Imperfect Competition as a Determinant of Trade

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Until now we have assumed that the production of goods is carried out by perfectly competitive firms, i.e. the firms have no market power. In this chapter we analyze the implications of relaxing this assumption. What is the effect of imperfect competition on the pattern of trade? Will international trade still be beneficial?

An obvious, and extreme, example would be existence of monopolies in certain industries of the economy. These could arise due to increasing returns of scale, i.e. the costs of production decline as the total output increases. Therefore, small firms which produce small levels of output will find it unprofitable to produce, whereas large firms producing at a larger scale will find it profitable to produce. Another reason for existence of monopolies is the presence of barriers to entry. These could arise due to regulatory restrictions such procurement of licenses to set up firms or due to restricted access to technology because of patents. Some examples of such firms are Microsoft, Intel, Boeing and Airbus.

In this chapter will not go into reasons behind the presence of monopolies. Instead, we will assume that there exists a monopoly. Starting with autarky, suppose production in sector X in country H is carried out by a monopoly. Furthermore, for simplicity, assume that this firm does not have monopsony (single buyer) power in the factor market.

The profit maximizing condition for any firm is that the revenue from selling an additional unit of output must equal the cost of producing the additional unit of output, i.e. marginal revenue equal marginal costs: $MR = MC$. Under perfect competition, marginal revenue is equal to price because the firms is a price taker. Therefore, the condition that ensures that the firm maximizes its profits (given the price) is that price is equal to the marginal cost, $p = MC$. In case of our two goods, this implies that $p_x/p_y = MC_x/MC_y$. In case of a single factor, labor, $MC_x = w\Delta L_x/\Delta X$ and $MC_y = w\Delta L_y/\Delta Y$. Since an increase in the labor force allocation to X implies a decline in the allocation to Y, $\Delta L_x = -\Delta L_y$. This means that $MC_x/MC_y = -\Delta Y/\Delta X = MRT$. This in turn means that $p_x/p_y = MC_x/MC_y = MRT$, which is the condition for efficient production for the economy - price line is tangential to the production possibility frontier.

Unlike a perfectly competitive firm, a monopoly is not a price taker. It is the single producer that supplies a good to the entire economy. Therefore, the monopolist faces the

downward sloping aggregate (economy's) demand curve for the good. Unlike the perfectly competitive firm, the monopolist cannot sell its entire output at a given price. The downward sloping demand curve implies that the monopolist must reduce the price of the good to sell more. Notice that when the monopolist reduces the price to sell an additional unit, the reduced price also applies to the other units as well. Therefore the change in total revenue is given by:

$$\Delta TR = p_x \Delta X + X \Delta p_x \quad .$$

The first term, on the right-hand side, is the change in revenue due to the change in output, holding price constant. The second term is the loss in revenue on the existing sales due to the reduction in price ($\Delta p_x < 0$) in order to sell additional unit of X. Dividing both sides of the equation by ΔX gives the marginal revenue.

$$MR_x = \frac{\Delta TR}{\Delta X} = p_x + X \frac{\Delta p_x}{\Delta X} \quad .$$

Since $\Delta p_x < 0$ and $\Delta X > 0$, it means that $\Delta p_x / \Delta X < 0$ and therefore $MR_x < p_x$. This means that the marginal revenue is less than the price for a monopolist.

Multiplying and dividing the second term, on the right-hand side, by p_x and rearranging gives

$$MR_x = p_x \left[1 + \frac{\Delta p_x / p_x}{\Delta X / X} \right] \quad .$$

Since the price elasticity of demand is defined as the proportional change in demand for a good in response to a given proportional change in price of the good, it implies that the price elasticity of demand for X is given by:

$$e_x = - \frac{\Delta X / X}{\Delta p_x / p_x} \quad .$$

Using this in the expression for marginal revenue of X, the profit maximizing condition is given by

$$MR_x = p_x \left[1 - \frac{1}{e_x} \right] = MC_x \quad .$$

Denoting $1/e_x$ by m_x, we can write this condition as $p_x(1 - m_x) = MC_x \Rightarrow p_x = MC_x + p_x m_x$. m_x could be interpreted as a markup rate that the monopolist imposes. Thus, the price is equal to the marginal cost plus a markup revenue, i.e. price is greater than marginal cost.

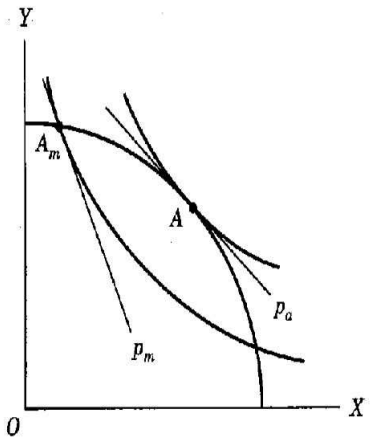

Figure 1: Autarky Equilibrium with Monopoly

The markup is an inverse function of the price elasticity of demand - *the more price elastic is the demand for X the smaller is the markup and the more price inelastic is the demand for X the higher is the markup.* A higher markup signals greater market power of the monopolist, whereas a smaller markup signals lower market power of the monopolist. Note, under perfect competition, the price elasticity for an individual firm is infinity. Therefore, the markup is zero - $m_x = 1/\infty = 0$, implying zero market power for firms and therefore price is equal to marginal cost.

Going back to our two good model, assume that sector Y is perfectly competitive, i.e. price is equal to marginal cost in sector Y. Now, in equilibrium it must be that

$$\frac{p_x(1-1/e_x)}{p_y} = \frac{MC_x}{MC_y} = MRT < \frac{p_x}{p_y} \quad ,$$

i.e. the equilibrium price ratio p_x/p_y is greater than the slope of the production possibility frontier (MRT). Figure 1 compares the competitive (in which both sectors are perfectly competitive) autarky equilibrium point A with the monopoly (in which sector X has a monopoly producer) autarky equilibrium point A_m. p_a is the autarky price ratio under perfect competition in both sectors and p_m is the autarky price ratio when sector X has a monopoly.

The key implication of introducing a monopoly are the following: (1) monopoly restricts the output of X (at A_m) below its competitive level (at A), (2) monopolist charges a price

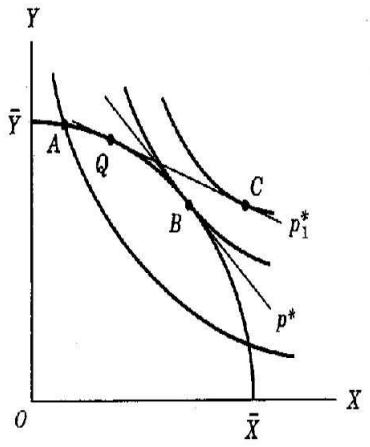

Figure 2: Small Open Economy with Monopoly

higher than the marginal cost, implying that the monopoly price of X (at A_m) is higher than the competitive price (at A), and (3) welfare is reduced in the presence of monopoly as illustrated by the lower level of utility achieved at A_m than at A.

1 Trade in the Presence of Monopoly

Now suppose this economy is a small open economy, i.e. the producers in this economy face fixed world prices. Also, assume that the fixed world price ratio happens to be equal to the undistorted competitive autarky price ratio of our economy. The autarky equilibrium is denoted by point A in figure 2. Point B represents the competitive autarky equilibrium. Since this is a small open economy, the monopolist in sector X faces a fixed world price of X, p_x^*. In other words the monopolist will have to sell at this price, implying $MR = p_x^*$. Thus, the monopolist faces a horizontal demand curve which has an infinite elasticity of demand. In other words, with the opening up of the economy to trade the market power of the monopolist (or the markup) goes to zero, and it is forced to behave like a perfectly competitive producer in the world market. As a result, equilibrium will be restored at point B, where the MRT equals the world price ratio. The economy will produce and consume at this point.

The movement of the economy from point A to point B is referred to as pure, *pro-competitive gains from trade*. Essentially, this is the gain that could be achieved by eliminating monopoly in the closed economy. Note that, in this special case wherein the world price ratio is equal to the undistorted autarky price ratio, there are gains from trade but at the final equilibrium point B the economy is indifferent between trading and not trading.

We could start from a situation where the world price ratio is not equal to the undistorted autarky price ratio. For instance, suppose the world price ratio is p_1^*. In this case, since the small economy must take this price ratio as given, the economy would consume at point C and produce at point Q. The gains from trade in moving from A to C can be decomposed into two parts: (1) the pure pro-competitive gains in moving from A to B, and (2) the comparative advantage gains from trade in moving from B to C. Therefore, the pro-competitive gains from trade add to the usual comparative advantage driven gains from trade.

Of course, the assumption of a small open economy simplifies the analysis a whole lot. One could be concerned if the pro-competitive gains from trade would exist when this assumption is dropped. In the case where our economy is not a small economy, when trade is permitted, there will be a large number of foreign X producers competing with the monopolist. Due to this competition (though not as severe as in the small open economy case), each individual producer will now have lower market power and would therefore, have less influence over the market price. Greater competition due to trade means that an individual producer faces a more elastic demand curve. This would mean that that even though the full extent of pro-competitive gains may not be realized, some of those gains will still exist.

2 Cournot Competition

In this section we go a step further in analyzing the role of monopoly in trade. Lets us start with two identical countries, each with a monopoly producer in sector X (but we assume that none of them acts as monopsonist in the factor market). The reason for allowing for

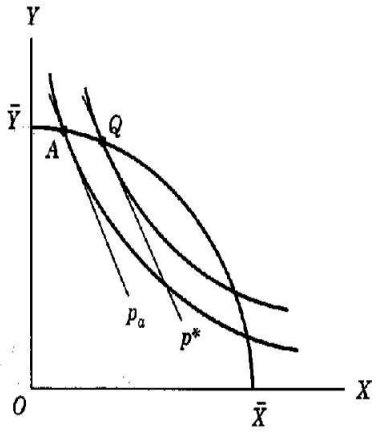

Figure 3: Pro-Competitive Gains in Cournot Competition

monopoly power in both countries in sector X is that usually an industry which is imperfectly competitive in one country also happens to be imperfectly competitive in other countries. A good example is the presence of scale economies in certain sectors across countries.

In figure 3, point A is the initial autarky equilibrium for both countries. When the economies open up to trade sector X will have two monopolist competing against each other. This also called a *duopoly*. We will assume that the each firm will choose an output level to maximize its profit taking as given the output of the other firm. This is also called *competition in quantity* or *cournot competition*. In game theory language, each firm chooses a *best response* to the output of the other firm. An equilibrium is one where the choice of best responses by the firms is such that there is no incentive for them to change their best response. This equilibrium concept is also known as *Nash equilibrium*, named after Nobel laureate John Nash.

So the world supply (or production) of good X, after we allow for trade, is $X_p = X_p^h + X_p^f$. Now, each firms profit and marginal revenue will be a function of the other firms output choice. This is because the world price of good X is a function of the world supply, i.e. $p_x^* = P(X)$. So, the marginal revenue of the firm in country H is given by:

$$MR_x^h = p_x^* + X_p^h \frac{\Delta p_x^*}{\Delta X_p} \frac{\Delta X_p}{\Delta X_p^h} = p_x^* + X_p^h \frac{\Delta p_x^*}{\Delta X_p} \quad ,$$

since $\Delta X_p / \Delta X_p^h = 1$. This is because the home firm takes the output of the foreign firm as given, and as any change in world supply of X is only due to change in home supply of X.

The above expression can be rewritten as

$$MR_x^h = p_x^* + p_x^* \frac{X_p^h}{X_p} \left[\frac{\Delta p_x^*/p_x^*}{\Delta X_p/X_p} \right] \quad ,$$

where $X_p^h/X_p = s_h$ is the market share of home firm in total world sales of good X and the term in the square brackets is the price elasticity of demand for good X denoted by e_x. Therefore, the profit maximization condition for the home firm is given by:

$$MR_x^h = p_x^* \left[1 - \frac{s_h}{e_x} \right] = MC_x^h \quad .$$

Analogously, for the firm producing good X in the foreign country

$$MR_x^f = p_x^* \left[1 - \frac{s_f}{e_x} \right] = MC_x^f \quad .$$

So, in the cournot competition model the markup of the firm depends not only on the price elasticity of demand (as in the case of a monopolist) but also on the each firms market share, i.e. markup is s_h/e_x. The inclusion of market share is to reflect the loss of revenue from a one unit increase in the output of the home firm. When the home firm increases its output by one unit, the loss of revenue resulting from the price reduction due to larger supply must be shared between the two firms. The share of this lost revenue borne by the home firm is given by the home firms market share. The home firm does not take into account the revenue loss to the foreign firm when it decides to increase its output by an additional unit. In the case of a monopolist only in the home country, as considered previously, the market share of the home firm is one.

The result of opening up the two identical economies to trade is that the market share of each firm will fall from 1 (when it is monopolist in autarky) to 1/2 (when it is a duopolist under trade). The fall in market share implies that the marginal revenue of the firms will rise. This is because as one firm increases its output, the revenue loss due to the ensuing drop in price is shared by the two firms. Thus, with a higher marginal product than in the case when each firm is a monopolist under autarky, the firms will expand output till $MR = MC$ equality is reestablished. Therefore, the equilibrium over from point A to a point like Q in figure 3, where the equilibrium world price ratio is p^*. At the new equilibrium there is no pattern of comparative advantage since both countries are (still) completely identical.

Thus, the countries are indifferent between trading and being autarky. However, there are still gains from trade. The presence of two firms in sector X, instead of just one when the economies were closed, competition results in higher output and hence lower price. These gains are shown by the higher indifference curve at point Q. This increase in welfare can be termed as 'pure' pro-competitive gain from trade. *An important result to notice is that you do not need a pattern of comparative advantage in order to gain from trade.*

3 Qualification to Existence of Gains from Trade

The gains from trade are the result of an expansion in output of the good that is undersupplied (by the monopolist under autarky). This is called the *production expansion condition.* Another way to understand is that under autarky the monopolist charges a price higher than the marginal cost, which implies that the marginal benefit from producing an additional unit is higher than its marginal cost. Trade forces the monopolist to expand output and therefore reduce the price. This brings the economy closer to the efficient production case where price equals marginal cost. However, if somehow firms of the two countries are able to collude following a reduction in barriers to trade, then we will not get pro-competitive gains from trade. However, the production expansion condition is a sufficient but not a necessary condition for gains from trade.

It is possible that trade may not result in an expansion of production of undersupplied goods, in which case there will be no gains from trade.

3.1 Different Costs

Suppose that the home country firm in sector X has higher costs of production than the foreign country firm. This will imply that when trade is allowed, the foreign country firm will have a comparative advantage in producing X. This will reduce the output of X in the home country. However, if the firms are not able to collude, due to the competition there will be some pro-competitive gains from trade. If the first effect dominates, then there will be a net reduction in output of good X in home which may result in negative gains from trade.

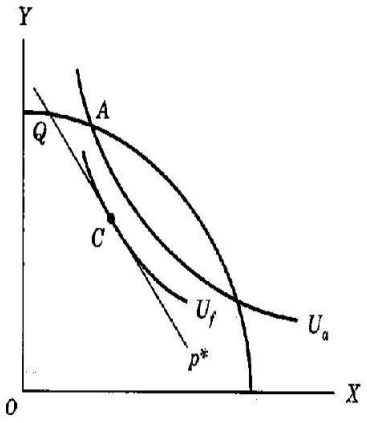

Figure 4: Negative Gains from Trade

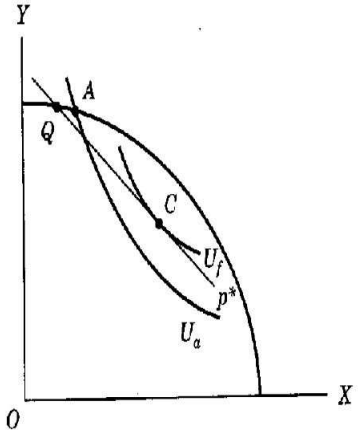

Figure 5: Gains from Trade When Costs are Different

This is illustrated in figure 4. For the home country, point A is the autarky equilibrium whereas point Q and C are the production and consumption equilibrium, respectively under trade.

However, if the costs of production of the foreign firm are significantly lower than, the world price ratio will fall further (as compared to that in figure 4) and this may induce the home country to specialize in the production of good Y. This will result in significant gains from trade as illustrated in figure 5. In this case the monopolist in the home country may be driven out of the market completely. Foreseeing such a scenario the monopolist will lobby hard to prevent the trade liberalization.

3.2 Countries of Different Sizes

Suppose the two countries identical except for their size, and both have a monopolist in autarky. Suppose the home country is much larger than the foreign country. Upon opening up to trade, home firm will have a rival producer. However, from its point of there has been only a very small expansion in the total market size (country Fs market is very small as compared to that of country H). For the home country it as if another firm has been added to the home market. This may result in the contraction of the home firms output. The foreign firm also has a rival upon opening up to trade, but from its point of view there has been a large increase in the market size. Thus, the first effect which works to contract output of the home firm is countered by this pro-competitive effect which works to increase the output of both firms. If the first effect dominates, we will see decline in the welfare of home. If, on the other hand, the second effect dominates, we will see an increase in the welfare of home.