

README for

Moraga-González, Sándor, and Wildenbeest

“Consumer Search and Prices in the Automobile Market”

Overview

The code in this replication package constructs the output tables, figures, and numbers reported in Moraga-González, Sándor, and Wildenbeest (2022): “Consumer Search and Prices in the Automobile Market” from the data sources listed in the Data Availability Statements using Matlab.

Data Availability Statements

The analysis in the paper is based on the following datasets:

- **Car characteristics data** is obtained from the Dutch car magazine AutoWeek (Autoweek 2009b) and included in the replication package as part of [cars.mat](#). Model-specific data can be retrieved using <https://www.autoweek.nl/auto/autoweekid>, where autoweekid is a unique ID that is part of the dataset and identifies a specific car model. The number of households and average yearly gasoline prices are obtained from Statistics Netherlands (Statistics Netherlands 2009, Statistics Netherlands, Ministry of Economic Affairs, and NOVE 2009).
- **Car sales data by model** is obtained from Bovag (Bovag 2004-2008) and included in the replication package as part of [cars.mat](#).
- **Survey data on search behavior and purchases** are obtained from TNS NIPO (now part of Kantar). This data is obtained from two separate surveys that were administered in 2010 and 2011 by the Dutch survey agency TNS NIPO as part of their investigation named “De Nederlandse Automobilist” (TNS NIPO 2010, 2011) and included in the replication package as [survey.mat](#).
- **Neighborhood statistics** are obtained from Statistics Netherlands for 2007 (Statistics Netherlands 2007) and included in the replication package as part of [wijkenbuurten.mat](#). Latitude and longitude data for the centroids of the neighborhoods are obtained using the software package ArcGIS using the Statistics Netherlands neighborhood maps for 2007 (Statistics Netherlands and Kadaster 2007).
- **Dealership data** is obtained from the Dutch car magazine AutoWeek (Autoweek 2009a) and included in the replication package as part of [dealers.mat](#). Note that latitude and longitude data for the addresses are obtained using <https://www.gpsvisualizer.com/geocoder> (using Bing Maps as a source).
- **Car production cost data** is included in the replication package as part of [cars.mat](#). This data is constructed using data from various sources:
 - Unit labor costs are calculated using data from the Conference Board International Labor Comparisons (ILC) program (Conference Board International Labor Comparisons Program 2019). Registration is necessary for complimentary access to all ILC files. Unit Labor Costs are calculated as Total Labor Cost / (Nominal Value Added / CPI), using data for all manufacturing and a base year of 2006.
 - Steel prices are obtained through Datastream using the CRU Steel Price Indicator for Europe (Thomson Reuters Datastream 2021). Note that Datastream typically is accessed through a dedicated workstation on a university library.
 - European car sales data by model is obtained from Carsalesbase.com (Carsalesbase 2020). The data can be obtained by using the relevant make and model in the following URL: <https://carsalesbase.com/europe-make-model>.

- Manufacturer-specific global production data for 2003-2007 are obtained from various editions of the Global Market Data Book (Automotive News Europe 2004, 2005, Automotive News 2007, 2008) and for 2008 from world motor vehicle production statistics from OICA (OICA 2008).
- Manufacturer-specific global sales data for 2003-2007 are obtained from various editions of the Global Market Data Book (Automotive News Europe 2004, 2005, Automotive News 2007, 2008) and for 2008 from the manufacturers' annual reports.
- Producer Price Indices are obtained from the IMF International Financial Statistics (IMF International Financial Statistics 2019a). For India and Romania Consumer Price Indices are used due to missing PPI data (IMF International Financial Statistics 2019b).

Description of Code

The replication code runs in Matlab. The main file is `estcars.m`, which runs the complete replication code. The uniform quasi-random draws used in the code are provided in `qmc48_rng1.mat` and `rndz5.55_rng1.mat`. Initial parameters are stored in `params.mat`. Several functions and script files are called from within this script file (in order of appearance):

function/script	description
<code>distances.m</code>	creates distances matrices
<code>dist.m</code>	calculates distance in kilometers based on the Haversine formula
<code>micromoments.m</code>	constructs the micromoments
<code>condlogit.m</code>	estimates the conditional logit models in Table 3 of the paper
<code>update_params.m</code>	updates the struct variable that contains the parameters
<code>update_data.m</code>	updates the struct variable that contains the data
<code>logitsearch.m</code>	estimates the logit search model
<code>gmmobjlgt.m</code>	calculates the GMM objective function value for the logit search model
<code>mufunc.m</code>	computes the non-linear part of utility
<code>scfunc.m</code>	computes search costs
<code>squarem.m</code>	computes the mean utility level using SQUAREM for the search model
<code>ind_shseq.m</code>	computes the individual-specific choice probabilities for the sequential search model
<code>probw.m</code>	computes the integrand in equation (11) of the paper that is needed to calculate P_{if}
<code>var_cov.m</code>	calculates the variance-covariance matrix for the conditional logit search model
<code>jacobnum.m</code>	obtains the Jacobian for calculation of the standard errors in the conditional logit search model
<code>dsdp_seqownTnew.m</code>	computes the market share derivatives for the general search model (for last period)
<code>probw_d.m</code>	computes the integrand used for calculation of the own-firm price derivatives
<code>probw_dc2.m</code>	computes the integrand used for calculation of the cross-firm price derivatives
<code>fullmodel.m</code>	estimates the complete model
<code>gmmobj.m</code>	calculates the GMM objective function value for the complete model
<code>mufunc_srv.m</code>	computes the non-linear part of utility for the survey respondents
<code>scfunc_srv.m</code>	computes search costs for the survey respondents
<code>squarem_nl.m</code>	computes the mean utility level using SQUAREM for the full information model
<code>ind_shseq_srv.m</code>	computes the survey respondents' choice probabilities for the search model
<code>ind_sh_srv_nl.m</code>	computes the survey respondents' choice probabilities for the full information model
<code>probs_srv.m</code>	computes the survey respondents' search probabilities
<code>probps0A.m</code>	computes F_i^{rmax} in equation (A26) of the paper
<code>probps1C.m</code>	computes $(F_{if}^w(y) - F_{if}^r(y))F_{i,-f}^r(y)$ in first integrand of equation (A29) of the paper
<code>probps1D.m</code>	computes $F_{i,-f}^r(x)F(x)$ in second integrand of equation (A29) of the paper
<code>ind_sh_nl.m</code>	computes the individual-specific choice probabilities for the full information logit model
<code>markup2.m</code>	computes the markups
<code>jacob.m</code>	obtains the Jacobian needed for calculation of the standard errors for the complete model
<code>consumersurplus.m</code>	computes consumer surplus
<code>counterfactual.m</code>	simulates prices for different levels of distance-related search costs
<code>simblp.m</code>	evaluates the pricing first-order condition
<code>simblp_fp.m</code>	solves the pricing equilibrium treating it as a fixed point
<code>probs.m</code>	computes the search probabilities
<code>probps0.m</code>	computes the integrand in equation (A26) of the paper
<code>probps1A.m</code>	computes the first integrand in equation (A28) of the paper
<code>probps1B.m</code>	computes the second integrand in equation (A28) of the paper
<code>multibranding.m</code>	simulates prices for the multi-branding counterfactual

Computational requirements

The code was last run with Matlab Release 2021a on a 4-core Intel based desktop with MacOS version 11.6. The code uses the Optimization Toolbox and the Parallel Computing Toolbox. The approximate time needed to reproduce the analyses on this machine is 20 hours.

List of tables and programs

The provided code reproduces all numbers provided in the main text (in output/numbers_maintext.txt) and appendix (in output/numbers_appendix.txt), with section numbers in which the numbers appear in square brackets, as well as selected tables and figures in the paper, as explained and justified in the table below.

Figure/Table	Program	Line Number	Output File
Figure 1(a)	n.a. (no data)		
Figure 1(b)	n.a. (no data)		
Figure 2	estcars.m	142	output/figure2.eps
Table 1	estcars.m	210	output/table1.txt
Table 2	estcars.m	250	output/table2.txt
Table 3	estcars.m	333	output/table3.txt
Table 4	estcars.m	614	output/table4.txt
Table 5	estcars.m	681	output/table5.txt
Table 6	estcars.m	712	output/table6.txt
Table 7	estcars.m	743	output/table7.txt
Table 8	estcars.m	819	output/table8.txt
Table 9	estcars.m	865	output/table9.txt
Table 10	estcars.m	1065	output/table10.txt
Table A1	n.a. (no data)		
Table A2	estcars.m	770	output/tableA2.txt

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