Exclusive dealing as an entry barrier? – Evidence from automobiles

Laura Nurski and Frank Verboven

University of Leuven

August 2013

Automobile demand and distribution networks

- The size of distribution networks
  - has a substantial impact on automobile demand
  - may partly explain the home bias and its declining role over the past decade
- Plan of talk:
  - First verify these claims with panel data for European countries
  - Then assess the role played by exclusive dealing

Automobile demand and distribution networks

Nested logit model

$$\ln s_j/s_0 = x_j\beta - \alpha p_j + f_j\left(N_j, \gamma\right) + \sigma_1 \ln\left(s_{j|hg}\right) + \sigma_2 \ln\left(s_{h|g}\right) + \xi_j$$

- Nests: segments; subnests = domestic/foreign; products: model
- Estimate for panel of 9 European countries during 2000-2009.
- Account for endogenous prices and product-specific fixed effects j

Nested logit demand model (9 European countries, 2000-2009)

	(1)	(2)	(3)	(4)
price (relative to income)	-1.41	-1.34	-1.38	-1.22
	(-25.09)	(-22.02)	(-22.04)	(-18.50)
$\ln\left(s_{j\|hg}\right)$	0.69	0.43	0.39	0.32
	(18.46)	(9.19)	(8.24)	(5.69)
$\ln\left(s_{h\|g}\right)$	0.44	0.25	0.18	0.15
	(11.24)	(5.55)	(3.65)	(2.75)
foreign (1/0)	-0.62	-0.37	-0.44	-0.53
	(-10.56)	(-6.46)	(-7.43)	(-8.88)
foreign*trend	0.03	0.00	0.01	0.01
	(5.55)	(0.54)	(1.16)	(1.72)
dealers/household		6.34		
		(13.34)		
dealers/squared km			0.10	
			(15.46)	
log(dealers)				0.31
				(11.26)
Observations	18,029	18,021	18,021	18,021
Number of models	495	495	495	495
R-squared	0.708	0.590	0.558	0.520

The role of exclusive dealing

- Main research questions
  - Do incumbent firms apply exclusive dealing to **soften competition and foreclose entry** by (foreign) firms?
  - Or do they have an **efficiency motivation**, i.e. raise demand by protecting brand reputation and preventing free-riding?
  - What are the effects of exclusive dealing on market shares, consumer surplus and welfare?
- We address these questions with an empirical analysis of the car market in Belgium
  - demand model with product and spatial differentiation
  - model of oligopoly pricing (and location decisions)
  - counterfactuals of a shift from exclusive dealing (ED) to multi-branding (MB)

Outline rest of talk

- Vertical restraints and exclusive dealing in the car market
- Previous literature
- Profit incentives for exclusive dealing
- Empirical model
- Empirical analysis and counterfactuals

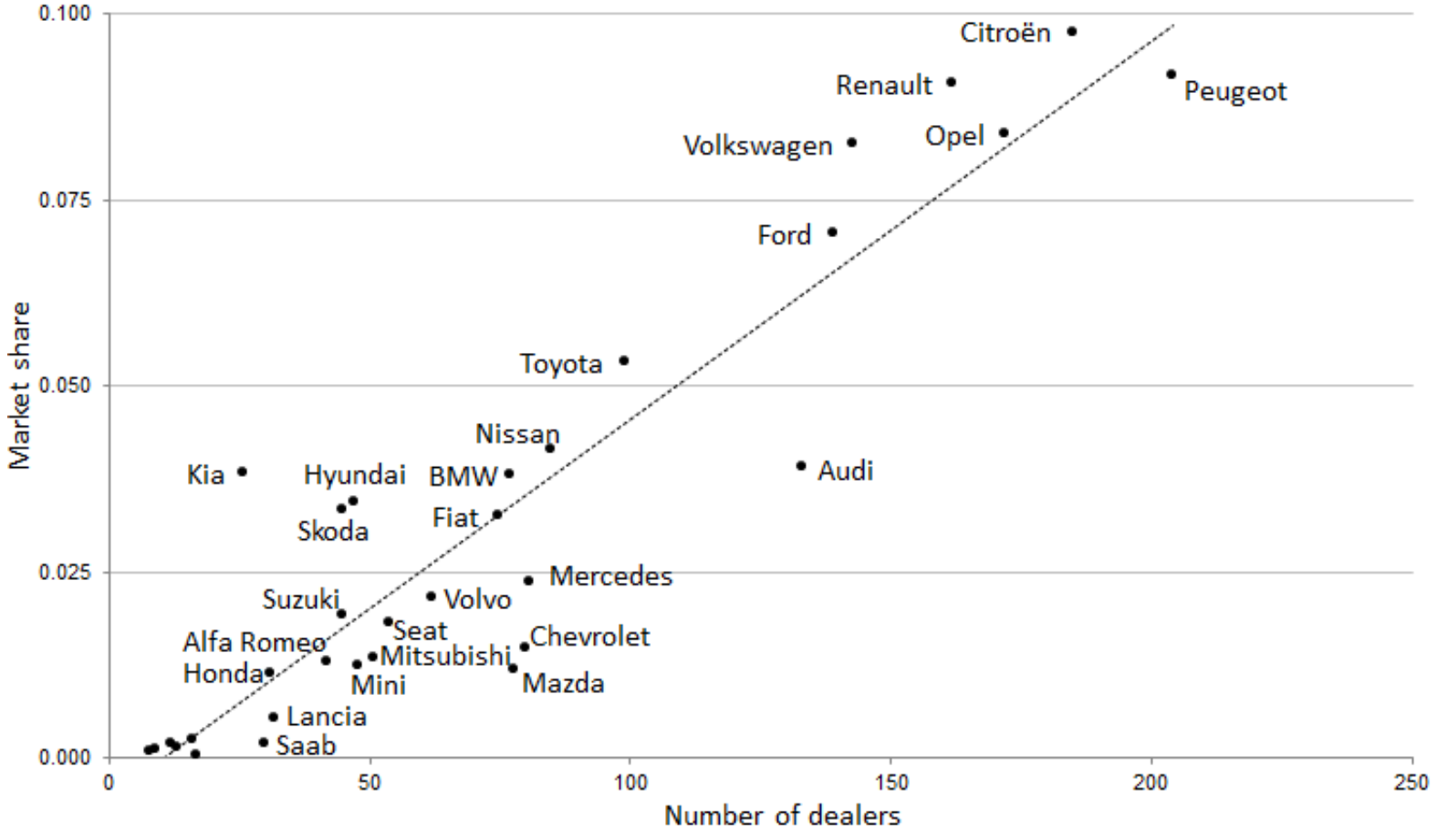
Vertical restraints in the European car market

- Manufacturer and dealer contracts
  - selective distribution = quant. and qual. restrictions
  - exclusive distribution = exclusive territories
  - **exclusive dealing** = no competing brands
- European Commission has tolerated these vertical restraints through a series of block exemptions:

	sel. distr.	excl. distr.	excl. deal.
1985-2002	AND	AND	up to 80%
2002-2010	OR	OR	up to 30%
2010-2013	OR	OR	up to 80%

Preliminary evidence (Belgium)

As for rest of Europe, market shares show positive correlation with dealer network size.



Preliminary evidence (Belgium)

Exclusive dealing is common, but there is also multi-branding.

	Number of dealers	% of dealers
1 brand (=exclusive)	1501	81%
2 brands	291	16%
3 brands	57	3%
4 brands	8	0%
5 brands	3	0%

- 75% of multi-brand dealers only sell brands of the same firm
- Most common multi-brand combinations are:
  - VW group (VW, Audi, Skoda, Seat, Porsche)
  - Fiat group (Fiat, Alfa Romeo, Lancia)
  - Big luxury brand + small luxury brand (BMW-Mini, Mercedes-Smart)

Literature on foreclosure: mixed theoretical findings

- Chicago School: **Incumbent** cannot profitably compensate **buyer** to sign an ED contract and thus cannot exclude efficient entry
- Post-Chicago theories: Incumbent can induce the buyer to sign an exclusive contract under certain circumstances
  - Aghion & Bolton (1987); Rasmusen, Ramseyer & Wiley (1991), Segal & Whinston (2000), Fumagalli & Motta (2006), etc.
- Our paper: **Entrant** may compensate **incumbent** not to sign an exclusive contract with the buyer.

Literature on foreclosure: scarce empirical evidence

- Laboratory experiments
  - Smith (2007), Landeo & Spier (2009), Boone, Müller & Suetens (2013)
- Empirical evidence on prices
  - Slade (2000): ED raises prices, lowers welfare
  - Sass (2004): ED raises prices, consumption, welfare
- Empirical evidence on foreclosure
  - Sass (2004): no, since ED more common in larger markets
  - Asker (2005): no, since ED does not raise rival costs
  - Ater (2010): yes, since ED reduces total sales

Profit incentives for ED: overview

A move from exclusive dealing to multibranding with new entrant:

- intensifies competition, leading to lower **prices**
- reduces demand because of **reputation loss**
  $=>$ these aspects are usually emphasized in theoretical work
- increases demand because of increased **spatial availability**
  - single incumbent: MB can only attract new customers
  - multiple incumbents: MB can also steal business from other incumbents $->$ strong individual incentive, but not necessarily a joint incentive for MB
- may imply fixed cost savings since entrant can make use of incumbent's network
  $=>$ these aspects may also be important in practice

Empirical framework: overview

- To account for these various effects, we estimate a spatial product differentiation demand model, derive fixed cost bounds and perform counterfactuals
- We use combination of
  - micro-data: car model sales by zip code and sex
  - aggregate data: dealer locations, and distribution of other demographics at zip code level (income, household size, urbanization, etc.)

Empirical framework: data

We combine four data sets

- Car sales: by model, town, sex (Febiac)
- Car characteristics: price, horsepower, length, fuel efficiency (JATO)
- Dealers: location and all brands sold at each location (Spectron Business solutions)
- Consumer demographics by area code: men, women, income, household size, age, immigrants and urbanization (StatBel)

Nr. of obs.: 573,888 = 588 (towns) x 488 (models) x 2 (sexes)

Summary statistics

Variable	Mean	Std. Dev.	10%.	Median	90%	# Obs.
Sales	0.7	2.0	0	0	2	573,888
- incumbents	1.1	3.3	0	0	3	223,440
- entrants	0.4	1.5	0	0	1	350,448
Dealer characteristics						
Distance (km)	11.7	12.1	2.3	8.4	24.2	573,888
- incumbents	7.1	5.2	1.7	6.0	13.7	223,440
- entrants	14.7	14.2	3.3	10.9	29.8	350,448
Multibrand (0/1)	0.4	0.5	0	0	1	573,888
- incumbents	0.3	0.5	0	0	1	223,440
- entrants	0.4	0.5	0	0	1	350,448

Summary statistics

Variable	Mean	Std. Dev.	10%.	Median	90%	# Obs.
Model characteristics						
Price (/GDP per cap)	0.9	0.6	0.4	0.7	1.4	488
Horsepower (in kW)	94.9	45.2	51	85	150	488
Fuel effciency (liter/km)	5.8	1.5	4.3	5.4	7.5	488
Length (in cm)	436.3	43.2	374.0	440.6	485.4	488
Household demographics						
Population(10^3)	17.8	28.1	4.0	11.4	32.3	588
Men(10^3)	8.7	13.7	2.0	5.6	15.8	588
Women(10^3)	9.1	14.4	2.1	5.8	16.6	588
Mean income(10^3)	24.6	3.5	20.2	24.4	29.3	588
Hh size	2.5	0.2	2.3	2.5	2.6	588
Age	52.7	1.3	51.6	52.8	54.0	588
Immigrants (%)	5.7	6.7	1.0	3.2	14.6	588
Urbanization	5.3	3.0	2	5	9	588

Empirical framework: spatial demand model

- Utility of consumer i for buying model j in market t

$$u_{ijt} = x_{jt}\beta_i + \alpha_i p_{jt} + \gamma d_{ij} + \xi_{jt} + \epsilon_{ijt}$$

$$= \underbrace{x_{jt}\beta + \alpha p_{jt} + \xi_{jt}}_{\delta_{jt}} + \underbrace{\{x_{jt}, p_{jt}\}\Pi D_i + \{x_{jt}, p_{jt}\}\Sigma\nu_i + \gamma d_{ij}}_{\mu_{ijt}(\nu_i, D_i, d_{ij})} + \epsilon_{ijt}$$

- Probability that i chooses product j:

$$\Pr_{ijt}(\nu_i, D_i, d_{ij}) = \frac{\exp(\delta_{jt} + \mu_{ijt}(\nu_i, D_i, d_{ij}))}{1 + \sum_{k=1}^{J} \exp(\delta_{kt} + \mu_{ikt}(\nu_i, D_i, d_{ij}))}$$

- Market share of product j:

$$s_{jt} = \int \Pr_{ijt}(\nu, D, d) dF(\nu, D, d)$$

Empirical framework: pricing

- Profit of firm f who produces subset of models $j \in F_f$

$$\pi_f = \sum_{j \in F_f} (p_j - c_j)\, s_j(\mathbf{p}, \mathbf{d})\, L$$

- Bertrand-Nash equilibrium in prices $\mathbf{p}^*(\mathbf{d})$ solves

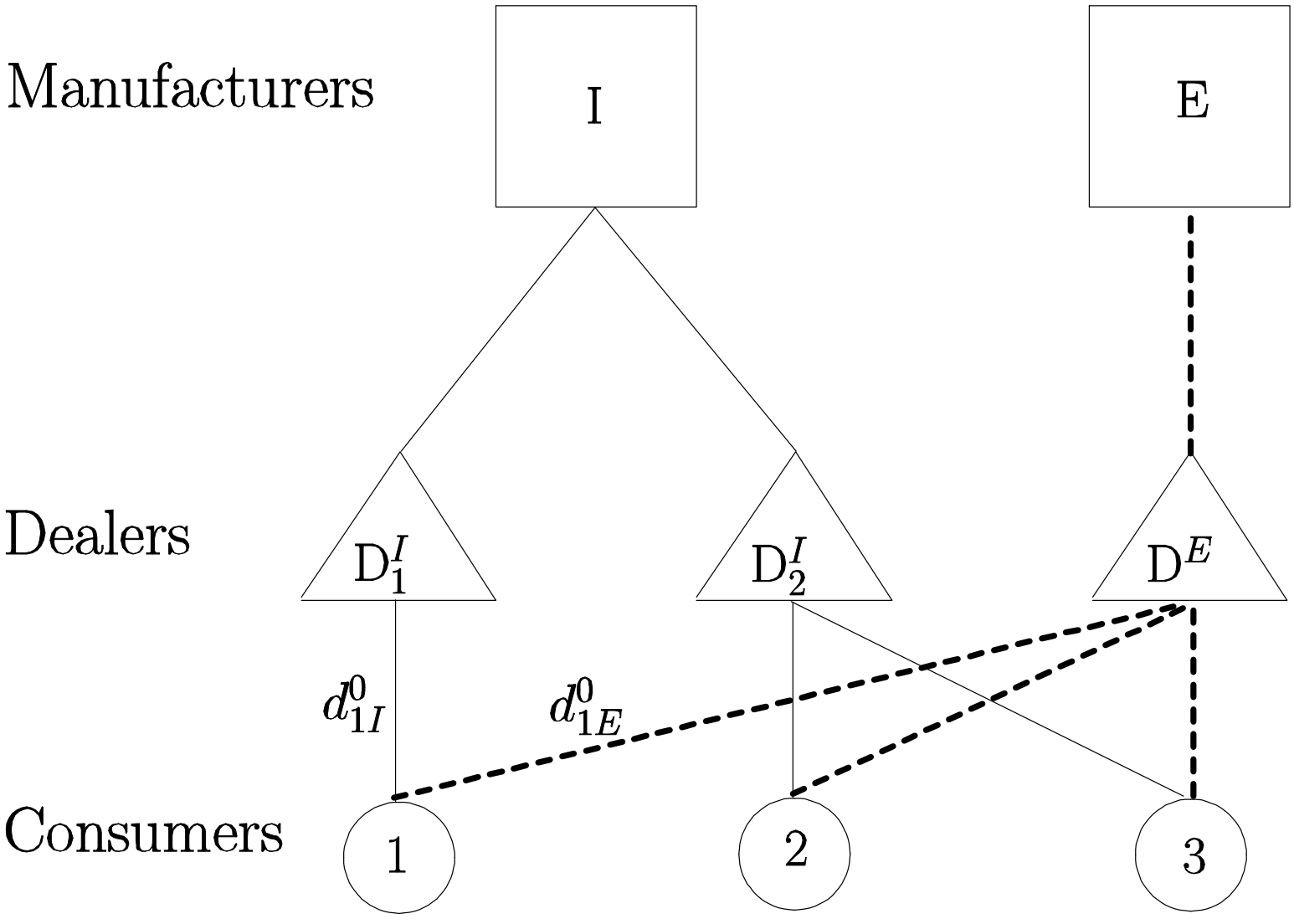
$$q_j(\mathbf{p}, \mathbf{d}) + \sum_{k \in F_f} (p_k - c_k) \frac{\partial q_k(\mathbf{p}, \mathbf{d})}{\partial p_j}$$

- Remark: as if manufacturers are vertically integrated with dealers (non-linear contracts)

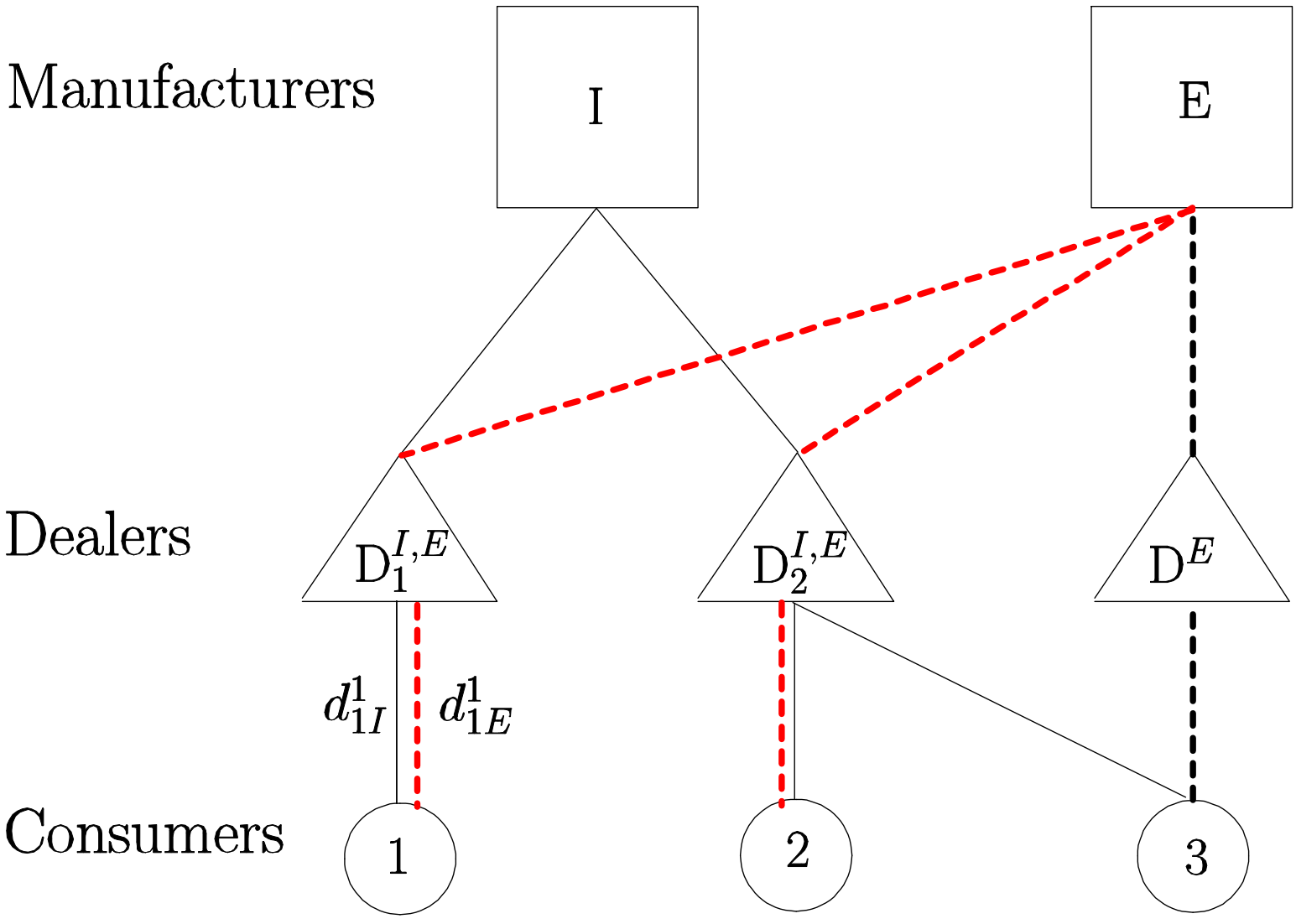
Empirical framework: dealer entry

- Derive bounds on fixed entry cost for an exclusive dealership
  - lower than variable profit drop when dealer would be removed
  - higher than the variable profit increase when dealer would be added
- Account for selection issue as in Eizenberg (2010)
- Use these to compute the maximum fixed cost savings below which ED is profitable

A move from exclusive dealing...



... to multibranding



From ED to MB

We consider various MB agreements and compute

- Profit incentive: change in variable profits
- Welfare effects:
  - change in incumbent and entrants' market share
  - change in consumer surplus
  - change in total welfare

Estimation: Method of Simulated Moments

Macro moments

- Product characteristics x_{jt}, $j = 1, \ldots, J$, are exogenous, uncorrelated with ξ_{jt}. This implies:

$$G^1(\theta) = \frac{1}{TJ} \sum_t \sum_j \xi_{jt}(\theta) z_{jt}$$

where z_{jt} includes product j's own characteristics x_{jt} and sums of other products' characteristics, and ξ_{jt} is

$$\xi_{jt}(\theta) = \delta_{jt}(s^{\text{obs}}, \theta) - x_{jt}\beta - \alpha p_{jt}.$$

Estimation: Method of Simulated Moments

Equate predicted micro moments to observed moments in the data

- Average consumer demographics D_i:

$$\begin{aligned} G^2(\theta) &= \mu_{D^1}^{\text{obs}} - \mu_{D^1}^{\text{pred}}(\theta) \\ &= \sum_t \sum_i \sum_j (q_{ijt} - Pr_{ijt}(\theta) L_{it}) D_i^1 \end{aligned}$$

- Covariance between consumer demographics $D_i$and product characteristics x_j.
- Average dealer characteristics d_{ij}.
- Variance of mean product characteristics accross submarkets.

Results from spatial demand model

variable	coefficient	std.err.	t-value
const	23.02	9.55	2.41
- const $\times$ urban	-0.63	0.10	-6.06
- const $\times$ age	-0.13	0.18	-0.71
- const $\times$ hhsize	-7.39	0.84	-8.84
- σ_1	-9.42	1.62	-5.81
price	-6.01	0.61	-9.80
- princ $\times$ income	0.86	0.11	7.58
- σ_2	-0.39	0.10	-3.85
hp	4.47	1.72	2.61
- hp $\times$ age	-0.00	0.03	-0.11
- σ_3	0.04	0.22	0.16
length	6.29	2.44	2.58
- length $\times$ df	-12.48	0.54	-23.05
- length $\times$ immigrants	-0.22	0.04	-5.46
- σ_4	3.15	0.47	6.65

Results from spatial demand model

variable	coefficient	std.err.	t-value
fuel	-8.55	0.84	-10.16
- fuel $\times$ df	-0.27	0.22	-1.23
- fuel $\times$ urban	0.14	0.03	5.50
- σ_5	-1.27	0.17	-7.62
distance	-0.14	0.01	-17.24
multibrand	-0.04	0.02	-2.80
year dumies	yes		
origin dumies	yes		

Results from spatial demand model (cont'd)

- **Mean utility parameters**: price and fuel consumption have negative impact, horsepower has positive impact
- **Distance & multibrand**: negative impact
- **Observed consumer heterogeneity**:
  - high income households less price sensitive
  - women prefer smaller cars
  - city households less sensitive to fuel efficiency
  - city households more likely to choose outside good
- **Unobserved consumer heterogeneity**:
  - strong heterogeneity, regarding outside good, price, size, fuel efficiency

Counterfactuals

- Multibrand agreements
  - between 8 incumbents and 24 smaller entrants
  - involves shift in distance matrix and multibrand dummy
  - "one-way access": entrants at incumbents' locations (if profitable), but not vice versa
- Two types of counterfactual
  - single multibrand agreements: unilateral incentives?
  - joint multibrand agreements: collective incentives?

Variable profit incentives of multibranding

	Current	Unilateral agreement Change in variable profits			Collective agreement Change in variable profits		
	joint	big	small	joint	big	small	joint
Peugeot & 3	156.51	-0.01	0.14	0.13	-2.10	0.07	-2.03
Citroën & 3	166.27	0.00	0.05	0.05	-2.29	-0.02	-2.31
Opel & 3	201.43	-2.76	7.98	5.22	-4.07	7.08	3.01
Renault & 3	187.63	-2.12	3.12	1.00	-3.91	2.36	-1.54
Volkswagen & 3	256.31	-0.80	8.07	7.27	-2.07	6.80	4.72
Ford & 3	182.69	-1.00	1.95	0.95	-2.42	0.83	-1.59
Audi & 3	183.28	-0.18	3.99	3.81	-0.93	2.55	1.62
Toyota & 3	192.53	-0.88	2.37	1.49	-1.87	0.83	-1.04
Mean	190.83			2.49			0.10
Total	1526.64			19.92			0.84

Variable profit incentives of multibranding

- Unilateral MB agreements increase variable profits, on average by $+2.49$ mil.
  - this is because of business stealing: demand $\uparrow$ from more spatial availability outweights demand $\downarrow$ from reputation loss
- Joint MB agreements increase variable profits much less, in total by only $+0.84$ mil.
  - this is because of increased price competition, and no scope for business stealing
- Conclusion: maybe unilateral, but no collective incentives to make MB agreements with entrants.

Total profit incentives of ED: fixed costs

	Unilateral agreement	Collective agreement
Variable profits		
Variable profit increase	€2.49 mil.	€0.84 mil.
Number of brands added at incumbents' locations	175	1401
Variable profit increase per brand added	€14,220	€598
Fixed costs of add. brands that rationalize ED		
(as % of estimated bounds of FC of single brand)		
- at lower bound (€31,990)	>44%	>2%
- at mean (€76,265)	>19%	>1%
- at upper bound (€120,540)	>12%	>0%

- Unilateral incentive for ED if fixed costs of additional brands are at least 12%–44% of first brand
- Collective incentive for ED if fixed costs of additional brands are least 0–2%
  $\Rightarrow$ collective incentive for ED for large range of extra fixed costs, unilateral incentive for much smaller range

Welfare effects of shift to multibranding

	Current	Total change	Change due to distance	Change due to MB	Change due to prices
			Market shares (%)		
Outside good	78.8%	-0.04%	-0.06%	0.02%	0.00%
Inside goods	21.2%	0.04%	0.06%	-0.02%	0.00%
Incumbents	60.8%	-1.3%	-1.4%	0.1%	0.06%
Entrants	39.2%	1.3%	1.4%	-0.1%	-0.06%
			Variable profits (€ million)		
Incumbents	951.7	-19.7	-20.1	0.9	-0.47
Entrants	574.9	20.5	23.0	-2.1	-0.45
Total	1526.6	0.8	2.9	-1.2	-0.92
			Consumer surplus		
Total (€ million)		77.8	116.7	-44.3	5.4
Per hh (€)		104.2	156.3	-59.4	7.3
			Welfare (€ million)		
Total		78.6	119.6	-45.5	4.5

Welfare effects

A ban on exclusive dealing would

- shift market shares mainly due to increased spatial availability
  - from incumbents: –1.3%
  - in favor of entrants: +1.3%
- benefit consumers: 77.8 € million or 104.2 € per household
  - gains from increased availability: +156.3 € per household
  - losses from demand inefficiency: -59.4 € per household
  - gains from reduced prices: +7.3 € per household
- benefit welfare: similar to consumer effects

Conclusions

- Spatial coverage has a positive impact on the demand for cars, but consumers dislike multibranding
- Profit incentives of exclusive dealing
  - stem partially from demand efficiency
  - and also from keeping prices high
- External effects of ban on exclusive dealing
  - Positive impact on the entrants' market share
  - Positive impact on consumer and total welfare, mainly because of increased spatial availability.