

Marketing-induced demand generation and the evolution of market concentration: online appendix B

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OB.1. Pseudocode for the construction of the division variables

This section of online appendix B provides a procedure describing how to construct the parameters of the behavioural variables governing the division of funds to category-specific expenditure and the remainder (savings) of each mental budget.

Procedure Setting the parameters of β^s behavioural variables governing the division of funds: part 1

- 1) Set $\delta_1, \delta_2, \delta_3$ (the net percentage changes of net disposable income (NDI), that will be used for the identification of parameters)
- 2) Set the size of the total saving rate (out of NDI) corresponding to the values of betas for no change in the net disposable income.
- 3) Calculate the values of mental accounts η^s , as in appendix A.
- 4) Calculate the initial values of category-specific saving rates, $\sigma_{sr,0}^s$, and set the maximum (limit) category-specific saving rates $\sigma_{sr,max}^s$; as in appendix A.
- 5) Set the values of β^s corresponding to no change in the net disposable income (i.e., $\delta_2 = 0$; in principle, any value can be chosen as the inflection point, but this one is suggested by behavioural economics and psychology). Depending on the version of consumer behaviour, we have

$$\bar{\beta}^s = \eta_s - \sigma_{sr,0}^s = \eta_s - \sigma_{sr,max}^s \quad (\text{expansionary}),$$

$$\bar{\beta}^s = \eta_s - \sigma_{sr,0}^s \quad (\text{volatile}),$$

$$\bar{\beta}^s = \eta_s - \sigma_{sr,0}^s = \eta_s \quad (\text{extreme saver, prudent}),$$

$$\bar{\beta}^s = \eta_s - \sigma_{sr,0}^s \quad (\text{reversed, consumption habits}),$$

- 6) Set the values of β_{s1} :

$$\beta_{s1} = \eta_s \quad (\text{expansionary, volatile}),$$

$$\beta_{s1} = \eta_s - \sigma_{sr,max}^s \quad (\text{extreme saver, prudent, reversed, consumption habits})$$

Procedure Setting the parameters of β^s behavioural variables governing the division of funds: part 2

7) Set the values of β_{s2} :

$$\beta_{s2} = \eta_s \quad (\text{expansionary, reversed, consumption habits}),$$

$$\beta_{s2} = \eta_s - \sigma_{sr,max}^s \quad (\text{volatile, extreme saver, prudent}),$$

8) Set the values of β_{s5} :

$$\beta_{s5} = \bar{\beta}^s - \beta_{s1}$$

9) Define y_{IN}^s and y_{DCR}^s according to the equations $\{(24), (25)\}$, $\{(30), (31)\}$, $\{(36), (37)\}$, $\{(43), (44)\}$, $\{(49), (50)\}$, $\{(55), (56)\}$ (depending on the consumer type) given in the paper, and to the values of the ω coefficients provided in table 19 in appendix A.

10) Calculate β_{IN}^s and β_{DCR}^s using equations (18) and (19).

11) Set $\beta_{s6} = \bar{\beta}^s - \beta_{s2}$.

12) Using equations (72) and (73), calculate β_{s3} and β_{s4}

OB.2. Other parameter and initial values

Parameter or a constant variable	Value
Debt interest rate r^{cr}	0.07
Saving deposit interest rate r^d	0.01
Depreciation period of other durable goods	8
Depreciation period of vehicles	40
β^{dur}	0.2
β^{veh}	0.1
β^H	0.7
ω^{CA}	$\frac{2}{3}$
Rental rate r^{rent}	0.15
Tax rate r^{tax}	0.2
Utility bills rate if renting r^{bills}	0
Utility bills rate if one flat r^{bills}	0.05
Utility bills rate at least one flat and one house r^{bills}	0.1

Table 1 – Values of other parameters.

The values of behavioural division-of-funds variables $\{\beta^s\}_s$ are initialised with parameter values constructed as described above and in appendix A, using $\tilde{\Omega}_0 = 1$ as the initial value of gross percentage change of net disposable income.

Variable	Initial value
$\tilde{\Omega}_t^i / \tilde{\Omega}_{t-1}^i$	1
Income Ω	30000
Net income $\tilde{\Omega}$	$\Omega_0 \cdot (1 - r^{tax} - r^{rent} - r^{bills})$
P^F	$\tilde{\Omega}_0 \cdot 4 \cdot 15 \cdot 0.3$
P^H	$\tilde{\Omega}_0 \cdot 4 \cdot 15 \cdot 0.3$
Depreciation value of other durable goods δ_{dur}	0
Depreciation value of a vehicle δ_{veh}	0
Debt db	0
Debt payments dps	0
Number of owned flats F	0
Number of owned houses H	0
RBT	$\Omega_0 \cdot (r^{tax} + r^{rent} + r^{bills})$
d^{CA}	Ω_0
$d^{CA,dur}$	$\Omega_0 \cdot \sigma_{sr,0}^{CA} \cdot \beta_{dur}$
$d^{CA,veh}$	$\Omega_0 \cdot \sigma_{sr,0}^{CA} \cdot \beta_{veh}$
$d^{CA,H}$	$\Omega_0 \cdot \sigma_{sr,0}^{CA} \cdot \beta_H$

Table 2 – Initial values of variables, excluding $\{\beta^s\}_s$.

OB.3. Pseudocode for the main block

Procedure Main block: initial conditions subblock

- 1) Load the parameters of beta division variables and the income series.
- 2) Set the interest rates, the mental transfer rates ($\beta_{dur}, \beta_{veh}, \beta_H$)
- 3) Set the initial values of $dep^{CA,dur}, dep^{CA,veh}, dep^{CA,H}, dep^{SA}$. The results in the paper were obtained by assuming $\Omega_0 \cdot \sigma_{sr}^{CA} \cdot \beta_{dur}; \Omega_0 \cdot \sigma_{sr}^{CA} \cdot \beta_{veh}; \Omega_0 \cdot \sigma_{sr}^{CA} \cdot \beta_H; \Omega_0 \cdot \sigma_{sr}^{SA}$, respectively.
- 4) Set the initial values of the beta division variables:

$$\beta_0^s = \beta_{s5} \cdot \exp(\beta_{s3} \cdot (1 - 1)) + \beta_{s1}$$

- 5) Create the arrays of possessed number of houses, flats, vehicles, other durable goods (with all entries equal to 0).
 - 6) Set the starting rental rate, the tax rate, the utilities bills rate.
 - 7) Create the arrays and initial values of:
 - Net Income,
 - admissible debt,
 - debt,
 - prices of flats,
 - prices of houses,
 - current account deposit (and its value in t=1),
 - prices of vehicle,
 - depreciation value of a vehicle,
 - price of a durable good,
 - depreciation value of the durable good,
 - debt payments,
 - gross percentage change of net disposable income,
 - the sum of rents, utility bills, and taxes
 - the size of σ_{sr}^{CA}
 - the size of σ_{sr}^{SA}
 - $\{CONS_s\}$ for $s = b, \dots, cs_{edu}$
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Procedure Main block: The working life loop subblock: part 1

for $t \in \text{range}(1, T)$:

1) Prices increase or not, depending on the version of the price process.

2) If the consumer holds debt that has not yet been paid –
calculate debt payments in the current period, using a standard multi-
period

debt formula:

$$dps_t = \left(\frac{CD - dm + 1}{CD} \cdot r_{t-dm} + \frac{1}{CD} \right) \cdot HD_{t-dm}$$

where CD is credit duration, dm is the current value of debt maturity, r_{t-dm} is the fixed interest rate, and HD_{t-dm} is the nominal amount of debt taken out in period $t - dm$.

3) Calculate rents, utility bills and taxes relative to the housing good possession of a consumer:

if $H_t = 0 \wedge F_t = 0$:

$$r^{rent} = 0.15$$

$$r^{bills} = 0$$

else if $(H_t = 1 \wedge F_t = 0) \vee (H_t = 0 \wedge F_t = 1)$:

$$r^{rent} = 0$$

$$r^{bills} = 0.05$$

else if $(H_t = 1 \wedge F_t = 0)$:

$$r^{rent} = 0$$

$$r^{bills} = 0.1$$

else

$$r^{rent} = 0$$

$$r^{bills} = 0.1$$

$$RBT_t = \Omega_t \cdot (r^{rent} + r^{bills} + r^{tax})$$

4) Calculate net disposable income and its one-period gross percentage change.

5) Calculate the values of β_t^s variables in the current period.

6) Calculate the values of category-specific expenditure on frequently bought goods' categories in the current period, i.e. $\beta_t^s \cdot \tilde{\Omega}_t$.

Procedure Main block: The working life loop subblock: part 2

for $t \in \text{range}(1, T)$:

7) Calculate the relative and actual sizes of transfers to accumulation-devoted current and saving accounts:

$$\sigma_{sr,t}^{CA} = \frac{2}{3} \cdot (1 - \sum_s (\beta_t^s))$$

$$\sigma_{sr,t}^{SA} = \frac{1}{3} \cdot (1 - \sum_s (\beta_t^s))$$

8) Determine the size of admissible debt:

$$HD_t^{adm} = (r_t + \frac{1}{CD})^{-1} \cdot (\tilde{\Omega}_t \cdot (crc))$$

where $crc = 0.3$ is the credit constraints parameter.

9) The decision rule for the housing goods purchases: as in the procedures given in the main body of the paper.

10) The decision rule for vehicle purchases (δ_t^{veh} is the current depreciation state of the possessed vehicle, while $\bar{\delta}^{veh}$ is the tolerance value; theoretical justification is satisficing behaviour):

if $P_t^{veh} \leq d_t^{CA,veh} \wedge \delta_t^{veh} > \bar{\delta}^{veh}$:

$$d_{t+1}^{CA,veh} = d_t^{CA,veh} - P_t^{veh} + \tilde{\Omega}_t \cdot \sigma_{sr,t}^{CA} \cdot \beta_{veh}$$

$$\delta_{t+1}^{veh} = 0$$

else

$$d_{t+1}^{CA,veh} = d_t^{CA,veh} + \tilde{\Omega}_t \cdot \sigma_{sr,t}^{CA} \cdot \beta_{veh}$$

$$\delta_{t+1}^{veh} = \delta_t^{veh} + 1$$

11) The decision rule for other durable goods purchases is analogous to the one for vehicle purchases:

if $P_t^{dur} \leq d_t^{CA,dur} \wedge \delta_t^{dur} > \bar{\delta}^{dur}$:

$$d_{t+1}^{CA,dur} = d_t^{CA,dur} - P_t^{dur} + \tilde{\Omega}_t \cdot \sigma_{sr,t}^{CA} \cdot \beta_{dur}$$

$$\delta_{t+1}^{dur} = 0$$

else

$$d_{t+1}^{CA,dur} = d_t^{CA,dur} + \tilde{\Omega}_t \cdot \sigma_{sr,t}^{CA} \cdot \beta_{dur}$$

$$\delta_{t+1}^{dur} = \delta_t^{dur} + 1$$

12) Update the values of $d_{t+1}^{SA,i,a}$, $\Omega_{t+1}^{i,a}$ and $d_{t+1}^{CA,i,a}$
