A Note On Excess Demand Curves

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Abstract

The possibility of a kinked excess demand curve is demonstrated. Implications are drawn with regard to optimal tariffs and optimal export taxes.

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1. Introduction

In the partial equilibrium approach to international trade theory, the concept of an excess demand curve plays an important role in the determination of equilibrium prices and trade flows. Using these concepts it is also possible to establish an optimal tariff and optimal export tax argument that follows from Enke's pioneering article on the optimal tariff. For example, the optimal export tax in the partial model can be derived as the solution that follows from the exporting country acting as a pure monopolist in the international market.

Given these considerations a closer look at the structure of excess demand curves is merited. If linearity is assumed and the possibility of negative demand (supply) at any positive price is excluded then it is clear that the corresponding excess demand curve will be kinked at two points -- where the domestic demand curve touches the price axis and where the domestic supply curve touches the price axis. Consider Figure 1 where under the stated assumptions domestic demand can be represented as OAD and domestic supply as OBS. The corresponding excess demand curve is then EFGHD. Note how the curve is kinked at points H and F where the excess demand curve assumes the slope of the demand and the supply curve respectively.

2. Implications For the Optimal Export Tax and Optimal Tariff

Consider the case of an exporting nation that decides to operate as a monopolist in the international market in order to take advantage of its potential market power. Suppose further that the excess demand curve (DKD') that it faces is kinked in the area of concern as represented

in Figure 2. The marginal revenue curve that it faces will thus have a discontinuity in it (AB). Now if the excess demand curve of the exporting country is representable as S^1S^1 a dilemma develops. Clearly, exports will be Q^1 as can be easily established by a limiting argument on either side of Q^1 -- given that a monopolistic pricing policy is being employed. However, it is also clear as Sweezy noted in his original article on kinky curves that marginal revenue is not necessarily equal to the marginal cost of supplying the exports. As with the kinky oligopolistic curve this has several interesting implications. To proceed, first note that the price charged to importers will be P^1 while the price that prevails in the exporting nation will be P^2 . The tax revenue is then equal to the per unit tax $P^1 - P^2$ times the size of exports Q^1 . Consider the implications of an outward shift of the supply curve in the exporting country caused by, say, an improvement in technology. It is clear from Figure 1 that this will signal an outward shift in the excess demand curve of the exporter to, say, S^2S^2 . Note the following: (1) the price charged to the importing nation has not changed; (2) price prevailing in the exporting nation has decreased; and (3) quantity of exports has not changed. Therefore, there is no surplus change in the importing country, and any surplus gain resulting from the improvement in technology accrues solely to the exporting country. Similarly, any inward shift of the exporting country's excess demand curve so as to leave it within the zone of discontinuity would leave price in the importing country at P^1 , thus affecting only the exporter. This is to be contrasted with the usual linear model where an outward shift of the excess demand curve of the exporting country would lead to a fall in price charged to the importer and an increase in the amount exported.

At this time it should also be noted that an entirely symmetric argument can be made for a country imposing the optimal tariff in a partial model where the excess demand curve of the exporting nation is kinked. The general result will be that any shift of the excess demand curve of the importer within the zone of discontinuity will not be transmitted to the exporter. Therefore, as a general rule inflationary or deflationary pressures are not always transmitted internationally if monopolistic or monopsonistic practices are in effect and if there is a possibility of a kink in the respective excess demand curves.

A similar result will also hold for the "pure Millheman" model where an economic agent, say a large international corporation, tries to extract economic surplus from both sides of the market by acting as a monopolist and a monopsonist simultaneously. If, for example, the excess demand curve of the importing nation is kinked then certain changes in the cost structure in the exporting country may not be transmitted internationally.

Given the existence of the kink, one might legitimately wonder what the probability is that, say, in the optimal export tax example the excess demand curve of the exporting country will pass through the zone of discontinuity? This question can be partially answered by examining the size of the gap AB in Figure 2. Stigler points out the size of the discontinuity (Δ) will be proportional to the slopes of the upper and lower segments of the kinked demand curve. For the oligopolistic case this is adequate. However, the case at hand is slightly different in that the positioning of the kink is determined by the relationship between the supply and demand curves in the importing country. Any shifts of

these curves will affect the positioning of the kink, thus, a closer look is warranted. To proceed consider the domestic supply-demand situation described by

$$(1) \quad P = a - bq^D \quad a, b, c, d > 0$$

$$(2) \quad P = c + dq^S$$

where q^D is domestic demand, q^S is domestic supply and P is price. From Figure 2, it is clear that the size of the gap AB is equal to the difference between the marginal revenue of the excess demand curve and the marginal revenue of the domestic demand curve at quantity Q^1 . Algebraically Q^1 is the point of intersection between the original demand curve and the excess demand curve.^{1/} Solving for Q^1 yields $\frac{a-c}{b}$ and similarly solving for Δ obtains

$$(3) \quad \Delta = \frac{b(a-c)}{(b+d)}$$

Therefore, any outward shift of the demand or the supply curve will tend to increase the size of the discontinuity, as partial differentiation will easily verify. Further, it is readily seen that, ceteris paribus, the more elastic supply (demand) is the greater (smaller) is the size of the discontinuity, given a is greater than c . However, it should be remembered that a portion of the discontinuity may well be below the abscissa, as would be the case if the lower portion of the kinked curve in Figure 2 were inelastic. Therefore, an increase in the size of the discontinuity may not in some cases appreciably change the feasible area of the gap.

The preceding arguments give rise to the question of how important kinked excess demand curves are in reality. The question cannot be answered

without further empirical analysis. However, the position of the kink delimits some possibilities. In the case of the optimal export tax, the kink in the excess demand curve is at the point where the importing country produces none of the commodity in question, while in the case of the optimal tariff the kink occurs at a point where the exporter consumes none of the commodity it produces. Therefore, the possibility of the phenomenon occurring in the real world is limited in the optimal export tax case to situations where all of a commodity consumed is produced abroad. A few possible examples are the international coffee trade and trade in certain types of military hardware.

3. Concluding Remarks

The possible existence of a kink in excess demand curves has been demonstrated. Several interesting inferences relating to non-competitive practices in international trade have been drawn.

4. Footnotes

^{1/} Note that $Q^D = \frac{a-P}{b}$, $Q^S = \frac{P-c}{d}$ and, therefore,

excess demand $Q^E = Q^D - Q^S = \frac{ad + bc - (b+d)P}{bd}$ and the marginal revenue

of excess demand can be written $\frac{ad + bc - 2bdQ}{(b+d)}$ after

solving for P. The other results follow directly.

5. References

- Lnke, S., 1944, The Monopsony Case for Tariffs, Quarterly Journal of Economics 58.
- Sweezy, P., 1939, Demand under Conditions of Oligopoly, Journal of Political Economy XLVII, 568-573.
- Stigler, G., 1947, The Kinky Oligopoly Demand Curve and Rigid Prices, Journal of Political Economy, LV, 432-49.

Figures 1
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Figures 2
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