Empirical workshop 4: Cartels

Stockholm School of Economics

Matilda Orth
Research Institute of Industrial Economics IFN, Stockholm

May 7, 2019

This empirical workshop deals with a railroad cartel in the US: the Joint Executive Committee (JEC). The aim is to use time series data on the cartel to test the hypothesis that the observed prices switch from collusive to non-cooperative behavior.

The JEC was a cartel of the railroads involved in transports from Chicago to the Atlantic seaboard in the 1880s. The majority of shipments consisted of grain. The market allocation took the form of market share allotments. While firms set their rates individually, JEC collected and informed about weekly stock of sales. Due to high variation in demand, the actual market shares depended on all prices and the realization of the demand shock. To maintain collusion, the JEC used a variant of trigger price strategy. Information gathering and dissemination to member firms on weekly basis were the main functions of the cartel.

You access weekly time series data from the JEC cartel during the period 1880-1886. The data come from Porter's (1983) article *A study of cartel stability: the Joint Executive Committee 1880-1886*. The data set is named *jec.dta* (*jec.csv*) and contains the following variables: WEEK, MONTH, LAKES, TGQ, GR, PO, and PN, where *LAKES* is a dummy variable equal 1 if Great-Lakes were open to navigation, and 0 otherwise; *TGQ* is total quantity of grain shipped (in tones); *GR* is grain rate in dollars per 100 lbs;[1] *PO* is a cheating dummy variable equal 1 if colluding according to the *Railway Review* and 0 otherwise; and *PN* is an estimated cheating dummy variable

[1] GR is an index of prices that the JEC obtained from polling firms.

equal 1 if colluding and 0 otherwise.

There were four important events (structural changes) in the market) during the study period due to, e.g., entry or extension of existing networks:

(i) week 28, 1880 to week 10, 1883 - entry by the Grand Trunk Railway;

(ii) week 11, 1883 to week 25, 1883 - an addition to New York Central;

(iii) week 26, 1883 to week 11, 1886 - entry by the Chicago and Atlantic;

(iv) week 12, 1986 to week 16, 1886 - departure of the Chicago and Atlantic from JEC.

The total quantity demanded is assumed to be a log-linear function of price,

qty = f(price, lakes)

$$log(TGQ_t) = \alpha_0 + \alpha_1 log(GR_t) + \alpha_2 LAKES_t + \varepsilon_t^d, \quad (1)$$

where ε_t^d is distributed $i.i.d$ normal. The supply of the industry is given by,

price = f(qty, collusion, era)

$$log(GR_t) = \beta_0 + \beta_1 log(TGQ_t) + \beta_2 I_t + \beta_3 S_t + \varepsilon_t^s, \quad (2)$$

where ε_t^s is distributed $i.i.d$ normal and I_t is an indicator variable equal 1 when the industry is in a cooperative regime and zero otherwise. Therefore, I_t is either PO_t or PN_t. The parameter β_2 would be equal to $log(|\alpha_1|/(1+|\alpha_1|))$ if the firms behaved as to maximize single-period joint profit returns in cooperative periods. The larger the profits in cooperative periods, the greater the marginal benefit to secretly cut price. In cooperative periods, β_2 should be positive, but less than $log(|\alpha_1|/(1+|\alpha_1|))$.

1. Show and discuss summary statistics of the data. Plot and discuss the evolution of the index of prices (GR), the total quantity recorded shipped by the JEC (TGQ), and the variable when the railway magazine reported periods of price war (PO).

2. What factors facilitate collusion in this application? Are there any factors that would make collusion more difficult? Explain.

3. Estimate the demand and supply functions independent of each other using PO. Discuss your results.

4. Estimate demand and supply functions using an instrumental variable approach. You might include the cheating variable PO and account for structural changes in the market. If we assume $\beta_2 = -log(1 + \theta/\alpha_1)$, compute and discuss the conduct parameter θ at the industry level.

5. Re-run the instrumental variable regression and compute θ in question 4 using the estimated cheating variable PN instead of PO. Note that PN differs slightly from Porter's article. Discuss and relate the results to your findings in question 4.

6. There are various changes in industry structure during the study period. Are you satisfied with how the model deals with these factors? Can we answer the following question based on the proposed methodology: How much of the existence and success of the cartel relate to changes in industry structure? Explain your answer.

7. The model relies on a number of assumptions, out of which industry structure discussed in question 6 constitutes one example. Discuss one assumption that you believe is less restrictive and one that you believe is more restrictive for the application at hand. Discuss and justify your choices.

8. Information about collusion is either reported (PO) or estimated separately from demand and supply (PN). Would it be possible to generalize the model along this dimension? Comment.

The report needs to be no more than 6 pages. The report must be e-mailed to matilda.orth@hhs.se by 23:59, on Tuesday May 14, 2019, at the latest. I will let you know that I have received the report.

References

Harrington, J. (2008), "Detecting Cartels", in Handbook in Antitrust Economics, Paolo Buccirossi, editor (MIT Press).

Levenstein, M. and V. Suslow (2006), "What Determines Cartel Success?", *Journal of Economic Literature*, Vol. XLIV, 43-95.

Porter, R. H. (1983), "A study of cartel stability: the Joint Executive Committee, 1880-1886", *The Bell Journal of Economics*, 14(2), 301-314.