5321 Industrial Organization: Problem Set 2 (Updated April 18)

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You work as a consultant and act as an expert for investigations regarding the automobile industry. In this project you are told to evaluate price effects and market outcomes following a number of different merger scenarios in the European car market.

To do the analysis, you access data on all newly registered cars in five EU countries during a 30 year period, from 1970 to 1999.[1] The countries are Belgium, France, Germany, Italy and the UK. An observation in the data is a car model (co) in a given year and country. You observe the number of new car registrations (qu), and the price of the car measured in 1000s of Euros in 1999 purchasing power (price). The data also contain information about several product characteristics, such as, horsepower measured in kW, fuel measured as fuel efficiency in liter per 100 km, as well as width and height in cm. The variable type shows the name and brand of the model, domestic is a dummy variable for domestic cars, firm contains the name of the firm, and pop is country population. Furthermore, the car market is classified into five different segments (segment), i.e., subcompact, compact, intermediate, standard, and luxury.

The data can be downloaded from the course web page. The data set is named Cars.dta. You can use any software package you want to solve the exercise. I will be using Stata in the tutorials and in my solutions. I recommend using the `mergersim` package if you use Stata. This package is described in [Björnerstedt and Verboven, 2014].

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[1]For detailed information, please see [Goldberg and Verboven, 2001], [Björnerstedt and Verboven, 2014] and https://sites.google.com/site/frankverbo/data-and-software/data-set-on-the-european-car-market

1. Show and discuss summary statistics of the car market in the five EU countries. Focus on what you believe are key variables given the questions at hand.

2. Estimate a hedonic price equation, i.e., regress log of price on product characteristics of cars. Discuss the results.

3. Assume henceforth that the total market size is the number of households, approximated by total population divided by 4. Estimate demand using a logit specification [Berry, 1994]. Assume that a household's expected utility from choosing a given car is a linear function of `price`, `horsepower`, `fuel` (fuel economy), `width`, `height`, `domestic` (a dummy indicating that the car is a domestic brand), `year`, country fixed effects and car model fixed effects. What is your estimated α parameter? Is it consistent with economic theory?

4. Estimate demand using a nested logit specification where segment is defined as the nest [Berry, 1994]. What are your estimated α and σ parameters? Are they consistent with economic theory?

5. Discuss the endogeneity problem of the price variable and suggest two types of instruments that could be used to solve it. You are not expected to implement a specification with instruments.

6. Assume Nash-Bertrand competition in prices on the supply side. Calculate the implied marginal costs in 1998 based on the estimates from the logit and nested logit specification in (3.) and (4.). Present firm level averages of price, marginal cost, and the Lerner index.

   Do the logit or the nested logit estimates produce more believable results?

   Use the demand estimates from the nested logit specification in (4.) in all merger simulations below. Furthermore, consider only the effect of the merger on the German Market.

7. Consider a merger wherein VW (firm=26) acquires General Motors (GM) (firm=15) in 1998. Assume, for now, no further adjustments in production and that there are no cost savings. Calculate the pre-merger and post-merger unweighted average prices for each brand. Also present the aggregate change in consumer and producer surplus. Should a competition authority which follows the consumer welfare standard approve the merger?

8. Reconsider the merger scenario in [8] with the only difference that there are cost efficiencies. The cost saving for combined VW-GM entity is a 10% reduction in marginal costs. Calculate the pre-merger and post-merger unweighted average prices for each brand. Also present the aggregate change in consumer and producer surplus. Should a competition authority which follows the consumer welfare standard approve the merger?

9. Consider a case where the competition authority can let VW buy all GM models except for three Opel models (with model codes $co = 164, 166, 168$). The efficiency gain of

the combined entity would then only be 9%, and the three Opel models that remain unacquired suffer a 2% loss in efficiency. Calculate the pre-merger and post-merger unweighted average prices for each brand. Also present the aggregate change in consumer and producer surplus. Should a competition authority which follows the consumer welfare standard approve the merger?

10. Propose at least two additional features that you would like to include and account for in your merger analysis.

References

[Berry, 1994] Berry, S. T. (1994). Estimating discrete-choice models of product differentiation. *The Rand journal of economics*, 25(2):242–262.

[Björnerstedt and Verboven, 2014] Björnerstedt, J. and Verboven, F. (2014). Merger simulation with nested logit demand. *The Stata journal*, 14(3):511–540.

[Goldberg and Verboven, 2001] Goldberg, P. K. and Verboven, F. (2001). The evolution of price dispersion in the european car market. *The Review of economic studies*, 68(4):811–848.