# Variation in own-brand penetration across product categories and stores: the role of rivalrous vs industry-expanding advertising

Rachel Griffith[1,2], Michal Krol[2] and Kate Smith[1]

[1]The Institute for Fiscal Studies, [2]The University of Manchester

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# Introduction

What determines retailers' product selection, specifically the decision whether or not to introduce own brands in place of national brands?

Propose a theoretical model focusing on the role of advertising, specifically:

- the strength of its **'intra-store' rivalrous capture** effect between brands in a product category ($a_{riv}$) vs. its **industry expansion** effect ($a_{ind}$)
  e.g. *shampoo* - high $a_{riv}$, low $a_{ind}$, vs. *oranges* - low $a_{riv}$, high $a_{ind}$
- the strength of **'inter-store' rivalrous capture** ($a_{ret}$) - extent to which offering heavily advertised brands attracts consumers from other stores

Other factors: consumers' **willingness-to-pay** ($V$) and **retailer size** ($s$)

$\Rightarrow$ *then take the predictions to UK supermarket data*

# Benchmark Case: No Own Brands (2N)

## Players / Timing of Moves

Three stages of the game:

1. Two manufacturers simultaneously set levels of effort $e_1^m, e_2^m$ they exert each advertising one distinct variety within the same category
2. Manufacturers simultaneously set wholesale prices $p_i^m$ at which to offer their products to retailers
3. Each retailer independently sets retail prices $p_i^r$ of *both* national brands

Consumers, with tastes' characteristic $x$ uniformly distributed on $[0, 1]$, each buy one unit of product $i$ iff:

$$U_i(x) > \max\{U_{-i}(x), 0\}, \text{ where:}$$
$$U_i(x) = V - p_i^r - |x - (i-1)| + a_{riv}(e_i^m - e_{-i}^m)/2$$

# Benchmark Case: No Own Brands (2N)

## Optimal Prices

Assume:

**(1)** $V \geq 3$, **(2)** no fixed retail costs, no manufacturing costs **(3)** retailers do not compete on prices, only on brand selection. Here, the latter is the same across stores, so for every retailer we have equilibrium prices:

$$p_i^{r^*} = \left[p_i^m - p_{-i}^m - 2 + a_{riv}\left(e_i^m - e_{-i}^m\right)\right]/4 + V$$
$$p_i^{m^*} = a_{riv}\left(e_i^m - e_{-i}^m\right)/3 + 2$$

and the following market shares & profits:

$$\bar{x}_1^* = \bar{x}_2^* = \left[a_{riv}\left(e_1^m - e_2^m\right) + 6\right]/12$$
$$\pi^{r^*} = V - 5/2 + \left(e_1^m - e_2^m\right)^2 a_{riv}^2/72$$

# Benchmark Case: No Own Brands (2N)

## Optimal Advertising Efforts

For manufacturers' it's like selling to a monopolistic retailer, and optimal efforts $e_i^m$ maximize:

$$\Pi_i^m = \left[1 + a_{ind}\left(e_1^m + e_2^m\right)\right] p_i^{m^*} \left|\bar{x}_i^* - (i-1)\right| - \left(e_i^m\right)^2$$

Assuming $a_{riv}, a_{ind}$ not too big, a unique equilibrium exists, with efforts:

$$e_1^{m^*} = e_2^{m^*} = \left(3a_{ind} + a_{riv}\right) / \left(6 - 2a_{ind}a_{riv}\right)$$

So, a symmetric equilibrium, but manufacturers advertise less and charge more than they would if selling directly to consumers.

# Introducing Own Brands

## A Single Own Brand (ON)

Suppose that, once equilibrium efforts $e_i^{m^*}$ are set, one of the retailers unexpectedly finds itself in a position to introduce their own brand and offer it to consumers instead of an existing national brand (say, brand $i = 1$).

The retailer can then set their own level of advertising effort $e_1^r \geq 0$ before prices are set.

We assume this is **not** in order to compete with the remaining national brand **within** the store, but rather to bring more people **into** the store via industry-expansion and inter-store rivalrous capture.

# Introducing Own Brands

## A Single Own Brand (ON)

In particular, the retailer's total profit is given by:

$$\Pi^r_{ON} = \pi^{r^*}_{ON} \times M - (e^r_1)^2$$

where $\pi^{r^*}_{ON}$ is the retailer's profit *per unit mass of consumers*, obtained by substituting $e^m_1 = 0$ and $e^m_2 = e^{m^*}_2$ in $\pi^{r^*}$, i.e.:

$$\pi^{r^*}_{ON} = V - 5/2 + (0 - e^{m^*}_2)^2 a^2_{riv}/72$$

and $M$ is the mass of consumers visiting the store, specified as:

$$M = s[1 + \overbrace{a_{ind}\left(e^r_1 + e^{m^*}_1 + e^{m^*}_2\right)}^{\text{industry expansion}}] + \overbrace{a_{ret}\left(e^r_1 - e^{m^*}_1\right)}^{\text{inter-store riv. capture}}$$

# Introducing Own Brands

## Two Own Brands (2O)

Similarly, suppose the manufacturer replaces **both** national brands with its own brands, thereby eliminating the intra-store rivalrous effect and making both brands equally attractive to consumers at equal prices.

However, it can now advertise both own brands, i.e. set $e_1^r, e_2^r \geq 0$ to attract consumers into the store more effectively.

$$\Pi_{2O}^r = \pi_{2O}^{r^*} M - (e_1^r)^2 - (e_2^r)^2$$

where $\pi_{2O}^{r^*}$ is obtained by substituting $e_1^m = e_2^m = 0$ in $\pi^{r^*}$ and:

$$M = s\left[1 + a_{ind}\left(e_1^r + e_2^r + e_1^{m^*} + e_2^{m^*}\right)\right] + a_{ret}\left[(e_1^r + e_2^r) - \left(e_1^{m^*} + e_2^{m^*}\right)\right]$$

# Results

## Optimal Product Selection

We compare equilibrium profits $\Pi^{r^*}_{2N}$ (no own brands), with optimal profits $\Pi^{r^*}_{ON}$ and $\Pi^{r^*}_{2O}$, corresponding to the introduction of one or two own brands and setting advertising efforts $e^r_i$ optimally.

We find a dual motivation to introduce own brands:

- at the intra-store level, having cheap alternatives to national brands helps get the most out of any mass of consumers who visit
- at the inter-store level, having much-advertised own brands helps in getting more people to visit

Having a single own brand is a compromise between the two, while having two means pursuing the second objective.

# Results

## Optimal Product Selection

Larger $s$ **supports** both motives: (1) benefits from effective price differentiation are applied to a larger mass of consumers; (2) bigger stores appropriate a larger share of any industry-wide increase in demand.

Larger $a_{ret}$ **discourages** own brand introduction, as more consumers follow heavily advertised national brands. But when shopping in **many** categories on a single visit, they may be less likely to switch retailers if a national brand is removed from any **single** category (i.e. $a_{ret}$ may be smaller in this case).

Thus, own brands are more likely to penetrate multi-product, concentrated retail sectors, like the supermarket industry.

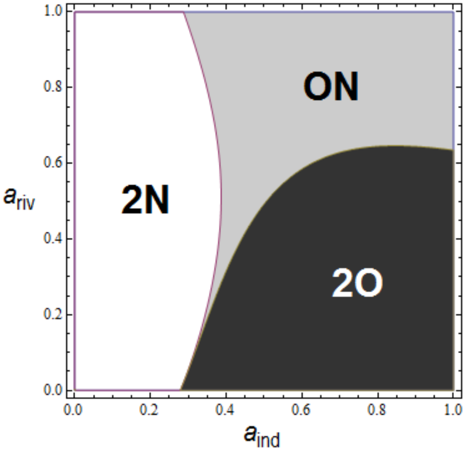
# Results

## Optimal Product Selection

Consider then the role of two other parameters: $a_{ind}$ and $a_{riv}$, in the context of the UK supermarket industry:

- dominated by a small number of large retailers with market shares around $1/4$, so set $s = 0.25$.
- people consider many product categories on a single visit, so small $a_{ret}$ and $V$ (likely to opt out of one if too expensive); set $V = 3$ (smallest value allowed, market just about covered) and $a_{ret} = 0.005$.

# Results: Large Stores (s = 0.25)




**Three** parameter regions:

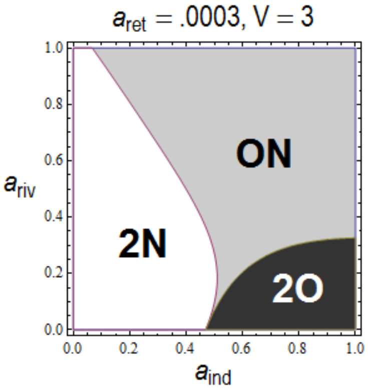
(**2N**) no own brands - small $a_{ind}$, large retailers better internalize industry expansion;

(**ON**) own brands mixed with national brands - large $a_{ind}$ and $a_{riv}$, both price differentiation and attracting new consumers are important;

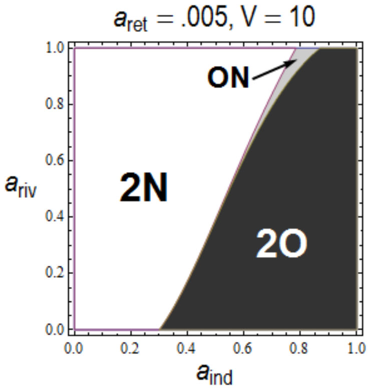
(**2O**) own brands dominate - large $a_{ind}$, small $a_{riv}$, market expansion the main objective

# Results: Small Stores (s = 0.05)

A *ceteris paribus* $s \downarrow$ would enlarge '2N', but $a_{ret} \downarrow$ or $V \uparrow$ could offset.




(Lidl?) more budget brands & less advertising




(M&S?) more standard own brands, more advertising