Investigating the Effect of Restrictive Covenants on Entry Deterrence in Retail

Structural Estimation of Games

September 16, 2025

Motivation

- Geographic location is important for retailers
- Retailers use various ways to stake out attractive locations
- **Restrictive covenant** is a clause within a contract that imposes certain limitations or restrictions on how that land/property can be developed or used
- Restrictive covenants have been in practice in the US, the UK, Canada, New Zealand and Australia

How some big grocery chains help ensure that food deserts stay barren

by Lela Nargi
05.03.2022, 2:12pm

Business

Xinhua/Wang Ying via Getty Images

The Counter

How some big grocery chain ensure that fo deserts stay b

by Lela Nargi
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Art of the covenant: The tactic supermarkets have been using to 'unduly restrict' competition

John Anthony • 19:02, Mar 08 2022

MONIQUE FORD / STUFF

The Commerce Commission insists supermarket reforms it is recommending will make a difference.

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Phase out of supermarket restrictive lease provisions: Supabarn undertaking

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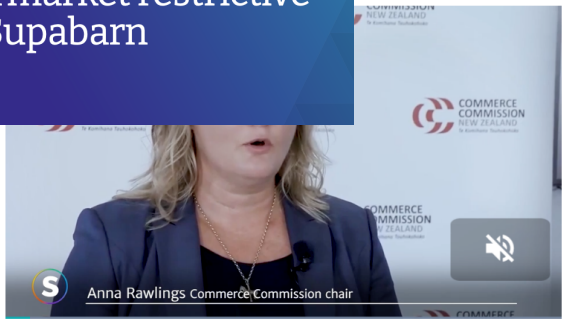
The tactic been using ompetition.



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Phase out of su
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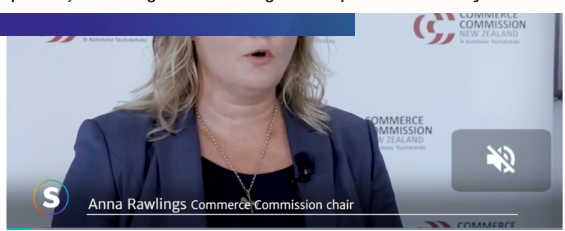
The Norwegian Competition Authority: The grocery chains may have banned competitors from 200-300 properties

With the help of special non-competition clauses linked to property, Norwegian grocery companies can have banned competitors from operating on a number of properties, according to the Norwegian Competition Authority.



MONIQUE FORD / STUFF

The Commerce Commission insists supermarket reforms it is recommending will make a difference.

One less obstacle for grocery challengers – the start of something new?

From the new year, it became more difficult to prevent competitors from establishing themselves in vacant shop premises. Could it be the start of a paradigm shift in the Norwegian grocery trade?

Research Question and Data

This study: the role of restrictive covenants in competition and market dynamics

Data:

- Covenant data
- Geocoded store-level from 2011 to 2020 provided by Geodata
  - Store-level revenue, location, chain affiliation, store size, the number of employees
- Detailed demographics information at the basic unit level: population, income, etc.

Covenant Dataset

Initial dataset: 23,387 observations provided by the NCA

- Observation: a clause from a document in the land registry (grunnboken)
- Property/land: cadastral number, owner, address
- Covenant information: right holder, date of issue, document number, covenant wording, type of rights

Challenges:

- reveal relevant covenants
- attribute covenants to grocery chains

Example of Relevant Covenant

Grunnboksinformasjon

HJEMMELSOPPLYSNINGER

Rettighetshavere til eiendomsrett

2016/25765-1/200 **HJEMMEL TIL EIENDOMSRETT**
11.01.2016 VEDERLAG: NOK 40 000 000
NEDRE NØTTVEIT 12 EIENDOM AS
ORG.NR: 915 687 040
GJELDER DENNE REGISTERENHETEN MED FLERE

Dokumenter av særlig interesse for salg- eller pantsettelsesadgang
2004/41855-2/106 URÅDIGHET

HEFTELSER

Dokumenter fra den manuelle grunnboken som antas å kun ha historisk betydning, eller som vedrører en matrikkelenhets grenser og areal, er ikke overført til denne matrikkelenheten sin grunnboksutskrift.

Servitutter tinglyst på hovedbruket/avgivereiendommen før fradelingsdatoen, eller før eventuelle arealoverføringer, er heller ikke overført. Disse finner du på grunnboksutskriften til hovedbruket/avgivereiendommen. For festenummer gjelder dette servitutter eldre enn festekontrakten.

2004/41855-2/106 **URÅDIGHET**
07.12.2004 [illegible]
FORBUD MOT Å DRIVE DAGLIGVAREHANDEL UTEN SAMTYKKE FRA
COOP HORDALAND AS org.nr. 982 594 421
[illegible]

Example of Irrelevant Covenant

2004/10621-1/44 06.12.2004	**ERKLÆRING/AVTALE** Bestemmelse om anlegg og vedlikehold av ledninger m.m. Med flere bestemmelser Rettighetshaver: LYSE GASS AS
2013/386376-1/200 14.05.2013	**ERKLÆRING/AVTALE** RETTIGHETSHAVER: COOP KLEPP SA ORG.NR: 913 426 789 RETTIGHETSHAVER: ORSTAD HELSEHUS AS ORG.NR: 984 178 824 Avtale om refusjon av anleggskostnader GJELDER DENNE REGISTERENHETEN MED FLERE
2023/853225-1/200 10.08.2023 21.00	**PANTEDOKUMENT** BELØP: NOK 250 000 000 PANTHAVER: JÆREN SPAREBANK ORG.NR: 937 895 976 GJELDER DENNE REGISTERENHETEN MED FLERE

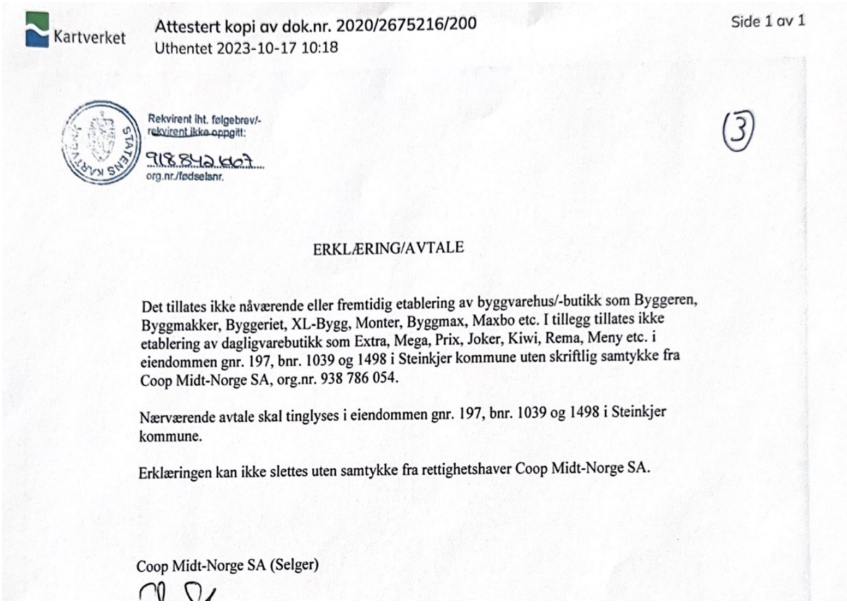
Agreement on reimbursement of construction costs applies to this register unit and several others

Covenant Dataset: Steps

Revealing relevant covenants:

- Examine the wording of a covenant: "Prohibition on grocery business," "Prohibition on activities competing with the right holder," "Prohibition on leasing to grocery stores or related businesses in competition with the right holder," and other similar wording
- Examine registered rights: 45 various registered rights in the data, 17 of them are relevant
  - Relevant: agreement, right of use, purchase contract, right of pre-sale, etc.
  - Irrelevant: provision on water lines, provision on roads, etc.
- Ordered 15 registered documents from the Norwegian Land Registry (kartverket.no) to gain deeper insights

Example of Agreement



Kartverket

Attestert kopi av dok.nr. 2020/2675216/200
Uthentet 2023-10-17 10:18

Side 1 av 1

STATENS KARTVERK

Rekvirent iht. følgebrev/-
rekvirent ikke oppgitt:
918 849 667
org.nr./fødselsnr.

(3)

ERKLÆRING/AVTALE

Det tillates ikke nåværende eller fremtidig etablering av byggvarehus/-butikk som Byggeren, Byggmakker, Byggeriet, XL-Bygg, Monter, Byggmax, Maxbo etc. I tillegg tillates ikke etablering av dagligvarebutikk som Extra, Mega, Prix, Joker, Kiwi, Rema, Meny etc. i eiendommen gnr. 197, bnr. 1039 og 1498 i Steinkjer kommune uten skriftlig samtykke fra Coop Midt-Norge SA, org.nr. 938 786 054.

Nærværende avtale skal tinglyses i eiendommen gnr. 197, bnr. 1039 og 1498 i Steinkjer kommune.

Erklæringen kan ikke slettes uten samtykke fra rettighetshaver Coop Midt-Norge SA.

Coop Midt-Norge SA (Selger)

Covenant Dataset: Steps

- 1056 land sites with relevant covenants

Mapping covenants with grocery chains:

- Examine whether the right holder or the property owner is affiliated with grocery chains
- Collected a list of affiliated companies for each grocery chain
  - Norgesgruppen has 359 affiliated companies, 77 of them are property management companies
  - Coop has 122 affiliated companies, 27 of them are property management companies
  - Rema has 158 affiliated companies, 43 of them are property management companies
  - Bunnpris has 80 affiliated companies
- Examine the wording of a covenant (Ex.:*Prohibition against operating a grocery store without consent from COOP Hordaland AS*)

Covenant Dataset: Steps

Retrieving addresses of land sites:

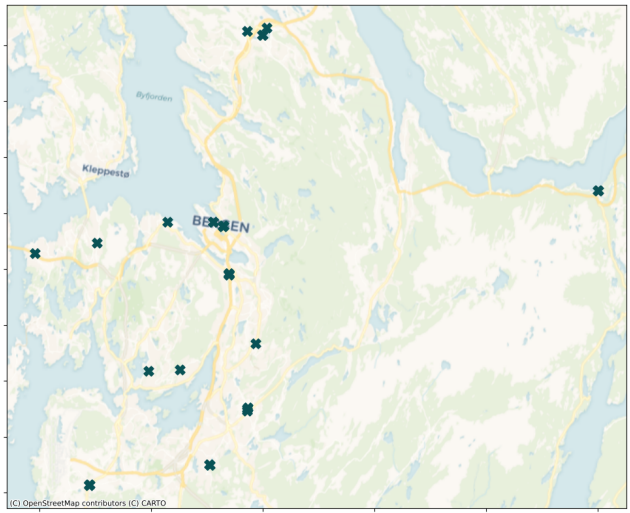
- Based on the cadastral number, each covenant is assigned to a road address
- Collected longitude and latitude (using GoogleAPI)
- Residential buildings with multiple addresses $\rightarrow$ treat as one observation as area above the ground floor is not suitable for a grocery store

Retrieving areas of land sites:

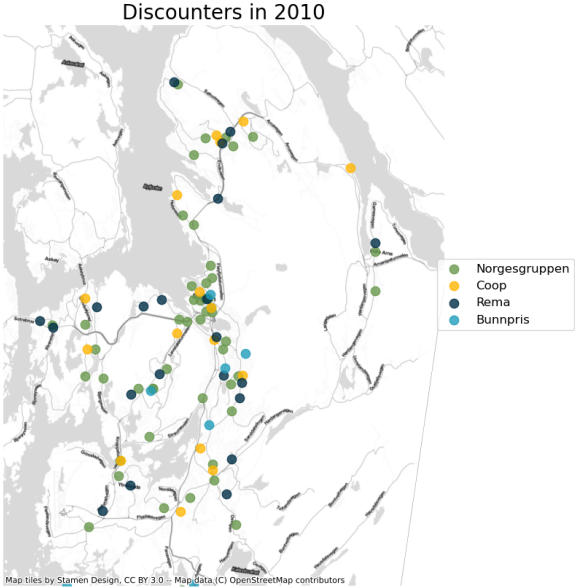
- Excluded sites smaller than 50 sq. meters, irregular shapes, coverage of roads

570 land sites with relevant covenants with the right holder

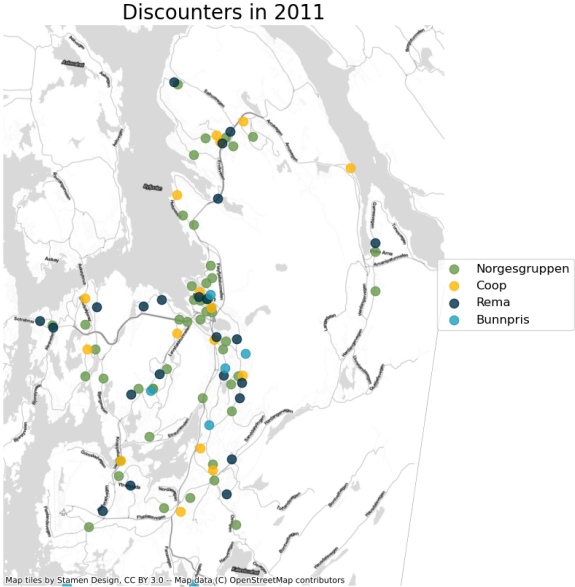
Land Sites with Covenants in Bergen



Dynamics of Store Openings in Bergen



Dynamics of Store Openings in Bergen



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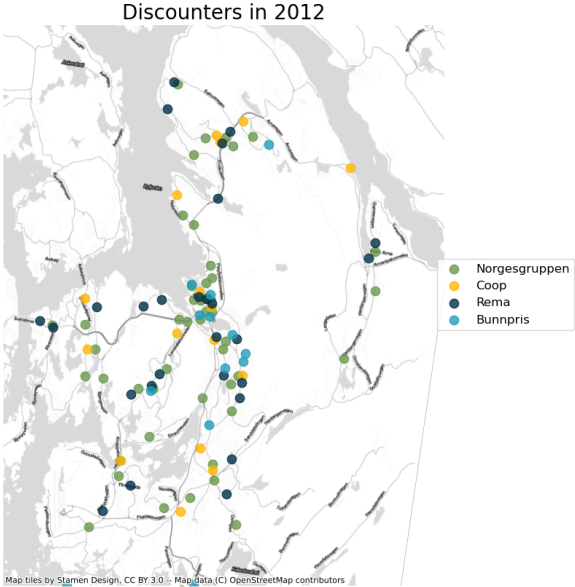
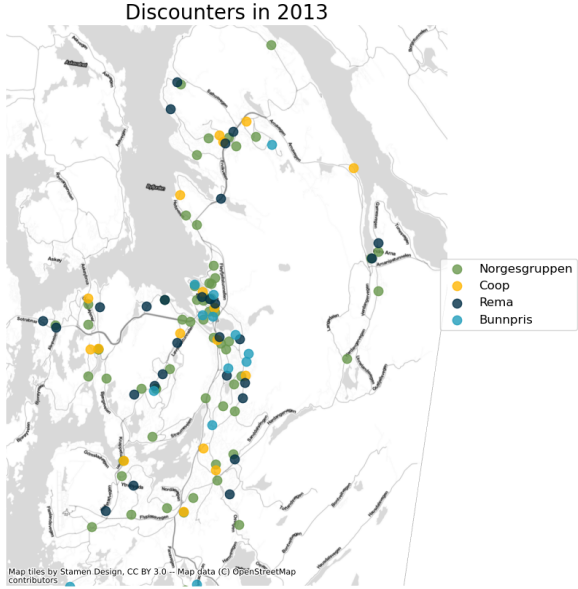
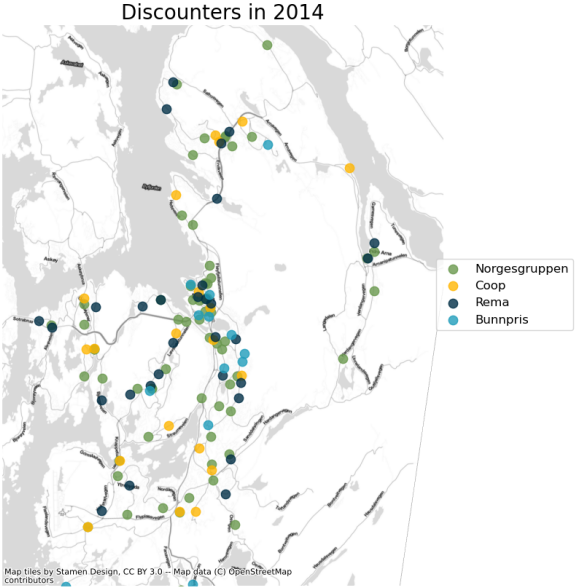


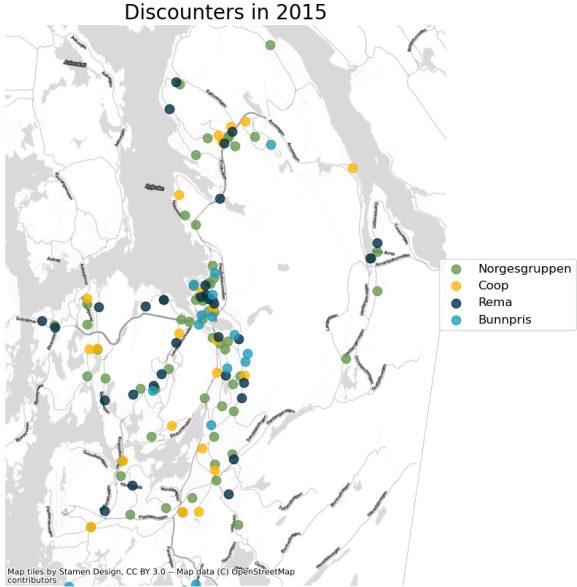
Dynamics of Store Openings in Bergen



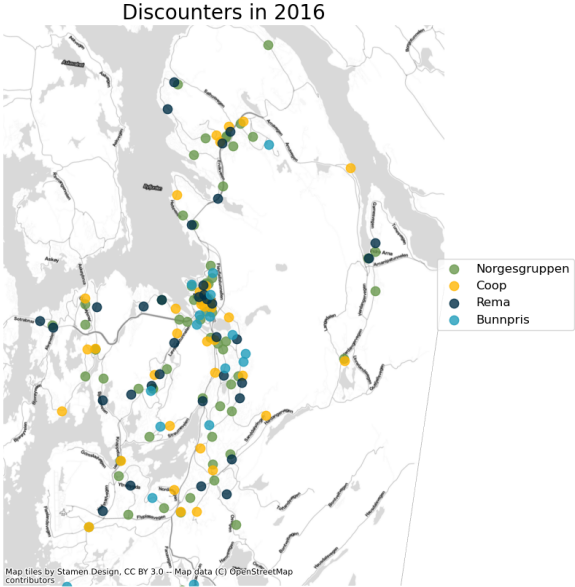
Dynamics of Store Openings in Bergen



Dynamics of Store Openings in Bergen



Dynamics of Store Openings in Bergen



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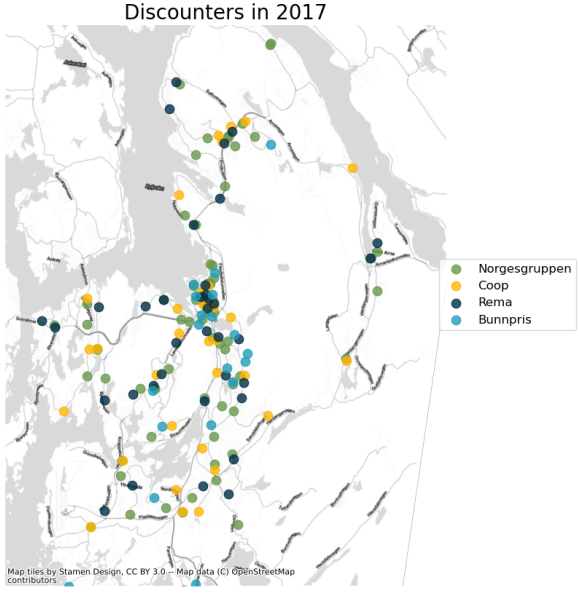

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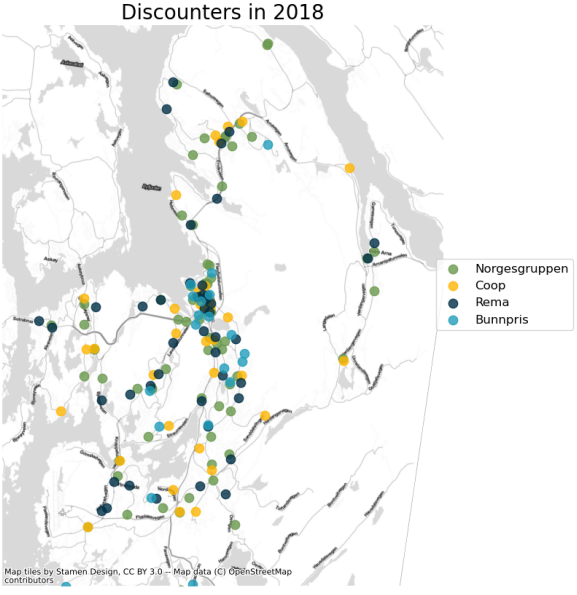

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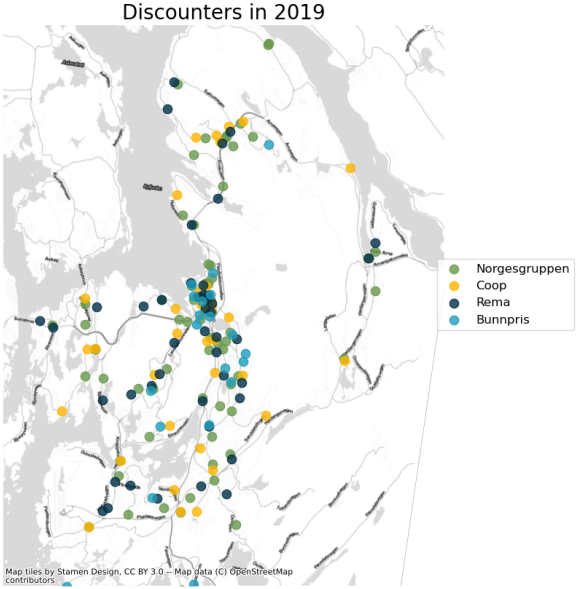

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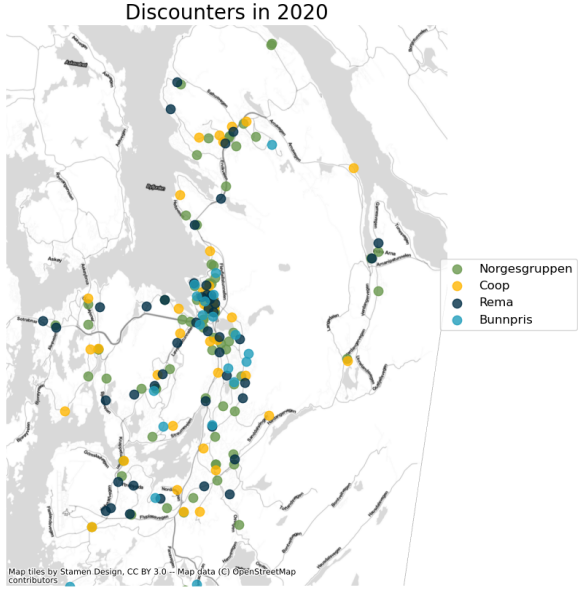


Top-10 Municipalities by the Number of Covenants

Municipality	Number of covenants	Number of entries	Number of active stores	Pop.	Av.income (thou. NOK)
Trondheim	152	49	119	205163	720
Asker	56	25	50	94441	1250
Sandefjord	53	14	35	63764	718
Oslo	44	255	406	693494	1143
Stavanger	38	39	91	143574	985
Bergen	34	84	178	283929	795
Steigen	28	0	6	2608	609
Moss	27	9	29	49273	672
Larvik	27	14	28	47204	746
Lillestrøm	25	21	41	85983	788

Markets with Covenants

Retail group	Markets by the number of covenants	Number of entries	Market share in 2020
Norgesgruppen	Leader	6.4	0.55
	Non-leader	2	0.35
Coop	Leader	2.7	0.36
	Non-leader	2	0.24
Rema	Leader	2.7	0.27
	Non-leader	2.1	0.24

Restricted Land Sites by Retail Groups

Period	Grocery chains				Total
	Bunnpris	Coop	Norgesgruppen	Rema	
1960 - 1964		2			2
1965 - 1969		1			1
1970 - 1974		1			1
1975 - 1979		2			2
1980 - 1984		13			13
1985 - 1989		15	5		20
1990 - 1994		15			15
1995 - 1999	3	32	22		57
2000 - 2004		108	41	1	150
2005 - 2009		27	17	15	59
2010 - 2014	20	44	20	8	92
2015 - 2019	1	35	89	13	138
2020		13	3	4	20
Total	**24**	**308**	**197**	**41**	**570**

Locations with Covenants and Store Locations

	Covenant	Store
Land site area (sq.m.)	850	680
Center zone	30.9%	27.5%
Shopping mall	20.5%	10.2%
Distance to closest store (m)	487	2,704

Why Do Retailers Issue Covenants?

- To shield own stores?
- To occupy attractive locations for future entry?

Table: Distance between covenants and stores

Retail Group	Distance to closest store	Distance to own closest store	Distance to competing closest store	Share of covenants when own store is closest
Norgesgruppen	332	849	813	62%
Coop	619	1,441	1,274	43%
Rema	233	374	389	76%
Bunnpris	526	2,219	621	29%

Retail Group	Share of covenants within 500 m from own store	Share of covenants within 1 km from own store
Norgesgruppen	82.1%	90.5%
Coop	68.9%	83.9%
Rema	78.6%	92.9%
Bunnpris	29.2%	29.2%

How Do Covenants Affect Firm Outcomes?

$$y_{jmt} = x_{jmt}\beta + \gamma_1 N^1_{jmt} + \gamma_2 N^2_{jmt} + \epsilon_{jmt}$$

- j is the store index,
- m is the market index,
- t is the time period,
- N^1_{jmt} and N^2_{jmt} represent the number of own covenants and competing covenants, respectively,
- x_{jmt} includes market and store characteristics.

OLS Results

	Dependent variable: Store revenue
Number of covenants of own chain	0.676^{***}
	(0.234)
Number of covenants of other chain	4.309^{***}
	(0.503)
Store size	0.045^{***}
	(0.002)
Shopping mall	9.440^{***}
	(1.802)
In center	3.648^{***}
	(1.254)
Number of stores	-0.312^{**}
	(0.153)
Population	0.002^{***}
	(0.0004)
Market land area (sq.km)	-0.001^{*}
	(0.001)
Population 0-19 years	-0.006^{***}
	(0.001)
Population 67+ years	-0.005^{***}
	(0.001)
Average income	0.00005^{***}
	(0.00001)
Observations	4,117
R^2	0.605

Note: Estimates are controlled for retail group and store format dummies. *p<0.1; **p<0.05; ***p<0.01.

Dynamic Entry Model: Setting

- Time is discrete and indexed by t, time horizon is infinite,
- Set of players consists of I multi-store retailers and is indexed by $i \in \{1, \ldots, I\}$,
- $\mathcal{L} = \{1, \ldots, L\}$ is a finite set of L locations where retail chains can operate stores,
- Competitors move *sequentially*, with the order of the moves determined by an exogenous Markov process,
- Shops open and never close $\rightarrow$ *directional*
- Game of incomplete information with EV1 private information attached to the discrete choices of entry

Dynamic Entry Model: State Space

- The state space is described by a tuple $s = (x, m)$, where:
  - $x \in \{1, \ldots, N(I, L)\}$ is the spatial configuration of the industry,
  - $m \in \{1, \ldots, I\}$ denotes the firm which has the right to move in the current period.
- Each location can have a store of either chain or be unoccupied
- Firm-location specific unobserved pay-off shocks: $\epsilon = \{\epsilon_i\}_{i=1}^{I}$, where $\epsilon_i = \left(\epsilon_i^1, \ldots, \epsilon_i^L, \epsilon_i^{L+1}\right)$, corresponding to the full set of choices available to the firm.

Dynamic Entry Model: Action Space

- A firm may open at most one store per period
- The choice variables of each firm is denoted $a_i \subset A$ and given by a vector $a_i = (a_i^1, \ldots, a_i^{L+1})$ where each element a_i^l is either zero or one and indicates whether a store is open in a particular location, or no action is taken.
- Choice set of firm i:

$$A_i(x, m) = \begin{cases} \{l : x_l = 0 \text{ and } c_{il} = 0\} \cup \{\varnothing\}, & \text{if } m = i, \\ \{\varnothing\}, & \text{if } m \neq i \end{cases} \tag{1}$$

Dynamic Entry Model: Motion Rules

- All players have identical beliefs about the evolution of the state variables x in the future
- Motion rule for spatial market configuration depends deterministically on the choice of the player who has the right to move in the current period
- The right of move m is an exogenous Markov process governed by a transition probability matrix composed of conditional probabilities $f(j|i) = Pr(\{m = i\} \cap \{m' = j\})$.

Dynamic Entry Model: Profit Function

The firm's i current profit is:

$$\Pi_i(x, a_i) = R_i(n) - FC_i(n) - \mathbf{1}\{i = m\}EC_i(a_i),$$

where

- $R_i(n)$ is firm i current period revenue,
- $FC_i(n)$ is the cost of running a chain of stores:

$$FC_i(n) = \theta_i^{FC} \sum_{l}^{L} \mathbf{1}\{n_l = i\},$$

- $EC_i(a_i)$ is the costs of setting up a new store or imposing a covenant:

$$EC_i(a_i) = \sum_{l=1}^{L} a_i^l(\theta_i^{EC} - \epsilon_i^l),$$

where parameter $\theta_{i,l}^{EC}$ denotes the cost of opening a new store, potentially firm-specific.

Dynamic Optimization Problem

- All players solve the infinite horizon expected profit maximization problem:

$$\max_{a_i} \sum_{t=1}^{\infty} \beta^t \mathbb{E}[\Pi_i(x_t, a_{it})]$$

- If in the current period firm i has the right to move, the Bellman equation is given by:

$$V_i(x, i, \epsilon_i) = \max_{a_i \in A(i,x)} \left\{ \pi_i(x, a_i) + \beta \left[\sum_{k=1}^{I} f(k|i) \int V_i(\eta(x, i, a_i), k, \epsilon_i') dG(\epsilon_i') \right] + \epsilon_i(a_i) \right\}.$$

- If the right to move belongs to another firm, then the Bellman equation for firm i is given by

$$V_i(x, j, \epsilon_i) = \pi_i(x, \varnothing) + \beta \sum_{a_j \in A(j,s)} Pr_j(a_j|x) \left[\sum_{k=1}^{I} f(k|j) \int V_i(\eta(x, j, a_j), k, \epsilon_i') dG(\epsilon_i') \right],$$

where $Pr_j(a_j|x)$ is the conditional choice probability for firm j to take the action a_j in the current spatial configuration x.

Expected Value Functions

- Due to the deterministic evolution of the spatial configuration, we can work with the *post-decision spatial configuration* $x' = \eta(x, i, a_i)$, which subsumes the current spatial configuration x and action taken a_i
- Define the *post-decision expected value function* as:

$$EV_i(x', m) = \begin{cases} \sum_{k=1}^{I} f(k|i) \int V_i(x', k, \epsilon_i') dG(\epsilon_i'), & \text{if } m = i, \\ \sum_{a_j \in A_j(x)} Pr_j(a_j) \left[\sum_{k=1}^{I} f(k|j) \int V_i(x', k, \epsilon_i') dG(\epsilon_i') \right], & \text{if } m \neq i. \end{cases}$$

Bellman Equation in Expected Value Function

$$EV_i(x', m) = f(i|m) \log \left[\sum_{a_i \in A_i(x')} \exp\Big(\pi_i(x', a_i) + \beta EV_i(\eta(x', i, a_i), i)\Big) \right] +$$

$$+ \sum_{\substack{k=1 \\ k \neq i}}^{I} f(k|m) \left[\pi_i(x', \varnothing) + \beta \sum_{a_k \in A_k(x')} Pr_k(a_k|x') EV_i(\eta(x', k, a_k), k) \right]$$

CCPs

Given the fixed point $EV_i(x', m)$ and the EV1 assumption on ϵ, the conditional choice probabilities take the familiar logit form:

$$Pr_i(a_i|x) = \frac{\exp(\pi_i(x, a_i) + \beta EV_i(\eta(x, i, a_i), i))}{\sum_{a \in A(i,s)} \exp\left(\pi_i(x, a) + \beta EV_i(\eta(x, i, a_i), i)\right)}.$$

MPE

- Set of strategy functions: $\alpha \equiv \{\alpha_i(n_t, m_t, \epsilon_i) : i \in I\}$, where $\alpha_i : (I+1)^L \times I \times \mathbb{R}^{IL} \to a_i$
- Firm i's best response function, $\alpha_i^{BR}(n_t, m_t, \epsilon_t; \alpha_{-i})$, is:

$$\alpha_i^{BR}(n_t, m_t, \epsilon_t; \alpha_{-i}) = \arg\max \{v_i(n_t, m_t, a_i) + \epsilon_i(a_i)\}.$$

- A set of strategy functions $\alpha^* \equiv \{\alpha_i^*(n_t, m_t, \epsilon_t) : i \in I\}$ is an MPE if and only if for any firm i and any state (n_t, m_t, ϵ_t) we have that:

$$\alpha_i^*(n_t, m_t, \epsilon_i) = \alpha_i^{BR}(n_t, m_t, \epsilon_i; \alpha_{-i}).$$

Example of Solution: Simple Model

Simple model:

- 2 players, 2 locations
- Iterative approach à la (Pakes and McGuire, 1992)
  - Inner loop: VFI solver for each player
  - Outer loop: Iterate between players

Setting

Spatial configuration transition if player 1 moves

Actions \ Spatial configuration	(0, 0)	(0, 1)	(0, 2)	(1, 0)	(1, 1)	(1, 2)	(2, 0)	(2, 1)	(2, 2)
1	**(1, 0)**	**(1, 1)**	**(1, 2)**	x	x	x	x	x	x
2	**(0, 1)**	x	x	**(1, 1)**	x	x	**(2, 1)**	x	x
no entry	**(0, 0)**	**(0, 1)**	**(0, 2)**	**(1, 0)**	**(1, 1)**	**(1, 2)**	**(2, 0)**	**(2, 1)**	**(2, 2)**

Spatial configuration transition if player 2 moves

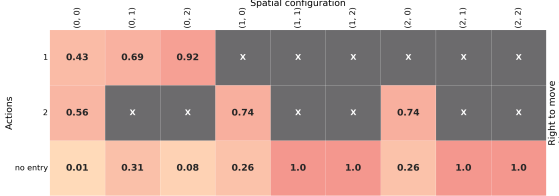
Actions \ Spatial configuration	(0, 0)	(0, 1)	(0, 2)	(1, 0)	(1, 1)	(1, 2)	(2, 0)	(2, 1)	(2, 2)
1	**(2, 0)**	**(2, 1)**	**(2, 2)**	x	x	x	x	x	x
2	**(0, 2)**	x	x	**(1, 2)**	x	x	**(2, 2)**	x	x
no entry	**(0, 0)**	**(0, 1)**	**(0, 2)**	**(1, 0)**	**(1, 1)**	**(1, 2)**	**(2, 0)**	**(2, 1)**	**(2, 2)**

Payoff matrix

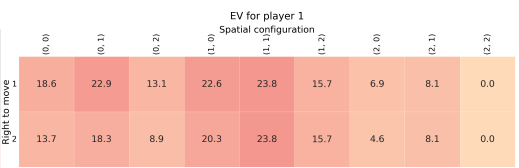
Players \ Spatial configuration	(0, 0)	(0, 1)	(0, 2)	(1, 0)	(1, 1)	(1, 2)	(2, 0)	(2, 1)	(2, 2)
1	0.0	1.45	0.0	1.39	2.56	0.97	0.0	1.07	0.0
2	0.0	0.0	-0.57	0.0	0.0	-0.66	-0.57	-0.77	-1.48

Solution

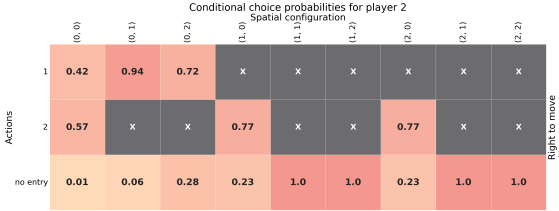
Conditional choice probabilities for player 1



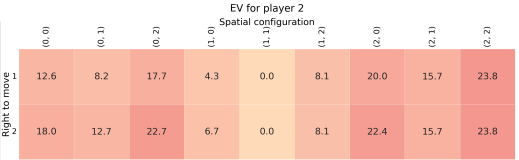
EV for player 1



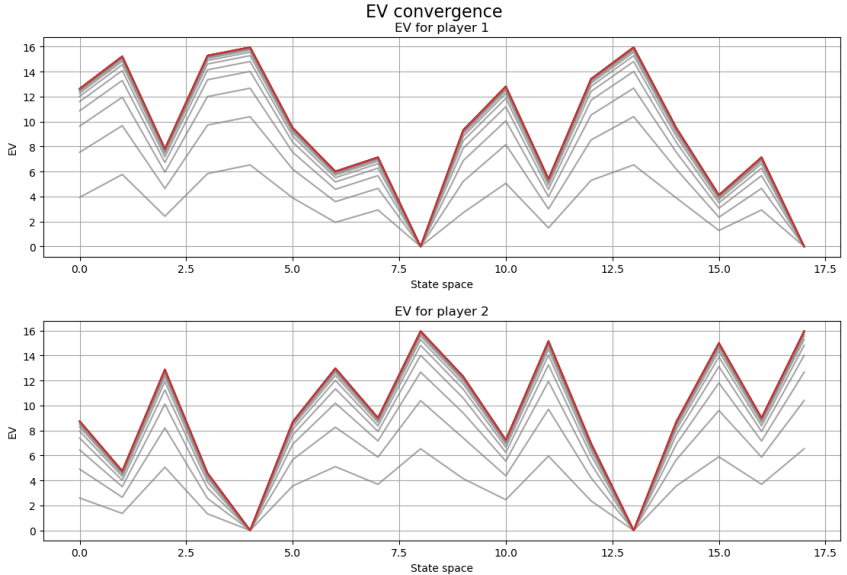
Conditional choice probabilities for player 2



EV for player 2



Solution: Expected Value Functions Convergence



Challenges

1. Cardinality of the state space
   - The number of points in the state space with L locations and I players/chains is $(I+2)^L$
   - Omit the identity of the covenant owner (otherwise would be $(2I+1)^L$
   - Impose symmetry between all but the largest chain: solve for $(2+2)^L = 2^{2L}$ spatial configurations
   - *Simulate* most paths through the state space using forward simulations as in BBL and Hotz, Miller, Sanders, Smith (1994)
   - Solve the model on the union of simulated paths
2. Multiplicity of MPE
   - Alternative move + symmetry $\rightarrow$ limited
   - RLS solution approach + NRLS nested estimator
   - How hard are the stage equilibria?

References I

Ariel Pakes and Paul McGuire. Computing markov perfect nash equilibria: Numerical implications of a dynamic differentiated product model, 1992.