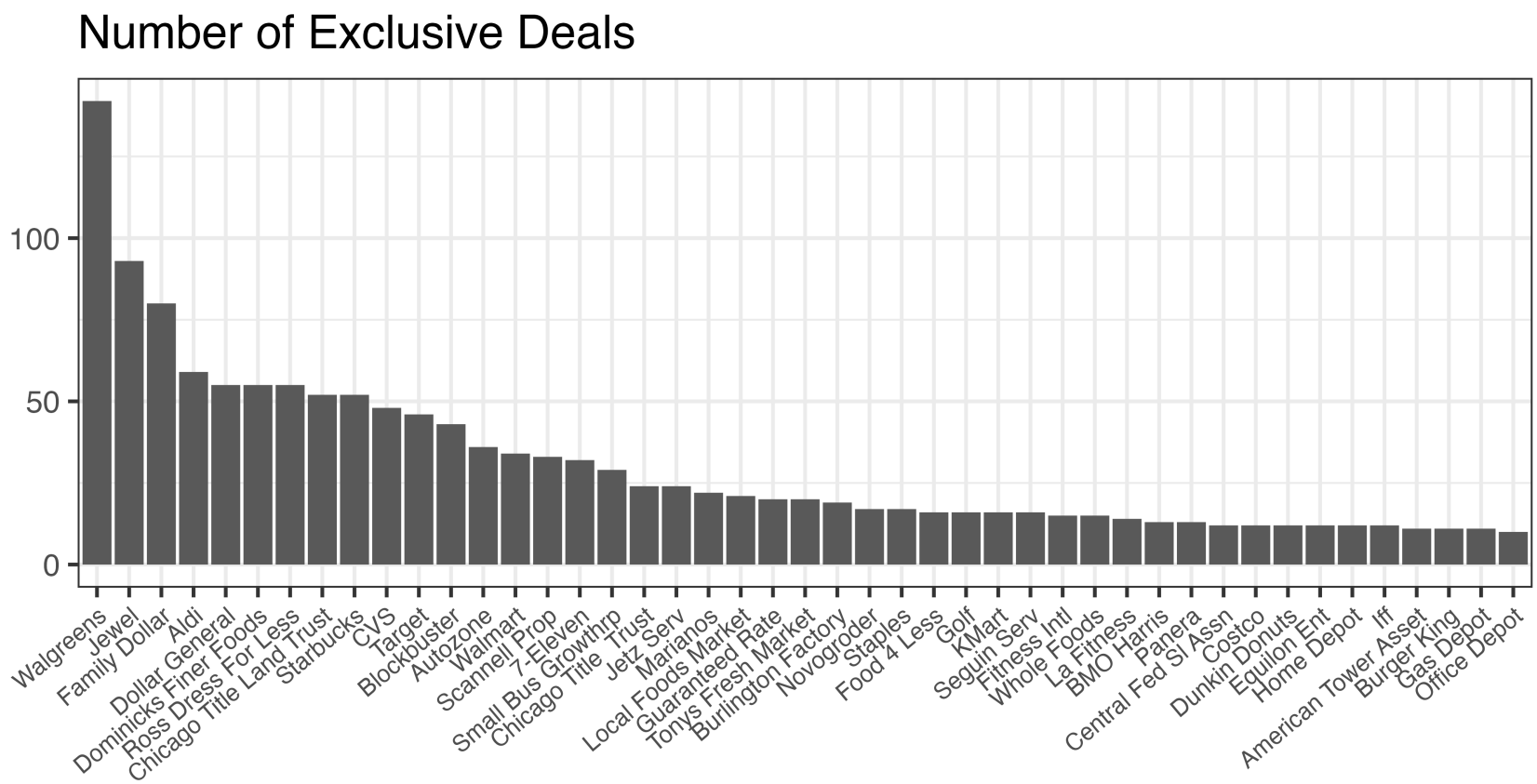


Figure shows three of the levels of aggregation in the Numerator data. This figure follows a similar figure in Handbury (2021). On a trip, a consumer purchases a set of individual items recorded at the barcode level, called Item ID's, that comprise the individual's basket of purchases for that trip. Numerator data classifies items in to several categories, broader and broader categories. Figure 9 shows these categories. For example, a single item "French's Crispy Fried Jalapenos 5oz", belongs to a larger category of goods that are similar to the consumer but might be quite different in terms of content. These categories are then grouped into larger departments, which are itself grouped into larger groceries.

Figure 10: Retailers with the Most Number of Exclusive Dealing Contracts

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

Figure 11: Retailers with Exclusive Dealing Contracts



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

Figure 12: Contents of Exclusive Dealing Contracts

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

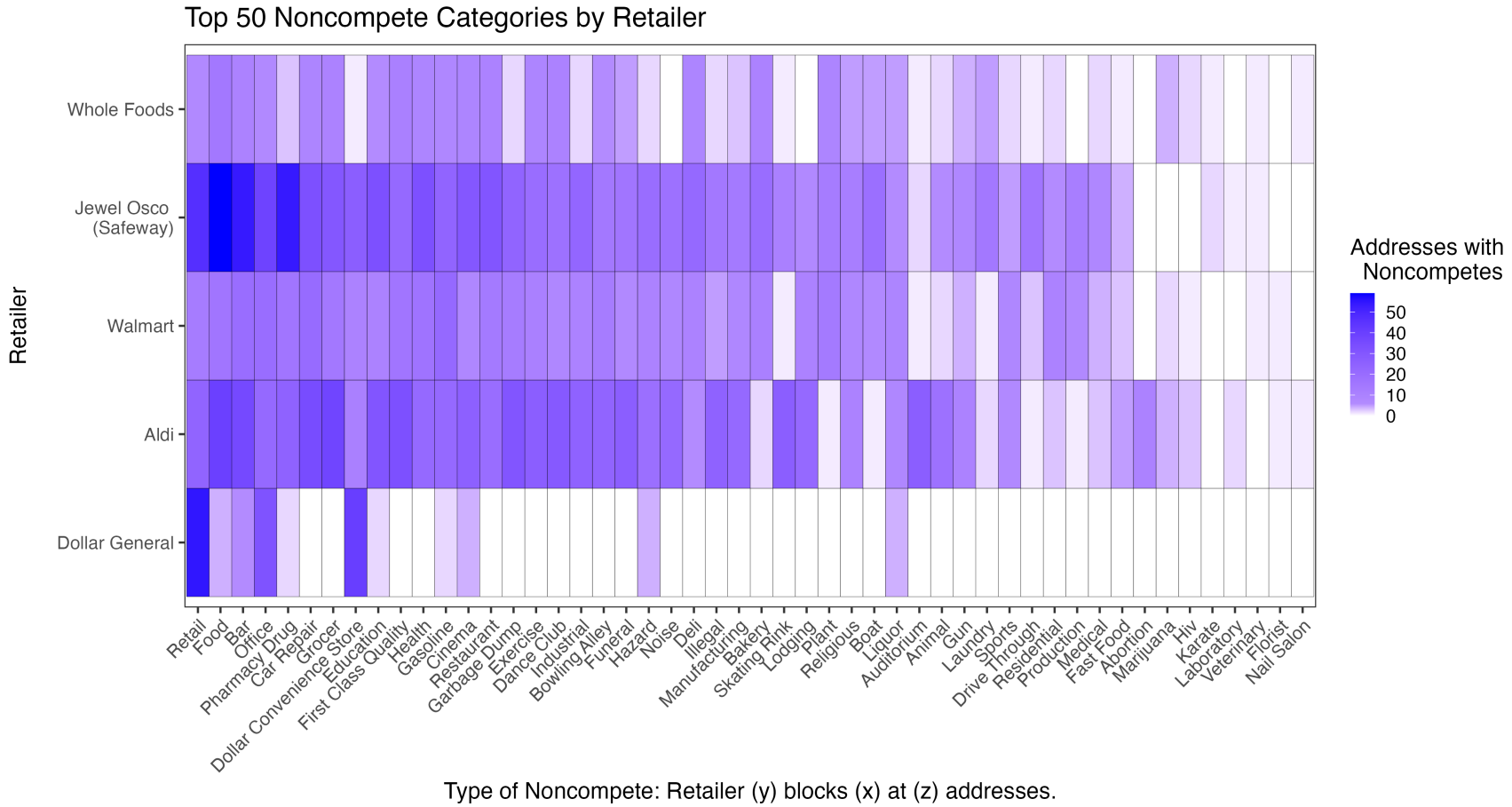


Figure 14: Contents of Exclusive Dealing Contracts: Variation Across Drug Store Chains

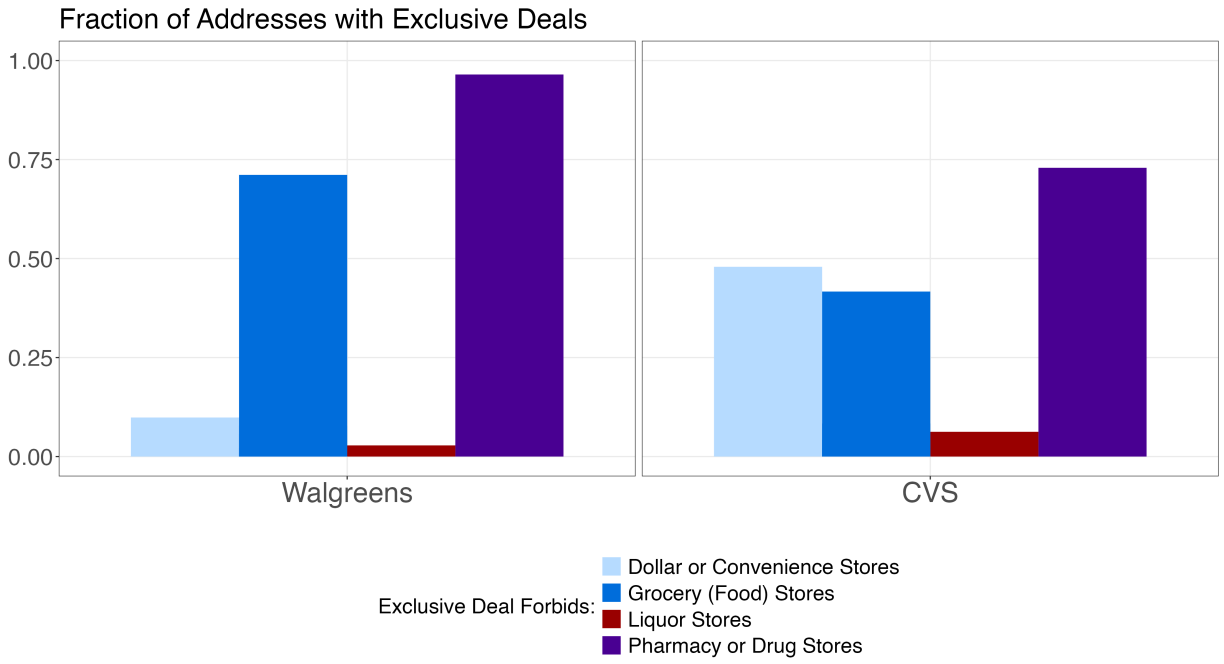


Figure 15: Contents of Exclusive Dealing Contracts: Variation Across Drug Store Chains

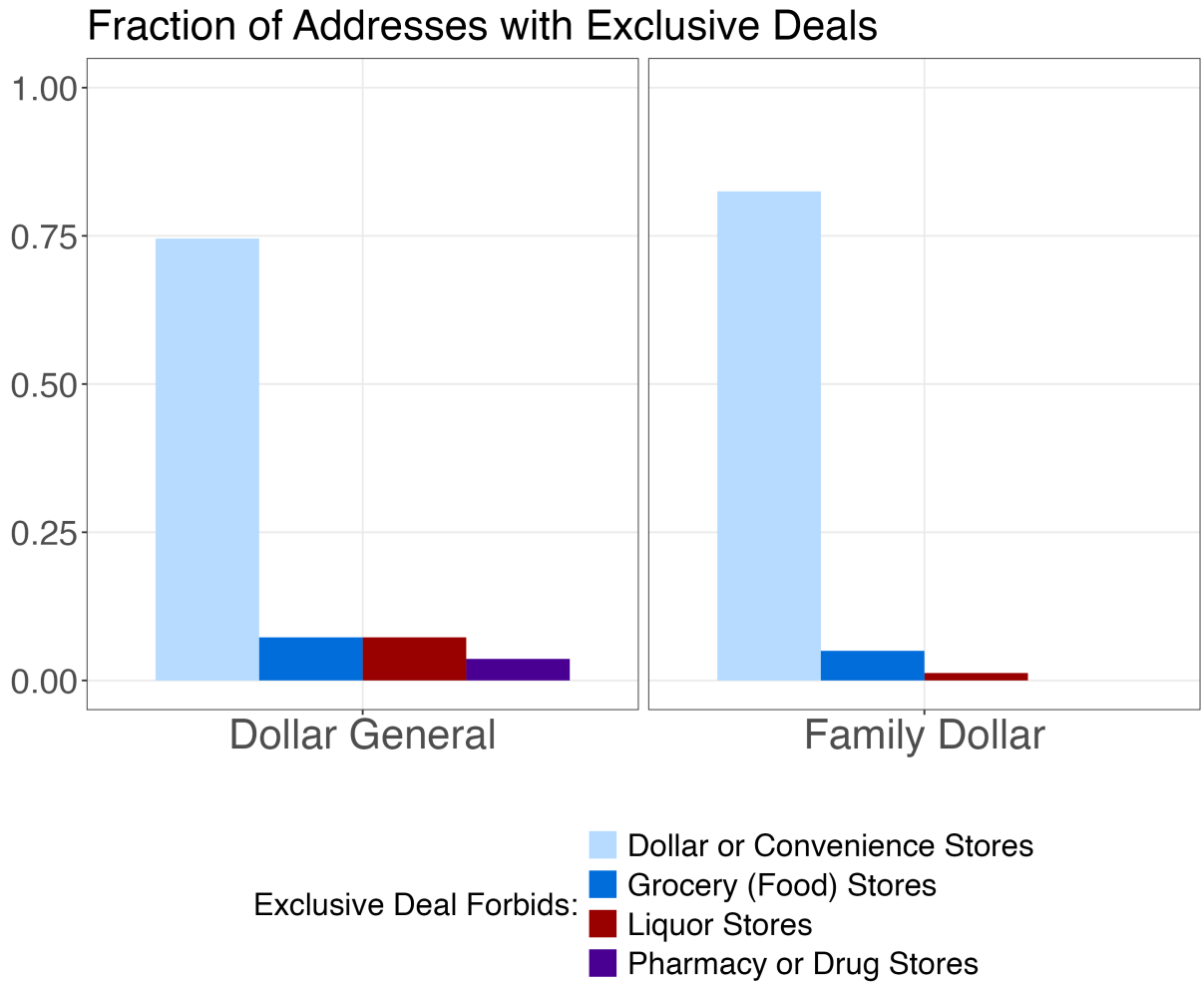
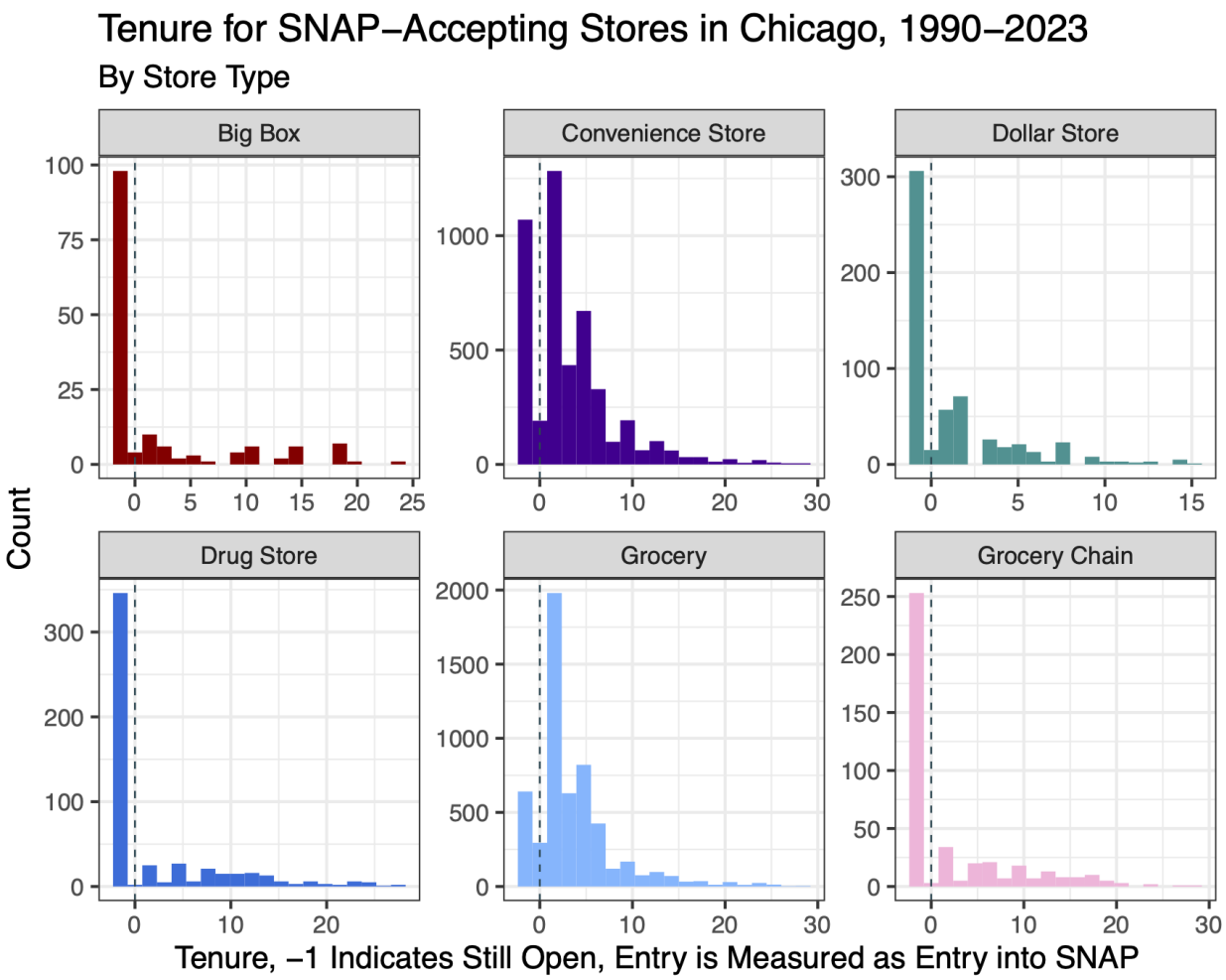
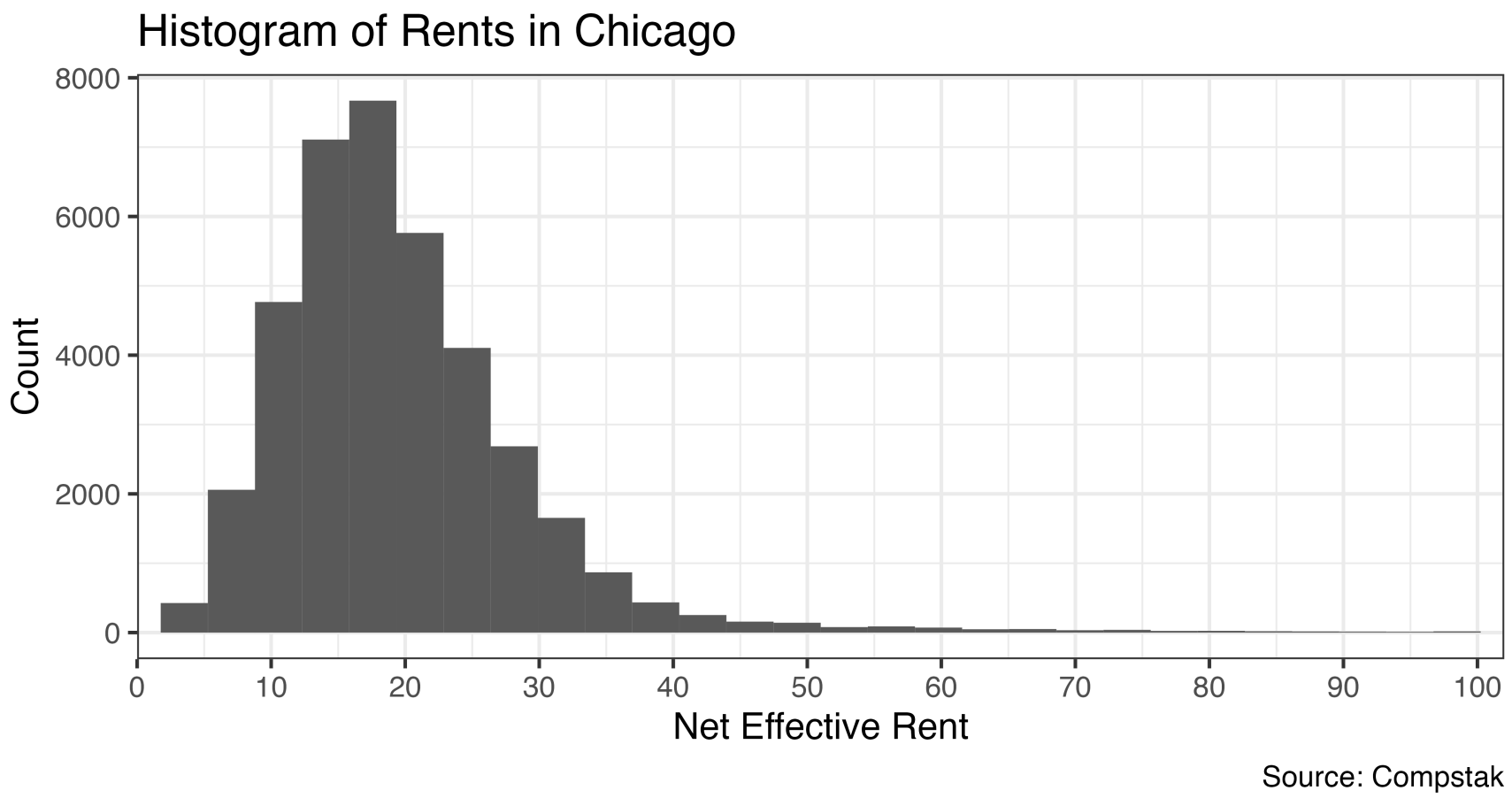


Figure 16: Grocery Store Tenure: Age of the Retailer Location When it Closes



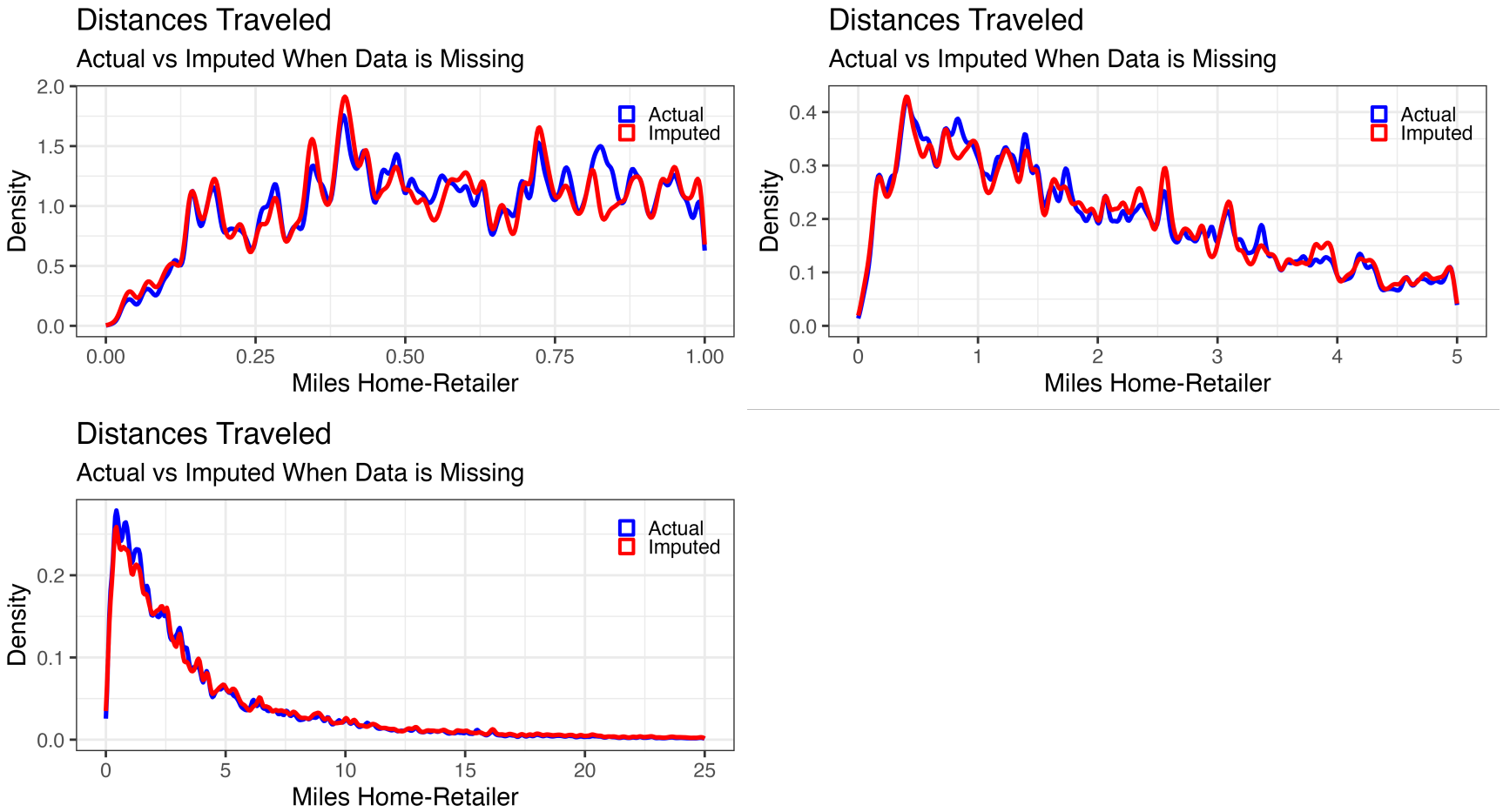
Source: SNAP Retailer Database. Figure plots the number of years each store stays open by store type. At x = -1 is the mass of stores that has not yet closed. The vast majority of chain grocery stores or big box stores do not close over the time period. Each row represents a different city, and each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

Figure 17: Rental Prices in the Data



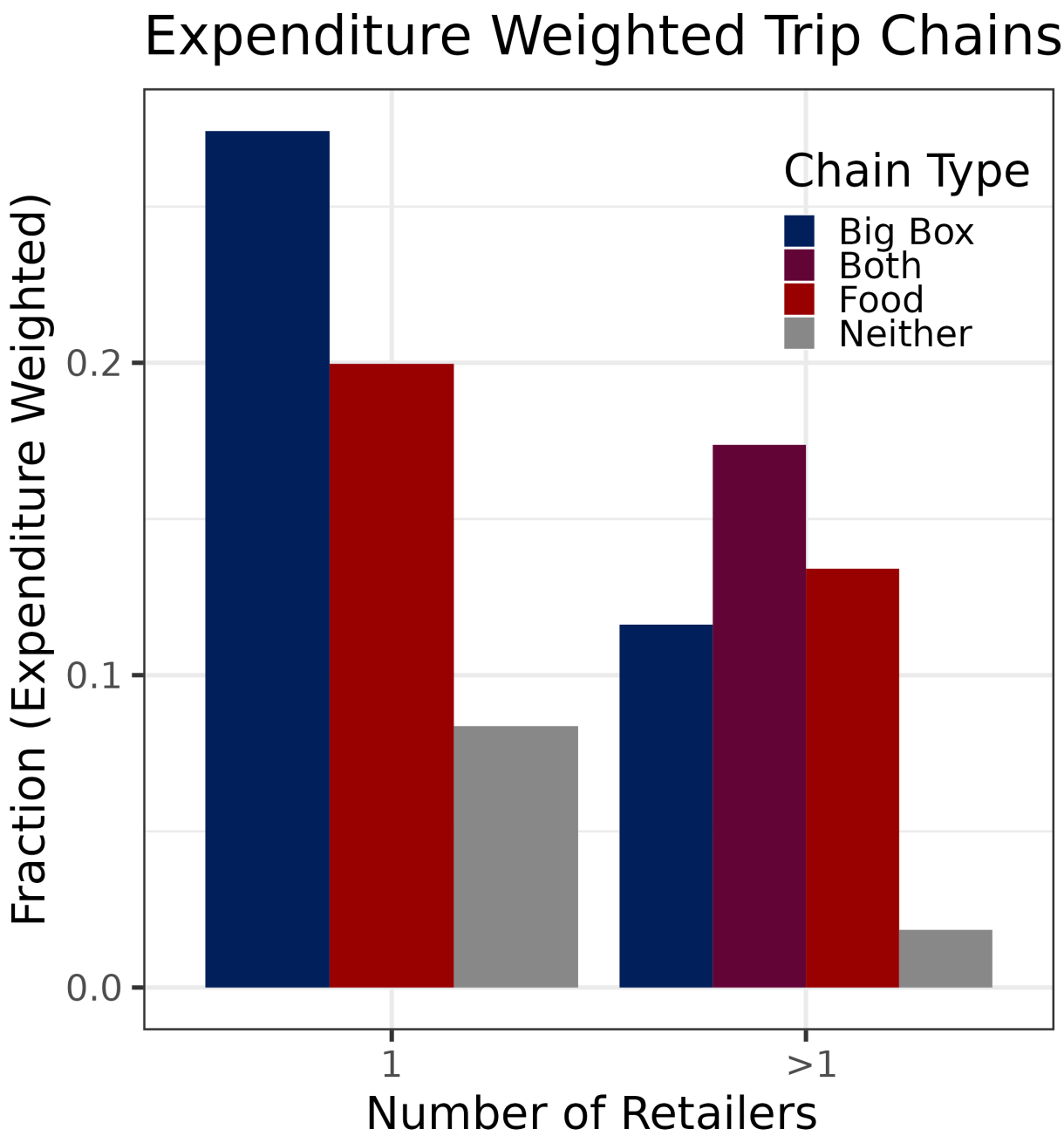
Source: Compstak. Histogram of rental prices in the Compstak data.

Figure 18: Comparing Observed and Imputed Distances Traveled to Retailers



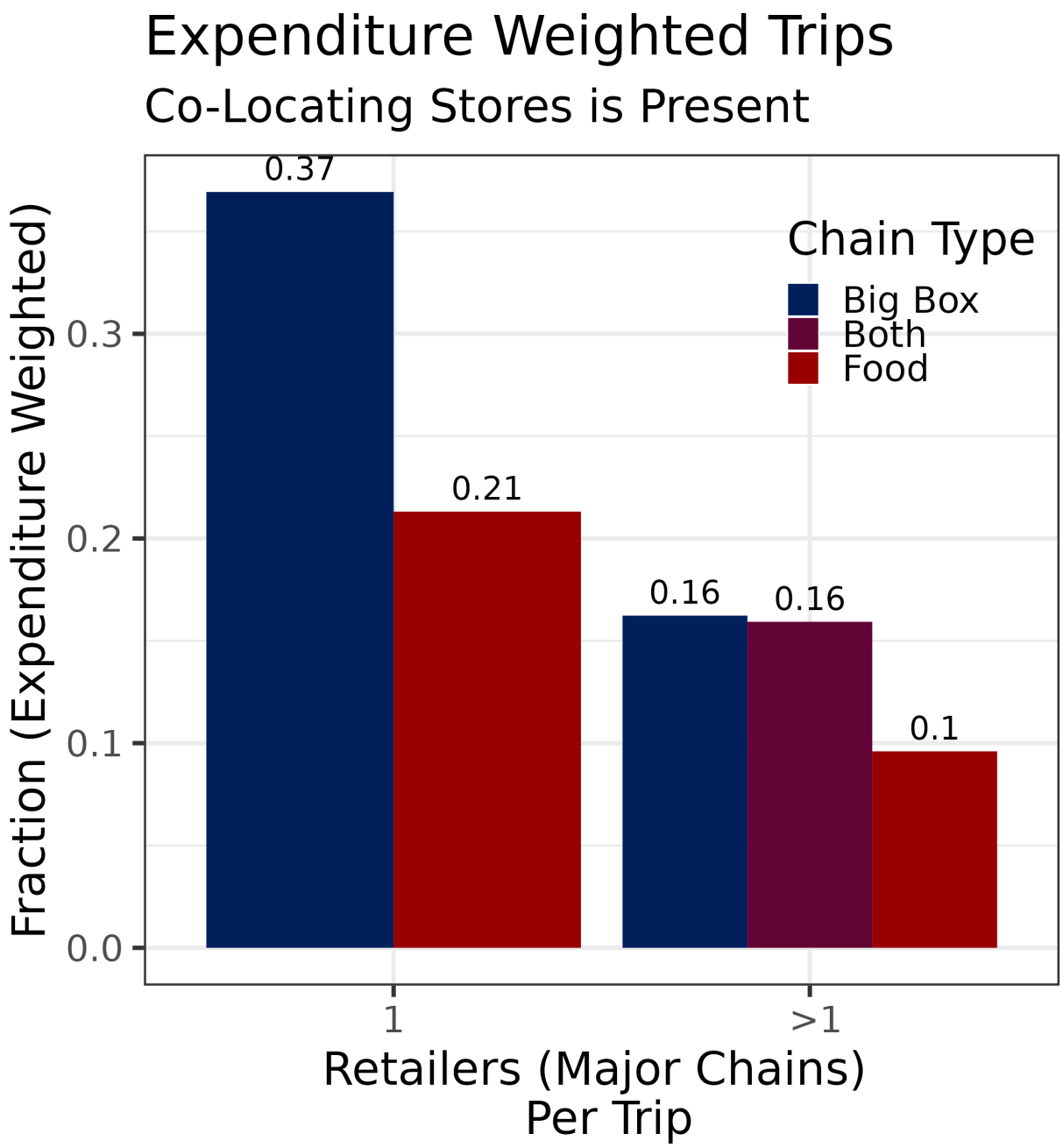
Source: Numerator. Comparison of actual distances traveled versus imputed distance traveled when the data on store locations are missing for distances between (a) 0-1 miles, (b) 0-5 miles and (c) 0-25 miles. When the store location is not available, the distance is imputed by assuming the consumer goes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

Figure 19: Multi-Homing



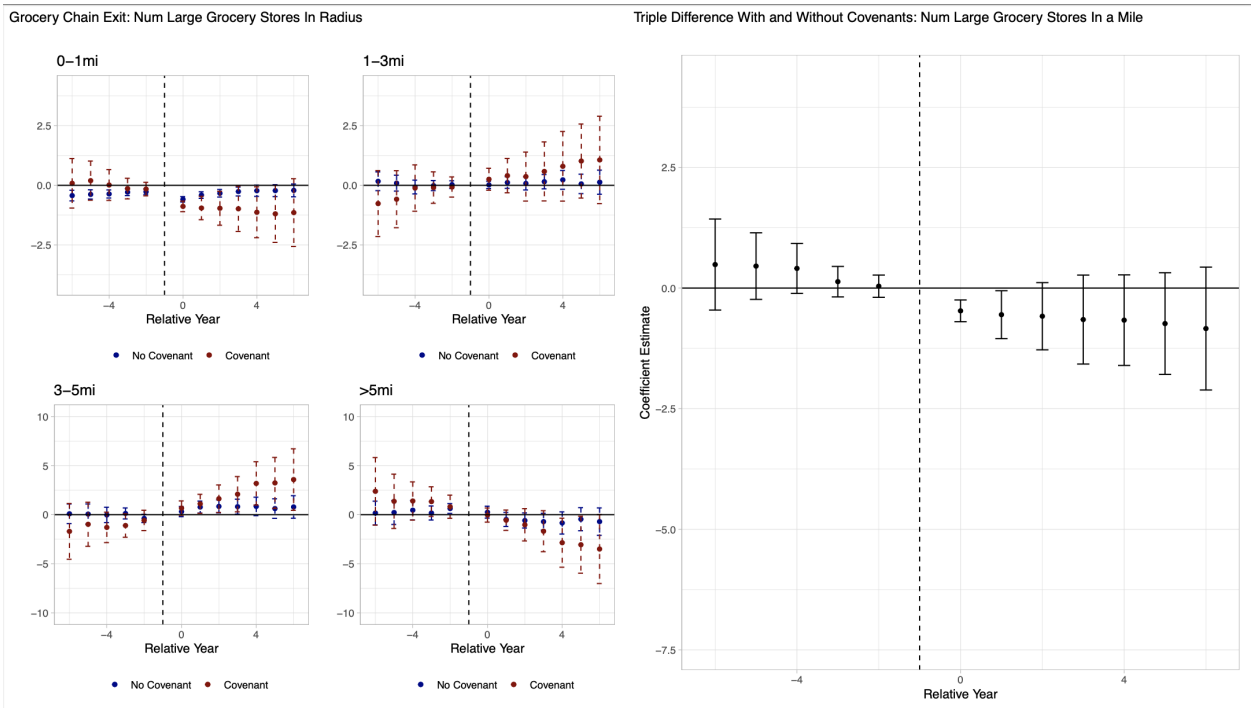
Source: Numerator. Figure shows prevalence of multi-homing or shopping at more than one store in the same day, broken down into store type categories.

Figure 20: Multi-Homing with Large Retail Chains when Co-Locating Stores Are Present



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

Figure 21: Number of Grocers

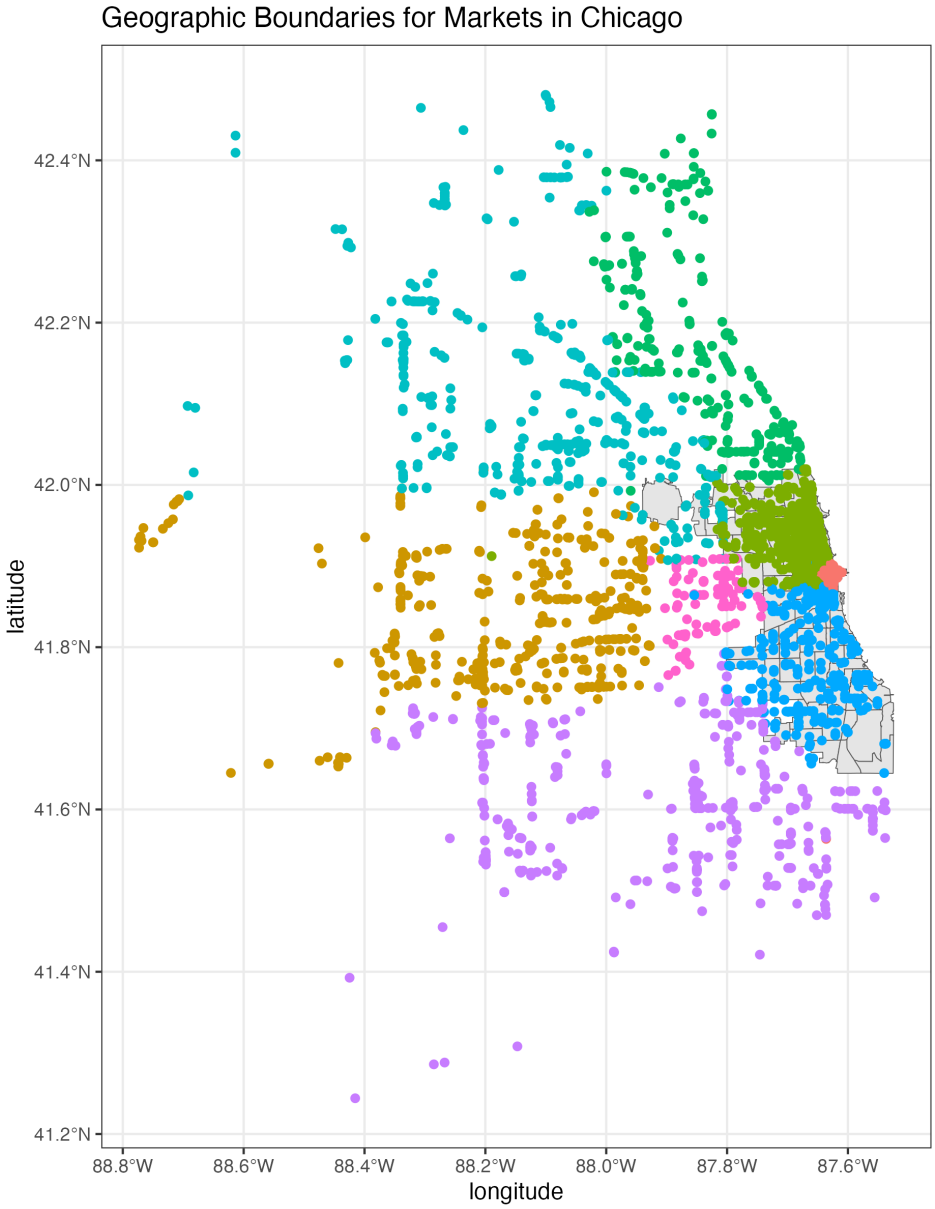


Notes: Figure shows an event study regression where the event is grocery exit and the outcome is grocery count, by exclusive dealing status. The grocer did not have an exclusive dealing contract (blue) and did have an exclusive dealing contract (red). The control group are chain stores that also exit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

Figure 22: Exclusive Dealing Contracts and Demand Estimate Complementarites

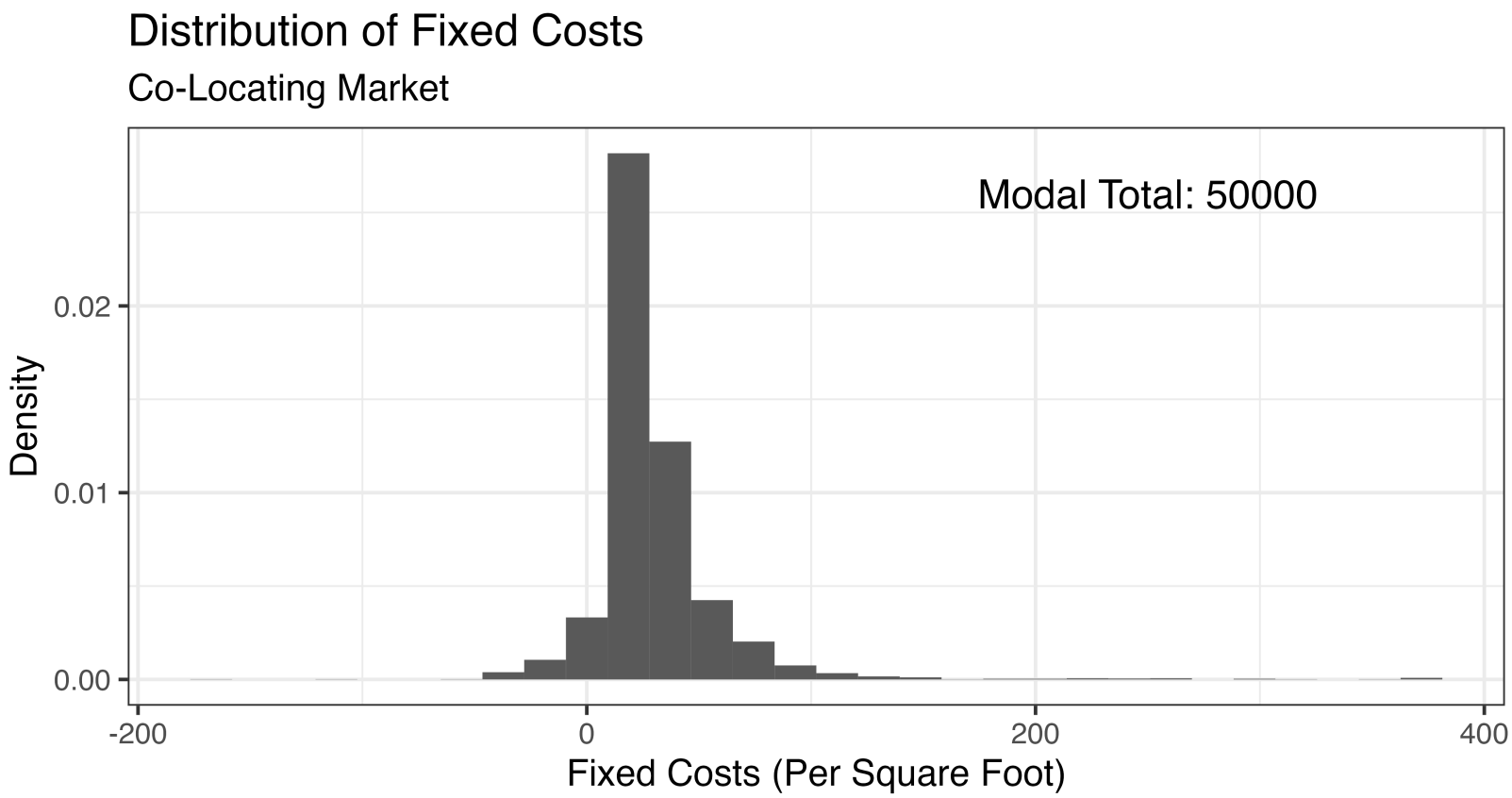
Source: Numerator and Cook County Recorder of deeds. Figure overlays blocking patterns from exclusive dealing contract and product demand estimates.

Figure 23: Markets in Chicago: Available Retailer Locations 2000-present



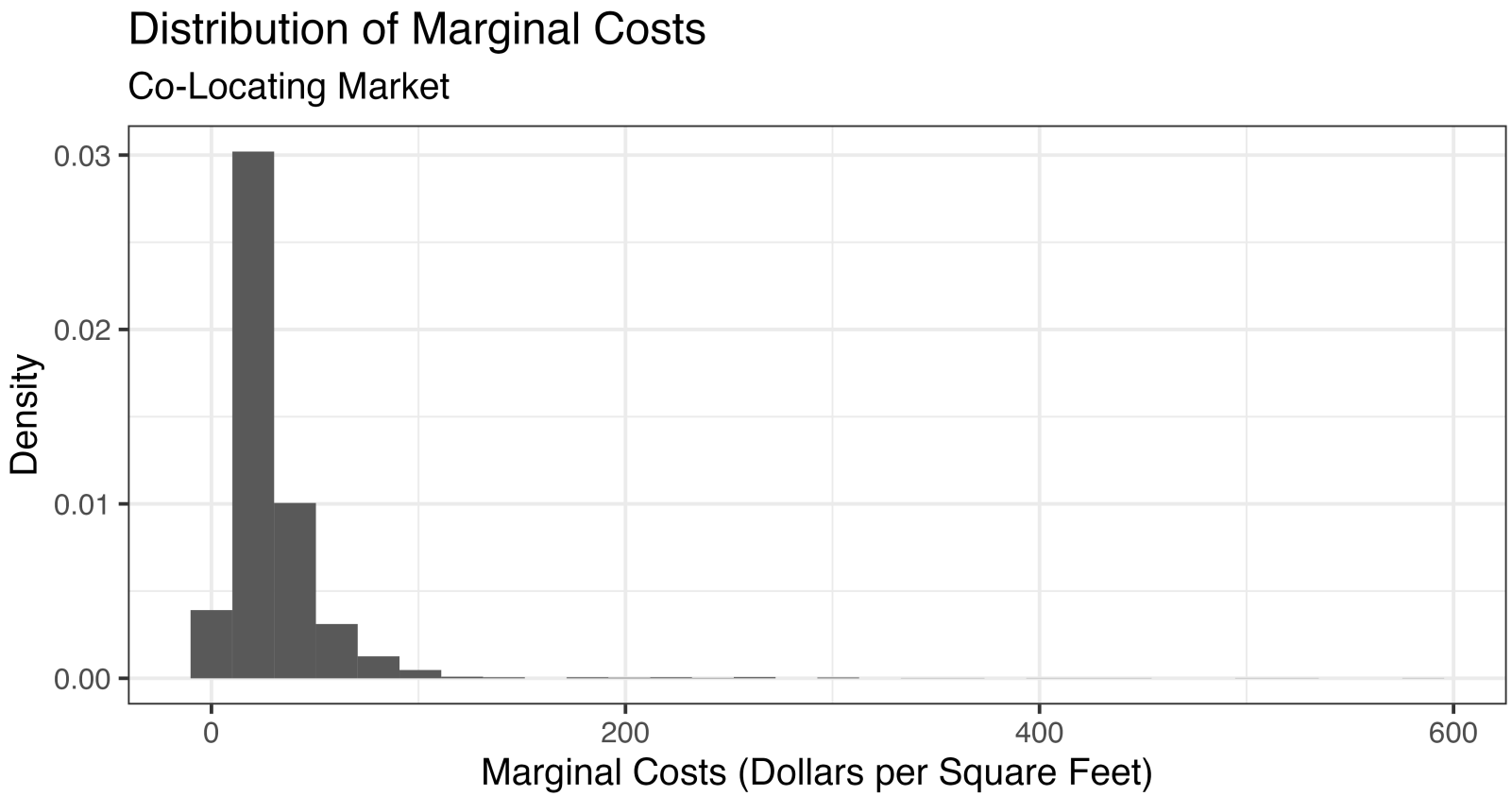
Source: Compstak. Data shows the total potential locations for all retailers (retailers and co-locating stores) in the analysis. The potential locations are colored by different markets. The boundaries are defined to minimize the probability a consumer shops across boundaries, from data and conversations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

Figure 24: Fixed Costs, Co-Locating Market



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

Figure 25: Marginal Costs, Co-Locating Market



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

10 Tables

Table 10: 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 11: 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 12: Subset of Exclusive Dealing Data

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

Table 13: Exclusive Dealing Observed in Chicago

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

Table 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	20.02
5th percentile	8.10
25th percentile	13.65
Median	18.07
75th percentile	23.80
95th percentile	35.32

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

Table 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

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

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

Table 18: Hedonic Price Regression

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

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

Table 19: 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 20: 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 21: 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 22: 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 23: 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 24: 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.