Competition and Organizational Form Choice: Evidence from Fast Food Chains *

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Abstract

The majority of franchise firms employ a dual distribution strategy: a share of the outlets are owned and operated by franchisees, which are entrepreneurs bound to the franchise firm by contractual agreement, while the rest are owned by the franchise firm outright and operated by employed managers. This organizational form choice has potential consequences for firm performance, investment and consumer welfare, since economic theory suggests that employed managers have lower incentives to exert effort compared to franchisees. A large literature explores potential factors that may affect this organizational form decision. However, little has been written about the effect of product market competition on organizational form choice. I study this question empirically using data on fast-food chains in Germany. Reduced-form regressions reveal that a larger number of competitors positively correlates with outlets being manager-operated. To address the concern that unobserved market profitability may both affect the number of competitors and the organizational form decision, I employ a profit inequality approach that allows me to account for unobservable market characteristics. The results from the profit inequality approach corroborate that franchise firms rely more on employed managers in markets where there are many competitors.

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1 Introduction

Franchising describes a contractual arrangement where an entrepreneur licenses a companies trademark, as well as the right to use their business model for a limited period of time. Franchising has been extremely successful as a business model and employs over 8 million people in the US alone (International Franchise Organization, 2023). One of the most important sectors where franchising is extensively used are quick service restaurants.

The majority of fast food franchise firms employ a dual distribution strategy: a share of the restaurants are owned and operated by franchisees, while the rest are owned by the franchise firm outright and operated by employed managers. This paper empirically studies the effect of product market competition on this organizational form choice.

The two distribution strategies are characterized by a number of important differences. In the franchising case, an entrepreneur signs a franchise agreement with a franchise firm[1], which defines the conditions under which the franchisee can use the companies trademark, as well as the fees and the royalty rate (which is a share of revenue) that the franchisee has to pay to the franchise firm. In addition, franchise agreements often stipulate in some detail the way products have to be prepared, what the outlet should look like, and more generally lay out many terms that apply to the daily operation of the outlet. Apart from agreeing to the franchise terms, the franchisee also invests capital in the outlet, and takes on the managerial duties such as hiring and supervising staff, as well as setting prices. In contrast, for outlets that are manager-operated, the franchise firm incurs all the capital expenses, and an employee of the franchise firm manages the day to day operations that include hiring and monitoring staff. In general, managers are thought to have lower incentives to provide effort for two reasons: firstly, substantial rents are left for the franchisees Kaufmann and Lafontaine (1994), and secondly in addition to being incentivized by profit, franchisees are also incentivized by their ownership of the outlet (Brickley, Dark and Weisbach, 1991).

In order to explain why firms use franchising in the first place, scholars have considered several reasons. Firstly, capital market imperfections may lead to firms using franchisees rather than banks for capital to expand their business. Secondly, firms may rely on the franchisees knowledge of local market conditions in order to make make profitable entry decisions. Lastly, franchising might be used for reasons of moral hazard - supervising many employed managers may be hard, and therefore giving those that manage the outlets strong incentives may be the most efficient way of ensuring that the manager is acting in the interests of the franchise firm. Consistently with the largest share of literature on franchising (Lafontaine, 2014 Brickley et al. (1991), Krueger (1991), Lafontaine (1993)), I will focus conceptually

[1]Throughout the paper, I will refer to the "franchisee" as the operator of franchise outlets, and "franchisor" or "franchise firm" as the owner of the trademark, and as such the firm that fees and royalty payments accrue to.

on a moral hazard framework, where the franchise firm has to monitor managers of company-owned outlets and provide incentives to both managers and franchisees to ensure the provision of effort.

The literature on franchising has explored many potential explanations why franchise firms employ dual distribution. Rubin (1978) considers monitoring costs as the main driver of dual distribution. Some units, will be cheaper to monitor than others, meaning they can be profitably operated by employed managers. Units that cannot be monitored as efficiently will be operated by franchisees, who are incentivized to exert effort through their profit share and not through monitoring. Minkler (1992) models the franchisee-franchisor relationship as an information problem, where the franchisees have location-specific knowledge, for example about local tastes, that allows them to operate more profitably than a centralized chain. Over time, the franchise firm might learn about local market conditions through franchisees, and use this knowledge to operate company-owned outlets. Gallini and Lutz (1992)) study the role of company-owned outlets as a signal of the brands quality that the franchise firms send in order to attract franchisees.

A second strand of the literature on franchising has studied which local markets are more suitable for franchisees or managers, given that a franchise firm employs dual distribution (see Lafontaine, Slade (2014) for a survey). The factors that are thought to be determinants of the organizational form decision include exogenous market characteristics, such as its distance to the franchise firms headquarter and local market risk, and outlet-specific characteristics, such as the outlets size and the relative importance of the franchisees and the franchisors effort. To the best of my knowledge, I am the first to study the role of competition on the organizational form choice of franchise firms. I find that in my empirical context, firms rely more on manager-operated outlets when there are more fast food chain competitors in the local market.

There are multiple reasons why organizational form might depend on the level of competition. Firstly, in markets with a lot of competition, returns to providing effort may be low (Raith, 2003), which means that the franchise chains optimally use the manager-operated organizational form to incentivize a lower level of effort (Brickley et al., 1991). Secondly, following the literature on franchising that emphasizes the role of local market knowledge (Minkler (1992). Gallini and Lutz (1992)), the fact that close competitors have already entered a market may be used as a signal for franchise companies that a given local market is profitable, leading them to be able to enter a market without relying on the franchisees local market knowledge. Thirdly, franchise firms may find it profitable to cluster manager-operated outlets closer together to decrease the cost of monitoring them (Rubin (1978)). If this is true, we may be more likely to find manager-operated outlets in urban areas where there is enough demand to support several outlets from the same chain, but where there are also more competitors. Lastly, franchise firms might favor manager operated restaurants in areas where restaurants of the same chain are spatially close in order to relax competition. If these restaurants were operated by independent

franchisees, they might find it profitable to compete intensely, leading to cannibalization without benefiting the franchise chain. These four channels would imply that franchise firms prefer to locate manager-operated outlets in markets with many competitors.

Conversely, franchise restaurants may be able to charge higher prices, and therefore make larger profits in markets with fewer competitors. Given that the literature shows, that franchise firms leave substantial rents to franchisees (Kaufmann and Lafontaine (1994)), franchise firms may want to enter these markets with manager-operated outlets in order to capture a larger share of the profits. Recent empirical literature (Ackermann, 2019, Ackermann, 2024) shows however, that manager-operated outlets are generally less profitable than franchise operated outlets.

On the whole, both the theory and the existing empirical evidence suggests that franchise firms should be more likely to enter using manager-operated outlets in markets with many competitors. My empirical approach will allow me to control for benefits from clustering manager-operated outlets close together, and reveals that even accounting for these effects, franchise chains use manager-operated outlets more in local markets with many competitors.

The question of how the optimal organizational form varies with respect to competition is closely related to the theory of optimal contracts with endogenous entry. Raith (2003), illustrates this problem using a model of spatial competition, where each firm consists of a principal and an agent. The principal offers the agent a linear contract consisting of a fixed salary and a piece rate that is based on the imperfectly observed effort level of the agent. He finds that the effect the number of competing firms in the same market on optimal incentive pay is ambiguous: 1) If there are many competitors because entry costs are low, this should lead to a lower optimal effort level and hence a lower piece rate. 2) If there are many competitors because the market is large, this should lead to a higher optimal effort level and a higher piece rate. 3) If substitutability increases (i.e. transport costs in the spatial competition model decrease), this leads to a decrease in the number of competitors and an increase in the optimal effort level and piece rate. While this model has received considerable attention in organizational economics and in studies about the effect of competition on executive pay (Fernandes, Ferreira, Winters (2018)), to my knowledge it has not been considered in the study of the organizational-form choice of franchise firms. In the context of fast food firms, I interpret a increase in the piece rate as consistent with a higher probability of franchising, consistent with Lafontaine (2014) and Brickley et al. (1991).

Raith (2003) shows, that market characteristics that are typically unobserved to the researcher such as entry costs and market-level substitutability changes the optimal contract that the principal should offer the agent by changing the extent of competition. However, the literature on franchising (Brickley et al., 1991, Rubin, 1978, Minkler, 1992, Gallini and Lutz, 1992. Lafontaine, 2014) also shows that these factors may influence the choice to franchise directly. This makes it challenging to assess the impact of competition on organizational form choice. To address this con-

cern, I build on the profit inequalities approach employed by Ellickson, Houghton and Timmins (2013).

Ellickson et al. (2013) study entry and competition of discount retail stores in the US. Their paper is part of a literature that emphasizes the economies of density, that large retail chains are able to exploit (Jia (2008), Holmes (2011)). These economies of density create a complex decision problem for retail chains: how profitable entering a local market is becomes a function of the competition in the local market, but also the effect of economies of density, as well as cannibalization as the new store may attract shoppers that would otherwise have gone to a close store of the same chain. The goal of Ellickson et al. (2013) is to quantify these different channels. Rather than estimating a dynamic game (Jia (2008), Holmes (2011), Igami and Yang (2016)), the estimation strategy of Ellickson et al. (2013) relies on a simple assumption: the entry choices of discount retail chains as observed are profit maximizing. Relying on prior work by Bajari, Benkard and Levin (2007) and Pakes, Porter, Ho and Ishii (2015), they model store profit using a reduced form equation that includes variables capturing local market competition as well as distance to the distribution center and headquarter. Then, they create a number of counterfactual entry scenarios (or "local perturbations"). By assumption, the chain profit under the counterfactual entry scenario must be lower than the profit given the observed entry decisions. Using a maximum score estimator, they then estimate the parameters of the reduced form profit function.

In my approach to estimating the parameters that determine organizational choice, I follow the same approach as Ellickson et al. (2013). I create counterfactual organizational form decisions, that by assumption lead to lower profits for the franchise firm. The flexibility of the profit inequality approach allows me to account for economies of scale that might arise from clustering each type of format. Using the profit inequality approach, I find that the observed organizational form choice pattern suggests that manager-operated restaurants are more profitable in high competition areas.

In addition to the literature of chain store entry that pioneered much of the econometric tools that I rely on, my work relates to the literature on firm entry by fast food chains. Toivanen and Waterson (2005) show in their influential paper that fast food chains are more likely to enter in markets where their main rival is already present. They attribute this to firms learning about market profitability through the presence of their rival. Igami and Yang (2016) use techniques developed to estimate dynamic games to study the entry dynamics of hamburger chains in Canada. They emphasize the importance of unobserved market-level profitability and show that both cannibalization and preemption play important roles in the evolution of market structure. In contrast to this literature, I will not be able to shed light on the dynamic evolution of market structure.

2 Empirical Setting and Dataset

In order to retrieve restaurant level information, I scrape the company websites of both McDonald's and Burger King in Germany[2]. On their respective websites, these franchise firms report for each restaurant the address, and the name of the restaurant operator (or in the case of a chain-operated restaurant the legal name of the franchise firm, e.g. "McDonald's Germany LLC"). For reference, I include a screenshot in the appendix (figure 2). I use this information to classify restaurants into chain-operated and franchisee operated restaurants and to retrieve spatial coordinates for each restaurant using their addresses and Google Maps. In addition, I use data on potential restaurant competitors from Open Street Map[3], as well as geospatial data on the borders of postcodes from ESRI[4] and demographic information at the postcode level from the German statistical office.

2.1 Market Definition

I define a local market as a post-code area. This definition has the advantage, that it captures likely differences in the size of the relevant local markets between urban and rural areas (see 4 for an illustration). Using this definition, many markets have neither a McDonald's or Burger King in them. For the empirical analysis, these markets will not be considered. This leaves 1413 markets with at least one McDonald's or Burger King restaurant. Since I allow for the possibility that clustering manager-operated restaurants could entail economies of density beyond the local market, I need to define the area in which these economies of density could arise. To be consistent with the chosen market definition, I choose the two-digit postcode area as the definition for this region.

2.2 Descriptive Statistics and Reduced Form Evidence

I divide potential competitors into three different groups: chain fast-food restaurants, other fast-food restaurants and other restaurants. Chain fast-food restaurants are outlets belonging to restaurant chains that are active nationwide in Germany (see table **??** in the appendix for a list of the included chains). Other fast-food restaurants are all restaurants that are classified as "fast-food" by Open Street Map, but are not affiliated with any of the major chains. These restaurants include independent Turkish fast-food restaurants that are very popular in Germany. Lastly, "other restaurants" are all restaurants that do not fit the criteria of the chain fast-food or fast-food restaurants.

[2] The websites were accessed between 6.4.2021 and 1.6.2021

[3] https://www.openstreetmap.org

[4] https://opendata-esri-de.opendata.arcgis.com/datasets/5b203df4357844c8a6715d7d411a8341_0/explore?location=49.753977%2C6.622704%2C13.58

Variable	N	Mean	Std. Dev.	Min	Pctl. 25	Pctl. 75	Max
Area (ha)	1115	12387.48	16505.24	175.58	2294.57	16536.39	226697.74
Chain Restaurants	1115	0.85	1.72	0	0	1	18
Other Fast Food	1115	9.14	8.46	0	3	12.5	52
Other Restaurants	1115	21.35	19.13	0	9	27	190
Population	1115	20144.61	9912.73	8	13365	25488	55073

Table 1: Market-level summary statistics

Market level summary statistics (table 1) reveal that market level competition is heavily skewed. Out of 1115 postcode areas with at least on McDonald's or Burger King restaurant in it, most do not have a restaurant of a fast-food chain competitor. Similarly for other forms of competition, the average market has 10 other fast food restaurants and 21 restaurants, while the markets with the maximal number of fast-food restaurants and other restaurants have 52 and 190 restaurants respectively. Similarly, markets vary a lot in size, both when measured in terms of area and population. The large variance captures that McDonald's and Burger King restaurants are present in both urban areas, as well as at highway service stations, where the corresponding postcode areas might be very large and sparsely populated.

	BK Franchise			BK Manager			McD Franchise			McD Manager		
Variable	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
Population	561	20373.75	10556.89	98	21432.09	9086.28	1166	20089.43	10045.01	77	18359.31	10945.95
Avg. Income	561	23918.67	2923.89	98	22258.45	1649.33	1166	23719.44	2890.4	77	25065.29	3570.93
Market Area (ha)	561	10149.48	12404.2	98	17597.3	25177.04	1166	12063.47	16310.19	77	7105.34	10085.06
# of ff-chain rest.	561	1.11	2.16	98	1.11	2.3	1166	1.05	2.03	77	2.74	4.06
# of other ff-rest.	561	10.18	9.3	98	10.01	8.33	1166	9.98	9.44	77	12.23	11.49
# of other rest.	561	23.42	21.64	98	19.07	19.84	1166	22.93	21.52	77	27.81	27.45
# of cafes	561	9.03	10.64	98	7.72	9.63	1166	9.06	10.65	77	10.91	12.35

Table 2: Summary statistics by chain and organizational form

The sample of restaurants is composed of 1902 restaurants, with 1166 McDonald's franchise restaurants, 77 McDonald's manager-operated restaurants, 561 Burger King franchise restaurants and 98 Burger King manager-operated restaurants. By account of these raw numbers, McDonald's relies less on manager-operated restaurants than Burger King. The summary statistics by chain and organizational form (table 2) show that the markets that are served by both chains and their organizational forms are mostly similar in terms of population, income and market area. While McDonald's manager operated restaurants seem to be located in markets with higher competition than their franchise counterparts, this pattern does not seem to hold for Burger King.

Plotting population against the number of restaurants (figure 1) reveals, that population does not seem to be a primary driver for the number of restaurants in a market. The pattern is similar across subfigures A and B, which plot the number of chain fast-food restaurants and fast-food restaurants against market popula-

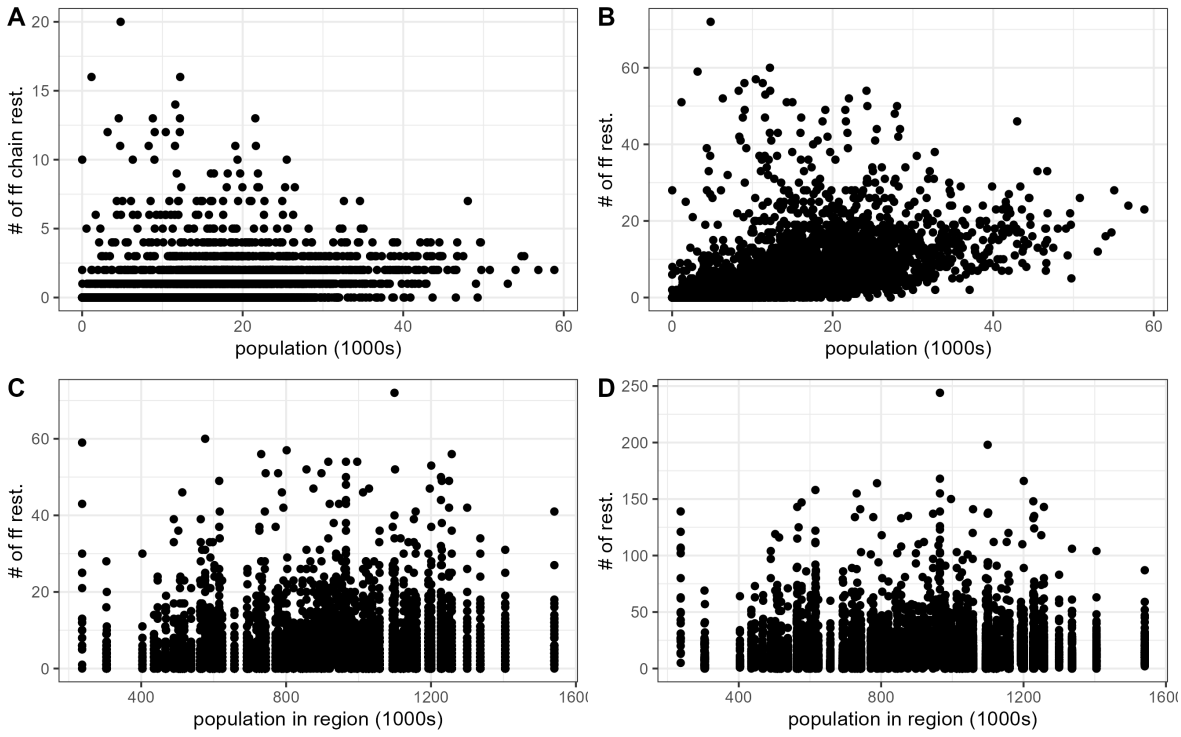

Figure 1: Correlation between number of restaurants and population

tion respectively. Subfigures C and D plot the number of fast-food restaurants and restaurants against regional population. Regional population here is defined as the population living in a two digit postcode area. The fact that market (i.e. postcode) or regional population do not seem strongly correlated with the number of chain fast-food, fast-food or ordinary restaurants suggests that consistently with the literature, unobserved factors contribute a lot to the profitability of a market. This motivates my empirical strategy which enables me to difference out market-level fixed effects.

Finally, I estimate a logistic regression, where the dependent variable is equal to one if a restaurant is operated by a manager. The estimated coefficients (table 3) show, that the number of chain fast-food restaurants in the same market correlates positively with using a manager to operate a restaurant. For the purpose of these regressions, the variable "# of chain comp. restaurants" includes Burger King restaurants if the focal observation is a McDonald's restaurant and vice versa. The number of same chain restaurants in the same market, and the number of same chain manager-operated restaurants in the same region appear to be important determinants of organizational form choice. In line with the intuition form the literature, restaurants in markets with more competitors are more likely to be manager-operated. Proxies for market size, such as market population, income, the interaction of income and population or regional population weakly correlate with the organizational form decision. However, these results cannot be interpreted causally:

unobserved market heterogeneity may drive the organizational form choice, which is why an approach that deals with market-level unobserved heterogeneity explicitly is necessary.

Table 3: Logit Regression Results

	Dependent variable:		
	Manager dummy		
	(1)	(2)	(3)
# of chain comp. rest.	0.223*** (0.060)	0.218*** (0.060)	0.219*** (0.060)
# of same chain rest.	−0.315** (0.156)	−0.306** (0.156)	−0.322** (0.157)
# of manager rest. in reg.	0.500*** (0.042)	0.499*** (0.042)	0.503*** (0.042)
# of other FF-rest.	0.003 (0.016)	0.002 (0.016)	0.001 (0.016)
# of other rest.	−0.018*** (0.007)	−0.018** (0.007)	−0.018*** (0.007)
Population (1000)	0.007 (0.010)	0.102 (0.084)	0.101 (0.083)
Income	0.0001 (0.00003)	0.0001* (0.0001)	0.0001* (0.0001)
Income x Pop. (100 000)		−0.0004 (0.0004)	−0.0004 (0.0003)
Region Pop.			−0.00000 (0.00000)
Dist. to HQ	0.002*** (0.001)	0.002*** (0.001)	0.002*** (0.001)
McDonald's dummy	−0.855*** (0.183)	−0.860*** (0.183)	−0.870*** (0.184)
Constant	−4.651*** (0.978)	−6.490*** (1.870)	−5.865*** (1.906)
Observations	1,902	1,902	1,902
Note:			*p<0.1; **p<0.05; ***p<0.01

3 Conceptual Framework

I consider the location and organizational form decision as a full information static entry game. The players are the two franchise firms, McDonald's and Burger King. I do not model the entry decisions of franchisees, but rather assume that if there is a geographical market that McDonald's or Burger King want to enter using the franchise organizational form, there exists a potential franchisee that is willing to invest and operate the restaurant. The decision of where and with which organizational form to enter is therefore fully up to the franchise firm.

In keeping with much of the literature on firm entry, I do not have information on prices, quantities, detailed store characteristics or costs. Therefore, in order to estimate the effect of competition on organizational form choice, I specify a reduced form profit function where restaurant-level profit is a function of local market-level observable variables. Therefore, I assume that each restaurant's profit function is

known up to a vector of parameters to model restaurant-level profits. In what follows, "profit" always refers to the profit that accrues to the franchise firm. A restaurant of a given chain can either be franchisee- or manager-operated. I index the organizational form choice between franchise and manager-operated by o and express profit of a restaurant of chain c under organizational form o in market i as:

$$\pi_i(o) = \underbrace{\alpha + \beta X_i' + \mathbb{1}(o = m)[\eta + \gamma X_i']}_{V_i^o} + \theta_i, \quad o \in \{m, f\} \tag{1}$$

In the above equation, β is a vector of coefficients that govern the influence of market characteristics on restaurant profits. The vector of observable market characteristics X_i contains the following variables:

- Distance to the chains headquarter
- Number of chain-competitor restaurants (includes Burger King restaurants if the focal restaurant belongs to McDonald's and vice versa)
- Number of same chain manager operated restaurants in market
- Number of same chain franchisee operated restaurants in market
- Number of same chain manager operated restaurants in region
- Number of same chain franchisee operated restaurants in region
- Population

The indicator variable $\mathbb{1}(o = m)$ takes the value 1 if a restaurant is manager-operated. As a result, the parameters η and γ capture the difference between franchising and manager-operated as the organizational form. The error term θ_i is a market-level effect, that is assumed to be observed by the firms, but unobservable for the econometrician.

Even though the reduced form analysis suggests that there are important differences between the two chains when it comes to their use of the manager- and franchise organizational form, I abstract from chain differences in this analysis for issues of computational complexity. In appendix 3, I detail how the profit inequality approach can be used to estimate the parameters of a chain-specific profit function, how the profit inequality approach can be used in the case with multiple formats even with data from just a single chain, and lastly how the profit function can be modified to include a format-specific market-level unobserved term.

While the focus of this analysis is analyzing the effect of competition on organizational form choice, it is important to recognize that the network structure of manager- or franchise-owned operated restaurants could have an effect on profitability as well. In total, the empirical approach accommodates five ways for organizational form choice to impact profits:

- **Direct Profitability Effect:** There are several ways in which organizational form may impact profitability directly. First and foremost, franchise firms capture the full profit margin from a manager operated restaurant, whereas they only receive a share of the profits from a franchise operated restaurant. While there are other ways for a franchise firm to extract profits from a franchise outlet, i.e. through fixed fees or higher prices on goods that franchisees purchase from the franchise firm, the literature suggests, that the rent that is left to franchisees is high (Kaufmann and Lafontaine, 1994). However, industry experts claim that in general, manager operated outlets are less profitable than franchise operated outlets. Important channels for this profit differential might be longer response time for service teams in case equipment fails[5]. Since the share of manager-operated restaurants is relatively small, I expect the second effect to dominate the first and the associated parameter η to be negative.

- **Number of competitors:** With the inclusion of this variable, I aim to test the hypothesis that franchise firms use manager-operated restaurants in high competition markets and franchisee-operated restaurants in markets where competition is less intense. In keeping with the reduced form analysis, I divide competitors into chain fast-food competitors, fast-food competitors, and other (i.e. standard restaurant) competitors. I expect the coefficients that govern the influence of competition on the profit of manager-operated restaurants $\gamma^{comp}, \gamma^{other-FF}, \gamma^{other-rest}$ to be positive, with the strongest effect for γ^{comp}, i.e. fast-food chain competitors.

- **Number of same-chain restaurants in market:** Franchise chains may realize economies of density at the market level, i.e. through more efficient servicing of equipment or savings from warehousing or deliveries. However, there may also be a revenue cannibalization effect. The overall effect is ambiguous.

- **Number of same chain franchise-operated restaurants in region/Number of same chain manager-operated restaurants in region:** I include this parameter to flexibly account for the economies of density that could arise at the region level. It may be cheaper for chains to monitor manager-operated restaurants if they are clustered together. This channel has been documented in the existing literature (Kehoe, 1996), and I expect the parameter $\gamma^{own-m-reg}$ to be positive. Franchised restaurants might realize similar economies of density, for example through joint marketing campaigns at the region level, since I they are less likely to cooperate as well as manager-operated restaurants, I expect the overall effect captured in $\beta^{own-f-reg}$ to be ambiguous.

[5] Based on an interview that I conducted with an executive for a large fast food chain in the German market.

4 Estimation Strategy

The estimation strategy closely follows Ellickson et al. (2013) - building on work by Pakes (2010), I treat the firms entry and organizational form decisions as the outcome of a one-shot entry game, where the observed decisions of each firm are profit maximizing. The one-shot nature of the game then allows me to consider deviations from the observed (and assumed to be optimal) strategy, assuming the decisions of competitors to be unchanged in order to construct the profit inequalities. Combining these inequalities across chains allows me to difference out the market fixed effects. To estimate the parameters of the profit function with these inequalities, I use the maximum score estimator (Fox (2007), Ellickson et al. (2013)).

To illustrate, consider an example of two markets: market A has a franchise-operated McDonald's restaurant, market B has no McDonald's restaurant, but a franchise-operated Burger King restaurant. To construct one profit inequality, we consider the observed entry and organizational form behavior of McDonald's and compare it to a hypothetical counterfactual:

$$\pi_A^{McD}(o = f) > \pi_B^{McD}(o = m)$$

using the restaurant-level profit function that we have defined in 1, we can rewrite this inequality as:

$$\alpha + \beta X_A^{McD} + \theta_A > \alpha + \beta X_B^{McD} + \theta_B + \eta + \gamma X_B^{McD}$$

which we can rewrite as:

$$\beta X_A^{McD} - \beta X_B^{McD} + \theta_A - \theta_B - \eta - \gamma X_B^{McD} > 0$$

The vector of market characteristics is indexed by McD, because it contains variables that are specific to the chain, such as the distance of the market to the *McDonald's* headquarter. As is, the parameters of the profit function cannot be identified, because the profit inequalities contain the market-level unobserved terms θ_A, θ_B. To remedy this, we can create an offsetting inequality for Burger King:

$$\pi_B^{BK}(o = f) > \pi_A^{BK}(o = f)$$

which subsequently becomes:

$$\beta X_B^{BK} - \beta X_A^{BK} + \theta_B - \theta_A > 0$$

Adding the two inequalities yields the following inequality:

$$\beta X_A^{McD} - \beta X_B^{McD} + \beta X_B^{BK} - \beta X_A^{BK} - \eta - \gamma X_B^{McD} > 0 \tag{2}$$

Combining the two inequalities yields a function that no longer contains the market-level unobservables. This example abstracts from economies of density at the region level. In this example, only the parameters that reflect the difference in profit function due to the manager-organizational form and chain-specific market level variables (in X^{McD}, X^{BK}) can be identified. Since each chain is assumed to only have a single restaurant in each market, the only chain-specific covariate that remains is distance to the headquarter.

To be able to estimate the parameters that relate to market-level interactions of restaurants and the economies of density, we aggregate profit at the region level. This way, "moving" a restaurant from one region to another not only changes profits because of different market characteristics, but also because it affects a different set of restaurants of the same chain (for simplicity, I omit the chain superscript from the expressions that follow):

$$\Pi_r(N_i^m + N_i^f) = \sum_{i \in r} \left[N_i^m V_i^m(X_i) + N_i^f V_i^f(X_i) + (N_i^m + N_i^f)\theta_i \right]$$

where $V_i^m(X_i), V_i^f(X_i)$ are the restaurant-level profits excluding the market-level unobservable effect θ_i for manager- and franchisee-operated restaurants respectively. Importantly, the vector of market characteristics *includes* the number of same-chain franchise- and manager-operated restaurants both at the market and the region level. The region-level profit for a chain is the sum of profits of restaurants of both organizational forms for all markets i in that are in the region r.

In order to construct the profit inequalities, I consider the sum of profits for two regions, $r1$ and $r2$. Because the observed entry and organizational form decisions are assumed to be profit maximizing, "moving" a restaurant from market j in region $r2$ to market i in region $r1$ is necessarily profit decreasing. As the entry game is assumed to be static, the number of competitor restaurants are held at their observed level. Constructing profit functions for the observed and counterfactual entry and organizational form choices leads to four possible profit inequalities per chain that I will exploit to recover the strategic parameters of the profit function:
manager$^+$-manager$^-$ inequality:

$$\Pi_{r1}(N_i^m, N_i^f) + \Pi_{r2}(N_j^m, N_j^f) > \Pi_{r1}(N_i^m + 1, N_i^f) + \Pi_{r2}(N_j^m - 1, N_j^f)$$

franchisee$^+$-franchisee$^-$ inequality:

$$\Pi_{r1}(N_i^m, N_i^f) + \Pi_{r2}(N_j^m, N_j^f) > \Pi_{r1}(N_i^m, N_i^f + 1) + \Pi_{r2}(N_j^m, N_j^f - 1)$$

manager$^+$-franchisee$^-$ inequality:

$$\Pi_{r1}(N_i^m, N_i^f) + \Pi_{r2}(N_j^m, N_j^f) > \Pi_{r1}(N_i^m + 1, N_i^f) + \Pi_{r2}(N_j^m, N_j^f - 1)$$

franchisee$^+$-manager$^-$ inequality:

$$\Pi_{r1}(N_i^m, N_i^f) + \Pi_{r2}(N_j^m, N_j^f) > \Pi_{r1}(N_i^m, N_i^f + 1) + \Pi_{r2}(N_j^m - 1, N_j^f)$$

After rearranging, the profit inequalities can be simplified. In particular, consider "moving" a McDonald's franchise restaurant from market i to market j (i.e. the *franchisee$^+$-franchisee$^-$* case):

$$\Delta V_{r1}^{McD}(N_i^f - 1) + \Delta V_{r2}^{McD}(N_j^f + 1) + (\theta_j - \theta_i) \geq 0$$

where $\Delta V_r(.)$ represents the change in the deterministic part of region-level profit associated with removing or adding a restaurant to that market. The other types of profit inequalities (*manager$^+$-manager$^-$*, *manager$^+$-franchisee$^-$*, *franchisee$^+$-manager$^-$*) yield similar expressions. The difference $\theta_j - \theta_i$ is the difference in profits captured by market-level effects, which contain variables observed by the firms but not the econometrician. In order to be able to estimate the strategic parameters, we now need to construct the offsetting inequality. We consider a "move" of a Burger King restaurant from market i in region $r1$ to market j in $r2$. This will lead to a similar inequality as above, only that the market level fixed effects will enter with opposite signs. Adding the two inequalities yields:

$$\begin{aligned}\Delta V_{r1}^{McD}(N_i^f - 1) + \Delta V_{r2}^{McD}(N_j^f + 1) + (\theta_j - \theta_i) + \\ \Delta V_{r1}^{BK}(N_i^f + 1) + \Delta V_{r2}^{BK}(N_j^m - 1) + (\theta_i - \theta_j) \geq 0\end{aligned}$$

This combination leads to the unobserved terms θ_i and θ_j being differenced out. This is the inequality that will be used for the estimation. Note that this procedure yields 16 different combinations of inequalities. Compared to the example in 4, there are now additional parameters that can be estimated:

At this point, the framework cannot rationalize that in practice, some of the inequalities may not hold. In keeping with EHT, I therefore introduce an additional market-pair specific error, v_{ij} so that we can express the above combined inequality as:

$$\Delta V_{r1}^{McD}(N_i^f - 1) + \Delta V_{r2}^{McD}(N_j^f + 1) + (\theta_j - \theta_i) + \tag{3}$$

$$\Delta V_{r1}^{BK}(N_i^f + 1) + \Delta V_{r2}^{BK}(N_j^m - 1) + (\theta_i - \theta_j) \geq v_{ij} \tag{4}$$

In line with the literature, I interpret this error as the effect on profits of the difference between the franchise firms expectations about the evolution of the exogenous market-level variables (such as population) and their realization. This error is specific to the pair of markets i, j such that it is not differenced out in the above procedure. This error is assumed to be median-independent of the realized values of all other variables.

4.1 Identifying Assumptions

The profit inequality approach relies on four main identifying assumptions. In keeping with EHT, I need to assume that some endogenous attributes of markets (such as the distance to the firms headquarter and the number of same-chain restaurants in the same market or region) are firm-specific. Other market attributes, such as the number of competitors are not assumed to be firm specific, which means that I am not able to identify their corresponding β parameter, i.e. the effect of these attributes on profit that is common across both franchise- and manager-operated firms. Secondly, I assume that the unobserved market-level factor θ_i is additively separable and the same across both chains and organizational forms. This assumption may be violated if part of the reason why franchise chains rely on franchisees is due to their superior knowledge of local market conditions. I show in appendix 3 how to accommodate a market-level organizational form specific unobserved term. Third, I assume that the noise term v_{ij} is median-independent of the market attributes. In line with EHT, I interpret this additional error as the difference in how exogenous market attributes (such as population) have evolved in the two markets. Fourth, I need to assume that the observed entry and organizational form decisions are indeed profit maximizing. The profit inequality approach does not work if franchise firms have other motives to use dual distribution, that would induce them to enter a market with a manager-operated outlet, even though using a franchisee would be more profitable. This may occur if franchise firms want to have direct control over some share of outlets in order to more effectively test new products and services. I abstract from this potential channel for reasons of computational complexity, even though it could in principle be accommodated in a profit inequality approach, where profits are aggregated at the chain level and the chain-wide number of franchise- and manager-operated outlets enters into the profit function. Finally, in order to establish point-identification, I again rely on the arguments of EHT, which in turn rely on the findings of Manski (1985) and Fox (2007): point identification requires at least on regressor with continuous support. As in EHT, I rely on the normalized distance to the headquarter to be this regressor.

4.2 The Maximum Score Estimator and Inference

I generate 3000 inequalities by drawing an equal share of the $manager^{+}$-$manager^{-}$, $franchisee^{+}$-$franchisee^{-}$, $manager^{+}$-$franchisee^{-}$ and $franchisee^{+}$-$manager^{-}$ inequalities. Since the number of manager-operated restaurants is much lower than the number of franchise-operated restaurants, manager-operated restaurants will be over-represented in these inequalities, which will help to identify the γ parameters.

I subsequently rely on the maximum score estimator outlined Fox (2007), maxi-

mizing the following objective function:

$$Q_n(\alpha, \beta, \eta, \gamma) = \sum_{a=1}^{n} \mathbb{1}[\Delta\Pi_a(\alpha, \beta, \eta, \gamma) > 0]$$

where $\Delta\Pi_a(.)$ represents inequalities as introduced in equation 4. In keeping with Fox (2007) and EHT, I normalize the parameter $\beta^{HQ} = -1$. For inference, I rely on subsampling as described in Delgado, Rodrıguez-Poo, and Wolf (2001) and Bajari and Fox, 2007. To create the subsamples, I use 100 draws of 750 inequalities sampled without replacement. Since the bounds of the 95% confidence intervals the correspond to the 98% and 2% quantile of the distribution of subsample estimates, the subsample confidence intervals are not necessarily symmetric around the point estimate.

5 Results

The results in table ?? have to be interpreted in comparison to the normalized parameter β^{HQ}. The subsample confidence intervals indicate that the majority of the parameters could not be precisely estimated. Apart from the parameter γ^{comp} that captures the influence of the presence of chain-competitor restaurants (including Burger King in the case of McDonald's and vice versa) on the profits of franchise operated restaurants, all other confidence intervals include 0. Consistent with the conceptual framework, the presence of chain competitors positively affects profits of manager-operated outlets. While not significant, the parameter that relate to economies of density are directionally in line with theoretical predictions too: $\gamma^{own-m-reg}$ is positive, indicating positive density effects from clustering manager-operated outlets in the same region. The parameter η is negative, suggesting that in line with the literature, manager-operated outlets are generally less profitable than franchise-operated ones. Finally, the parameter β^{own} is negative, suggesting that revenue cannibalization might be an important consideration for both manager- and franchise-operated outlets.

	Estimate	95% CIs
β^{HQ}	-1	[-1, -1]
β^{own}	-8.65	[-26.83, 9.53]
$\beta^{own-m-reg}$	-3.02	[-35.41, 29.36]
$\beta^{own-f-reg}$	-0.03	[-0.42, 0.36]
η	-78.1	[-172.82, 16.86]
γ^{HQ}	-4.39	[-20.98, 12.20]
γ^{comp}	20.96	[5.37, 36.55]
$\gamma^{other-FF}$	-1.73	[-4.99, 1.53]
$\gamma^{other-rest}$	-0.89	[-2.43, 0.65]
γ^{own}	-2.03	[-26.74, 22.68]
$\gamma^{own-m-reg}$	7.78	[-26.35, 41.91]
$\gamma^{own-f-reg}$	0.58	[-32.32, 33.47]
γ^{pop}	0.002	[-0.001, 0.006]
Inequalities	3000	
Note:	Subsample variance CI's with 100 draws of 750 inequalities	

Table 4: Profit inequality estimation results

6 Conclusion

In this paper, I investigate the relationship between the organizational form choice of fast-food chain restaurants and competition. Prior literature suggests, that competition should induce fast-food chains to rely more on the manager-organizational form (cites). Reduced form evidence suggests, that more competition from other fast-food chains correlates with a higher likelihood of choosing a manager to operate an outlet. However, this reduced form evidence faces an important identification challenge: entry and organizational form choice, as well as competition might be driven by market-level unobserved factors. To account for these market-level unobserved factors, I employ a profit inequality approach as pioneered by Fox (2007) and Ellickson, Houghton, Timmins. This profit inequality approach relies on creating two profit inequalities in such a way, that the market-level unobservable term is differenced out. While the resulting estimates are noisy, the coefficient that relates to the effect of chain competition on the profit of manager-operated restaurants is positive and significant. The other parameters are directionally in line with theoretical predictions.

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A Additional Descriptive Evidence

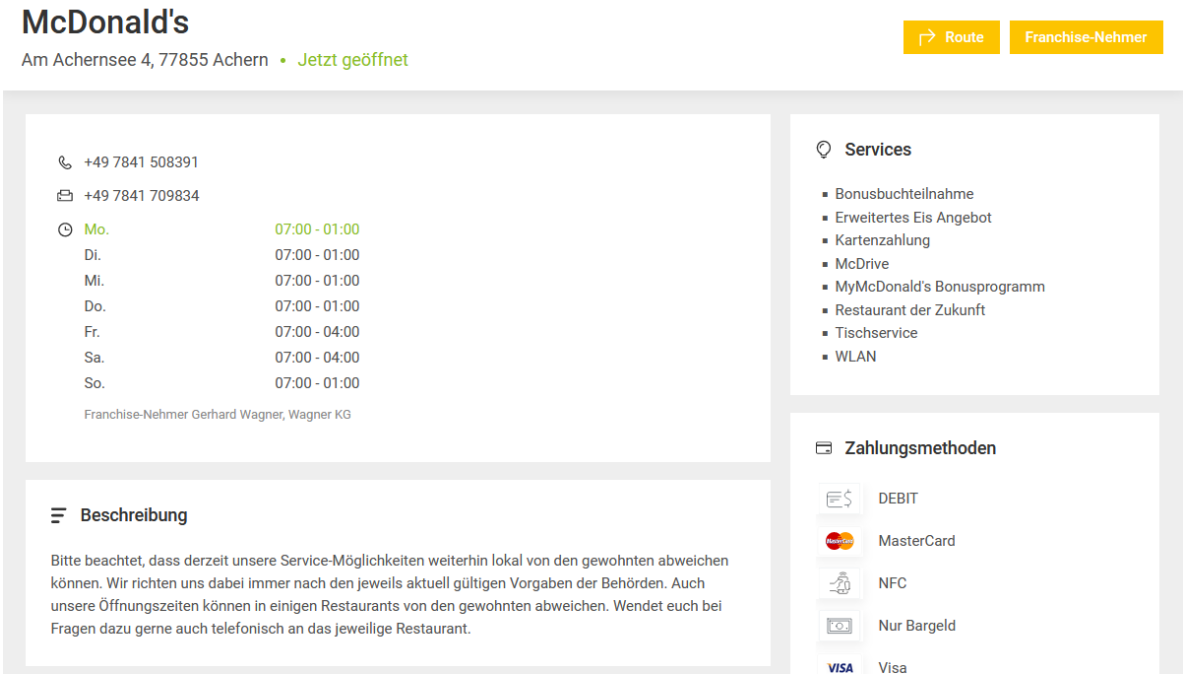

Figure 2: McDonald's restaurant website

	Chain Name	Restaurant Count
1	Subway	535
2	Nordsee	247
3	Coffee Fellows	120
4	Domino's	110
5	Starbucks	109
6	KFC	77
7	Domino's Pizza	75
8	dean&david	67
9	Vapiano	63
10	Pizza Hut	60
11	Dunkin' Donuts	29

Table 5: Fast-food chain competitors

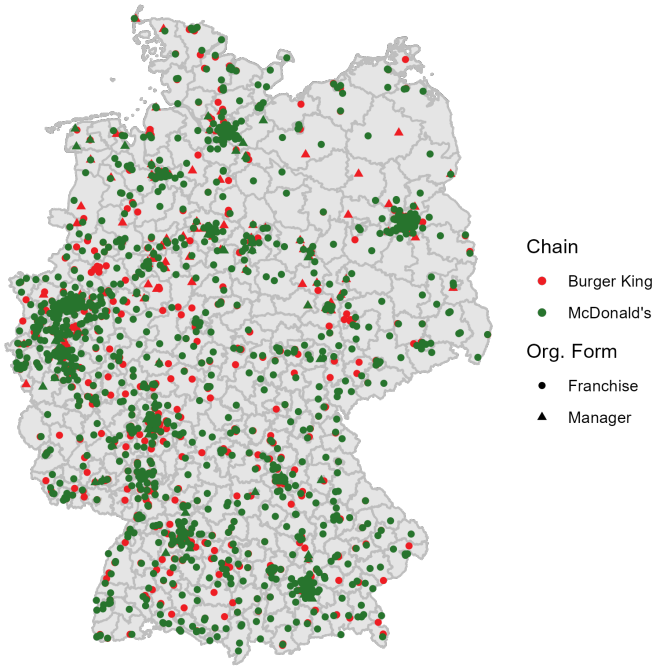

Figure 3: Map of locations of McDonald's and Burger King restaurants in Germany

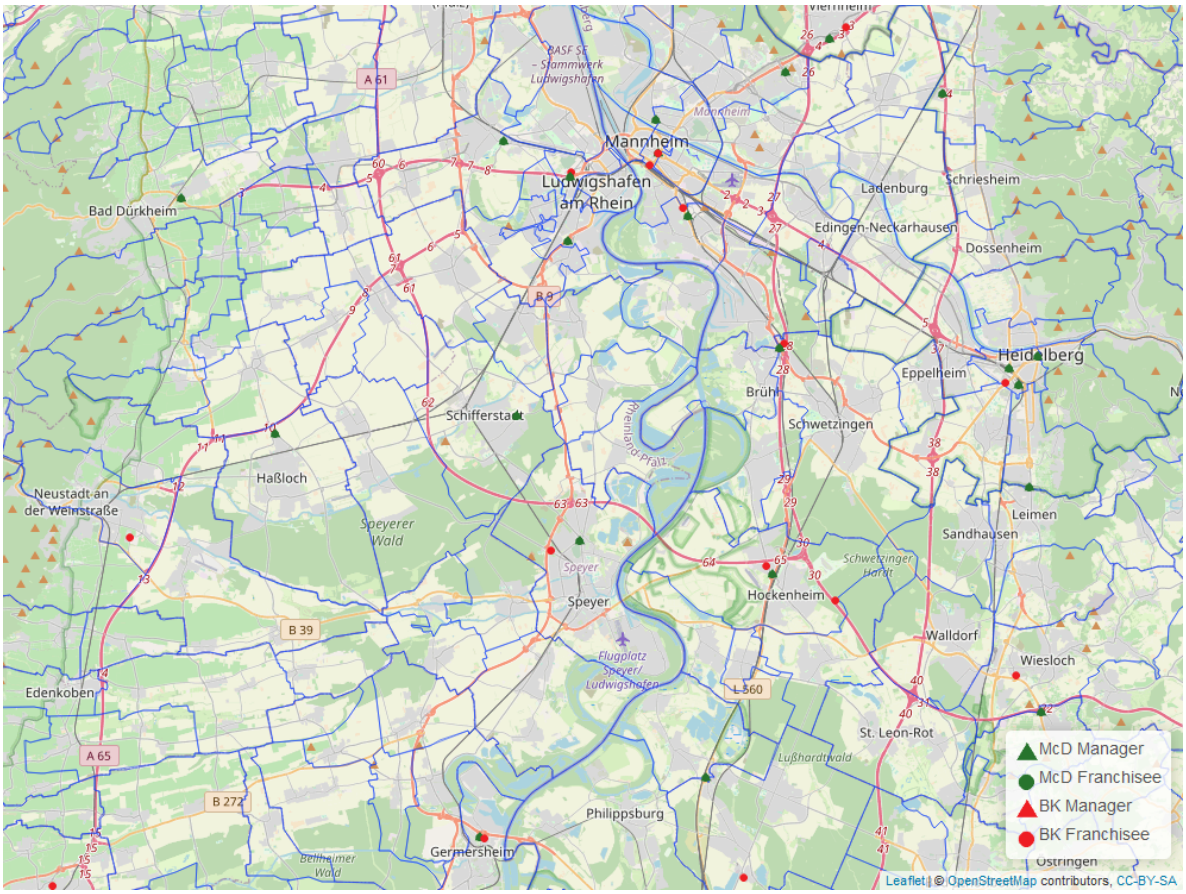

Figure 4: Example map of restaurant locations and market boundaries in the Mannheim region

B Alternative inequality estimation

B.1 Identification of chain-specific parameters

The construction of the inequalities outlined in the main part of the text allows for the estimation of chain-specific parameters without large modifications. In line with Ellickson et al. (2013), the profit function becomes:

$$\pi_i^c(o) = \underbrace{\alpha^c + \beta^c X_i' + \mathbb{1}(o = m)[\eta^c + \gamma^c X_i']}_{V_i^c(o)} + \theta_i, \quad o \in \{m, f\} \quad c \in \{McD, BK\}$$

as before, this allows for the construction of four kinds of inequalities (*manager*$^+$-*manager*$^-$, *manager*$^+$-*franchisee*$^-$, *franchisee*$^+$-*manager*$^-$, *franchisee*$^+$-*franchisee*$^-$) per chain that can be combined into 16 types of offsetting inequalities.

B.2 Identification with one chain

If only data from one chain is available, we can still identify the effect of competition on the profit of manager-operated outlets (γ^{comp}). As in the main analysis, the profit function can be written as:

$$\pi_i(o) = \underbrace{\alpha + \beta X_i' + \mathbb{1}(o = m)[\eta + \gamma X_i']}_{V_i(o)} + \theta_i, \quad o \in \{m, f\}$$

While in the main analysis, combinations of inequalities that keep the total number of manager- and franchise operated restaurants in each market constant can be used to identify the effect of chain-specific variables (such as the distance to headquarter), the fact that this dimension of variation is missing means that we cannot use these inequalities for identification. Specifically, we can only use combinations of inequalities that vary the total number of manager-/franchise-operated outlets in each market.

B.3 Identification with a format-specific market-level unobserved term

Some literature on franchising suggests that an important aspect for the existence of franchising is local market knowledge, that is hard for franchise firms to acquire. They therefore use independent entrepreneurs who are informed about the local market conditions to make effective market entry decisions (sources). To reflect the fact that there is this potential difference in local market knowledge, we could augment the restaurant profit function by a format-specific unobserved market effect:

$$\pi_i^c(o) = \underbrace{\alpha^c + \beta^c X_i' + \mathbb{1}(o = m)[\eta^c + \gamma^c X_i']}_{V_i^c(o)} + \theta_i^o, \quad o \in \{m, f\} \quad c \in \{McD, BK\}$$

We have to modify our approach to creating offsetting inequalities in order to still be able to difference out the format-specific market level unobserved effect. Importantly, we need to combine inequalities in such a way, that the overall number of manager- and franchise-operated restaurant in each market stays the same. Given that we start with the possibility of creating four types of inequalities by chain (*manager*$^+$-*manager*$^-$, *manager*$^+$-*franchisee*$^-$, *franchisee*$^+$-*manager*$^-$, *franchisee*$^+$-*franchisee*$^-$) we have a priori 16 combinations of offsetting inequalities that we can create if we do not permit the market level effect to be form specific. In the case of a format-specific unobserved error, we can only use the following four combinations of inequalities:

- *manager*$^+$-*manager*$^-$ & *manager*$^+$-*manager*$^-$
- *manager*$^+$-*franchisee*$^-$ & *manager*$^+$-*franchisee*$^-$
- *franchisee*$^+$-*manager*$^-$ & *franchisee*$^+$-*manager*$^-$
- *franchisee*$^+$-*franchisee*$^-$ & *franchisee*$^+$-*franchisee*$^-$

With these combinations, the counterfactual choices of the two chains offset each other in such a way, that after combining the the inequalities, the same number of franchise- and manager operated outlets are present in each market in both the observed and the counterfactual scenario (only their chain membership changes). It should be noted, that in order to identify the non-chain specific parameter γ^{comp} in the main part of the analysis, exactly those inequalities that *change* the number of manager-/franchise-operated outlets between the observed and the counterfactual entry and organizational form choice scenario identify the parameter γ^{comp}. To be able to draw conclusions about the effect of competition on organizational form choice while accommodating a format-specific market level unobserved term, we therefore need to estimate chain-specific parameters. Similarly, it is not possible to accommodate a market-level unobserved effect with data from just one chain.