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I. INTRODUCTION

Possible foreign supply interruptions (FSI) provide the basis for one of the recurring arguments advanced for the intervention of government in the marketplace. In its simplest form the argument goes that potential foreign supply interruptions could lead to serious socioeconomic consequences. From this reasoning the intuitive leap is made that some form of government intervention in the market is necessary to support high cost, technologically inefficient domestic producers over their lower cost foreign competitors. This intervention may run the whole gamut of tarriff/non-tariff barriers. Historically, this type of reasoning was behind the Buy American Act, the old U.S. oil import quotas, and has been used frequently as a justification for import-substituting industrialization programs in LDCs. On the other side of the coin, the same sort of reasoning on the part of the supplier has been behind the embargoes of Rhodesia and South Africa and President Reagan's embargo of pipeline parts for the USSR. Thus what we will be concerned with here is a rather wide class of related problems found in the literature on commercial policy which have a common

underlying logic. For example, Johnson (10) addresses the effect of uncertainty in general on international trade, whereas Tolley and Wilman (12) and Mayer (11) provide more detailed insights on the issues of foreign dependence and national defense, respectively, and Cox and Wright (5) deal solely with the case of oil. Bhagwati and Srinivasin (4), on the other hand, examine the issue from the viewpoint of the foreign supplier facing such pre-emptive restrictions. And, still others such as Hay (7) and Areskoug (2) and the ensuing literature (see Amacher, Tollison, and Willett (1), Hay (8), and Heitmann (9), Areskoug (3), respectively) address only the issue of what is the optimal method and/or level for controlling imports rather than the question of the rationale for imposing any control.

While there is some truth to these simple arguments, if extended too far they would lead to virtual autarky. After all, there is no such thing as a 100% sure supply either domestic or foreign. And, any bottleneck resulting from a supply interruption will impose a cost on some segment of society. Ultimately, the validity of such arguments really depends upon the values of a number of underlying parameters that will determine the associated potential costs of alternative possible scenarios. And, economic efficiency requires that in determining the optimal policy to follow that the cost of these different contingencies be compared.

Unfortunately, doing a truly systematic analysis of each possible scenario can be quite complicated for the policy analyst. And, explaining the results to the politicians who must make the decisions may be even more difficult. As such the simple argument advanced earlier frequently goes unchallenged.

The purpose of this paper is to give a brief summary of the possible arguments in economic theory for the imposition of such restrictions. We will critically analyze the basic issues implicit in all such cases, discuss the circumstances in which such arguments may be valid, and draw attention to the type of factual information that is necessary to make responsible decisions about trade policy. Ideally, this will facilitate the policy analyst in arriving at the optimum policy recommendation. At the least it will help him explain to the politician that the intuitive argument is too great a simplification of reality.

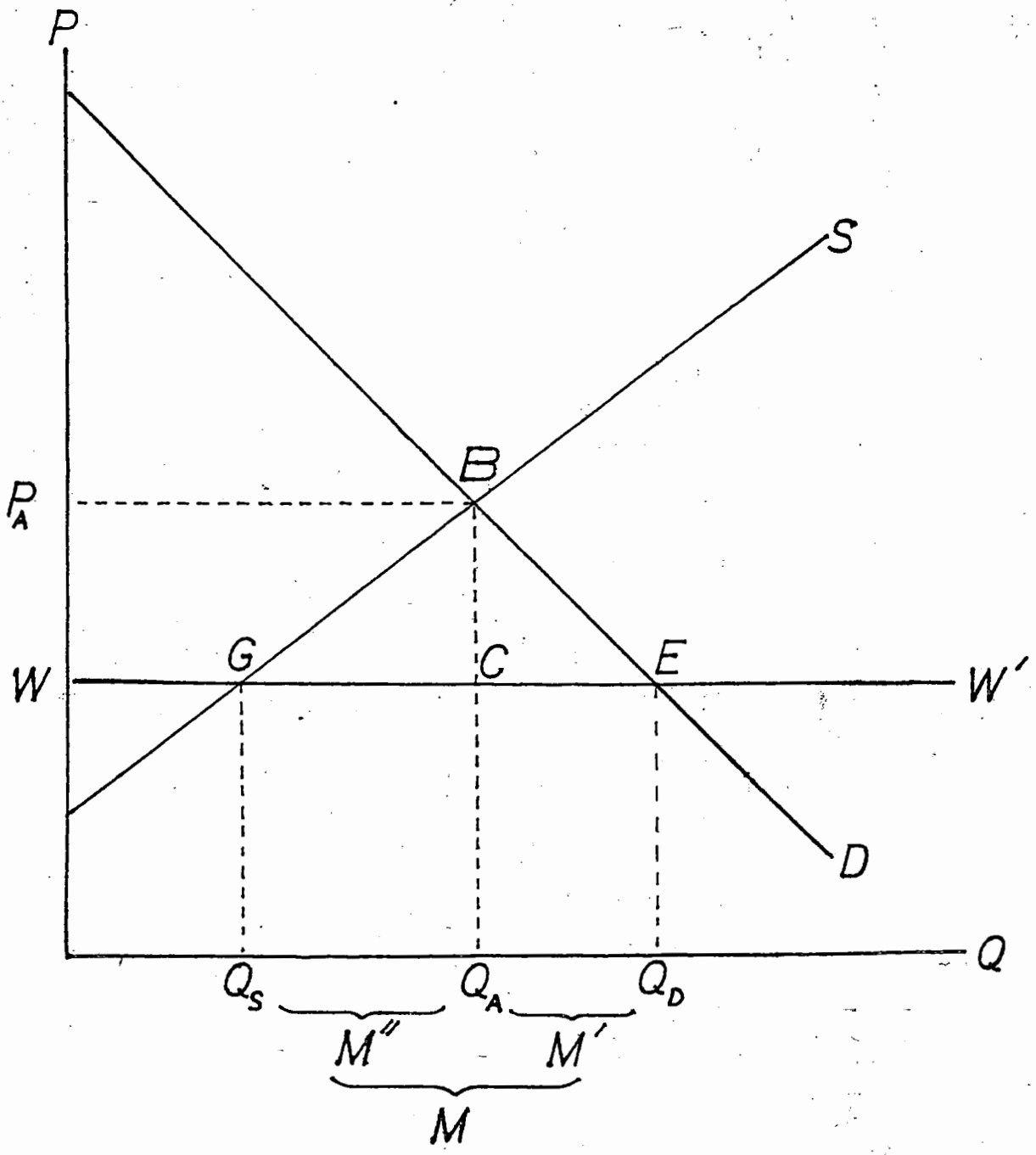
II. FOREIGN SUPPLY INTERRUPTION

Instantaneous Adjustment

Let us begin by considering what is most likely the commonest case. Depicted in Figure 1 is the familiar partial equilibrium diagram representing the case of a price taker importer in a world market with some domestic production and initially no trade restrictions or foreign supply difficulty. The price line WW' represents the world market supply curve, S the domestic supply curve, and D the domestic demand curve. With the given world price we have Q_D units of the good demanded domestically, Q_S units of the good produced domestically, and the difference $Q_D - Q_S = M$ units imported. Now assuming that S and D represent long run situations and ignoring time, either a total FSI or a prohibitive tariff or quota would have the effect of moving the equilibrium to point B where we would have autarky price P_A and autarky production and consumption of Q_A units.

Now it is apparent that Q_A is the highest level of domestic production that can be achieved in the absence of a subsidy. It is also apparent that Q_A is less than Q_D, that is, $Q_D - Q_A = M'$ represents the short-fall of domestic production from the free trade situation regardless of whether there is a FSI or prohibitive domestic trade barrier. Thus M'

FIGURE 1



represents the uninsurable loss of units of the good with an accompanying loss of domestic consumer surplus, of BCE. Now consider the remainder of the FS, $Q_A - Q = M''$. Once again, regardless of the source of the problem in the long run domestic producers can make up these units so that they are not lost, but only at a cost (loss) of BCG in domestic consumer surplus. Thus with either a total permanent FSI or a prohibitive domestic trade barrier the long-run costs incurred by the domestic society can be measured by BEG with a loss of M' units of the good. The difference is that the FSI is usually not a 100% certainty, and if it occurs, will occur only at some future date. The trade barrier, however, is proposed for today and if enacted becomes a certainty. Clearly then for any normal range of social time rate of discount, free trade would be optimal even when faced with a possible FSI.

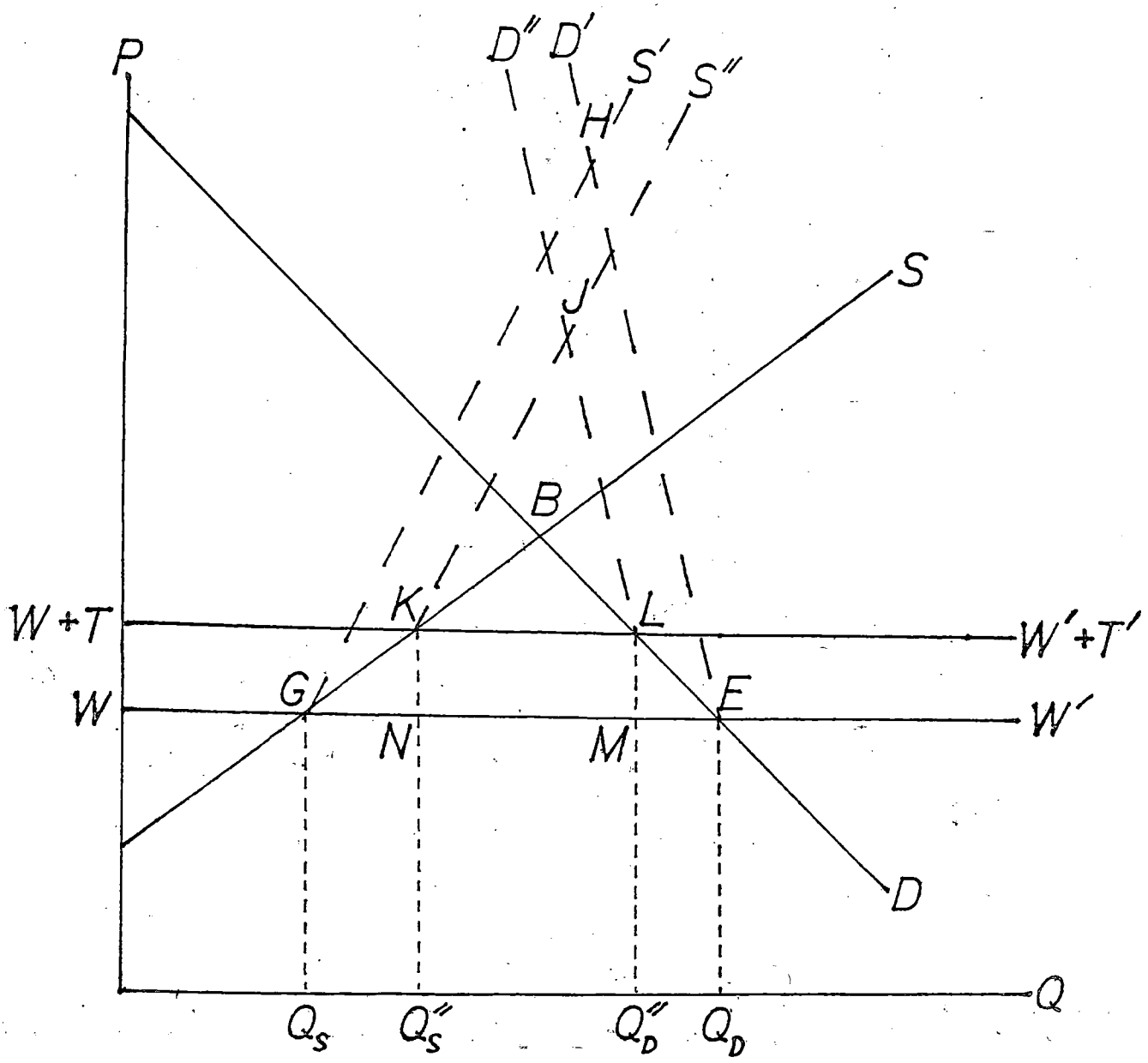
The Role of Adjustment Costs

So where does the possible validity, if there is any, of the arguments for protection arise? It arises potentially from our concentration on the long-run time period, or to be more precise the implicit assumption that we are able to make long-run adjustments instantaneously and costlessly if a FSI occurs.

Suppose instead, that both domestic producers and consumers are unable to adjust instantaneously to changes in the FS, as reflected in Figure 2 by the steeper short-run curves S' and D' intersecting the respective long-run curves at the pre-FSI levels of production and consumption. In that case if a FSI were to occur the loss of domestic surplus during the adjustment period would be represented by EGH which is substantially greater than the long-run loss of EGB. Furthermore, assuming that the short-run curves always intersect the long-run curves at the initial points of production and consumption, it is clear that the imposition of a pre-FSI tarriff could reduce this adjustment cost.[2] In the example of Figure 2, with a specific tariff of T per unit the adjustment cost would be reduced to EGKJL[3]. Of course this tariff would also impose a cost equal to GKN + ELM due to the inefficiencies in domestic production and domestic consumption it introduces.

In order to see how all these different costs can be compared, let us consider a three time period model in which it is known with certainty that a complete, permanent FSI will occur at the begining of the second time period and that all adjustments will be completed by the end of that period. In that case the present value of the cost of the FSI in the absence of a tariff would be given by:

FIGURE 2



$$\text{PV cost FSI} = 0 + \frac{EGH}{1+i} + \frac{EGB}{(1+i)^2}$$

If instead a tariff of T was imposed at the begining of the first time period, then the present value of the costs becomes:

$$\text{PV cost FSI (with tariff)} = (GKN + ELM) + \frac{EGKJL}{1+i} + \frac{EGB}{(1+i)^2}$$

Whether the tariff restricted case is preferable to the non-tariff case depends on how the present value costs of the two scenarios compare. Since after the second period, i.e., once the long-run autarky equilibrium gets established, the costs are identical under both situations the decision hinges on whether:

$$\frac{EGH}{(1+i)} \gtreqless (GKN + ELM) + \frac{EGKJL}{(1+i)}$$

or rewriting:

$$\frac{EGH - EGKJL}{(1+i)} \gtreqless GKN + ELM$$

i.e.,whether the present value of the adjustment cost savings exceeds, equals, or is less than the tariff cost.

As noted in the Introduction, the resolution of this problem depends upon the values of a number of underlying parameters. What is needed now is to identify those

parameters and the qualitative role they will play in the decision ceteris paribus. Let us begin with an obvious but frequently ignored variable - the social time rate of discount (i).[4] Since even in a many time period model, the costs associated with the tariff must always be incurred before the adjustment cost savings, it follows that the greater is the value for i the less likely it is that the trade restriction will prove optimal. And, although we have considered only a three time period model, it is a straight forward extension of the role of i to note that in a many time period model, the further in the future is the FSI, the less likely it is that the trade restriction will prove optimal. Alternately stated, even in the face of a certain, complete, future FSI with domestic adjustment costs, the optimal tariff may still be zero.

Although we have considered a 100% certain FSI, it is obvious that a reduction in the probability of the FSI reduces the expected adjustment cost savings without affecting the cost associated with any tariff.[5] Thus the smaller is the probability of a FSI, the greater is the likelihood that the optimal tariff will be zero. Equally, if the FSI is less than complete, the smaller is the percentage of the FS affected, the smaller will be the expected adjustment cost savings and the greater will be the likelihood that the optimal tariff is zero. Furthermore, the shorter is the duration of the FSI,

the smaller will be the adjustment cost savings, and the greater will be the likelihood that the optimal tariff is zero. Finally, the more price elastic are S' (S'') and D' (D'') the less will be the adjustment cost savings associated with any tariff and hence the more likely that the optimal tariff is zero. This follows since the tariff costs are dependent only on the size of T and the price elasticies of S and D[6].

III. CONCLUSION

The potential threat of a FSI is often put forth as an argument for the imposition of a pre-emptive domestic trade restriction. The validity of such arguments really depends upon a number of underlying assumptions and the values of a number of parameters. What we have done in this paper is to try, using an illustrative model, to identify what these assumptions and parameters are and the qualitative role they play in the decision. As illustrated, crucial to the justification of any trade restriction is the existence of adjustment costs either in terms of domestic suppliers and/or domestic consumers. The validity of this will obviously vary from sector-to-sector, country-to-country, and time-to-time. And, is likely to be a function of information, entrepreneurship, and institutional framework.

If these adjustment costs exist, whether they will

justify the imposition of a tariff will depend upon the probability of the expected FSI; when, to what extent, and how long the FS is interrupted; the price elasticities of the short-run domestic supply and demand; and the social time rate of discount. Of all of these the latter may be the most difficult for the policy analyst to determine and yet perhaps the most important in the decision to restrict trade.

NOTES

[1]We could of course pursue the argument in terms of the two good, small-country, general-equilibrium framework and arrive at the same conclusions, but the approach adopted here seems to have heuristic value. The large-country case is more interesting, but still a fairly straight-forward extension of the logic presented here. It is, however, important to note that the optimum tariff from the viewpoint of minimizing FSI adjustment costs generally will not be the same as the optimum tariff from the viewpoint of exercising monoposony power. And, any such difference must be included in the short-run opportunity cost of any tariff imposed for the former purpose.

[2]Implicit in this, is the assumption that the tariff could be phased-in at a rate consistent with domestic consumers and producers having time to make their adjustment along the long-run schedules.

[3]It may not at first be evident why the adjustment cost should be measured as EGKJL rather than simply KJL. Consider first the area KLMN which represents the tariff revenue collected by the domestic government. Clearly if imports were to cease this revenue would be lost and thus it is a cost of the FSI. Now GMN and ELM represent the inefficiency costs of

the tariff that are already being incurred on the prematurely over-stimulated S and the under-stimulated D and are really independent of the FSI in the sense that they would be incurred even without the FSI. Nonetheless, since they represent a deviation between the present case and the free-uninterrupted trade situation they must be included in the present period's costs.

[4]A good discussion of the importance of this variable and how one might determine it is provided in (6, Chapter 13). This work also provides a very good review of cost-benefit analysis in general.

[5]We are assuming that the probability of a FSI is independent of the imposition of a tariff. If, however, the probability of a FSI is a function of the level of the tariff this would not necessarily follow. It is not clear a priori, however, what the qualitative direction of such a function would be. One could argue that the imposition of a tariff to the extent it reduces domestic dependency on the FS reduces the probability of a FSI. However, since most FSI seem to be politically motivated, one could also argue that the imposition of a tariff increases the probability of a retaliatory embargo.

[6]Both the tariff costs and the adjustment cost savings will depend on the magnitude of the price elasticities of S and D and in the same way. Thus a priori it is impossible to arrive at any qualitative conclusion as to the role that they will play in determining the optimal tariff.

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