PROTECTION WITH INCREASING RETURNS AND COMPARATIVE DISADVANTAGE

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This paper reconsiders the economics of protection in a two-country partial equilibrium analysis of an industry subject to increasing returns. Under strong comparative disadvantage in one country any tariff distorted equilibrium in which both countries produce the commodity must be unstable. In general, under strong comparative disadvantage, the case for free trade is greater than in standard trade theory. It also takes exceptionally high tariffs to protect a high-cost increasing returns industry. Beneficial tariffs or subsidies for the country with comparative *disadvantage* become prominent when the country with a comparative *advantage* faces a relevant capacity constraint.

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Many general equilibrium models with increasing returns in one industry have just examined free trade between two *identical* countries (e.g., James R. Melvin, 1969; Arvind Panagariya, 1981; Wilfred J. Ethier, 1982; Elhanan Helpman, 1984). Indeed, who has not seen the familiar "bowed-in" production possibility curve shared by two countries found in virtually every textbook (e.g. Dominick Salvatore, 2004, p. 169) and some articles (e.g., Melvin, 1969)? Frank Graham (1923) pioneered the study of protection of an increasing returns industry with two different countries, but used cumbersome numerical examples. Ethier and Roy J. Ruffin (2009) take a step forward by examining a simplified general equilibrium model of two different economies with economies of scale, and provide a nice taxonomy of the possible outcomes as functions of the parameters . This paper complements Ethier and Ruffin (2009) with a partial equilibrium analysis that is (1) more general because it is not based on particular functional forms, (2) explicitly examines the role of tariffs, and (3) tries to clarify the foundations of the classical question of whether increasing returns provides an argument for protection. The advantage of partial equilibrium is that it is easier to study tariffs and multiple equilibrium outcomes. Since comparative advantage is revealed through money prices

and costs, we can continue to use the same terminology as in the literature on general equilibrium.

Throughout I make the same assumption of average-cost pricing adopted in the vast majority of the literature.[2] It is now widely recognized that with prices above average costs, the possibility of profit-shifting between countries introduces strategic considerations with conflicting policy consequences (Jonathan Eaton and Gene Grossman, 1986). Thus, if one wants clear-cut results, the assumption must be made. As well-known, average-cost pricing is compatible with either economies of scale external to the firm but internal to the industry or internal economies of scale with perfectly free entry and exit.[3] Most importantly, the assumption implies that tariffs will normally have to be exceptionally high to protect a domestic industry subject to increasing returns and comparative disadvantage.

Briefly, I will argue that under this assumption the case for free trade is stronger with increasing returns. It is shown that the most serious multiple equilibrium outcomes conducive to beneficial tariffs or subsidies for the country with a comparative *dis*advantage hinge on the existence of capacity constraints in the country with a comparative advantage. Much can happen: there may be four distinct possibilities, three of which involve one of the countries possibly being better off at autarky and one of which involves both countries being better off with free trade. Identifying these possibilities in practice may be difficult. Without those capacity constraints, the infant

[2] Graham (1923), Ronald W. Jones (1968), Kemp and Negishi (1970), Eaton and Panagarya (1970), Panagariya (1981), Ethier (1982), Helpman (1984), Helpman and Krugman (1985, Ch. 5),Kiminori Matsuyama (1991), Kemp and Albert G. Schweinberger (1991), and Ethier and Ruffin (2009) all make the assumption of average-cost pricing.

[3] An earlier version of this paper implicitly assumed internal economies of scale instead of external economies of scale.

industry case of temporary tariffs or subsidies for the country with a comparative advantage depends on the certain parameters of nation-wide external economies of scale.

The focus of the literature dealing with industries subject to increasing returns and the gains from trade has been whether trade increases the output of such goods relative to goods that are produced under constant or decreasing returns (Frank Graham, 1923; Tinbergen, 1945; Kemp, 1969; Negshi, 1972; Kemp and Schweinberger, 1991). Negishi (1972) calls this the Graham-Tinbergen proposition: to put it simply, *welfare rises or falls as trade causes the output of goods produced under increasing returns rises or falls.* However, as is well-known, the literature is in an unsatisfactory state (Helpman, 1984; Kemp and Schweinberger, 1991). First, such theorems are generally single-country theorems dealing with the opening of trade but without specifying world demand conditions or stability; and, second, they generally ask what happens when the terms of trade improve (Eaton and Panagarya, 1970), but with increasing returns the move from autarky to free trade need not improve the terms of trade. Ethier (1982) made considerable progress by showing that if two countries produce the good under free trade, the equilibrium must be unstable. I show that tariffs do not change this fundamental result, but capacity constraints do.

Section I introduces the topic by (1) distinguishing between internal and external returns to scale, (2) showing that Marshallian stability is the appropriate dynamic adjustment assumption, and (3) displaying the basic economics of free trade between two different countries under increasing returns. Section II examines the stability of a tariff-distorted equilibrium and shows that it will generally be unstable if both countries produce the good, just as Ethier (1982). Section III then argues that the case for free

trade is greater with economies of scale, especially if there are international external economies or internal economies of scale. The section also defines the prohibitive tariff under increasing returns, and shows that it is higher than any notion of a cost-equalizing "scientific" tariff. In contrast to standard tariff theory, any tariff less than prohibitive must cause the domestic industry to shut down completely. Any other solution would be unstable. Section IV shows that if the country with a comparative *dis*advantage is large enough, bringing in the role of capacity constraints in the small country, then there are possibly three stable equilibrium outcomes, where beneficial tariff considerations arise. Capacity constraints turn the economics of protection under comparative disadvantage upside down and Graham-Tinbergen comes to the fore.

I. The Economics of Economies of Scale

External versus Internal Economies

External economies basically mean that a firm's costs are lower because of the size of the industry in which it operates. It was Alfred Marshall who laid out the basic economics of external economies (Marshall, 1920, Book IV, Ch. X). Paul Krugman's Nobel prize lecture compactly summarized Marshall: external economies to the firm exist because of knowledge spillovers, labor market pooling, and specialized capital inputs (Krugman, 2009).

Let $c(x)$ be the average cost of producing the quantity x with $c'(x) < 0$. If internal economies of scale, then there is a single firm with total costs $xc(x)$ and marginal cost = $MC = c(x) + xc'(x) < c(x)$ if $c' < 0$. One can have an equilibrium with $P = c(x)$ in a contestable market with free entry and exit; a single firm dominates the market. Ronald W. Jones (1968) and John Chipman (1970) assumed that with national external

economies of scale, a single firm has total costs $x_i c(x)$, where x_i is the firm's output and x is industry output. If the firm assumes that its output does not affect industry output, then the firm's $MC = AC = c(x)$. At the firm level, the firm has constant returns to scale. Under either scenario, market clearing implies that $P = c[D(P)]$, where $D(P)$ is market demand.

It is important whether external economies are *international* or *national* in scope (Ethier, 1979). If international, a firm in the home country has total costs of $x_i c(x + x^*)$, where x^* is output in the foreign country. This case is very similar to internal increasing returns because with average-cost pricing and free trade, the good will be produced in the country with the lowest average cost instead of the single firm in the country with the lowest average cost.

Autarkic Stability

Ethier (1982) quite properly assumes Marshallian dynamic adjustment for the case of external returns to scale, so when the demand price exceeds the supply price, output expands. In the external case, Walrasian stability (price adjustment) would be suggested if each individual firm had upward-sloping MC curves, which are ruled out when firms display constant returns (Jones, 1968; Chipman, 1970). Thus, there is no supply curve in the conventional sense so for any $P > c(x)$, any firm would simply want to expand output. The same should also hold for internal economies of scale because there is a single firm.

Under Marshallian dynamics, the autarkic stability condition is that the slope of the demand curve be steeper than the slope of the average cost curve. Thus, output increases (decreases) if the demand price exceeds (is less than) the supply price (Ethier,

1982). The demand curve is $D(P)$, where P is the price. Define the demand price as $P_D(x) = D^{-1}$ and $c(x)$ is the supply price. Thus, the time derivative is $dx/dt = P_D - c(x)$ so that the second time derivative is $dx^2/dt^2 < 0$ if $dP_D/dt - c' = 1/D' - c' < 0$. Thus:

Proposition 1: There is autarkic stability if $\Delta = 1 - D'c' > 0$.

Obviously, a similar condition would hold for stable free trade if only one country is producing the good.

From a single country standpoint and average-cost pricing and no producer surplus to worry about, the Graham-Tinbergen proposition is disarmingly simple. In the case of imports, $P = c[D(P)-M]$, then more imports raises the domestic price ,since $dP/dM = -c'/\Delta > 0$ given autarkic stability, so a loss of consumer surplus. Now consider the case of exports, $P = c[D(P) + X]$, then more exports lowers the domestic price since $dP/dX = c'/\Delta < 0$, and a gain of consumer surplus. But this does not tell the whole story.

Free Trade

Suppose now that there are two countries, home and foreign, with average cost curves $c(x)$ and $c^*(x^*)$. Assume $c' < 0$ for all x and $c^{*\prime} < 0$ for all x^*. I assume the foreign country has a strong comparative advantage in the good, so that $c(y) > c^*(y)$ for *any* common output, y. World demand is $D^o(P) = D(P) + D^*(P)$. Let us look at the potential equilibria. Define $D^o[c(x)] = x_F$ and $D^o[c^*(x^*)] = x_F^*$ as the potential free trade levels of output. Denote $c^*(x_F^*) = P_F^*$ as the *non-reversal equilibrium* and $c(x_F) = P_F$ as the *advantage reversal equilibrium.* These equilibrium outcomes are illustrated in Figure 1 by points F and F*. To avoid clutter, Figure 1 assumes $D = D^*$.

In the case of internal returns or international external returns to scale, the advantage reversal solution P_F is unstable because $P_F = c(x_F) > c^*(x_F)$. Accordingly,

entry will occur in the foreign country until P falls to $P_F^* = c^*(x_F^*)$.[4] However, in the case of national external economies of scale, $P_F = c(x_F)$ is stable as long as $P_F < c^*(0)$, as in Figure 1. Thus, under that condition, both $P_F = c(x_F)$ and $P_F^* = c^*(x_F^*)$ are stable solutions. Notice, however, that the foreign country can be worse off in the advantage reversal solution because it is possible for $P_F > P_A^*$, where $D^*(P_A^*) = x_A^*$ and $c^*(x_A^*) = P_A^*$, the autarky price in the foreign country, as illustrated in Figure 1.[5] The home country is better off in either the advantage-reversal position or the non-reversal solution. Summarizing:

Proposition 2: With national external economies of scale, there is a stable free trade solution in which either the country with comparative advantage or disadvantage supplies the entire market. If the country with a comparative disadvantage supplies the world market (the advantage reversal outcome), the other country may be worse off than autarky. Both countries better off in the non-reversal equilibrium outcome.

Proposition 3: With internal economies of scale or international external economies, there is only a stable free trade solution in which the country with a comparative advantage supplies the entire market. Both countries are better off than autarky.

In the national external economies case, the situation in which historical accident has the wrong country producing the good, the right country can use a temporary tariff or subsidy to make both countries better off in a regime change (Ethier and Ruffin, 2009). But there is no case for permanent protection.

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[4] See Helpman and Krugman (1985), p. 71.

[5] Helpman (1984) shows that this is unrealistic in the Ethier (1982) example of general equilibrium between two identical countries; but Figure 1 shows that it is probably more likely than suggested by the functional forms chosen by Helpman and Ethier.

II. A Tariff-Distorted Production Equilibrium is Unstable

This section applies the stability analysis in Ethier (1982) to the case of a tariff-distorted equilibrium in which both countries are producing the commodity. *I now rule out international external economies of scale.* There is a specific tariff T on each unit of the good imported into, say, the home country. The analysis does not depend on which country has a true comparative advantage, so it could conceivably apply the case of external returns to scale with the high-cost home country exporting the commodity, depending on the starting point.

An Unstable Equilibrium

Consider a momentary market clearing for some pair (x, x^*):

$$D^o(P, P^*) = D^*(P^*) + D(P) = x + x^* \tag{1}$$

with $P = P^* + T$. Thus in our dynamic analysis we are assuming that markets clear at every instant and that there are no arbitrage profits. Following Ethier (1982), we can solve for the demand prices

$$P_D = H(Q, T) \text{ and } P_D^* = H^*(Q, T), \tag{2}$$

where $Q = x + x^*$. It should be clear that the derivatives are $\partial H/\partial x = \partial H^*/\partial x^* = 1/D^{o\prime} = 1/(D^{*\prime}+D')$ because with perfect arbitrage the prices hang together. Define the Marshallian adjustment mechanisms where output rises per unit time (t) if the demand price exceeds the supply price. What is the supply price? If the industry is producing in both countries, the relevant supply price is $c(x)$ or $c^*(x^*)$. This holds for both an internal returns to scale as well as national external economies. Thus:

$$dx/dt = a_1 \equiv H(x + x^*, T) - c(x) \text{ and } dx^*/dt = a_2 \equiv H^*(x + x^*, T) - c^*(x^*). \tag{3}$$

Ethier (1982) refers to $a_1 = 0$ and $a_2 = 0$ as the *allocation curves.* Define:

$a_{11} = \partial H/\partial x - c' = 1/D^{o\prime} - c'$; $\quad a_{12} = \partial H/\partial x^* = 1/D^{o\prime}$;

$a_{22} = 1/D^{o\prime} - c^{*\prime}$; $\quad a_{21} = 1/D^{o\prime}$.

I now show that $a_1 = a_2 = 0$ is not a stable equilibrium.

Figure 2 measures home country output horizontally and foreign country output vertically. Just as in Ethier (1982), I show that *if* $a_1 = 0$ is flatter than $a_2 = 0$ then the equilibrium E is unstable (for the moment ignore the dotted line). If the home country increases the tariff, its allocation curve ($a_1 = 0$) shifts to right; and the foreign country's allocation curve shifts to the left. To understand the relative slopes of these curves we need to keep in mind that as x or x^* changes the price changes in the same direction by a larger amount than average costs since the demand curve is steeper than the average cost curve. Thus, imagine we move southwest down $a_2 = 0$ where $P^* = c^*$. It is necessary for P^* to be higher since x^* is lower and, therefore, P to be higher because of arbitrage. Thus, $P > c$ because x is larger. In order to reach $P = c$, we must increase x more in order for P to fall to c, so that $a_1 = 0$ is flatter. Mathematically, the absolute slope of $a_1 = 0$ is $a_{12}/a_{11} = 1/(1 - D^{o\prime}c')$ and the absolute slope of the $a_2 = 0$ is $(1 - D^{o\prime}c^{*\prime})$. Stability requires that $(1-D^{o\prime}c')(1-D^{o\prime}c^{*\prime}) > 1$. But our condition for autarkic stability implies that $1 > (1-D^{o\prime}c')(1-D^{o\prime}c^{*\prime})$. Thus:

Proposition 4: There is no stable tariff-distorted equilibrium in which both countries can produce the good with either nation-wide external or internal economies of scale. The global stability condition $(1- D^{o\prime}c^{*\prime})(1 - D^{o\prime}c') > 1$ is not satisfied, where $D^{o\prime}$ is the slope of the world demand curve with $c^{*\prime}, c' < 0$.

Notice this proof holds for any situation in which both countries produce the commodity with a tariff. All the proof assumes is that both countries produce the good with a possible tariff (given the stability condition for a single producer).

A Stable Equilibrium

It is critical in this proof that there is an "interior" solution. If there is a corner solution, so the foreign country is producing at capacity, then $c^{*\prime} = \infty$, such an equilibrium would be stable. This is illustrated in Figure 2 with the dotted line showing the capacity constraint in the foreign country, with *E'* being a stable solution. In that case, there are multiple stable solutions: two where the foreign country is at capacity and the other is where the home country is the only producer. These are studied in the final section.

III. The Case for Free Trade is Greater

We have thus proven that if each country can individually supply world demand the only conceivable trading equilibrium with or without a tariff would be described by complete specialization by one of the countries. Let us examine in detail the situation in which the home country does not produce the commodity. This has been shown to be a stable equilibrium.

The Height of Protective Tariffs

The theory of tariffs under increasing returns has very little in common with the standard theory of tariffs. In standard theory, a tariff improves the terms of trade; in the present case, a tariff worsens the terms of trade. In standard theory, the difference in

autarky prices measures the prohibitive tariff; in the present theory, a prohibitive tariff would be where autarky yields more direct consumer utility than importing.

We have defined autarky as $D[c(x_A)] = x_A$. Consider a tariff on foreign imports that is high enough so the imported price equals the home autarkic price:

$$D(P^*+T) + D^*(P^*) = x^*,$$

$$P^* = c^*(x^*),$$

$$c(x_A) = P^* + T.$$

The tariff is just prohibitive on the above definition, and we shall call that tariff level T_A. This assumes, realistically, that consumers do not make the connection between tariff revenue and their welfare. The prohibitive tariff exceeds any cost-equalizing tariff because the home country is not at the margin of producing more or less, as in standard theory. With the usual upward-sloping supply curve in the low-cost country, a higher tariff drives down the supply price but not as much as the tariff so the domestic price rises, increasing the domestic incentive to produce. In the present case, there is a finite margin between the low-cost country and the high-cost country is not at the margin between producing more or less. Any tariff less than the prohibitive tariff still allows imports and the domestic industry is shut-down. [6]

The Case for Lowering Tariffs

With a tariff $T < T_A$, we simply have $D[c^*(x^*)+ T)]+ D^*[c^*(x)^*]= x^*$. Thus, any increase in the change results in:

$$dx^*/dT = D'/\Delta^{*o} < 0, \tag{4}$$

[6] Here is an example. Let D = 200 -.5P and D* = 80 - .5P*. If c(x) = 50 - .1x and c*(x*) = 40 - .1x*, then T_A = \$17.30. In autarky, $c(x_A) = c(184) = \$31.6$ and $c^*(x_A^*) = c^*(63) = \$33.7$. With a tariff of \$12 per unit, which exceeds the cost-equalizing tariff, x* = 260, P* = \$14, and P = \$26, where $D[c^*(x^*)+ 12)]+ D^*[c^*(x)^*]= x^*$.

where $\Delta^{*o} = 1 - D^{o}{}'c^{*\prime} > 0$ since the world demand curve intersects c* from above. The impact on the domestic price is:

$$dP/dT = dP^*/dT + 1 = c^{*\prime}dx^*/dT + 1 > 1 \tag{5}$$

Moreover, since imports equal $M = D(P)$, $dM/dT = D'dP/dT < 0$.

Now consider welfare analysis. Since there is no domestic production, there is no producer surplus (there would not be in any case because with production $P = c$). Thus, welfare is:

$$W = \int_P^{\infty} D(\theta)d\theta + T[D(P)] \tag{6}$$

In this case, imports $M = D(P)$. Accordingly,

$$dW/dT = D(P)(1- dP/dT) + TdM/dT \quad . \tag{7}$$

Since $dP/dT > 1$ and $dM/dT < 0$, $dW/dT < 0$. Welfare continuously diminishes from free trade to autarky! The intuition is that the tariff increases the domestic price more than the increase in the tariff because foreign costs now rise and so swamps any beneficial tariff revenue effect. The case for free trade is greater in these circumstances.

IV. The Case for Tariffs or Subsidies

If the high cost home country produces the good due to national external economies and historical accident, the low cost foreign country could impose a temporary subsidy to switch from production from home to foreign. This new equilibrium would be superior for both countries. We mentioned that if the foreign country faces a capacity constraint, there is the possibility of a stable equilibrium in which both countries produce the good. This section explores the consequences of this fact for protection.

Multiple Free Trade Outcomes

Assume that the foreign country meets a capacity constraint at x_c*, but up to that point $c(x) > c^*(x)$. The capacity constraint could be due to being a small country, as Ethier and Ruffin (2009), or in a broader setting due to the lack of backward linkages in an undeveloped country with a history of protectionism, war, or revolution. Thus, the foreign country does not have a strong comparative advantage. Now consider the world demand curve D^o in Figure 3 with national external economies. Figure 3 shows that had the world demand curve intersected the cost curve *c(x) below* point *a* and above the minimum of $c^*(x^*)$ both countries would be better off in the free trade solution $D^o(P^{e^*}) = x_c^*$ because the home country buys the good cheaper than autarky and the foreign country receives rents. Thus, I ignore this case as it is similar to Figure 1's solution *F**. As shown in Figure 3, the world demand curve passes *above* point *a*, so there are three possible equilibria: Point *e**, where only foreign produces the good; point *e,* where only home produces the good, and a third (not shown) where both countries produce the good. Thus, the three free trade solutions are:

$$D^o(P^{e^*}) = x_c^*, \tag{8}$$

$$D^o[c(x)] = x \tag{9}$$

$$D^o[c(x)] = x + x_c^*. \tag{10}$$

The final section of Ethier and Ruffin (2009) describes a simple general equilibrium representation of the above outcomes. I now examine each in turn.

Only Foreign Production. In outcome (8), the equilibrium point *e**, provided $P^{e^*} < c(0)$, is stable, but the home country might be better off choosing autarky; however, since the foreign country is better off in that position supplying the entire world market, a

cooperative solution may be suggested. To see that the foreign country is better off we need only note that it now earns economic rents as well as consumer surplus, and the standard argument that the gain in economic rents outweighs the loss of consumer surplus from exporting.

Only Home Production. In outcome (9), the equilibrum *e* is better for the home country, and will be stable with $P^e < c^*(0)$. But, again, the foreign country could be better off at autarky, so again a cooperative solution is suggested. Below, I examine the possibility of the home country granting a production subsidy to avoid the foreign country choosing autarky.

Both produce. Finally, in the third equilibrium (10), has one solution, but two trade outcomes. In other words, x is a function of x_c^* depending on $D^o(P)$, but $D^o = D(P) + D^*(P)$, so that it is possible for $D(P) > x$ or $D(P) < x$. If the home country happens to have a low demand for the good, which is perhaps unlikely, it could be the exporter and would be better off by trade. In this case where $D(P) < x$, the foreign country is also better off by importing the good because it is producing at capacity and $D^*(P) > x_c^*$, but the price will be lower than autarky because of the supply from the home country and, as usual, the gain in consumer surplus will be larger than the loss of producer surplus. Trade does not cause its production to increase, because it can't. If, on the other hand, $D(P) > x$, then home is worse off by trade because it is producing less of the good than under autarky and the foreign country is better off. In this case the Graham-Tinbergen proposition is in full flower: the home country produces less of the increasing returns good and is worse off by trade; and the foreign country produces more and is better off. The home country would be better off imposing a tariff and increasing its output of the

good produced under increasing returns to scale because not only does the price falls, but the country collects tariff revenue. Autarky generates no tariff revenue, so there is an optimal tariff, assuming no retaliation by the foreign country.

A Production Subsidy

It is quite possible that under any free trade outcome, one of the countries is better off at autarky. So consider the two countries being at loggerheads and stuck at autarky. Now imagine the home country decides to impose a subsidy on the production of the good.[7] In the following equilibrium, the home country grants a production subsidy of r per unit such that the foreign country is just as well off at autarky, $c^*(x_A^*)$, as importing all of its requirements from the larger home country:

$$D^o[c(x) - r] = x \qquad (11)$$

$$c(x) - r = c^*(x_A^*) \qquad (12).$$

These two equations solve for x and r as a function of x_A^*. Define the home country's consumer surplus as $S(P) = \int_P D(\theta)d\theta$, then the home country will be better off than autarky provided

$$S[c^*(x_A^*)] > S[c(x_A)] + rx \qquad (13)$$

The above condition need not be satisfied if $c^*(x_A)$ is too small relative to $c(x)$ because the necessary subsidy rises faster than consumer surplus. Under condition (13), subsidized production by the large country is appropriate. Of course, a slightly larger subsidy would also improve the position of the smaller foreign country compared to autarky.

V. Conclusion

[7] The reader is invited to consider an export subsidy.

I have tried to argue in this paper that with either external or internal returns to scale, the country with a strong comparative disadvantage in a good is better off if it imports all of its requirements from the other country simply because the price is cheaper. Generally speaking, a tariff imposed by a high-cost country will always hurt both countries because the price rises in the exporting country and rises by even more in the importing country, swamping any revenue effect. Such a tariff will not invigorate the domestic industry unless it is higher than any cost-equalizing scientific tariff.

As in Ethier (1982) for any free trade equilibrium between identical countries and diversified production, a tariff-distorted equilibrium with positive outputs and decreasing average costs in both countries must be unstable if there is autarkic stability. There will be stability if one of the countries is at capacity or one country is the only producer, however.

Beneficial tariffs or subsidies become prominent for disadvantaged country when the country with an initial comparative advantage faces a capacity constraint (presumably a small country). While such cases may be unrealistic, with national external economies of scale there may be four possible free trade outcomes, but in three of the outcomes autarky may be better for one of the countries. Should it happen that the small country with such an initial advantage is producing at capacity and the large country imports the good, the large country can gain from a tariff. There is an optimal tariff in this case Another possible outcome to avoid an autarky-inducing tariff war would be for the large country to supply the entire world market by providing a subsidy (production or export) to its increasing returns industry, though this can prove too costly if the autarkic price in the small country is too low. Notice that there is no case for a permanent tariff or subsidy

for a small country with an initial comparative advantage, only for a large country with a size-induced comparative advantage.

It is well-known that it is difficult for the government to identify candidates for industrial policy (Scott Callon, 1995). We can now see one of the reasons: there are too many possibilities for an information-constrained policy-maker. However, nothing here precludes such a situation from being identified by the industry itself, such as the subsidies provided to biotechnology companies by large drug companies. General Motors, after World War II, helped Fiat arrange private financing to keep the company afloat because of its long associations with Fiat.

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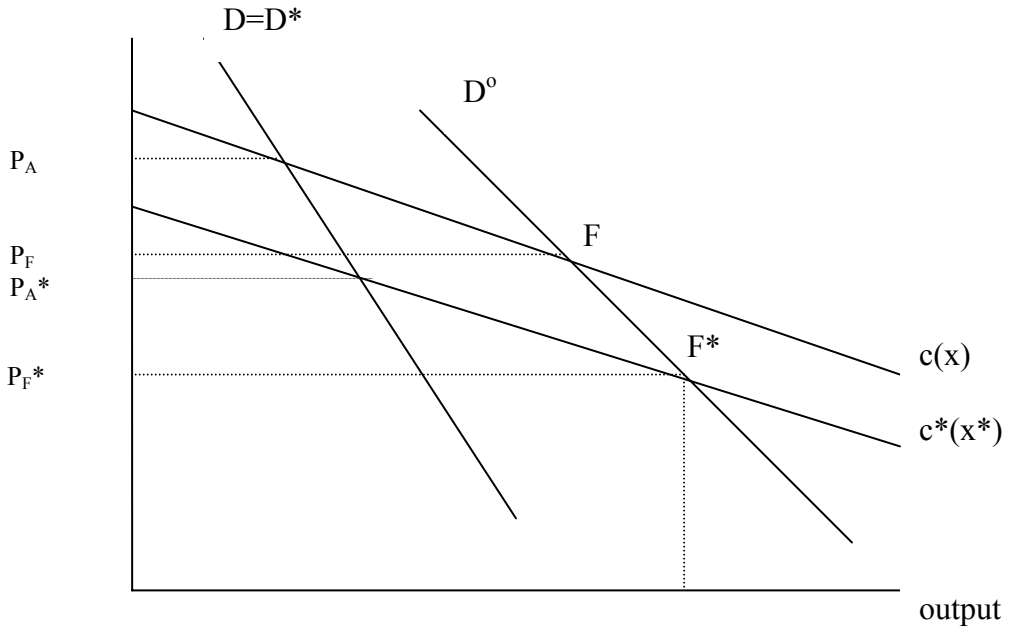

Figure 1: Autarky and Free Trade

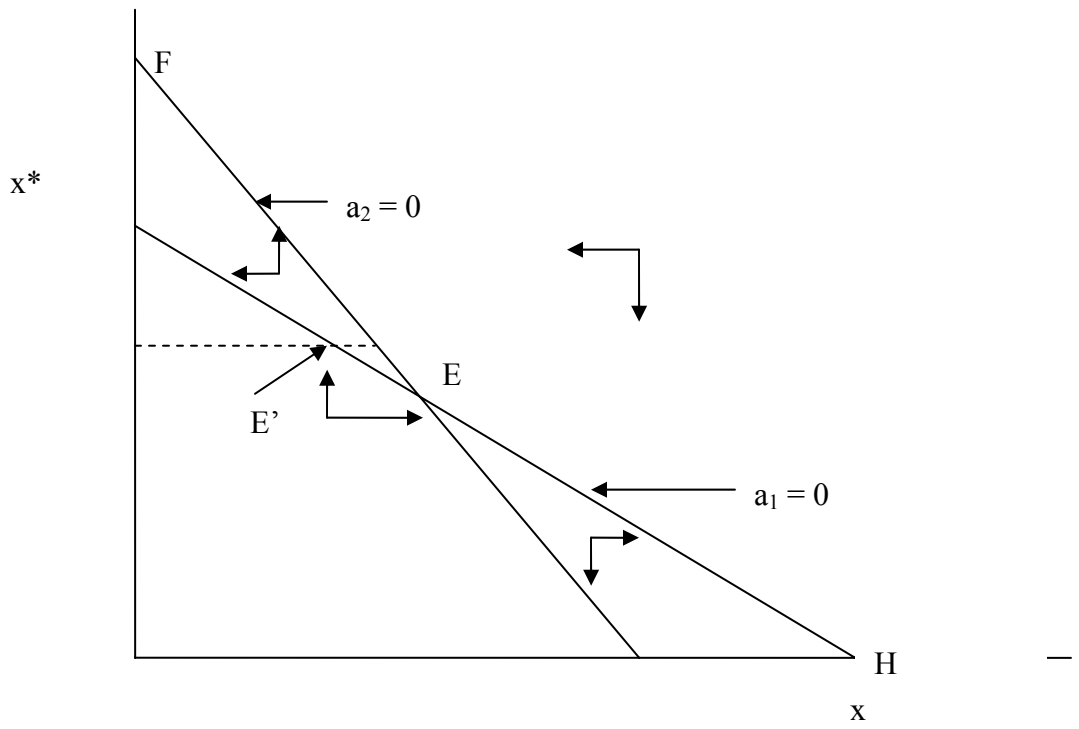

Figure 2: Unstable and Stable Solutions

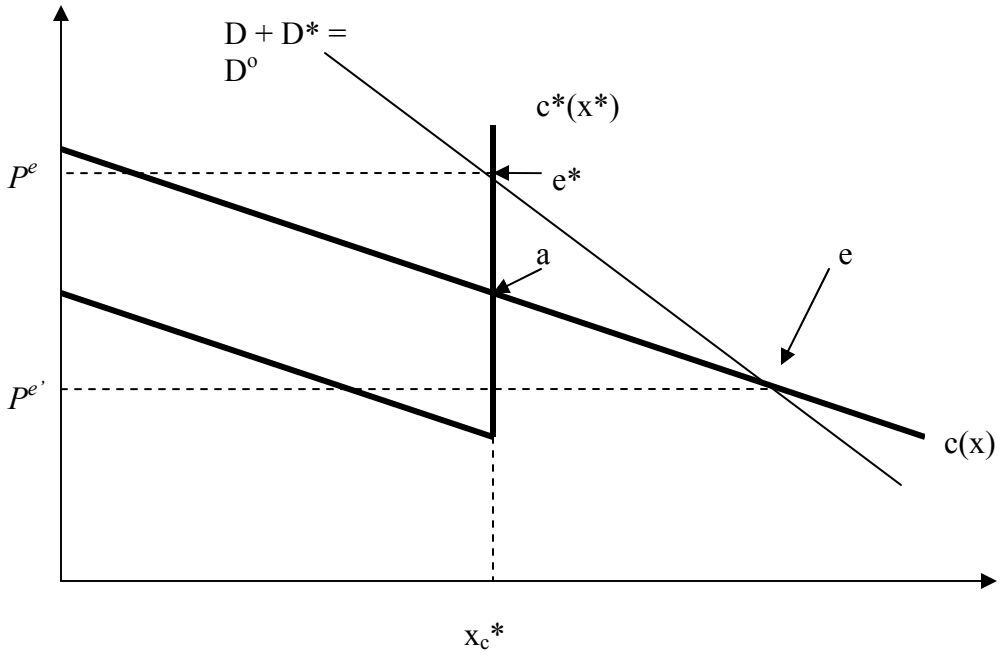

Figure 3: Multiple Equilibria