Additional Empirical Exercise 12.1

During the 1880s, a cartel known as the Joint Executive Committee (JEC) controlled the rail transport of grain from the Midwest to eastern cities in the United States. The cartel preceded the Sherman Antitrust Act of 1890, and it legally operated to increase the price of grain above what would have been the competitive price. From time to time, cheating by members of the cartel brought about a temporary collapse of the collusive price-setting agreement. In this exercise, you will use variations in supply associated with the cartel's collapses to estimate the elasticity of demand for rail transport of grain. The data file **JEC** contains weekly observations on the rail shipping price and other factors from 1880 to 1886.[1] A detailed description of the data is contained in **JEC_Description**.

Suppose that the demand curve for rail transport of grain is specified as $\ln(Q_i) = \beta_0 + \beta_1 \ln(P_i) + \beta_2 Ice_i + \sum_{j=1}^{12} \beta_{2+j} Seas_{j,i} + u_i$, where Q_i is the total tonnage of grain shipped in week *i*, P_i is the price of shipping a ton of grain by rail, Ice_i is a binary variable that is equal to 1 if the Great Lakes are not navigable because of ice, and $Seas_j$ is a binary variable that captures seasonal variation in demand. *Ice* is included because grain could also be transported by ship when the Great Lakes were navigable.

a. Estimate the demand equation by OLS. What is the estimated value of the demand elasticity and its standard error?

b. Explain why the interaction of supply and demand could make the OLS estimator of the elasticity biased.

c. Consider using the variable *cartel* as instrumental variable for ln(*P*). Use economic reasoning to argue whether *cartel* plausibly satisfies the two conditions for a valid instrument.

d. Estimate the first-stage regression. Is *cartel* a weak instrument?

e.Estimate the demand equation by instrumental variable regression. What is the estimated demand elasticity and its standard error?

f. Does the evidence suggest that the cartel was charging the profit-maximizing monopoly price? Explain. (*Hint:* What should a monopolist do if the price elasticity is less than 1?)

[1] These data were provided by Professor Robert Porter of Northwestern University and were used in his paper "A Study of Cartel Stability: The Joint Executive Committee, 1880–1886," *The Bell Journal of Economics*, 1983, 14(2), 301–314.