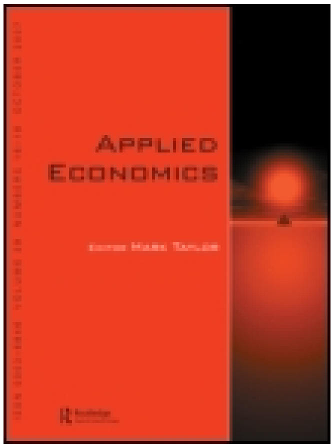

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On the size of home bias

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On the size of home bias

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Home bias in consumption refers to consumers strongly preferring domestic over foreign products. However, if the products were to be differentiated, would there then be a taste for country of origin? If this were the case, what would be the market shares if consumers were to only value prices and characteristics and not the brand's nationality? Using a structural demand, we account for home bias in the European car market and compute the counterfactual market shares in the absence of home bias. We find that home-biased preferences explain more than half of the market shares of domestic car manufacturers in their domestic markets, limiting the role of trade frictions.

Keywords: home bias in consumption; structural demand; European car market

JEL Classification: F1

I. Introduction

The integration of the European markets has been one of the main goals of the European Union. A single currency and common trade policies aim to create a single market, eliminating trade barriers within the Euro zone. However, what should one expect if the products were to be differentiated and there turns out to be a taste for domestic goods?

This article examines the counterfactual market shares that would arise if we could eliminate the home bias in preferences among consumers. We estimate a structural demand model of differentiated products that allow us to control for observable and unobservable characteristics. The estimated preference parameters allow us to compute market shares consistent with consumers choosing products based on their characteristics and prices, but not based on the product's nationality.

The majority of empirical studies on home bias in consumption focus on supply-side determinants (trade costs) and use trade flow data to measure the 'border effect', namely the frictions to international trade that limit the purchases of foreign goods (McCallum, 1995; Engel and Rogers, 1996). Naturally, the European Union has been conducting a considerable amount of research on this topic given the remarkable home bias, even despite the efforts on reducing trade frictions, such as the Single Market Program launched in the mid-1980s.[1] Notice that the estimated home bias coefficients in the trade flow regressions capture the net effects of supply and

This article is based on a chapter of author's PhD dissertation at the University of California, Berkeley.
[1] An incomplete list of the empirical papers studying home bias in the European Union includes Nitsch (2000), Head and Mayer (2000), Chen (2004), Chen and Novy (2011), Balta and Delgado (2009) and Pacchioli (2011) among many others.

Table 1. Average car characteristics

Characteristic	Origin	Belgium	France	Germany	Italy	UK
Size	Domestic	–	9.60	10.34	8.94	9.66
	Foreign	9.65	9.64	9.57	9.80	9.74
Inverse motor power	Domestic	–	1.97	1.03	1.87	1.06
	Foreign	1.36	1.16	1.37	1.31	1.23
Fuel efficiency	Domestic	–	7.85	8.75	8.10	8.53
	Foreign	8.22	8.21	8.15	8.07	8.17
Real price	Domestic	–	0.69	0.80	0.98	1.08
	Foreign	0.72	0.77	0.63	0.99	1.04

demand, since trade restrictions and home-biased preferences cannot be separately identified in these reduced-form estimations.

This article contributes to the literature by identifying consumers' preferences for domestic products and providing the size of the home bias that is rooted in the demand side. We focus on the European car market for two reasons: (i) products are differentiated and (ii) there is a remarkable home bias. We expect that significant trade costs (or other supply-side friction) should increase foreign car prices relative to their domestic competitors. However, the data in the automobile market show that foreign cars are not systematically more expensive than their domestic competitors, stressing the role of demand factors. Our estimates of home bias account for differences in car characteristics (including prices) and give us direct evidence of a preference for domestic goods. Our findings are consistent with a large and persistent brand loyalty for incumbent domestic manufacturers, similar to the findings of Bronnenberg *et al.* (2009) and Bronnenberg *et al.* (2012).

II. Data

We use the data collected by Goldberg and Verboven (2001) and updated by Brenkers and Verboven (2006). The yearly data set consists of the list prices, sales and physical characteristics of car models sold in Belgium, France, Germany, Italy and the UK from 1970 until 1999. The characteristics include dimensions (length, width and height), engine features and performance measures. The data set also includes information on manufacturer, segment, brand, model and place of production.[2]

To avoid collinearity, we construct three variables to summarize the car characteristics. We use size, $size = (lenght \times height \times width)$; inverse of motor power, $IMP = (horsepower \times cylinders \times max\ speed)^{-1}$; and fuel efficiency (arithmetic average of the fuel efficiency at different speeds). Table 1 presents the average of the car characteristics for domestic and foreign models, both being groups quite similar in general. Notice that the raw data do not support the hypothesis of trade costs for making foreign models always more expensive than domestic cars.

We define a time-invariant model's nationality based on the country of origin associated with each brand. For example, we assume that consumers consider the brand Rover-Triumph as British, regardless of the German ownership of the brand since 1994. Appendix 1 presents the details.

III. Demand Model

The demand for differentiated products follows the random coefficient model of Berry *et al.* (1995) (henceforth BLP). Thus, the utility of individual i from model j in market m is given by:

$$U_{ijm} = \alpha' X_{jm} - \beta_{im} \widetilde{p}_{jm} + \gamma_m h_{jm} + \xi_{jm} + \varepsilon_{ijm} \tag{1}$$

where X_{jm} is a vector of observable characteristics (size, inverse of motor power, fuel efficiency and various fixed effects) weighted by a taste parameter vector (denoted by α), $\widetilde{p}_{jm} = \frac{p_{jm}}{Y_m}$ is the ratio of nominal price (denoted by p_{jm}) over GDP per capita (denoted by γ_m) to account for income and inflation differences between countries,[3] h_{jm} is a

[2] The car segments are compact, subcompact, standard, intermediate and luxury.
[3] See Goldberg and Verboven (2001).

home bias dummy that is equal to 1 if model j is sold in the same country as its brand's nationality, ξ_{jm} is a model characteristic that is unobservable by the econometrician, and ε_{ijm} is a mean-zero stochastic term.

Consumer i's marginal utility of income is given by $\beta_{im} = \beta_m + \sigma_p v_i$, with standard normal shocks v_i capturing the unobservable consumer heterogeneity and parameter β_m capturing the country-specific mean of price sensitivity.

Parameter γ_m captures the total effect of home bias in utility combining different sources like 'nationalism', network quality (cheaper spare parts or repair service), brand loyalty (Train and Winston (2007)) and others. Unfortunately, we cannot identify the relative weights of these different explanations, but a large size of our results suggests a combination of all of them.

Assuming that ε_{ijm} is i.i.d. with a type I extreme value distribution and integrating over the mass A_{jm} of consumers who prefer product j, we obtain the predicted market shares, s_{jm}:

$$s_{jm}(\xi;\theta_m) = \int_{A_{jm}} \frac{\exp(\alpha' X_{jm} - \beta_m \widetilde{p}_{jm} + \gamma_m h_{jm} + \xi_{jm} - \widetilde{p}_{jm}\sigma_p v_i)}{1 + \sum_k \exp(\alpha' X_{km} - \beta_m \widetilde{p}_{km} + \gamma_m h_{km} + \xi_{km} - \widetilde{p}_{km}\sigma_p v_i)} d\Phi(v_i) \qquad (2)$$

where $\theta_m = (\alpha, \beta_m, \gamma_m, \sigma_p)$ is the vector of demand parameters to be estimated minimizing the difference between actual and predicted market shares.

We have neglected to incorporate nested logit demands used in the mentioned literature in order to avoid the decision nest between foreign and domestic cars that would have important consequences on the counterfactual exercise at hand. In our framework, the brand's nationality is treated like the other car characteristics.

IV. Results

This section presents our demand estimates and the counterfactual market shares when eliminating the home bias ($\gamma = 0$).

We estimate the model under different specifications and the heterogeneity is well captured by country-specific coefficients for price and home bias (β_m and γ_m, respectively). The only random coefficient that is statistically significant is the price coefficient, σ_p. Details on the different specifications and the implied elasticities are presented in the Appendix 2.

As mentioned in Section III, we face an endogeneity issue since the unobserved characteristic ξ might be correlated with prices. Hence, we have used the standard instruments suggested by BLP.[4]

Using our estimates, we compute the predicted market shares under no home bias. Table 2 presents the actual average market shares of the European car market between 1970–1999, and Table 3 presents the predicted market shares, assuming no home bias ($\gamma = 0$) while the other characteristics remain fixed (including unobservable ξ).

Comparing Tables 2 and 3, we conclude that home bias explains for the substantial amount of market shares of the domestic manufacturers. What price increase in domestic cars could generate the domestic market shares in Table 3? Using our estimated elasticities and a back-of-the-envelope calculation, we could in fact replicate the domestic market shares of Table 3 with significant price increases of domestic cars with the following

Table 2. Actual average market shares (1970–1999)

Brand Origin	Belgium	France	Germany	Italy	UK
American	9.7	6.1	10.8	5.8	25.4
French	28.2	**69.9**	10.6	15.9	15.5
German	19.9	8.1	**44.6**	9.8	8.2
Italian	6.9	6.2	5.2	**59.0**	3.8
British	13.4	5.6	18.9	5.5	**33.0**
Japanese	17.3	2.3	7.8	1.1	9.7
Other	4.6	1.9	2.0	2.8	4.2

[4] The BLP instruments are based on the competitors' car characteristics, product's characteristics of other models within manufacturers, the number of competitors and their interactions.

Table 3. Simulated average market shares under no home bias ($\gamma = 0$)

Brand Origin	Belgium	France	Germany	Italy	UK
American	9.7	13.8	16.1	12.0	33.3
French	28.2	**30.6**	15.8	36.7	20.4
Germans	19.9	18.6	**17.6**	21.0	10.7
Italians	6.9	14.9	7.8	**11.3**	5.1
British	13.4	12.9	28.1	11.7	**12.5**
Japanese	17.3	5.2	11.6	1.9	12.6
Others	4.6	4.1	3.0	5.4	5.5

increases: 28% increase in Italy, 21% in France, 13% in Germany and 10% in the UK.

V. Conclusion

Our results show that home bias is the most important advantage of the European car manufacturers in their domestic markets, explaining for more than half of their market shares in the countries considered. We show that the importance of home bias exceeds the importance of the difference in attributes, including prices, which could be linked to trade costs.

Bronnenberg *et al.* (2009) and Bronnenberg *et al.* (2012) have also documented a strong and persistent brand loyalty among consumers. The strong preferences for domestic brands found in the European car market are consistent with this behaviour.

The evidence of this article puts a limit to the expectations regarding outcomes in a frictionless market. If consumers in the European Union exhibit this degree of home bias, then the absence of trade costs may not have large impacts on relative market shares of foreign and domestic goods.

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Appendix 1: Brands and Nationalities

Table A1. Brands and Nationalities

Country	Brand name	Country	Brand name
Czech Republic	Škoda	Japan	Daihatsu
France	Citroën		Honda
	Peugeot		Mazda
	Renault		Mitsubishi
	Talbot		Nissan-Datsun
	Hillman-Chrysler		Subaru
	Matra		Suzuki
	Simca		Toyota
		The Netherlands	DAF
Germany	Audi	Korea	Daewoo
	BMW		Hyundai
	MCC		Kia
	Mercedes	Spain	Seat
	Princess	Sweden	Saab
	Volkswagen		Volvo
Italy	AlfaRomeo	UK	Opel-Vauxhall
	Autobianchi		Rover
	Fiat		Triumph
	Innocenti	US	Ford
	Lancia	Yugoslavia	Yugo

Appendix 2: Estimates and Specifications

This section presents the estimates under alternative specifications. All specifications have considered dummies by market, car segment, year, brand, firm and location of manufacturing plant. The counterfactual exercises of the article use the BLP specification in Table A2.

Table A3 presents several specifications under different set of random coefficients in the BLP model.

Table A2. Logit, IV and BLP estimates

	Estimates	Logit	SD	IV	SD	BLP	SD
$-\lvert\widehat{\beta}_m\rvert$	Price-Belgium	−1.85	(0.08)	−1.39	(0.38)	−1.86	(0.55)
	Price-France	−1.98	(0.09)	−3.63	(0.87)	−4.09	(0.97)
	Price-Germany	−1.99	(0.11)	−3.10	(0.84)	−3.25	(0.85)
	Price-Italy	−1.56	(0.06)	−1.37	(0.31)	−2.03	(0.62)
	Price-UK	−1.52	(0.06)	−0.70	(0.39)	−1.28	(0.63)
$\widehat{\gamma}_m$	Home-France	1.92	(0.06)	1.75	(0.09)	1.75	(0.09)
	Home-Germany	1.17	(0.07)	1.39	(0.18)	1.33	(0.18)
	Home-Italy	2.51	(0.06)	2.53	(0.07)	2.53	(0.06)
	Home-UK	1.33	(0.07)	1.27	(0.10)	1.28	(0.10)
$\widehat{\alpha}$	Inverse motor power	−1.03	(0.09)	−1.05	(0.11)	−1.11	(0.11)
	Size	0.68	(0.16)	0.72	(0.25)	0.77	(0.25)
	Litres per Km	−1.36	(0.11)	−1.32	(0.21)	−1.41	(0.23)
$\widehat{\sigma}_p$	SD price sensitivity	–	–	–	–	0.68	(0.35)

Table A3. BLP estimates different specifications

BLP	Estimates	Coeff.	SD	Coeff.	SD	Coeff.	SD
$-\lvert\widehat{\alpha}\rvert$	Price-Belgium	−1.81	(1.67)	−2.04	(0.64)	−1.87	(0.60)
	Price-France	−4.06	(2.22)	−4.43	(1.12)	−4.09	(1.13)
	Price-Germany	−3.20	(1.50)	−3.00	(0.94)	−3.25	(0.93)
	Price-Italy	−2.01	(1.71)	−2.37	(0.60)	−2.03	(0.77)
	Price-UK	−1.22	(2.13)	−1.39	(0.74)	−1.29	(0.68)
$\widehat{\gamma}$	Home-France	1.63	(4.71)	1.75	(0.10)	1.78	(0.66)
	Home-Germany	1.19	(5.47)	1.23	(0.19)	1.35	(0.51)
	Home-Italy	2.40	(5.17)	2.52	(0.07)	2.55	(0.56)
	Home-UK	1.12	(6.13)	1.27	(0.10)	1.29	(0.40)
$\widehat{\beta}$	Inverse motor power	−1.12	(0.29)	−1.28	(0.26)	−1.11	(0.11)
	Size	0.63	(2.96)	0.92	(0.66)	0.77	(0.25)
	Litres per Km	−1.42	(0.35)	−3.69	(3.74)	−1.41	(0.24)
$\widehat{\sigma}$	σ_p	0.61	(2.08)	0.65	(0.41)	0.68	(0.41)
	σ_{home}	0.59	(10.03)	–	–	0.16	(14.87)
	σ_{imp}	0.00	(5.81)	0.00	(2.39)	–	–
	σ_{size}	0.42	(4.69)	0.00	(5.24)	–	–
	σ_{fuel}	0.00	(9.66)	0.19	(2.42)	–	–
GMM	Obj. function	286.13	–	286.35	–	286.46	–

Table A4. Own price elasticities by market and origin. (SDs in parenthesis)

	Belgium	France	Germany	Italy	UK
All	−1.09	−2.79	−1.92	−1.53	−0.83
	(0.36)	(1.06)	(0.69)	(0.49)	(0.15)
Domestic	–	−2.58	−2.29	−1.51	−0.84
	–	(0.84)	(0.83)	(0.53)	(0.13)
Foreign	−1.09	−2.85	−1.86	−1.53	−0.83
	(0.36)	(1.11)	(0.64)	(0.48)	(0.15)