Exclusive dealing as a barrier to entry?
Evidence from automobiles*

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October 2015

Abstract

Exclusive dealing contracts between manufacturers and retailers force new entrants to set up their own costly dealer networks to enter the market. We ask whether such contracts may act as an entry barrier, and provide an empirical analysis of the European car market. We first estimate a demand model with product and spatial differentiation, and quantify consumers’ valuations for dealer proximity and dealer exclusivity. We then perform policy counterfactuals to assess the profit incentives and possible entry-deterring effects of exclusive dealing. We find that there are no unilateral incentives to maintain exclusive dealing, but there is a collective incentive for the industry as a whole. Furthermore, a ban on exclusive dealing would raise the smaller entrants’ market share. But more importantly, consumers would gain, not so much because of increased price competition, but rather because of the increased spatial availability, which compensates for the demand inefficiency from a loss of dealer exclusivity.

Keywords: Exclusive dealing, Vertical restraints, Foreclosure, Automotive industry

JEL Classification: L42, L62, L14

*We thank John Asker, Jan Boone, Otto Toivanen, Patrick Van Cayseele, Jo Van Biesbroeck, conference participants at the AEA Annual Meeting 2011, EEA-ESEM 2011, IIOC 2011, EARIE 2011, CEPR 2013, and seminar participants at NYU, Toulouse School of Economics, Tilburg University, Télécom ParisTech, CREST, Bocconi and University of Leuven, as well as five anonymous referees and the editor for helpful comments. We gratefully acknowledge financial support from University of Leuven Program Financing Grant and Science Foundation - Flanders (FWO).

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1 Introduction

Exclusive dealing has attracted a lot of attention from researchers and competition authorities alike. The early view considered exclusive dealing to be an anticompetitive barrier to entry, since it forces new entrants to set up their own costly distribution networks. The Chicago school [Bork 1978; Posner 1976] challenged this view. It stressed that the incumbent must pay the retailer to accept exclusivity, so that an exclusive deal does not turn out in their joint interest in the absence of efficiencies. The post-Chicago literature, in turn, identified conditions under which an incumbent and a retailer may have a joint incentive to contract on exclusive dealing as a way to foreclose upstream entry. The main insight is that such contracts imply externalities on other players not accounted for by the Chicago school.

In this paper, we contribute to the growing debate on whether exclusive dealing may act as a barrier to entry. We first provide a framework to empirically analyze the incentives and effects of exclusive dealing. We then apply it to the European car market, which has a long history of industry regulations towards vertical restraints. Since its first Motor Vehicle Block Exemption in 1985, the European Commission accepted that manufacturers could impose exclusive dealing on their retailers. As a result, exclusive dealing has become prevalent in most European countries, with exclusivity averaging around 70% of European car dealers.

We begin our analysis with a simple conceptual framework. Consistent with some recent post-Chicago theories, we assume that incumbents can convince their retailers to accept exclusivity, i.e. not sell competing brands. We instead focus on the largely ignored question whether the incumbent has an incentive to keep out an upstream entrant in the first place. The theoretical literature has typically taken this for granted, by assuming that upstream entry reduces the incumbent’s and entrant’s joint profits. In practice, however, this is not so obvious. On the one hand, entry through multi-branding leads to intensified price competition and it may also reduce demand if consumers value dealer exclusivity. But on the other hand, entry may also increase demand through two channels. First, when an individual incumbent allows an entrant on its distribution network, this leads to business stealing from other incumbents. As a result, no incumbent may have a unilateral incentive for exclusive dealing to deter entry. Second, when a group of incumbents allows entry on their distribution networks, there is no more business stealing from each other, but demand may still increase because of product differentiation (market expansion or “business stealing from the outside good”). Hence, incumbents may not even have a collective incentive for exclusive dealing as a mechanism to foreclose entrants.

In sum, while entry through the incumbents’ distribution network may intensify price competition and reduce demand if consumers prefer exclusivity, it may also raise demand...
because of business stealing and/or increased product differentiation. As a result, entrants may be able to sufficiently compensate incumbents for not signing exclusive contracts with their retailers.

This framework serves as a guide for our empirical analysis of exclusive dealing as an entry barrier in the European car market. We collected a rich data set on car sales per model at the level of local towns in Belgium, and we combined this with data on dealer locations. Our empirical analysis consists of two steps. In a first step, we estimate a rich discrete choice demand model with both product and spatial differentiation. We use a method of moments estimator that combines aggregate moments (as in Berry et al. (1995) and Nevo (2001)) and micro moments (in the spirit of Berry et al. (2004), adapted to exploit local market information, and supplemented with additional micro moments for dealer proximity). The model enables us to quantify how much consumers value differentiated models, and how much they value dealer proximity and dealer exclusivity (for both sales and after-sales services). Controlling for a rich set of local market characteristics, we find that dealer proximity is an important determinant of automobile demand. This gives a first indication that exclusive dealing may serve as an entry barrier. We also find that consumers value dealer exclusivity, suggesting that there is also a demand efficiency rationale for exclusive dealing.

In a second step, we combine the demand model with a model of oligopoly pricing to perform a counterfactual analysis of exclusive dealing. We focus on the effects of a shift from exclusive dealing to multi-branding agreements between (European) incumbents and more recent entrants. Consistent with competition policy approaches, we consider both the internal profit incentives and the external effects of such a shift.

Regarding the internal profit incentives, we find that incumbents obtain a relatively strong variable profit increase after a unilateral shift to multi-branding with recent entrants. While this slightly intensifies price competition and reduces demand because consumers intrinsically value dealer exclusivity, multi-branding enables the firms to steal business from other competitors because of increased spatial availability. At the same time, however, incumbents have no collective incentive to shift to multi-branding with entrants. This only creates a small amount of market expansion through increased spatial coverage (business stealing from the outside good), and this is largely outweighed by a demand drop from the

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1 Earlier discrete choice models with spatial differentiation are in Davis (2006) and Ishii (2008), who only use macro moments. For the car market in the San Diego area, Albuquerque and Bronnenberg (2012) use a maximum likelihood approach in a nested logit framework.

2 There is still a strong link between sales and after-sales services in Europe. A survey conducted by Lademann and Partner (2001) found that “The high value placed on after-sales servicing [...] shows that, when a new car is being purchased, the buying phase is already overshadowed by the expectations placed on the utilisation phase. Therefore after-sales servicing is already of utmost importance at the time of purchase.” Shortly after the purchase, brand loyalty is about 90%.
lost dealer exclusivity and by losses from intensified competition. Put differently, there is no unilateral rationale for the prevalent use of exclusive dealing, while there is a collective rationale. These findings may rationalize the industry’s efforts to organize exclusive dealing under an industry block exemption regulation, as this provides a collective incentive infrastructure for all incumbent firms.

Regarding the external effects, we find that a collective shift to multi-branding would raise the smaller entrants’ market share. But more importantly, consumers would gain from the removal of exclusive dealing contracts, namely €105 per household. These gains especially stem from increased spatial availability (+€156 per household), which compensates consumers for the lost value of dealer exclusivity (-€58 per household). There is only a small gain from increased price competition under multi-branding (+€7 per household). In sum, the prevalent use of exclusive dealing throughout the car industry does not have a substantial anti-competitive impact, but it implies important consumer and welfare losses because of too limited spatial coverage. These findings suggest that the European Commission’s recent decision to facilitate exclusive dealing in the car market may not have been warranted.

There is a large theoretical literature on exclusive dealing. Most of this work has focused on the challenge raised by the Chicago school that an incumbent is not able to pay a sufficient amount to the retailer to accept exclusivity, unless there are efficiencies. One example of such a post-Chicago theory is Aghion and Bolton (1987). They show that an incumbent and a retailer can at least partially exclude an efficient entrant if the contract includes liquidated damages (serving as an entry cost for the entrant). Another theory of exclusive dealing starts from the assumption that an entrant needs more than one retailer to cover its fixed entry costs (Rasmusen et al., 1991; Segal and Whinston, 2000). An incumbent can then take advantage of a coordination failure and induce each individual retailer to sign an exclusive dealing contract, given that the other retailers sign. Asker and Bar-Isaac (2014) show that exclusion may also arise from an equilibrium understanding between the incumbent and the retailers, without an explicit exclusivity clause in an enforceable contract. Our paper assumes the circumstances are such that incumbents can convince retailers to sign an

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3. This is consistent with Hemphill and Wu (2013)’s analysis. They argue that it is easier to coordinate on simultaneous exclusionary behavior than on collusive prices. Consequently, they predict that even oligopolies that compete on price may still cooperate on exclusion.

4. Extensions to this work have however shown that the circumstances under which an incumbent can exploit the retailers’ coordination failure are surprisingly subtle. Fumagalli and Motta (2006) show that the coordination problem may disappear when the retailers are not final consumers, but instead compete with each other. One single deviant retailer may then be able to serve the whole market by buying more cheaply from the entrant, enabling the entrant to cover its fixed costs. However, Simpson and Wickelgren (2007) reverse the results when there is contract breach. The incumbent is then able to prevent entry when retailers compete, but not when they are final consumers.
exclusive dealing contract, which is consistent with the evidence for the European car sector.\(^5\) We instead focus on the question whether an entrant can convince an incumbent \textit{not} to sign an exclusive dealing contract and allow entry on its distribution network. This provides interesting insights, relating also to the theoretical literature on the incentives for open access or common carrier policies in network industries.\(^6\) It suggests that more theoretical work could also focus in this direction.

Despite the variety of theories, empirical evidence on exclusive dealing remains very scarce, especially on the entry deterring motive. A small experimental literature has studied the role of specific game-theoretic assumptions behind exclusive dealing as an entry barrier. Consistent with the theory, these studies confirm that the outcome depends crucially on the set-up of the game, including communication and discrimination (Landeo and Spier, 2009), sequentiality and secrecy (Boone et al., 2009) and the number of buyers (Smith, 2011).

Empirical evidence outside of the laboratory is even scarcer; see Lafontaine and Slade (2008) for an overview. Since directly estimating the effect of exclusive dealing on entry is very difficult, all previous empirical studies have used an indirect approach. Sass (2005) finds that exclusive dealing is more prevalent in smaller markets, while foreclosure theory suggests the opposite. Similarly, Asker (2005) finds that rivals do not have higher costs when they must compete with firms who sell under exclusive dealing agreements. This goes against the raising-rivals’-cost prediction of foreclosure, according to which firms engage in exclusive dealing to raise the competitors’ costs and obtain a strategic advantage. One study suggests exclusive dealing contracts may be used to foreclose. Ater (2010) finds that exclusive dealing reduces sales, and concludes that this is inconsistent with efficiencies, so that exclusive dealing must be used for anti-competitive reasons. We take this literature a step further. By estimating a rich demand model with both product and spatial differentiation and dealer exclusivity, we can first assess the anti-competitive profit incentives for exclusive dealing, and subsequently evaluate the impact on consumers and welfare.

Note that our analysis of exclusive dealing focuses on possible foreclosure of upstream rivals by denying access to downstream distributors. This differs from recent empirical work that considers foreclosure of downstream rivals by denying access to upstream suppliers. For example, in a recent paper Crawford et al. (2014) analyze multichannel TV markets in

\(^5\)For evidence and discussion that exclusive dealing is common practice in the car industry in Belgium (and Europe in general), see Wade (2005) and Wijckmans and Tuytschaever (2011). It is enforced either through explicit contracts or through implicit contracts and bonus systems. See also our discussion of national distributors in section 2.

\(^6\)Armstrong (2002) provides a general overview of access policies and regulation in telecommunications; Bourreau and Dogan (2006) and Klump and Su (2010) are examples of theoretical work on an incumbent’s open access incentives in the absence of regulation. The focus in that work is on the incentives of a single incumbent, whereas we also consider multiple incumbents.
the US, and consider whether integrated cable distributors may foreclose downstream rivals (satellite) from upstream content (regional sports).

Our work does not only contribute to the academic literature, but also to the policy debate on vertical restraints, competition policy and non-tariff trade barriers. Policy makers in both the U.S. and in Europe have repeatedly expressed concerns that the reduction of government-imposed trade barriers (such as tariffs) may induce private companies to set up anti-competitive practices as a protection against foreign manufacturers. In this respect, our findings suggest that exclusive dealing in the European car market has only served as a mild entry barrier against Asian competitors, but with considerable consequences on consumers’ domestic welfare because of reduced spatial coverage.

The remainder of this paper is organized as follows. Section 2 discusses the relevant regulations in the European car market. Section 3 provides a conceptual framework for thinking of the internal profit incentives for exclusive dealing. Section 4 develops the model of demand and pricing, and the counterfactuals to assess the effects of a shift from exclusive dealing to multi-branding. Section 5 describes the data and section 6 describes estimation issues. Section 7 shows the empirical results and counterfactual analyses. Section 8 concludes.

2 Vertical restraints in the European car market

Car manufacturers have exercised control on their dealership networks through a wide range of vertical restraints. We first give a broad overview of the most relevant price and non-price restraints in the European car market. We then discuss the evolution in the European Commission’s policy towards the three main non-price restraints, with a focus on exclusive dealing. Finally, we present preliminary evidence on exclusive dealing and its relationship with market shares.

Price and non-price restraints European car manufacturers apply several types of price restraints. First, they publish recommended retail prices (or list prices) to their dealers and advertise these to consumers through price catalogues. Recommended retail prices are evidently not equivalent to resale price maintenance (RPM), since car dealers can still apply

7 For example, the following quote comes from two former European Commissioners for trade and competition policy: “[...] the incentive for firms to engage in anti-competitive behavior impeding market access (such as [...] vertical restraints) increases with the reduction of tariffs and other barriers”, see Brittan and Van Miert (1996). Similarly, the U.S. Federal trade Commission’s Assistant Director of the International Antitrust Division has stated that: “[...] as government barriers to market integration disappear, we can expect that private anticompetitive practices will assume increased importance. And vertical restrictions will be an important and complicated issue for competition enforcers”, see Valentine (1997).
discounts to the recommended retail prices. In practice, however, the distinction between both is often very small.\footnote{Discounts to recommended retail prices tend to be quite uniform and show little variation over time, as discussed in\cite{DegryseVerboven} based on a survey conducted through the European Commission. Furthermore, several manufacturers such as Volkswagen and DaimlerChrysler have been convicted for imposing RPM, as reviewed in\cite{Verboven}.} Second, manufacturers apply non-linear wholesale pricing policies in the form of bonuses to their dealers if they meet certain sales targets. As such, the bonus systems are similar to quantity fixing, see also\cite{WijckmansTuytschaever} for a detailed discussion. Based on both considerations, we will assume throughout the paper that manufacturers control retail prices either directly or indirectly, so there are no double marginalization effects.\footnote{Further evidence on the control of manufacturers can be found in the fact that 88\% of sales volume in Europe is organised through manufacturer-owned national distributors, see\cite{WadeBrown}. A dealer we talked to confirmed that both the national distributor and the manufacturer exert pressure on the dealer to comply with sales targets or exclusive contracts through bonus systems and refusals to supply. Finally,\cite{BrenkersVerboven} also find that double marginalization as a softening competition device is not profitable in this market (ruling out the possibility of\cite{ReyStiglitz}'s theory for this market).}

In addition to these price restraints, manufacturers apply three main non-price restraints: selective distribution, exclusive distribution and exclusive dealing. Selective distribution enables manufacturers to impose various quantitative and qualitative criteria on their dealers, such as a maximum number of dealers through the country, and minimum standards on showrooms, staff training and advertising. Exclusive distribution (or exclusive territories) allows manufacturers to appoint a designated territory to each dealer. Finally, exclusive dealing (or single-branding) restricts the dealer to sell competing brands, or only allows a maximum number of sales of competing brands. This third vertical agreement is the focus of our paper. For empirical work on exclusive territories in the car market, see\cite{BrenkersVerboven}.

**Evolution in policy towards non-price restraints** Before 1985 vertical restraints were allowed as individual exemptions under Article 81 of the EC Treaty. This was a costly process, and the arguments motivating the exemptions were typically the same across cases. Since 1985, the European Commission has therefore followed a policy of granting block exemptions applicable to the whole car sector. This eliminated the need to file for individual exemptions, and automatically allowed manufacturers to impose the vertical restraints as long as they remained within the “safe harbor” market share thresholds of the block exemption.

Table\[1\] summarizes the three main episodes of block exemptions. In 1985 the Commission introduced its first Motor Vehicle Block Exemption, renewed in 1992 with minor changes.
It allowed manufacturers to apply both selective and exclusive distribution, and impose exclusive dealing up to 80% of the dealers’ sales. In practice, the distribution system was rather rigid and led to a standardized system in which all firms essentially adopted the same vertical restraints. In 2002 a major reform took place, which became stricter towards manufacturers and promoted more diversity: manufacturers could adopt either selective or exclusive distribution, but no longer both. Exclusive dealing could only be imposed for up to 30% of the dealers’ sales (compared with 80% before). So in principle, between 2002 and 2010, European dealers could not be prohibited from selling up to three different brands.

In June 2010 the Commission again revised the regulation to make it more in line with the General Vertical Block Exemption that applied to other industries. It deemed that the level of competition was sufficient in the market of new car distribution, so manufacturers could again impose exclusive dealing for up to 80% of the dealers’ sales. Since June 2013 the car sector completely falls under the general block exemption rules towards vertical restraints, which also allows exclusive dealing.

This brief history of block exemptions shows an interesting evolution in the European Commission’s thinking about vertical restraints. Until 2002, the Commission was largely pre-occupied with its objective of the realization of a common market. It feared that a system of selective and exclusive distribution would give manufacturers too much control over new car sales, and would prevent parallel imports between European countries when international price differences become large. The Commission therefore took several initiatives to promote parallel imports and it periodically monitored the evolution of international price differences. Other research has documented how selective and exclusive distribution can influence international price differentials and European integration in general (Goldberg and Verboven, 2001; Brenkers and Verboven, 2006).

Since 2002 the Commission has clearly shifted its focus to the competition policy objective, perhaps because it considers that the common market objective has made sufficient progress. First, it has taken measures to loosen the link between the car manufacturers’ sales and after-sales networks, to reduce the risk of foreclosure of independent spare part manufacturers. Second, it showed concern with the practice of exclusive dealing, since it entails the risk of foreclosure of new entrants. The latter motivates our analysis of exclusive dealing as an entry barrier.

**Exclusive dealing in practice** Even though multi-brand dealerships were actively encouraged between 2002 and 2010, exclusive dealing still remained prevalent in most European

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10The 2010 regulation only became more strict towards manufacturers with respect to after-sales repair and maintenance services, since the Commission considered competition to be less intense in these markets.
Table 1: History of the European Motor Vehicle Block Exemption Regulation

<table>
<thead>
<tr>
<th>Period</th>
<th>Selective Distribution</th>
<th>Exclusive Distribution</th>
<th>Exclusive Dealing</th>
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<tr>
<td>1985-2002</td>
<td>AND</td>
<td>AND</td>
<td>up to 80%</td>
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<tr>
<td>2002-2010</td>
<td>OR</td>
<td>OR</td>
<td>up to 30%</td>
</tr>
<tr>
<td>2010-2013</td>
<td>OR</td>
<td>OR</td>
<td>up to 80%</td>
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Note: The table reports the regulation regarding selective and exclusive distribution and exclusive dealing throughout the three major reforms of the European Motor Vehicle Block Exemption Regulation.

countries. The European Commission acknowledged this as well in their press release accompanying the new block exemption on May 27th 2010, where they state: “The old rules have had little impact on favouring multi-dealerships [...]” ([DG competition][2010]). While in the U.S. only 57% of the dealers are exclusive to one brand, this amounts to 70% in Europe ([Wade][2005]).

Our empirical application considers the case of Belgium in 2010-2011, for which we were able to construct a rich data set. This application is interesting for several reasons. First, because of its highly urbanized structure exclusive dealing is even more prevalent in Belgium than in other countries, with 81% of the dealers selling one single brand. Second, the Belgian car market is the largest among countries that do not have a domestic producer.[11] This leads to a fairly unconcentrated market share with a strong market presence of most main European manufacturers. As we discuss below, this makes it particularly relevant to distinguish between unilateral exclusive dealing incentives (by a single incumbent) and collective incentives (by multiple incumbents).

Figure 1 presents preliminary evidence on the relationship between market shares and the number of dealers for 32 brands. This is based on our detailed data set at the level of individual towns, which we describe in section 5. Figure 1 shows there is a strong correlation between country-level market shares and the number of dealers (93%). While this suggests the importance of large distribution networks, it does not imply a causal relationship since manufacturers of intrinsically more popular brands may also open more dealerships. To address this in more detail, we estimate a spatial demand model using data on local towns, and control for model fixed effects and a rich set of local consumer demographics. This model will confirm the importance of dealer proximity, and serve as the basis for assessing the incentives and effects of exclusive dealing.

[11] The market is evidently smaller than that of the six large European countries with domestic producers (France, Germany, Italy, Spain and the U.K.). But it is larger than more populated countries such as the Netherlands (high taxes) or Poland (lower income per capita).
3 Profit incentives for exclusive dealing

We begin with a simple framework to discuss the incumbent firms’ profit incentives to engage in either exclusive dealing or multi-branding. Previous theoretical research has focused on the question whether an incumbent firm can compensate its retailers sufficiently to make them sign an exclusive contract and keep an entrant out of the market. Here, we simply assume the incumbent can indeed induce its retailers to sign an exclusive contract. For example, this may work by exploiting a lack of coordination between retailers (as in Rasmusen et al. (1991)), or even more simply by granting territorial exclusivity to the dealer in exchange for accepting to sell only one brand. Exclusion may also arise from an equilibrium understanding between the incumbent and the retailers without an explicit contract (see Asker and Bar-Isaac (2014)). The prevalence of exclusive dealing is consistent with the evidence for the European car sector, discussed in the introduction.

Instead of the question whether the retailer can be induced to sign an exclusive dealing contract, we focus on the equally important question whether the incumbent has an incentive to keep out the entrant in the first place. The theoretical literature has typically taken this

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Note: The figure plots the market shares and the number of dealers of each of the 32 brands in our data set.
for granted. In practice, however, this is not so obvious since the entrant may want to compensate the incumbent for *not* signing an exclusive contract with its retailers.

We first consider the case of one incumbent and one entrant. This introduces the basic incentives for exclusive dealing. Next, we consider the case of two incumbents and one entrant. This enables us to distinguish between the unilateral and the collective incentives for exclusive dealing by multiple incumbents.

### 3.1 One incumbent, one entrant

Consider a market with one incumbent firm *I* and one potential entrant *E*. Assume that *I* sells through its own (vertically integrated) downstream retailer, and *E* can only enter if it also obtains access to *I*’s retailer. We ask whether *I* has an incentive to use exclusive dealing to foreclose *E*, or whether instead *E* can convince *I* not to use exclusive dealing.

If *I* imposes exclusive dealing, it forecloses entry by *E* and obtains the monopoly profits $\pi_I^M$, and *E* obtains zero. If instead *I* allows multi-branding, then *I* and *E* obtain the duopoly profits $\pi_I^D$ and $\pi_E^D$. To achieve multi-branding, *E* is willing to compensate *I* by an amount up to $\pi_E^D$. At the same time, *I* requires a minimum compensation equal to its loss when going from monopoly to duopoly, $\pi_I^M - \pi_I^D$. Hence, the entrant cannot convince the incumbent to accept multi-branding, so that there is exclusive dealing if and only if $\pi_E^D < \pi_I^M - \pi_I^D$, or equivalently if

$$\pi_I^D + \pi_E^D < \pi_I^M,$$

i.e. if industry profits are smaller under duopoly than under monopoly. This is the typical assumption in the literature, and it is satisfied when the incumbent and the entrant sell homogeneous products and are equally efficient. In practice, however, industry profits may be higher under duopoly, for example if the entrant is more efficient or if it adds sufficient product differentiation to the market. Under these circumstances, *E* can convince *I* not to sign an exclusive dealing contract with its dealer and instead *I* and *E* would make a multi-branding arrangement.

### 3.2 Two incumbents, one entrant

Now consider a market with two incumbent firms *I* and *U* and one potential entrant *E*. Both *I* and *U* sell through their own downstream retailer, and *E* can only enter if it obtains access to either *I*’s or *U*’s retailer. We now distinguish between the incumbents’ unilateral and collective incentives to use exclusive dealing to foreclose entry.

If both incumbents *I* and *U* impose exclusive dealing, they foreclose entry and can main-
tain duopoly profits of $\pi_D^I$ and $\pi_D^U$, respectively, whereas $E$ obtains zero. If instead either $I$ or $U$ allows multi-branding with $E$, then $E$ becomes a viable competitor and $I, U$ and $E$ obtain triopoly profits. For simplicity, assume these triopoly payoffs are the same regardless of whether $E$ enters through a multi-branding agreement with $I$ or $U$, and denote these by $\pi_T^I, \pi_T^U$ and $\pi_T^E$. We do not make this assumption in our empirical analysis, and in appendix A we show that the same economic intuition holds in the more general case where triopoly profits depend on whether $E$ enters through $I$ or $U$.

To achieve multi-branding, $E$ is willing to compensate one of the incumbents by an amount up to $\pi_T^E$. The incumbent $I$ requires a compensation for going from duopoly to triopoly of at least $\pi_D^I - \pi_T^I$ and incumbent $U$ requires a compensation of at least $\pi_D^U - \pi_T^U$. The outcome depends on whether the incumbents make collective or unilateral exclusive dealing agreements.

**Collective exclusive dealing agreement** If the incumbents can make a collective agreement, the entrant must pay the minimum required compensation to both incumbents, i.e. pay a total compensation of at least $\pi_D^I - \pi_T^I + \pi_D^U - \pi_T^U$. Since $E$ is willing to pay at most $\pi_T^E$, the incumbents have a collective incentive for exclusive dealing if $\pi_T^E < \pi_D^I - \pi_T^I + \pi_D^U - \pi_T^U$ or

$$\pi_I^T + \pi_U^T + \pi_E^T < \pi_I^D + \pi_U^D. \quad (1)$$

The incumbents thus have a collective incentive to foreclose entry through exclusive dealing if industry profits are greater under duopoly than under triopoly (with entry through either $I$ or $U$). In practice, this will be the case if the entrant is not substantially more efficient or if it does not add too much product differentiation, i.e. if there is limited market expansion or “business stealing from the outside good”. Under these circumstances, the dominant effect of entry is intensified price competition and firms collectively prefer exclusive dealing.

**Unilateral exclusive dealing agreements** In contrast, if the incumbents cannot make a collective exclusive dealing agreement, $E$ must only convince either $I$ or $U$ to accept multi-branding, and pay at least $\min \{ \pi_D^I - \pi_T^I, \pi_D^U - \pi_T^U \}$. Since $E$ is willing to pay at most $\pi_T^E$, the incumbents have a unilateral incentive for exclusive dealing if

$$\pi_I^T + \pi_E^T < \pi_I^D \quad \text{and} \quad \pi_U^T + \pi_E^T < \pi_U^D. \quad (2)$$

The incumbents thus have a unilateral incentive to foreclose entry through exclusive dealing if each incumbent’s duopoly profits is greater than the sum of each incumbent’s and the entrant’s triopoly profits. A comparison between (1) and (2) shows that the unilateral
incentives for exclusive dealing are generally smaller than the collective incentives, i.e. as long as \( \pi_T^U < \pi_U^T \) and \( \pi_T^I < \pi_I^T \). Even if \( I \) and \( U \) have a collective incentive for exclusive dealing (so that (1) holds), \( I \) (resp. \( U \)) may have a unilateral incentive to start multi-branding with \( E \) because it does not take into account the profit losses from increased price competition and business stealing on the other incumbent, i.e. \( \pi_T^U < \pi_U^D \) (resp. \( \pi_I^T < \pi_I^D \)).

To summarize, under both collective and unilateral exclusive dealing agreements, the incumbents are concerned that multi-branding leads to intensified price competition with a third competitor. But each incumbent has a stronger incentive to unilaterally start multi-branding since this allows business stealing from the other incumbent and from the outside good. They have a lower incentive to collectively start multi-branding, since this only allows market expansion or “business stealing from the outside good”.

Our empirical framework will consider a much richer set-up to account for the particular characteristics of the car market. There may be both brand differentiation and spatial differentiation between competitors, and “entrants” may already be in the market but with only a limited spatial presence. We also account for the possibility that exclusive dealing has a direct effect on demand. A priori, this effect could be positive or negative. Manufacturers could invest more in exclusive dealers because exclusivity eliminates free riding issues. This would lead to better service, maintenance and repair and an overall better reputation of the brand. In this case exclusivity would raise demand. On the contrary, consumers could value multi-branding, since it allows them to compare cars more easily. In this case, exclusivity would lower demand. The basic economic intuition behind the profit incentives remains however the same when we account for this direct demand effect. On the one hand, incumbents have an incentive to engage in exclusive dealing to soften price competition (by limiting the spatial presence of small firms) or to keep reputation high. On the other hand, incumbents may be tempted to accept multi-branding, especially unilaterally, since this enables them to steal business from competitors or from the outside good.

4 The model

Keeping in mind the stylized example of the previous section, we now present a rich equilibrium model of the demand and supply of new cars. First, the demand side incorporates both product and spatial differentiation. We formulate a random coefficients logit model, in which consumers value both car characteristics and dealer characteristics. Second, the supply side

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13In a limiting case, \( \pi_T^U = \pi_U^D \), i.e. \( U \) is not affected when \( I \) makes a multi-brand agreement with \( E \), as may happen for example if the distance between the dealers of \( I \) and \( U \) is far. In this case, there is no difference between \( I \)'s unilateral and the collective incentives for exclusive dealing.
considers multi-product price-setting manufacturers. Each manufacturer has a network of exclusive dealers and determines prices to maximize profits. Finally, we discuss how a change from exclusive dealing to multi-branding may affect equilibrium profits, consumer surplus and welfare.

4.1 Demand

We specify a model of demand with both product and spatial differentiation. As in Berry et al. (1995), we start from a model of individual choice to obtain an aggregate demand system for differentiated products. As discussed in Berry et al. (2004), this framework is also suitable to incorporate micro-level data on consumer choices. In our application, we have additional micro-level data on sales per local market, which gives useful micro moments to identify the role of local dealer characteristics and consumer demographics.

In each year $t$ there are $L_t$ consumers choosing between $J$ differentiated products. The indirect utility of a consumer $i$ from buying car model $j$ in year $t$ is given by

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

(3)

Here, $x_{jt}$ is a $1 \times K$ vector of observable car characteristics, $p_{jt}$ is the price of product $j$, and $d_{ij}$ is a vector of observable characteristics of the dealer network for model $j$ and consumer $i$. We include in $d_{ij}$ the distance to the nearest dealer for consumer $i$ and a dummy variable to indicate whether this dealer is an exclusive (single-brand) or a multi-brand dealership. The term $\xi_{jt}$ is a product characteristic that is unobserved to the researcher, and $\epsilon_{ijt}$ is an individual-specific taste parameter for product $j$ in year $t$, modeled as a zero mean i.i.d. random variable with a Type 1 extreme-value distribution.

The vector of parameters $\gamma$ captures consumers’ taste for dealer characteristics such as proximity and exclusivity. They are thus of central importance to describe the extent of spatial differentiation in the car market. With the exception of Albuquerque and Bronnenberg (2012), most other empirical work on car demand has only considered product differentiation and neglected spatial differentiation and the role of dealer proximity and dealer exclusivity. For our purposes, the role of dealer proximity and exclusivity status are particularly relevant, since we will assess the effects of a move from exclusive dealing to multi-branding by changing both the distances that consumers need to travel to obtain certain products as well as the exclusivity of the dealer.

The parameters $\beta_i$ (a $K \times 1$ vector) and $\alpha_i$ are random coefficients, capturing individual-

---

14 In principle, one could allow this coefficient to vary across consumers, as we do for $\alpha$ and $\beta$. To keep the model parsimonious, we didn’t include additional heterogeneity in preferences for dealer characteristics.
specific tastes for car characteristics and price. The individual-specific taste parameters may vary across consumers because of both observed heterogeneity such as income and unobserved heterogeneity. Following Nevo (2001), we specify the \((K + 1) \times 1\) taste parameter vector as follows:

\[
\begin{pmatrix}
\alpha_i \\
\beta_i
\end{pmatrix} = \begin{pmatrix}
\alpha \\
\beta
\end{pmatrix} + \Pi H_i + \Sigma \nu_i,
\]

where \(H_i\) is an \(M \times 1\) vector of observed demographic variables taken from the empirical distribution, and \(\nu_i\) is a \((K + 1) \times 1\) vector of unobserved standard normal consumer valuations, \(\nu_i \sim N(0, I_{K+1})\), independent from the distribution of \(H_i\). The parameter vector \((\alpha, \beta)'\) is a \((K + 1) \times 1\) vector, capturing the mean valuations for the product characteristics, \(\Pi\) is a \((K + 1) \times M\) matrix describing how the valuations for price and the product characteristics vary with consumer demographics, and \(\Sigma\) is a \((K + 1) \times (K + 1)\) scaling matrix capturing unobserved heterogeneity in the valuations for the product characteristics. To reduce the number of parameters to be estimated, we restrict several parameters in the matrix \(\Pi\) to zero and we assume that \(\Sigma\) is diagonal, i.e. set the covariances in \(\Sigma\) to zero.

Instead of purchasing one of the car models \(j\), consumers may also decide not to purchase a car, in which case they consume the “outside good”. We specify \(u_{i0t} = \epsilon_{i0t}\), i.e. we normalize the mean and individual-specific valuations to zero, since they are not identified from the constant.

Define \(\delta_{jt} = x_{jt} \beta + \alpha p_{jt} + \xi_{jt}\) as the mean utility for car model \(j\) and \(\mu_{ijt} = \{x_{jt}, p_{jt}\} \Pi H_i + \{x_{jt}, p_{jt}\} \Sigma \nu_i + \gamma d_{ij}\) as the individual-specific deviation from that mean. Assuming that consumers choose the car model that maximizes utility, the probability that individual \(i\) in year \(t\) chooses car model \(j\), conditional on \((\nu_i, H_i, d_i)\), is given by

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

where \(d_i\) includes the dealer characteristics \(d_{ij}\) for all brands. To obtain the unconditional choice probability or predicted aggregate market share of car model \(j\) in year \(t\), we integrate the conditional logit probability over the density of \((\nu_i, H_i, d_i)\).

\[
s_{jt} = \int Pr_{ijt}(\nu, H, d) dF(\nu, H, d),
\]

where \(F(\nu, H, d)\) is the joint distribution function of \((\nu, H, d)\) in the population. Similarly, we can also obtain the predicted market shares in a local market \(m\) by integrating over the
population of individuals $i$ living in local market $m$:

$$s_{jmt} = \int_{i \in m} \Pr_{ijt}(\nu, H, d) dF(\nu, H, d). \quad (6)$$

The predicted aggregate market shares $s_{jt}$ will be used in the construction of our aggregate moments, and the predicted local market shares $s_{jmt}$ will be used in the construction of the micro moments since we observe sales at the level of these local markets.\(^{15}\)

It will be useful to express the aggregate market shares as a function of car prices and the geographic dealer network. For simplicity, we suppress the time subscript $t$ for the remainder of this section. Let $p$ be the $J \times 1$ price vector, with elements $p_j$. Furthermore, let $d$ be the $(J \cdot N) \times 2$ “dealer matrix”, where $N$ is the number of consumer locations. Hence, $d$ stacks the $1 \times 2$ vector $d_{ij}$ of the two dealer characteristics (distance and exclusivity) over car models and consumer locations. The first column of $d$ thus describes the distances that all consumers need to travel to the nearest dealer of each product $j$, while the second column declares whether this dealer is an exclusive dealer or not. We then rewrite the market share of model $j$ (without the time subscript) as $s_j(p, d)$, to indicate it is a function of the price vector $p$ and the dealer matrix $d$. As we discuss in the next subsection 4.2, prices are determined according to multi-product Bertrand pricing. Furthermore, as discussed in subsection 4.3, the dealer matrix is taken as given, but we will consider counterfactuals where the dealer matrix changes when firms open up their exclusive dealing networks.

### 4.2 Oligopoly pricing

As discussed in section 2, car manufacturers may influence retail prices in various ways, by setting wholesale prices, franchise fees, sales targets and dealer bonuses, etc. Based on this, we follow a simplified approach and assume each manufacturer sets retail prices to maximize total upstream and downstream profits over all its products, taking as given the retail prices set by the other firms. This is the multi-product Bertrand pricing assumption, common in much of the car market literature. It is as if manufacturers and dealers implement the vertically integrated solution. There is thus no double marginalization, which was also ruled out in other work on the European car market (Brenkers and Verboven (2006)).\(^{16}\) In other contexts, the multi-product Bertrand pricing equilibrium may also result from “interlocking

\(^{15}\)These local markets are thus not “relevant geographic markets” in the sense that consumers can only buy from dealers in their local market. Consumers buy from the nearest dealer, even if that dealer is located in another town. We base this assumption on Albuquerque and Bronnenberg (2012) who find that each dealership has a localized demand area and that choice probabilities decrease at a fast rate with distance between buyers and sellers.

\(^{16}\)See also our discussion of the no double marginalization assumption in section 2.
relationships” between manufacturers and dealers under non-linear pricing schemes as shown by Rey and Vergé (2010). Bonnet and Dubois (2010) apply their model, and find evidence that is consistent with the multi-product Bertrand pricing equilibrium.\footnote{This equilibrium without double marginalization is obtained under two-part tariffs and RPM (their Model 7). Some caution is warranted since their market is rather different (bottled water) and has a different retail structure (supermarkets, including a private label and more interlocking relationships).}

Note that in the car market, firms often own several brands, which in turn produce several models. We therefore implement multi-product pricing by firm, not by brand.

More formally, we observe $F$ firms, each owning several brands and producing a subset $\mathcal{F}_f$ of the $J$ different car models and selling it through the existing dealer network $d$. Omitting the time subscript $t$, firm $f$’s total variable profits $\pi^V_f$ over all its products $j \in \mathcal{F}_f$ across local markets $m$ are given by

$$\pi^V_f = \sum_{j \in \mathcal{F}_f} (p_j - c_j) s_j(p, d)L, \quad (7)$$

where $s_j(p, d)$ is product $j$’s aggregate market share, $L$ is the potential market size, and $c_j$ is the constant marginal cost of producing and selling product $j$.\footnote{More specifically, the aggregate market share $s_j$ is the weighted average of the local market shares, weighted by market size: $s_j = \sum_m s_{jm} L_m / \sum_m L_m$; and $L$ is the sum of the local market sizes $L = \sum_m L_m$.}

We thus assume that marginal costs $c_j$ are product-specific and do not differ across local markets $m$. We do however allow fixed costs of distribution to vary across locations and exclusivity status (see section 7.2.1). Hence, we allow a manufacturer’s investment in exclusive dealerships to affect fixed costs but not marginal costs. This would arise if the manufacturer pays for the training of the staff, the design or decoration of the showroom or local advertising, all of which are fixed costs for the dealership.

Each firm sets prices of all its products to maximize profits, taking as given the prices set by the other firms. Assuming existence of a pure-strategy Nash equilibrium, the first-order conditions are

$$s_j(p, d) + \sum_{k \in \mathcal{F}_f} (p_k - c_k) \frac{\partial s_k(p, d)}{\partial p_j} = 0, \quad \text{for all } j = 1, ..., J. \quad (8)$$

We write the Nash equilibrium solution to this system as $p = p^*(d)$. Existence has been shown in related general single-product firm models of product differentiation, see for example Caplin and Nalebuff (1991); and in more restrictive demand models with multi-product firms, e.g. Anderson and De Palma (1992)’s nested logit.\footnote{In our setting with a normally distributed random coefficient on price a technical issue arises, because there is a positive mass of consumers with a positive price coefficient. As a result, the first-order conditions
To write the first-order conditions in matrix form, define $\theta^F$ as the firms’ product ownership matrix, where a typical element $\theta_{jk}^F$ is equal to 1 if products $j$ and $k$ are produced by the same manufacturer, and 0 otherwise. Let $s(p)$ be the $J \times 1$ market share vector, and $\nabla_p s(p(d), d) \equiv \frac{\partial s(p(d), d)}{\partial p}$ be the corresponding $J \times J$ Jacobian matrix of first derivatives. Using the operator $\odot$ to denote the Hadamard product, or element-by-element multiplication, we can write the first-order conditions as

$$s(p, d) + \left( \theta^F \odot \nabla_p' s(p, d) \right)(p - c) = 0. \quad (9)$$

As is well-known, one can use the first-order conditions (9) to retrieve the current marginal costs $\hat{c}$ as the difference between the current prices and the equilibrium profit margins

$$\hat{c} = p - \left( - \left( \theta^F \odot \nabla_p' s(p, d) \right) \right)^{-1} s(p, d). \quad (10)$$

One can subsequently use the uncovered marginal costs to perform policy counterfactuals on (9), i.e. consider the effects of exogenous changes on equilibrium prices, profits and welfare. We now describe the type of counterfactuals we conduct.

### 4.3 From exclusive dealing to multi-branding

Our main goal is to assess the profit incentives and the welfare effects of a move from exclusive dealing to multi-branding. Such a move essentially consists of a change in the spatial availability of the products that become available at multi-brand dealerships, as well as a change in the dealer exclusivity variable. More formally, we define a move from exclusive dealing to multi-branding as a change in the dealer matrix $d$ (which consists of the distance and exclusivity status of the nearest dealer of each product for each consumer). Define the current system of mainly exclusive dealing by the dealer matrix $d^0$ and a new distribution system with more multi-branding arrangements by a new dealer matrix $d^1$.

To illustrate, consider Figure 2 which shows a move from exclusive dealing to multi-branding. Under exclusive dealing (left panel) the incumbent firm $I$ and the entrant firm $E$ each have their own dealers, but $I$ has two dealers while $E$ only has one, as it is a smaller entrant. The distance vector for consumer $i = 1$ is $d^0 = (d^0_{1I}, d^0_{1E})$, so this consumer has to travel far to the entrant $E$. Under multi-branding (right panel) $I$ opens its network to $E$, so

only define a local maximum, but in a global maximum it would be optimal to set an infinitely high price. A solution would be to impose a sufficiently low reservation price (because of wealth constraints) or to use a truncated normal distribution. In our setting, we estimate a relatively small standard deviation for the random coefficient on price, implying negative price coefficients for all drawn consumers, so that we effectively draw from a truncated normal distribution.
the distance vector for consumer $i = 1$ becomes $d^1_1 = (d^0_{1I}, d^0_{1E})$, i.e. consumer 1 now has to travel the same distance to $I$ and to $E$.

Figure 2: Entrant $E$ makes use of incumbent $I$’s dealerships under multi-branding

![Diagram showing exclusive dealing and multi-branding](image)

(a) Exclusive dealing

(b) Multi-branding

Note: The figure illustrates a move from exclusive dealing to multi-branding. The left panel shows the situation under exclusive dealing, when $I$ and $E$ each have their own dealers. The distances that consumer 1 must travel are given by distance vector $d^0_1 = \{d^0_{1I}, d^0_{1E}\}$. The right panel shows the situation under multi-branding, when $E$ can sell its goods at $I$’s dealer. The distance vector is now given by $d^1_1 = \{d^0_{1I}, d^0_{1E}\}$.

More generally, a move from exclusive dealing ($d^0$) to multi-branding ($d^1$) involves a change of the travel distances for all consumers whose nearest dealer of a particular product has changed. It also changes the exclusivity status for consumers whose nearest dealer has not changed, but whose dealer now also sells other brands. This increased spatial availability and decreased exclusivity has both direct effects and indirect effects through the change in the Nash equilibrium price vector $p^*(d)$.

In our counterfactual analysis we consider the effects of a move from exclusive dealing ($d^0$) to multi-branding ($d^1$) on demand, consumer surplus, gross producer surplus and total welfare. Gross producer surplus is simply the sum of variable profits

$$PS(p(d), d) = \sum_{f=1}^{F} \pi_f (p^*(d), d).$$

Total consumer surplus (up to a constant) is

$$CS(p(d), d) = \int CS_i(\nu, H, d) dF(\nu, H, d),$$
where \( CS_i(\nu, H, d_i) \) is the well-known logit expression for individual consumer surplus

\[
CS_i(\nu, H, d_i) = \frac{1}{\alpha_i} \ln \left( \sum_{j=1}^{J} \exp(\delta_j + \mu_{ij}(\nu, H, d_{ij})) \right),
\]

as shown in Williams (1977) and Small and Rosen (1981).

We focus on multi-branding agreements where one or multiple incumbents open their dealer network to smaller entrants (but not vice versa). We will decompose the total effects into different parts: the effects that stem from increased spatial availability (first element in \( d \)), from decreased exclusivity (second element in \( d \)), and from increased price competition (change in Nash equilibrium from \( p^*(d^0) \) to \( p^*(d^1) \)). For example, a multi-brand agreement may raise demand and variable profits because of increased spatial availability, it may lower demand and variable profits because of decreased exclusivity, and it may reduce prices and variable profits because of increased competition. The overall effect on variable profits is therefore ambiguous. The standard anti-competitive profit incentive for exclusive dealing only holds if the competition effect dominates the net demand effect.\(^\text{20}\)

5 Data

Our data set covers the car market in Belgium at a highly disaggregate level. After the five large countries France, Germany, Italy, Spain and the U.K., Belgium is the sixth largest car market in the European Union (larger than the more populated but high car tax country the Netherlands, and larger than the low income countries Poland and Romania). In contrast with the five large countries, there are no domestic brands. This results in a relatively unconcentrated market structure with many European incumbents of similar size.

We combine the following data sets. The main data set consists of car sales by model, town and sex. We combine this with three auxiliary data sets: dealer locations and dealer characteristics; car characteristics by model; and household characteristics by town.

Car sales data The data on car sales are collected by Febiac, the Belgian automobile federation. The data cover car sales during the years 2010-2011 for each model, by town and purchaser type. We observe 588 “towns”, covering either a medium sized town, a group of small towns or part of a city. These towns house on average 7500 households who bought on average 348 cars in a given year. The purchaser type may be one of three groups (in addition to a negligible rest category): men, women and corporations. Since corporations often buy

\(^{20}\)We refer to our working paper version for a more detailed decomposition of these effects.
their fleet centrally and have different relationships with the car dealers, we exclude car sales to private companies. We thus end up with car sales data per model, broken down by town and sex.

**Dealer data** The dealer data were assembled by WDM Belgium in 2012. They consist of dealer locations with address and brands sold at each location. We use the addresses to assign the dealers’ geographic \((x, y)\) coordinates and compute the distances between the center of each town and the nearest dealer of each brand. We also use the dealer information to categorize dealers into exclusive and multi-brand dealers, since the data lists every brand sold at each dealership. We define the exclusivity dummy to be 1 if a dealer sells only one brand and 0 if a dealer sells more than one brand. Of the 1860 dealer locations, 1501 (81%) sell only one brand. The remaining 359 dealers sell more than one brand, usually two brands (16%) and in rare cases 3 to 5 brands (3%). Of the 359 multi-brand dealers, 268 (75%) only sell brands that belong to the same firm and the remaining 91 (25%) sell brands that belong to different firms. The most common within-firm multi-brand dealers are dealerships belonging to the Volkswagen group (Volkswagen, Audi, Skoda, Seat and Porsche) and the Fiat Group (Fiat, Alfa Romeo and Lancia). Other common multi-brand dealerships are popular luxury brands that also sell smaller luxury brands, such as BMW-Mini and Mercedes-Smart.

To illustrate our data on dealerships, figure 3 plots all dealerships of one brand, Citroën, in Belgium. The black dots represent the dealerships and the gray areas represent the urban areas. Since the figure shows that dealerships are often located in or around urban areas, we will need to account for the degree of urbanization (and other market demographics) in the estimation.

**Car characteristics** The data on car characteristics come from JATO. We have data on several product characteristics by engine variant of each model, including: price, horsepower, maximum speed, acceleration, fuel consumption, length, width, and availability of standard or optional equipment (airbag, climate control, ABS, etc.). Using the characteristics at the engine variant level, we construct a baseline version of each model\(^{21}\). Since many of these variables are correlated, we only include four: price, horsepower, length and fuel consumption. Price is the list price, and therefore uniform across towns, but varying across years, as are the other car characteristics. We do not observe dealer discounts, but the evidence (discussed in section 2) suggests that discounts tend to be relatively uniform across

\(^{21}\)This baseline version is the 25th percentile of product characteristics across engine versions within a model.
Consumers, vary little over time, and mainly differ by brand (for which we control using model fixed effects) or for corporations (which we exclude from our analysis).

Consumer demographics Finally, we observe consumer demographics by local market, obtained from ADSEI (Belgian institute of statistics). As discussed, we observe 588 “towns”, covering either a medium sized town, a group of small towns or part of a city. The demographic information includes population of men and women, income, household size, age of head of household, degree of urbanization and immigration rate. One may expect that the distribution of these consumer demographics affects car sales. We therefore match the information on consumer demographics to car sales at the level of the town.

While individual-specific discounts still exist, the use of transaction prices does not necessarily resolve this issue. Even with household data, one at best observes the transaction price of the chosen alternative and not the ones of the non-chosen alternatives.
Summary statistics  Table 2 summarizes the variables in our data set. The top panel shows summary statistics on car sales. We observe sales of 488 models (247 in 2010 and 241 in 2011), in 588 towns and for 2 consumer types (men and women), amounting to a total of 573,888 observations. Since the data is at such a disaggregate level, there are many model/town/consumer type combinations with zero sales. In fact, average sales per model/town/consumer type are equal to 0.7, and the median of sales is zero. We also break down the sales separately for incumbents and entrants. We define incumbents as the 8 brands with the largest dealer network and entrants as the 24 remaining brands. The incumbents’ average sales per model and town are almost three times as large as entrants’ sales.

The second panel summarizes information on the calculated travel distances for consumers to the nearest dealer of each brand. The average travel distance is 11.7 km. This seems fairly large, but it follows from the fact that there are many brands with few dealers across the country. Indeed, the average travel distance to dealers of incumbent brands is only 7 km, which is half the average travel distance to entrants. For example, consumers need to travel on average 6 km to the nearest Opel or Citroën dealer, and more than 30 km to a Subaru or Daihatsu dealer.

The exclusivity status dummy (1 if the dealership sells a single brand, and 0 if it sells multiple brands) averages around 0.6, meaning 60% of model-town combinations correspond to an exclusive dealer, even though 80% of dealers are exclusive. This means that multi-brand dealers on average serve more towns than exclusive dealers. Or in other words, multi-brand dealers are located in areas with few other dealers of the same brand around, usually sparsely populated areas, typically serving several small towns. Exclusive dealers, on the other hand, are located in densely populated areas and closer to other dealers of the same brand, typically serving fewer towns each. To capture the exclusivity effect, it will thus be important to control for demographics such as urbanization rate. Incumbents seem to have a slightly higher degree of exclusivity compared to entrants.

The third panel shows summary statistics on the included model characteristics. The average car has a price equal to 0.9 times GDP/capita, but varies from 0.4 for the 10% quartile to 1.4 for the 90% quartile. The other car characteristics, horsepower, fuel consumption and length show similar variation across models.

Finally, the bottom panel summarizes the information on consumer demographics, by town. The average town has 18,000 inhabitants, about half of which are men. Average household income is around €25,000, and the average household contains 2.5 members.

\[^{23}\text{In appendix, we also consider another definition of incumbents, i.e. the 8 brands with the largest sales volume. We show that the results are robust with respect to this definition.}\]
Table 2: Summary statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>10%</th>
<th>Median</th>
<th>90%</th>
<th># Obs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>0.7</td>
<td>2.04</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>573,888</td>
</tr>
<tr>
<td>- incumbents</td>
<td>1.1</td>
<td>3.3</td>
<td>0.0</td>
<td>0.0</td>
<td>3.0</td>
<td>223,440</td>
</tr>
<tr>
<td>- entrants</td>
<td>0.4</td>
<td>1.5</td>
<td>0.0</td>
<td>0.0</td>
<td>1.0</td>
<td>350,448</td>
</tr>
</tbody>
</table>

**Dealer characteristics**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>10%</th>
<th>Median</th>
<th>90%</th>
<th># Obs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance (km)</td>
<td>11.7</td>
<td>12.1</td>
<td>2.3</td>
<td>8.4</td>
<td>24.2</td>
<td>573,888</td>
</tr>
<tr>
<td>- incumbents</td>
<td>7.1</td>
<td>5.2</td>
<td>1.7</td>
<td>6.0</td>
<td>13.7</td>
<td>223,440</td>
</tr>
<tr>
<td>- entrants</td>
<td>14.7</td>
<td>14.2</td>
<td>3.3</td>
<td>10.9</td>
<td>29.8</td>
<td>350,448</td>
</tr>
<tr>
<td>Exclusivity (0/1)</td>
<td>0.6</td>
<td>0.5</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>573,888</td>
</tr>
<tr>
<td>- incumbents</td>
<td>0.7</td>
<td>0.5</td>
<td>0</td>
<td>0.0</td>
<td>1.0</td>
<td>223,440</td>
</tr>
<tr>
<td>- entrants</td>
<td>0.6</td>
<td>0.5</td>
<td>0.0</td>
<td>0.0</td>
<td>1.0</td>
<td>350,448</td>
</tr>
</tbody>
</table>

**Model characteristics**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>10%</th>
<th>Median</th>
<th>90%</th>
<th># Obs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price (/GDP per cap)</td>
<td>0.9</td>
<td>0.6</td>
<td>0.4</td>
<td>0.7</td>
<td>1.4</td>
<td>488</td>
</tr>
<tr>
<td>Horsepower (in kW)</td>
<td>94.9</td>
<td>45.2</td>
<td>51</td>
<td>85</td>
<td>150</td>
<td>488</td>
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<tr>
<td>Fuel efficiency (liter/km)</td>
<td>5.8</td>
<td>1.5</td>
<td>4.3</td>
<td>5.4</td>
<td>7.5</td>
<td>488</td>
</tr>
<tr>
<td>Length (in cm)</td>
<td>436.3</td>
<td>43.2</td>
<td>374.0</td>
<td>440.6</td>
<td>485.4</td>
<td>488</td>
</tr>
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</table>

**Household demographics**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>10%</th>
<th>Median</th>
<th>90%</th>
<th># Obs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population(10^3 )</td>
<td>17.8</td>
<td>28.1</td>
<td>4.0</td>
<td>11.4</td>
<td>32.3</td>
<td>588</td>
</tr>
<tr>
<td>Men(10^3 )</td>
<td>8.7</td>
<td>13.7</td>
<td>2.0</td>
<td>5.6</td>
<td>15.8</td>
<td>588</td>
</tr>
<tr>
<td>Women(10^3 )</td>
<td>9.1</td>
<td>14.4</td>
<td>2.1</td>
<td>5.8</td>
<td>16.6</td>
<td>588</td>
</tr>
<tr>
<td>Mean income(10^3 )</td>
<td>24.6</td>
<td>3.5</td>
<td>20.2</td>
<td>24.4</td>
<td>29.3</td>
<td>588</td>
</tr>
<tr>
<td>Hh size</td>
<td>2.5</td>
<td>0.2</td>
<td>2.3</td>
<td>2.5</td>
<td>2.6</td>
<td>588</td>
</tr>
<tr>
<td>Age</td>
<td>52.7</td>
<td>1.3</td>
<td>51.6</td>
<td>52.8</td>
<td>54.0</td>
<td>588</td>
</tr>
<tr>
<td>Immigrants (%)</td>
<td>5.7</td>
<td>6.7</td>
<td>1.0</td>
<td>3.2</td>
<td>14.6</td>
<td>588</td>
</tr>
<tr>
<td>Urbanization</td>
<td>5.3</td>
<td>3.0</td>
<td>2</td>
<td>5</td>
<td>9</td>
<td>588</td>
</tr>
</tbody>
</table>

Note: The table reports means and standard deviations of the main variables, as well as the 10th, 50th and 90th percentiles. The total number of observations is 573,888: 488 models (covering 2 years) x 588 towns x 2 consumer types (men and women), covering Belgium in 2010 and 2011.
6 Estimation

We now discuss how we estimate the demand model with product and spatial differentiation. The estimated demand parameters are used to uncover markups and marginal costs, based on our equilibrium pricing model. This, in turn, allows us to conduct counterfactuals regarding the incentives and welfare effects of exclusive dealing agreements.

We estimate the demand parameters using a method of simulated moments estimator, where we combine aggregate and micro moments. Our first set of moments are Berry et al. (1995)'s aggregate moments, i.e. product characteristics and their sums over other products which serve as instrumental variables to identify the mean utility parameters. Our second to fifth sets of moment conditions are micro moments in the spirit of Berry et al. (2004) and Petrin (2002), where we include additional micro moments relating to the distance and exclusivity of the dealer. These micro moments mainly serve to identify the non-linear individual-specific taste parameters.

6.1 Aggregate moments

The first set of moments consists of the usual macro moment conditions proposed by Berry et al. (1995) to estimate aggregate product differentiated demand systems. The aggregate demand system (5) can be written in vector notation as:

\[ s_{obs}^t = s_t(\delta_t, \theta), \]

where \( s_{obs}^t \) is the observed market share vector, \( \delta_t = x_t \beta + \alpha p_t + \xi_t \) is the mean utility vector and \( \theta \) includes the parameters that affect the individual-specific part of utility (\( \Pi, \Sigma \) and \( \gamma \)).

This demand system can be inverted using Berry et al. (1995)'s contraction mapping to obtain a solution for the unobserved product characteristic of product \( j \) in market \( t \):

\[ \xi_{jt} = \delta_{jt}(s_{obs}^t, \theta) - x_{jt}\beta - \alpha p_{jt} \equiv \xi_{jt}(\theta, \beta, \alpha). \]

Price \( p_{jt} \) is an endogenous variable that may be correlated with the error term \( \xi_{jt} \), since firms may take \( \xi_{jt} \) into account in their pricing decisions. The common identification assumption is that the observed product characteristics \( x_{jt} \) are exogenous, uncorrelated with the error terms of all products. Following Berry et al. (1995), we specify a vector of instruments \( z_{jt} \), which consists of the product’s own characteristics \( x_{jt} \), the sum of each product characteristic across all other products, and the sum of each product characteristics across all other products of the same firm. This instrument vector \( z_{jt} \) is then assumed to be uncorrelated with the error.

\[ 24 \text{To approximate the integral in the aggregate market share system we simulate from the empirical distribution for demographics and dealer characteristics, and from a standard normal distribution for the unobserved part. See the appendix for details.} \]
term $\xi_{jt}$, implying the aggregate population moments $E(\xi_{jt} z_{jt}) = 0$. The sample analogue of these aggregate moments is given by

$$G^1(\theta, \beta, \alpha) = \frac{1}{TJ} \sum_t \sum_j \xi_{jt}(\theta, \beta, \alpha) z_{jt} = 0.$$  

6.2 Micro moments

The second to fourth sets of moment conditions make use of additional micro-level information. We do not only observe aggregate market shares of products in a certain year ($s_{jmt}^{\text{obs}}$), but also market shares at the local market $m$ ($s_{jmt}^{\text{obs}}$). The local market $m$ is at a highly disaggregated level of the town and purchaser type (women/men). We use the observed local market shares to calculate various micro moments in the data, which we equate to predicted moments using the predicted local market shares in (6).

We now show more precisely how we construct the various micro moments (with further details in appendix B). Our approach is in the spirit of Berry et al. (2004) with the following main differences: (i) instead of “survey data” we make use of “local market data”, and (ii) we construct additional micro moments relating to the distance and exclusivity of the dealers.

Mean consumer demographics and mean dealer characteristics

In each local market, we observe local market shares $s_{jmt}^{\text{obs}}$ and consumer demographics $H_m$ (as discussed, this includes income, household size, age, urbanization and immigration rate). This information allows us to calculate the average household characteristics of consumers who have purchased a car across all local markets. To take this information into account, we can calculate the average urbanization rate across all local markets for consumers who have purchased a car, and we can match this to the average urbanization rate as predicted by the model. Let $\mu_{Hh}$ be the mean for the $h$-th demographic variable $H^h$ conditional on purchasing a car. The mean predicted by the model is then set equal to the mean observed in the data, $\mu_{Hh}^{\text{obs}} - \mu_{Hh}^{\text{pred}}(\theta, \beta, \alpha) = 0$, which amounts to the following sample moments conditions:

$$G^{2,h}(\theta, \beta, \alpha) \equiv \sum_t \sum_m \sum_j L_{mt} (s_{jmt}^{\text{obs}} - s_{jmt}(\theta, \beta, \alpha)) H_m^h = 0$$

where $L_{mt}$ is the observed number of consumers in local market $m$ in year $t$ (such that $\sum_m L_{mt} = L_t$).

We compute the same moments for mean dealer characteristics, except that we also separate the moments by brand. For example, from the data we observe that consumers
live on average at a distance of 5.7 km from the nearest Peugeot dealer, whereas consumers who have actually bought a Peugeot live on average only 4.7 km from the nearest Peugeot dealer. This information suggests that consumers living in local markets with closer Peugeot dealers buy a Peugeot more often. We therefore equate, for each brand, the predicted average distance traveled and average exclusivity dummy to their empirical counterparts.

Covariance between consumer demographics and product characteristics

The information on local market shares $s_{jmt}^{obs}$ and consumer demographics $H_m$ also enables us to calculate covariances between demographics and product characteristics $x_{jt}$. For example, consumers in local markets with a higher average income tend to buy more expensive cars. To take this information into account, we calculate the covariance between price and income over all local markets and match it to the covariance as predicted by the model. Let $\rho_{H^h_k} = \text{covariance between the } h\text{-th demographic variable } H^h \text{ and the } k\text{-th product characteristic } x^k$. The covariance predicted by the model is then set equal to the covariance observed in the data, $\rho_{H^h_k}^{obs} = \rho_{H^h_k}^{pred}(\theta, \beta, \alpha) = 0$, which gives:

$$G_{3,hk}(\theta, \beta, \alpha) = \sum_t \sum_m \sum_j L_{mt} \left[ s_{jmt}^{obs} (H^h_m - H^h) - s_{jmt}^{obs} (\theta, \beta, \alpha) (H^h_m - H^h) \right] (x^k_{jt} - \mu^k) = 0.$$  

Variance of mean product characteristics across submarkets

Finally, we calculate the variance of the mean product characteristics across local markets, and equate the predicted variance to its empirical counterpart. For example, the mean horsepower of cars within a local market shows variation across local markets, so we equate the variance of the mean horsepower across markets to the variance predicted by the model. Let $\mu_{m,x^k}$ be the mean of the $k$-th product characteristic $x^k$ over cars sold in local market $m$ and $\sigma_{x^k}$ be the variance of $\mu_{m,x^k}$ across local markets. The variance predicted by the model is then set equal to the variance observed in the data, $\sigma_{x^k}^{obs} = \sigma_{x^k}^{pred}(\theta, \beta, \alpha) = 0$. This gives

$$G_{4,k}(\theta, \beta, \alpha) = \sum_t \sum_m \sum_j \left[ (\mu_{m,x^k}^{obs} - \mu_{x^k}^{obs})^2 - (\mu_{m,x^k}^{pred}(\theta, \beta, \alpha) - \mu_{x^k}^{pred}(\theta, \beta, \alpha))^2 \right] = 0.$$  

6.3 The objective function

We subsequently stack the four sets of moments into one vector $G(\theta, \beta, \alpha) = 0$ and use Hansen (1982) two-step generalized method of moments estimator. The optimal two-step

\footnote{More precisely, we stack $G_{2,h}^{obs}(\theta, \beta, \alpha)$ over all consumer and dealer characteristics and brands, $G_{3,hk}(\theta, \beta, \alpha)$ and $G_{4,k}(\theta, \beta, \alpha)$ over all demographics and product characteristics, and then stack these into $G(\theta, \beta, \alpha)$.}
GMM estimator takes the form

\[
(\hat{\alpha}, \hat{\beta}, \hat{\theta}) = \arg \min_{\alpha, \beta, \theta} G(\alpha, \beta, \theta)'WG(\alpha, \beta, \theta)
\]

where \( W \) is a consistent estimate of the inverse of the asymptotic variance-covariance matrix of the moments using consistent estimates of \((\alpha, \beta, \theta)\) from the first step. This weighting matrix \( W \) optimally weighs the aggregate and micro moments. The first-order conditions of the GMM objective function are linear with respect to \( \beta \) and \( \alpha \), so we can substitute these out and limit search to the non-linear parameters \( \theta \) (as discussed in Nevo (2001)). Finally, the asymptotic variance of the parameters is a function of (i) the gradient of the first-order conditions with respect to the parameters and (ii) the variance-covariance of the first order conditions, both evaluated at the true value of the parameters.

7 Empirical results and implications for exclusive dealing

We first discuss the estimated demand parameters, presented in table 3. We then combine these parameters with our equilibrium pricing model to perform policy counterfactuals on the effects of a move from exclusive dealing to multi-branding.

7.1 Empirical results of demand model

**Specification** The vector of car characteristics \( x_{jt} \) consists of a constant and the variables horsepower, length, and fuel consumption. The vector of consumer demographics \( H_i \) consists of the variables female, income, household size, urbanization, age and immigration rate. Finally, the dealer vector \( d_{ij} \) includes both distance (in km) and an exclusivity dummy, which is equal to 1 when the nearest dealer sells only one brand.

To account for observed consumer heterogeneity in the valuation of characteristics, we can in principle interact all consumer demographics \( H_i \) with price \( p_{jt} \) and the other car characteristics \( x_{jt} \) through the parameter matrix \( \Pi \). However, to avoid estimating too many nonlinear parameters, we only consider a limited number of interactions. Specifically, as shown in \( \Box \) we interact the constant with income, household size, urbanization and age; price with female and income; horsepower with female and age; length with female, immigrants and household size; and fuel consumption with female and urban\(^{26}\). The matrix \( \Sigma \) captures

\(^{26}\)Our micro moments for the covariances also refer precisely to these pairs of interactions.
unobserved heterogeneity in the valuations for product characteristics. As mentioned above, we assume that $\Sigma$ is diagonal, i.e. we restrict the covariances in $\Sigma$ to zero.

**Mean valuations for the car characteristics**  Price has a significant and negative impact on consumers’ mean utility. The implied average own-price elasticity across car models is equal to -3.14. This corresponds to a mean price cost-margin of 43% (median of 39%), which is broadly in line with other estimates, e.g. Berry et al. (1995) or Goldberg and Verboven (2001). Table 4 provides more detailed summary statistics for the price elasticities, margins and marginal costs.

Horsepower and length have a significantly positive impact on mean utility. Fuel consumption (liter per 100 km) has a negative effect, meaning that consumers on average care a lot about fuel efficiency.

**Observed and unobserved consumer heterogeneity**  There is considerable heterogeneity in the valuation of the car characteristics across consumers. Urban households are less likely to buy a car, as they have better access to public transportation. Our results indicate that larger households tend to be less likely to buy new cars. This may pick up other characteristics, such as social factors, or it may be because larger households are more likely to hold company cars, second hand cars or keep their own cars longer. High income households tend to be less price sensitive. Women tend to prefer smaller, cheaper and more fuel efficient cars. This may at least partly reflect the tradition of multi-car households to register the main family car under the man’s name and the second smaller car under the woman’s name. Older households have a lower valuation for horsepower, while immigrants have a preference for smaller cars. Finally, urban households are also slightly less concerned about fuel efficiency, possibly because they tend to have a lower annual mileage than households in rural areas.

Remaining unobserved heterogeneity across consumers is captured by the random coefficients ($\Sigma$). We find that 3 out of 5 standard deviations of the random coefficients are statistically significant and quantitatively important compared to the mean valuations (for length, fuel consumption and the constant). These findings indicate the importance of accounting for both observed and unobserved consumer heterogeneity. Accounting for this consumer heterogeneity implies more flexible substitution patterns, which will be important in our counterfactuals. Note that the standard deviation of the random coefficient for price is small and insignificant (0.09), so heterogeneity in the valuation for price is mainly driven by income and gender.\(^{27}\)

\(^{27}\)We verified that the price coefficient is always negative for our set of consumer draws (in combination
## Table 3: Results of the micro-BLP demand model

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Err.</th>
<th>T-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance</td>
<td>-0.13</td>
<td>0.01</td>
<td>-15.78</td>
</tr>
<tr>
<td>Exclusivity</td>
<td>0.04</td>
<td>0.02</td>
<td>2.87</td>
</tr>
<tr>
<td>Price</td>
<td>-6.02</td>
<td>1.20</td>
<td>-5.03</td>
</tr>
<tr>
<td>- price × female</td>
<td>-0.85</td>
<td>0.39</td>
<td>-2.19</td>
</tr>
<tr>
<td>- price × income</td>
<td>1.02</td>
<td>0.13</td>
<td>7.85</td>
</tr>
<tr>
<td>- price × ν₂ (σ₂)</td>
<td>0.09</td>
<td>0.13</td>
<td>0.70</td>
</tr>
<tr>
<td>Horsepower</td>
<td>7.00</td>
<td>1.45</td>
<td>4.83</td>
</tr>
<tr>
<td>- horsepower × female</td>
<td>0.55</td>
<td>0.37</td>
<td>1.46</td>
</tr>
<tr>
<td>- horsepower × age</td>
<td>-0.06</td>
<td>0.03</td>
<td>-1.97</td>
</tr>
<tr>
<td>- horsepower × ν₃ (σ₃)</td>
<td>0.23</td>
<td>0.23</td>
<td>1.01</td>
</tr>
<tr>
<td>Length</td>
<td>9.30</td>
<td>4.55</td>
<td>2.04</td>
</tr>
<tr>
<td>- length × female</td>
<td>-11.11</td>
<td>0.91</td>
<td>-12.24</td>
</tr>
<tr>
<td>- length × immigrants</td>
<td>-0.20</td>
<td>0.04</td>
<td>-5.16</td>
</tr>
<tr>
<td>- length × household size</td>
<td>-2.04</td>
<td>1.42</td>
<td>-1.44</td>
</tr>
<tr>
<td>- length × ν₄ (σ₄)</td>
<td>2.08</td>
<td>0.69</td>
<td>3.01</td>
</tr>
<tr>
<td>Fuel consumption</td>
<td>-8.35</td>
<td>0.80</td>
<td>-10.50</td>
</tr>
<tr>
<td>- fuel consumption × female</td>
<td>-0.68</td>
<td>0.34</td>
<td>-1.99</td>
</tr>
<tr>
<td>- fuel consumption × urban</td>
<td>0.11</td>
<td>0.03</td>
<td>4.00</td>
</tr>
<tr>
<td>- fuel consumption × ν₅ (σ₅)</td>
<td>1.52</td>
<td>0.17</td>
<td>9.15</td>
</tr>
<tr>
<td>Constant</td>
<td>7.68</td>
<td>5.46</td>
<td>1.41</td>
</tr>
<tr>
<td>- constant × income</td>
<td>0.23</td>
<td>0.19</td>
<td>1.16</td>
</tr>
<tr>
<td>- constant × household size</td>
<td>-3.82</td>
<td>0.80</td>
<td>-4.75</td>
</tr>
<tr>
<td>- constant × urban</td>
<td>-0.37</td>
<td>0.06</td>
<td>-6.53</td>
</tr>
<tr>
<td>- constant × age</td>
<td>0.00</td>
<td>0.10</td>
<td>0.00</td>
</tr>
<tr>
<td>- constant × ν₁ (σ₁)</td>
<td>-5.19</td>
<td>0.63</td>
<td>-8.28</td>
</tr>
</tbody>
</table>

### Note
The table shows parameter estimates, standard errors and t-statistics. Compared with the summary statistics in Table 2, the variables are scaled as follows: horsepower/100, fuel consumption/10, length/1000, distance/10 and income/10000.
Table 4: Price elasticities, marginal costs and margins

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std.Dev.</th>
<th>10%</th>
<th>Median</th>
<th>90%</th>
<th>#Obs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price (/GDP per cap)</td>
<td>0.86</td>
<td>0.60</td>
<td>0.39</td>
<td>0.74</td>
<td>1.37</td>
<td>488</td>
</tr>
<tr>
<td>Own price elasticity (%)</td>
<td>-3.14</td>
<td>1.86</td>
<td>-4.97</td>
<td>-2.76</td>
<td>-1.53</td>
<td>488</td>
</tr>
<tr>
<td>Margin (%)</td>
<td>0.43</td>
<td>0.19</td>
<td>0.21</td>
<td>0.39</td>
<td>0.70</td>
<td>488</td>
</tr>
<tr>
<td>Marginal cost (/GDP per cap)</td>
<td>0.58</td>
<td>0.59</td>
<td>0.11</td>
<td>0.45</td>
<td>1.09</td>
<td>488</td>
</tr>
</tbody>
</table>

Note: The table reports means and standard deviations of the main variables, as well as the 10th, 50th and 90th percentiles. The total number of observations is 488 models covering Belgium in 2010 and 2011.

**Dealer proximity**  In addition to car characteristics, consumers value dealer proximity: distance has a strong and highly significant, negative effect on consumer utility, implying that consumers are more likely to purchase a given brand if they are located closer to the brand. Note that the estimated distance coefficient is of a similar order of magnitude, though smaller than the estimates obtained in Albuquerque and Bronnenberg (2012)’s analysis of the car market in the San Diego area.28

The coefficient translates into a willingness-to-pay of €112 per km closer to the dealer. This has several possible interpretations. It may reflect direct travel costs associated with the search and purchase of a new car, or a higher brand awareness due to local marketing when a dealer of a particular brand is located nearby. It may also reflect travel costs for expected after-sales services (including the opportunity cost of time), because there are still strong links between the sales and after-sales network in the European car market (e.g. (Lademann and Partner, 2001)).29

Regardless the interpretation, the strong significance of the distance coefficients highlights the importance of a dense dealer network to establish market share. To gain further insights in this, Table 5 computes a distance elasticity matrix. Each cell shows the predicted percentage change of a brand’s market share when the distances to dealers of a given brand are decreased by 10%. The elements on the diagonal show the effect of the change in dealer distances on the brand’s own market share. We find that a brand’s market share would on average increase by 1.5% if its dealers are 10% closer to consumers. The relative with income and gender) : it is in the range of [-5.2543, -1.9925].

28Albuquerque and Bronnenberg (2012)’s coefficient ranges between -0.7 for the logit model and -0.2 for the nested logit model (when transformed from 100 miles to 10km), while we find -0.1 in our random coefficients logit model.

29According to Lademann and Partner (2001), a large fraction of consumers make use of maintenance and repair services at the dealer where they purchased their car. The car manufacturers actively promote the link between sales and after-sales services, for example through a warranty system at authorized dealers. In recent years, the European Commission has attempted to loosen the link, but apparently with mixed success.
increase is larger for brands that currently have a small distribution network. For example, Peugeot would only experience a market share increase of 0.6%, whereas Subaru’s market share would rise by 3.7%. The off-diagonal elements of the matrix represent the effects on the other brands’ market shares when a dealer’s distance decreases by 10%. The table shows that the brands would mainly gain at the expense of their competitors, rather than from attracting new consumers (outside good). This follows from the high significance of the estimated interactions and the random coefficient on the constant.

Table 5: Distance elasticity matrix

<table>
<thead>
<tr>
<th></th>
<th>Peugeot</th>
<th>Citroën</th>
<th>Daihatsu</th>
<th>Subaru</th>
<th>Outside good</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peugeot</td>
<td>0.574</td>
<td>-0.046</td>
<td>-0.042</td>
<td>-0.043</td>
<td>-0.003</td>
</tr>
<tr>
<td></td>
<td>(0.037)</td>
<td>(0.003)</td>
<td>(0.003)</td>
<td>(0.003)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Citroën</td>
<td>-0.054</td>
<td>0.643</td>
<td>-0.049</td>
<td>-0.048</td>
<td>-0.004</td>
</tr>
<tr>
<td></td>
<td>(0.004)</td>
<td>(0.042)</td>
<td>(0.004)</td>
<td>(0.003)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Daihatsu</td>
<td>-0.002</td>
<td>-0.002</td>
<td>3.518</td>
<td>-0.002</td>
<td>-1.93E-04</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.213)</td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Subaru</td>
<td>-0.005</td>
<td>-0.005</td>
<td>-0.005</td>
<td>3.710</td>
<td>-3.91E-04</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.204)</td>
<td>(0.000)</td>
</tr>
</tbody>
</table>

Note: The table reports the percentage change in market shares for Opel, Citroën, Daihatsu, Subaru and the outside good (columns), when dealers of Opel, Citroën, Daihatsu and Subaru are located 10% closer to consumers (rows). Standard errors obtained from 100 bootstraps are shown in brackets underneath each distance elasticity.

**Dealer exclusivity**  The coefficient of the exclusivity status of a dealer is positive and estimated significantly, implying that consumers prefer exclusivity over multi-branding. A priori, the effect of exclusivity could be either positive or negative. On the one hand, consumers could value multi-branding, since it allows them to compare cars more easily. On the other hand manufacturers could invest more in exclusive dealers because exclusivity eliminates free riding issues. This would lead to better service, maintenance and repair and an overall better reputation of the brand.\(^{30}\)

Since we estimate a positive coefficient, the first effect outweighs the second. Consumers’ willingness to pay for dealer exclusivity amounts to €383, which is about 1.9% of the average price of a new car (€20,038). On the one hand, consumers’ preference for dense dealer

\(^{30}\)As discussed in section 4.2, we assume that this manufacturer’s investment in exclusive dealers does not affect marginal costs but only fixed costs (e.g. training of the staff, the design or decoration of the showroom or local advertising).
networks indicates that exclusive dealing may serve as an entry barrier. On the other hand, due to consumers’ taste for exclusivity, exclusive dealing contracts constitute a demand efficiency, contributing to both consumer and producer surplus. We will explore this in much more detail in our counterfactuals in the next subsection.

Robustness of demand results  A potential source of concern is that, in addition to price, distance and exclusivity are also endogenous variables: dealers may especially enter in markets with a high (unobserved) valuation for certain brands or a high value for exclusive dealers. The estimated demand parameters will still be consistent to the extent the demand specification includes a rich set of market demographics. This can be motivated in Eizenberg (2012)’s two-stage framework. Suppose that firms do not observe local demand shocks (other than demographic shocks observed by the researcher as well) when choosing locations in a first stage, but that they do observe aggregate demand shocks when setting prices in a second stage. In this case, only price is an endogenous variable, correlated with the error term. The assumption that firms do not observe demand shocks other than those observed by the researcher when choosing locations, seems reasonable to the extent that the specification includes a sufficient set of demographics. Our specification attempted to account for this by including a rich set of local market demographics and interactions with car characteristics.

As a further robustness check to assess the possible endogeneity of the dealer characteristics, we also included a rich set of fixed effects at the district level (which on average contains 14 towns), interacted with a dummy variable for luxury brands. We report these results in column 3 in table 8 in appendix D.1. Interestingly, only one third of the interactions are estimated significantly, suggesting that the observable demographics do already capture most of the heterogeneity across local markets. Furthermore, the estimated preferences for distance and exclusivity are fairly robust to including these fixed effects. Comparing column 2, our main specification, with column 1, we also show that our estimates of distance and exclusivity are robust with respect to leaving out the random coefficients.

In principle, one could also account for the endogeneity of distance by generalizing the product unobservable $\xi_{jt}$ to a product $\times$ town unobservable $\xi_{jtm}$. This would imply computing a large number of fixed effects through a contraction mapping on local market shares by product and town. A practical difficulty with our data is that we have many zero market shares at the local level. Gandhi et al. (2014) propose a method that solves the issue of zero market shares by constructing “optimal” market shares. As a robustness check, we

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31Eizenberg (2012) does not only use this two-stage approach to motivate his estimator for the demand model in the second stage. He also uses it to provide an approach for obtaining consistent estimates of fixed entry costs in the first stage. These are of independent interest, and we come back to this in section 7.2 and appendix H.
use their method to estimate our model and use instruments for distance and exclusivity. Appendix D.2 provides more details on the method and the instruments, and reports the results in table 9. We find that the estimated effect for distance is very robust across all specifications. While the effect of exclusivity is estimated less precisely, our estimate in the main specification seems a fairly conservative one.

7.2 Incentives and effects of exclusive dealing

We use the estimated demand system and equilibrium conditions to uncover the manufacturers’ current marginal costs, as given by (10). We then perform policy counterfactuals to assess the effects of a shift from exclusive dealing to multi-branding. Following our framework set out in section 3, we consider both unilateral and collective multi-branding agreements between incumbents and entrants.

Our data set contains 32 brands, which we order in terms of the size of the dealer network. We classify the 8 largest ones as incumbents. They are Opel, Citroën, Peugeot, Renault, Volkswagen, Ford, Audi and Toyota. The remaining 24 brands are Asian, Eastern European and smaller Western European brands and we classify them as entrants.

In each multi-branding agreement we pair one of the 8 incumbents with 3 of the 24 entrants, so that dealers sell at most four brands. Specifically, our main counterfactual in the text pairs the largest incumbent in terms of number of dealers with the 3 smallest entrants in terms of dealers (and the next largest incumbent with the 3 next smallest entrants, etc.) Table 10 in appendix E lists the various firms in each of these 8 agreements. We also considered five variants with other possible combinations of agreements. In each variant we match the largest 8 brands, either in terms of number of dealers or in terms of sales, with 3 smaller entrants, where the ordering of the smaller entrants differs. We show all these other combinations of agreements in tables 11 through 15 in appendix E. For all cases, the tables give very similar conclusions to the ones from the main counterfactual.

For simplicity, we consider “one-way access”, i.e. the incumbents accept the entrants on their existing network, but not vice versa. We also assume that entrants keep their existing dealerships. Allowing two-way access would imply that the incumbents also obtain

32 According to our classification criterion, we also treat Toyota as an incumbent. This is reasonable because of its long market presence through local production facilities targeted mainly for European markets and large dealer network.

33 Our main specification and variants 2 and 4 rank the incumbents according to dealers, while variants 1, 3 and 5 rank the incumbents according to sales. The variants further differ regarding the choice of the smaller entrants (large incumbent with small entrant, or vice versa).

34 This continues the parallel between the foreclosure literature and the literature on incentives for open access in telecom, pointed out in the introduction.
new dealerships: this would go against most of the theoretical literature on exclusive dealing as an entry barrier, and is also likely to infringe current exclusive territory agreements (since the incumbents already have many dealerships, all with exclusive territories).

Furthermore, we make the counterfactuals as realistic as possible by only implementing multi-branding agreements in those dealerships where it would be locally profitable to do so (at least unilaterally). These are typically locations where entrants are not yet sufficiently present or are located very far away. In those locations the positive effect of reduced distance dominates the negative demand effect of multi-branding. This assumption reflects the profit rationale of the manufacturer and its dealers, since they would only implement multi-branding at locations where there are gains from trade.\(^{35}\)

As discussed in section 4, a shift to multi-branding can be modeled as a shift in the dealer matrix from \(d^0\) to \(d^1\): this includes a change in distance as well as a change in the exclusivity dummy. To illustrate, the collective agreement induces the following shift: the average distance across all models and consumers decreases from 11.6 km to 9.5 km and the average exclusivity dummy decreases from 64% to 47%. This shift may have direct effects on profits and welfare, and indirect effects through a change in the equilibrium price vector defined by (9).\(^{36}\)

In sum, we end up with 8 hypothetical unilateral multi-brand agreements, and we also consider one collective agreement where all 8 agreements are made simultaneously.\(^{37}\) We first consider the internal profit incentives, and focus on comparing unilateral with collective agreements. We subsequently consider the external effects on market shares, consumer surplus and welfare, focusing only on the collective agreement.

### 7.2.1 Internal profit incentives

Table 6 shows the effects of hypothetical multi-branding agreements on the manufacturers’ variable profits. The unilateral agreements are in the left panel, the collective agreement is in the right panel. The results are based on the demand parameters of the micro-BLP demand model discussed in the previous section.

\(^{35}\)Assuming that local profits are split between the manufacturer and the dealer, this assumption also reflects the dealer’s profit rationale to accept the multi-branding agreement proposed by the manufacturer.

\(^{36}\)We did not attempt to model a new location equilibrium after a ban on exclusive dealing: this would involve multiple equilibria, and would be computationally prohibitive in our case because of the many dealer locations.

\(^{37}\)As mentioned, Table 10 in appendix E lists all the agreements in detail, while tables 11 through 15 in appendix F list the alternative sets of agreements (and results) of our robustness analysis.
Variable profit effects of unilateral multi-branding agreements

According to Table 6, each unilateral multi-branding agreement would raise the firms’ combined variable profits. Consider for example an agreement between the incumbent Opel and the smaller entrants Kia, Saab and Honda. Although this agreement lowers Opel’s variable profits by €3 mil., it raises the other firms’ profits by €8 mil., implying a combined variable profit increase for the four brands of €5 mil. On average, the combined variable profit increase under multi-branding would amount to €2.51 mil. Since unilateral multi-branding agreements involve 3 additional brands at on average 58 existing dealer locations, the variable profit increase amounts to €14,395 per brand added and per location.

To explain this variable profit increase, recall our conceptual framework for the profit incentives for exclusive dealing in section 3. There are essentially three opposing effects of a multi-branding agreement. First, multi-branding raises spatial coverage and thus raises demand through business stealing from the competitors. Second, multi-branding has a direct negative impact on demand, since consumers prefer exclusivity. And third, multi-branding intensifies competition and thus reduces prices; this is the typical effect stressed in the theoretical literature. With unilateral agreements, the price effect is small, so it is the interplay between the positive demand effect of increased spatial availability and the negative demand effect of losing exclusivity that determines the profitability of the agreement. Since we only implement multi-branding in profitable locations (where entrants have few dealers), the distance effect dominates the demand inefficiency of multi-branding.

Variable profit effects of a collective shift to multi-branding

The situation is quite different when we consider the manufacturers’ collective incentives, i.e. when we compare variable profits assuming that all eight incumbent manufacturers simultaneously shift to multi-branding agreements with the smaller entrants. The combined profits of each incumbent-entrants quartet now no longer necessarily increase: there is only a profit increase for 3 out of the 8 agreements, and there is a profit reduction in the other 5 agreements. The average profit effect of the collective shift to multi-branding is barely positive, i.e. €0.41 mil., which is much smaller than the average profit increase of €2.51 mil. of a unilateral agreement. Since the collective shift to multi-branding involves 3 additional brands at on average 58 existing dealer locations, the variable profit increase amounts to only €2,331 per brand added per location, compared to a much larger €14,395 per brand added per location under unilateral multi-branding agreements.

The intuition for the much smaller variable profit increase under a collective shift to multi-branding again follows from the three opposing effects: a demand increase because of increased spatial availability, a demand reduction from lost exclusivity, and a price reduction.
Table 6: Internal profit incentives for exclusive dealing (in €mil.)

<table>
<thead>
<tr>
<th></th>
<th>(1) Current joint profits</th>
<th>(2) Unilateral agreement Change in variable profits</th>
<th>(3) Collective agreement Change in variable profits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Incumbent</td>
<td>Entrant</td>
</tr>
<tr>
<td>Peugeot &amp; 3</td>
<td>172.12</td>
<td>-0.07</td>
<td>0.19</td>
</tr>
<tr>
<td></td>
<td>(46.77)</td>
<td>(0.16)</td>
<td>(0.21)</td>
</tr>
<tr>
<td>Citroën &amp; 3</td>
<td>182.17</td>
<td>-0.03</td>
<td>0.09</td>
</tr>
<tr>
<td></td>
<td>(49.58)</td>
<td>(0.03)</td>
<td>(0.05)</td>
</tr>
<tr>
<td>Opel &amp; 3</td>
<td>224.84</td>
<td>-2.75</td>
<td>7.86</td>
</tr>
<tr>
<td></td>
<td>(60.92)</td>
<td>(0.79)</td>
<td>(2.44)</td>
</tr>
<tr>
<td>Renault &amp; 3</td>
<td>208.25</td>
<td>-1.91</td>
<td>2.98</td>
</tr>
<tr>
<td></td>
<td>(56.62)</td>
<td>(0.84)</td>
<td>(1.50)</td>
</tr>
<tr>
<td>Volkswagen &amp; 3</td>
<td>283.41</td>
<td>-0.67</td>
<td>8.03</td>
</tr>
<tr>
<td></td>
<td>(76.87)</td>
<td>(0.20)</td>
<td>(2.31)</td>
</tr>
<tr>
<td>Ford &amp; 3</td>
<td>204.76</td>
<td>-0.94</td>
<td>1.93</td>
</tr>
<tr>
<td></td>
<td>(55.24)</td>
<td>(0.44)</td>
<td>(0.99)</td>
</tr>
<tr>
<td>Audi &amp; 3</td>
<td>204.67</td>
<td>-0.16</td>
<td>3.95</td>
</tr>
<tr>
<td></td>
<td>(55.35)</td>
<td>(0.05)</td>
<td>(1.14)</td>
</tr>
<tr>
<td>Toyota &amp; 3</td>
<td>214.54</td>
<td>-0.87</td>
<td>2.41</td>
</tr>
<tr>
<td></td>
<td>(58.15)</td>
<td>(0.25)</td>
<td>(0.81)</td>
</tr>
<tr>
<td>Mean</td>
<td>211.85</td>
<td>-0.92</td>
<td>3.43</td>
</tr>
<tr>
<td></td>
<td>(57.44)</td>
<td>(0.29)</td>
<td>(1.12)</td>
</tr>
</tbody>
</table>

Note: The table reports for each of the 8 agreements between 1 incumbent and 3 entrants: (1) the current joint profit of the 4 parties; (2) the change in profits made by the incumbent and 3 entrants in a unilateral agreement; (3) and the change in profits when all agreements are made collectively. Precise definitions of the agreements are provided in the appendix. Standard errors obtained from 100 bootstraps are shown in brackets underneath value.
from intensified competition. Under a collective shift to multi-branding, the negative price effect becomes stronger, and the demand increase from more spatial coverage becomes much weaker: since all firms are now in multi-branding agreements, there is no longer net business stealing from each other, and the attraction of entirely new customers (“business stealing from the outside good”) turns out to be very limited.\footnote{Substitution to the outside good is limited since our demand model showed that consumers view the inside goods as quite close substitutes relative to the outside good (strong observed and unobserved heterogeneity regarding the constant).}

**Unilateral and/or collective profit rationale for exclusive dealing?** The results on the variable profit effects of multi-branding agreements can be summarized as follows. On the one hand, unilateral multi-branding agreements raise variable profits by €14,395 per brand added per location. On the other hand, a collective shift to multi-branding would lead to an average profit increase across all firms of only €2,331 per brand added per location. Intuitively, unilateral multi-branding agreements are profitable because they do not significantly reduce prices, and they lead to a net demand increase because of business stealing from the competitors. In contrast, a collective shift to multi-branding is unprofitable because it has a stronger impact on price competition, it involves no net business stealing from competitors and only a limited attraction of new customers (outside good).

To further explore whether there is only a collective rationale for exclusive dealing, we compare the magnitudes of the variable profit increases per brand added per location with the current fixed costs at existing exclusive (single-brand) dealerships. To estimate fixed costs we follow an approach of \cite{Eizenberg2012}, as explained in Appendix H. The results confirm the following conclusions. We can rationalize exclusive dealing from the collective perspective of all incumbents even if the extra fixed costs of adding multiple brands to existing locations are negligible. In contrast, we can only provide a unilateral rationale for maintaining exclusive dealing if firms incur sizeable fixed costs from adding brands.

In sum, we find no unilateral rationale for the prevalent use of exclusive dealing, while there is a collective rationale. These findings may explain the industry’s efforts to organize exclusive dealing under an industry block exemption regulation. This is also consistent with \cite{HemphillWu2013}’s analysis of parallel exclusion. They argue that it is easier to coordinate on simultaneous exclusionary behavior than on collusive prices. Consequently, they predict that even oligopolies that compete on price may still cooperate on exclusion.
7.2.2 External welfare effects of exclusive dealing

We can now consider the external effects of exclusive dealing. Given that a collective incentive for exclusive dealing is more likely than an individual incentive, we limit attention to the external effects from a collective multi-branding agreement. This may for example arise when the European Commission would no longer provide a group block exemption, or when it would actively promote a collective ban on exclusive dealing practices in the industry. Table 7 shows the effects of a collective multi-branding agreement on market shares, producer and consumer surplus and total welfare. To gain economic intuition, we present a decomposition into the two direct demand effects (the positive spatial coverage effect and the negative loss of exclusivity effect) and the indirect competition effect, which occur through changes in the equilibrium prices (as discussed in section 4).

Market shares would shift from the European incumbents in favor of the entrants after a collective ban on exclusive dealing. The incumbents would lose 1.16% points of market share, and the entrants would gain the same amount when they can access the incumbents’ dealer networks. Holding prices constant, the incumbents would lose slightly more (1.19% points of market share). But the incumbents gain back 0.03% points because they reduce prices more as a result of intensified price competition.

Note that the 1.16% point market share increase of the entrants is relatively modest. This suggests that exclusive dealing is not the main reason for the entrants’ smaller market shares and that it does not directly aim to deter entry. To explore this further, we performed alternative counterfactuals where the entrants do not only enter in the incumbents’ locations, but also obtain the same country of origin effect as the incumbent partners. The entrants’ market shares then change by a much larger amount, by +18.2% points of which +17.8% is due to origin effects, see table 16 in appendix G. The country of origin effect (especially from Germany and France) is thus much more important than spatial availability for building market share. This may reflect early-mover advantages, which provided incumbents time and resources to build a national brand reputation. In sum, while the incumbents’ large market share can partly be attributed to exclusive dealing, it especially follows from early-mover advantages which enabled them to build a national reputation. Note that, if part of this national reputation could be transferred to entrants through multi-branding agreements, then the effects of banning exclusive dealing, in a dynamic setting, could grow over time.

Consumers would gain from a collective ban on exclusive dealing. Consumer surplus would rise by €79 million, which amounts to €105 per household. This increase is the net result of the beneficial effects of increased spatial coverage and increased price competition, and the detrimental effect from the loss of the dealers’ exclusivity which is valued by consumers. First, the biggest source of the consumer surplus gain (€157 per household) is due
to increased spatial coverage: the larger number of dealerships means that consumers incur lower travel costs associated with sales and after-sales services. Second, a small part of the consumer surplus increase (€7 per household) is due to the reduced prices stemming from the increased competition after a ban on exclusive dealing. Third, the loss of the dealers’ exclusivity status is responsible for a consumer surplus reduction (€58 per household). On balance, most of the consumer gains from multi-branding are due to increased spatial availability which compensates for the demand inefficiency because of the lost dealer exclusivity. Only a small part of the gains from multi-branding is due to increased competition.

Finally, industry profits do not change that much from a ban on exclusive dealing. Hence, the total welfare increase from multi-branding largely coincides with the gains to consumers (+€82 million).

7.2.3 Summary

We can summarize these findings as follows. The prevalent use of exclusive dealing throughout the industry is more easy to rationalize from the collective perspective of all manufacturers. A collective ban on exclusive dealing would have only a limited effect on the incumbent’s market shares. As such, the European incumbents’ market share advantage is not so much due to the practice of exclusive dealing, but rather to first-mover advantages which enabled them to build a reputation and invest in larger networks. Although a ban on exclusive dealing would thus only have a limited impact on the incumbents’ market shares, it would have a beneficial impact on consumer surplus and total welfare. The consumer gains amount to €105 per household. These gains are largely due to an increased spatial availability of brands (+€157 per household), which compensates for the demand inefficiency in the form of consumers’ perceived loss in exclusivity status (€58 per household). There is only a small gain from increased price competition under multi-branding (+€7 per household). In sum, the prevalent use of exclusive dealing throughout the car industry, does not have an important anti-competitive impact, but it implies important consumer and welfare losses because of too limited spatial coverage.

8 Conclusion

Exclusive dealing contracts between manufacturers and retailers force new entrants to set up their own dealer networks to enter the market. If consumers care a lot about dealer proximity, then new entrants must set up dense networks to enter the market and obtain critical mass. Exclusive dealing may then act as a barrier to entry and foreclose new competitors. We
Table 7: Welfare effects of a ban on exclusive dealing

<table>
<thead>
<tr>
<th></th>
<th>Current change</th>
<th>Total change</th>
<th>Change due to distance</th>
<th>Change due to MB</th>
<th>Change due to prices</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Market shares (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outside good</td>
<td>78.84 %</td>
<td>-0.07</td>
<td>-0.10</td>
<td>0.03</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.01)</td>
<td>(0.02)</td>
<td>(0.00)</td>
<td>(0.00)</td>
</tr>
<tr>
<td>Inside goods</td>
<td>21.16 %</td>
<td>0.07</td>
<td>0.10</td>
<td>-0.03</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.01)</td>
<td>(0.02)</td>
<td>(0.00)</td>
<td>(0.00)</td>
</tr>
<tr>
<td>- Incumbents</td>
<td>60.84 %</td>
<td>-1.16</td>
<td>-1.30</td>
<td>0.10</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.20)</td>
<td>(0.17)</td>
<td>(0.05)</td>
<td>(0.01)</td>
</tr>
<tr>
<td>- Entrants</td>
<td>39.16 %</td>
<td>1.16</td>
<td>1.30</td>
<td>-0.10</td>
<td>-0.03</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.20)</td>
<td>(0.17)</td>
<td>(0.05)</td>
<td>(0.01)</td>
</tr>
</tbody>
</table>

| **Variable profits (€million)** | | | | |
| Incumbents                 | 1053.60 | -17.83 | -17.73 | 0.33 | -0.42 |
|                           | (285.69) | (5.84) | (5.45) | (0.84) | (0.16) |
| Entrants                   | 641.17  | 21.08  | 24.18  | -2.73 | -0.37 |
|                           | (173.81) | (6.76) | (7.17) | (0.99) | (0.14) |
| Total                      | 1694.77 | 3.25   | 6.45   | -2.41 | -0.79 |
|                           | (459.49) | (1.06) | (1.89) | (0.63) | (0.30) |

| **Consumer surplus**      | | | | |
| Total (€million)           | 78.72 | 116.93 | -43.50 | 5.29 |
|                           | (28.09) | (37.30) | (12.56) | (1.94) |
| Per household (€)          | 105.46 | 156.63 | -58.27 | 7.09 |
|                           | (37.63) | (49.97) | (16.83) | (2.60) |

| **Welfare (€million)**     | | | | |
| Total                      | 81.97  | 123.37 | -45.90 | 4.50 |
|                           | (29.04) | (39.04) | (13.13) | (1.64) |

Note: The table reports the effects of a collective shift to multi-branding on the market shares, profits, consumer surplus and total welfare. The effects are split into a change due to spatial availability, a change due to loss of exclusivity and a change due to changed prices. Standard errors obtained from 100 bootstraps are shown in brackets underneath each value.
develop a framework to understand the internal profit incentives and external effects of exclusive dealing, and apply it to the European car market. The empirical results from our demand model show, among other things, that consumers indeed put a high value on dealer proximity, possibly because of strong links with after-sales services. But consumers also value dealer exclusivity, possibly because of better service due to the elimination of free riding issues. Counterfactuals show that manufacturers have unilateral incentives to shift from exclusive dealing to multi-branding. However, the industry as a whole has a collective incentive to maintain exclusive dealing, even if the extra fixed costs of adding multiple brands to existing dealerships are negligible. A ban on exclusive dealing would shift market shares from the larger European firms to the smaller entrants. Consumers would gain, but mainly because of the increased spatial availability rather than because of intensified price competition.

Our analysis is based on a number of assumptions that may be generalized in future research. First, as in most of the car market literature we assumed a standard pricing equilibrium, where it is as if the upstream and downstream firm are vertically integrated. This equilibrium is consistent with the evidence on various price- and non-price restraints in the car market, and with some empirical evidence in another context (Bonnet and Dubois (2010)). Further work could also consider other pricing equilibria, but this would best require additional data such as wholesale prices or information on sales targets and bonuses at the dealer level.

Second, we considered simple policy counterfactuals, where alternative manufacturers shift from exclusive dealing to multi-branding. An extensive sensitivity analysis confirmed that the results remain similar for other collective multi-branding agreements. We also endogenized entry decisions to obtain fixed cost bounds for exclusive dealer locations. Several issues may be explored in future research. First, one could separately obtain fixed cost bounds for non-exclusive dealers: this would require more data, in particular for a geographically more diverse market such as Sweden, where multi-branding is more prevalent (only 19% in our case). Furthermore, one could compute a new entry equilibrium after a ban on exclusive dealing: this is challenging, not only because of the great number of possible dealer locations, but also since the equilibrium depends on the specific assumptions and is not necessarily unique. Finally, one could expand our policy counterfactuals beyond the effects of exclusive dealing to simultaneously consider the effects of exclusive territories in our spatial model.
References


Bourreau, Marc and Pinar Doğan, “‘Build-or-buy’ strategies in the local loop,” *The American economic review*, 2006, pp. 72–76.


