

## Stackelberg Oligopoly and International Trade

Many international markets are dominated by relatively few firms that possess not only market power but, in many instances, significant first-mover advantages. A recent article examines trade restrictions in duopolistic international markets in which one trading partner enjoys a first-mover advantage. The analysis shows that trade restrictions can enable foreign and domestic firms to earn higher economic profits. Moreover, when a home country enjoys a first-mover advantage, a quota placed above the existing level of imports generally reduces the output of both foreign and domestic firms.

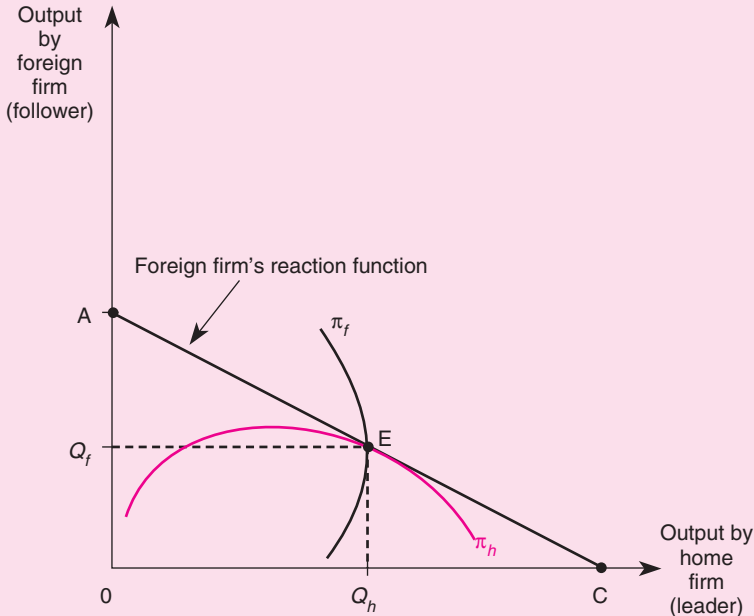
To see why this is true, suppose the market for international trade is characterized by a Stackelberg duopoly in which both firms sell output only in the home country (say, the United States). The foreign firm observes the domestic firm's output and, based on this, determines how much of its product to deliver to the

home country. Thus, the home firm (the leader) possesses a first-mover advantage and sets output, while the foreign firm (the follower) is a second mover; that is, the foreign firm perceives that the home-country firm will maintain the same output regardless of the foreign firm's export decision.

The foreign firm's reaction function—that is, the profit-maximizing response to any given output of the firm in the home country—is given by the line AC in Panel A. Stackelberg equilibrium in the absence of trade restrictions is at point E, where the home country's isoprofit curve is tangent to the foreign firm's reaction function. The foreign firm ships  $Q_f$  units of output to the home country, and the domestic firm sells  $Q_h$  units;  $\pi_h$  and  $\pi_f$  represent the profits enjoyed by the home and foreign firms, respectively.

Now suppose an export restraint of  $X$  is imposed on the foreign producer, as in Panel B. This may be

**PANEL A** Equilibrium before Export Restraint is at Point E



either a quota imposed by the domestic government or an export restraint imposed by the foreign government that restricts how much its firms can export abroad. The export restraint makes it illegal for the firm in the foreign market to export more than  $X$  units to the home country.

Under an export restraint of  $X$ , the foreign firm's "effective" reaction function becomes  $XGC$  in Panel B. Hence, the domestic firm's profits are maximized where its isoprofit curve is tangent to  $XGC$ , namely at point  $I$ . But this implies a lower output for the domestic firm ( $Q_h^*$ ), greater output by the foreign firm ( $X$ ), and higher profits for both firms ( $\pi_h^* > \pi_h$  and  $\pi_f^* > \pi_f$ ).

Thus, the export restraint increases the profits of foreign and domestic producers. While it is not surprising that it increases the domestic firm's profits, it may at first seem surprising that the foreign firm also benefits by facing an export restraint. The economic intuition, however, is simple. In the absence of controls on its foreign rival, the domestic firm knows that if it produces less than  $Q_h$ , the foreign firm will at-

tempt to capitalize on the higher price by expanding its output. If the export restraint is set at  $X$ , the foreign firm is unable to expand output beyond  $X$  in response to the output reduction by the domestic firm. At  $X$ , the domestic firm reduces its output because it knows the foreign firm cannot react to the higher price by expanding its output beyond  $X$ . As a consequence, both firms enjoy higher profits.

A foreign firm exporting to a market in which the home producer enjoys a first-mover advantage would be happy to have its government initiate and enforce a suitable export restraint. Indeed, this is precisely what occurred in Japan; the Japanese government has set export restraints limiting the number of cars that can be shipped to the United States.

Source: Michael R. Baye, "Export Restraints as Commitments in Stackelberg Trade Equilibrium," *Jahrbücher für Nationalökonomie und Statistik* 209 (1992), pp. 22-30.

**PANEL B** Equilibrium after Export Restraint Moves from Point E to Point I

