TARIFFS AND THE TERMS OF TRADE : A REVIEW

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This paper is circulated for discussion purposes and its contents should be considered preliminary.

1. Introduction

The effects of a tariff on the terms of trade, in a two-country, two-commodity "barter" model with fixed production possibilities, have now been exhaustively investigated. In such a model, real income is a function of the terms of trade alone, and so is welfare provided we make the necessary simplifying assumptions about the form of the community welfare function. This accounts for the traditional pre-occupation with the effects of tariff policy on the terms of trade, and for the logical extension of the analysis to derive the "optimum" tariff. This paper attempts to set out the main conclusions of the analysis (with the exception of the optimum tariff formula) and to show how these conclusions are derived.

The objections to the use of a two-country, two-commodity "classical" model are apparent. With only two countries no conclusions relating to customs unions can be derived. With only two commodities the subtleties of complementarity and substitutability both in production and consumption are ignored, and in particular intermediate and non-traded goods are neglected. A more important simplification made here is that the position of the community indifference curves from which we derive the offer curve is unaffected by the change in the distribution of income which necessarily accompanies any change in relative prices. Without this simplification the offer curve could assume a much wider variety of shapes which would greatly complicate the conclusions. The interested reader can pursue an analysis which allows for changes in the distribution of income elsewhere.[1]

2. The Offer Curve

The analytical device used here is the offer curve. This curve derives its characteristic shape from the community indifference curves, which we assume to be smoothly convex and fixed in position regardless of relative prices. In fig. 1 country A is assumed to

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1. See Johnson 1959 (1) and 1960 (2); Bhagwati and Johnson 1961 (3),

produce OX' units of commodity X which it exchanges for commodity Y produced elsewhere.[2] The dotted line X'H is A's offer curve, which is traced out by swivelling a price ray, anchored at X', and noting the successive points of tangency between the price ray and community indifference curves. Any price ray originating from X' (such as X'Y') has a slope of Y/X, and this slope therefore represents the quantity of imports which A obtains for each unit of exports, or the price of exports in terms of imports. It is easy to see that provided A's indifference curves are convex to the origin O, there will always exist a point such as J at which the quantity of exports which A is willing to supply reaches a maximum. At this point, because of the high price which residents of A are receiving for their exports, they are so well off that if the price of exports rises any higher they will prefer to export less rather than more, retaining more of their fixed output for their own consumption.

Point K is worthy of attention too. Beyond this point, any further rise in the price of exports leads to a reduction not only in the quantity of exports supplied, but also in the quantity of imports demanded. This appears paradoxical until it is realised that while A's trade is measured by taking X' as the origin, A's consumption is measured from the origin at O. It is then easy to see that beyond K, A's income is so high (as a consequence of the high price of exports) that imports have become an inferior good in A's consumption. If the reader constructs some offer curves of his own, first sketching the community indifference curves, he will find that a point such as K can only be made to exist if the indifference curves are made to converge as we move in the direction of X; and this is a familiar property of an indifference map in the case where one good is inferior at some levels of income.

Finally, it will be useful for subsequent analysis to note that the broken line OE in fig. 1 is the country's Engel curve or "income-consumption locus". This is the locus of points of tangency between successive indifference curves and successive budget lines of

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2. There is of course no need to assume that the country produces only one commodity; see Meade 1952 (4).

any given slope. It thus shows how residents of A, faced with a given price ratio between X and Y, will choose to divide any increment in income between the two goods. There is of course an infinity of Engel curves; one for each possible price ratio.

The offer curve can, of course, be readily converted into an ordinary demand curve for imports or supply curve of exports. At any point on the offer curve, such as B in fig. 1, we read off the quantity of imports demanded directly on the vertical axis, while the price at which this quantity is demanded is given by the reciprocal of the slope of the price ray drawn from X' through A. The reciprocal of the slope of this ray is X/Y, which thus measures the price of imports in terms of exports. As we move out along the offer curve from X' the quantity of imports demanded increases as the price of imports falls, and we derive a normal downward sloping demand curve. This is true until we reach K, where, as we have seen, any further fall in price causes a reduction in quantity demanded; the demand curve begins to turn back towards the origin.

3. The Elasticity of Demand

The discussion so far will have given some indication of the relationship between the shape of the offer curve and the elasticities of the demand and supply curves which may be derived from it. The offer curve itself has its own elasticity (the elasticity of reciprocal demand or reciprocal supply). Since the offer curve or reciprocal demand curve expresses the relationship between the quantity of imports demanded and the quantity of exports supplied, the elasticity of reciprocal demand is defined as the proportionate change in the quantity of imports demanded ($\frac{\Delta Y}{Y}$), divided by the proportionate change in the quantity of exports supplied ($\frac{\Delta X}{X}$). Algebraically, $E = \frac{\Delta Y}{Y} \div \frac{\Delta X}{X} = \frac{\Delta Y}{\Delta X} \Big/ \frac{Y}{X}$, where E = elasticity of reciprocal demand for imports.

In terms of fig. 1 the elasticity of the reciprocal demand schedule X'H at a point such as B is found taking the slope of the tangent to the offer curve at B (which has slope $\frac{\Delta Y}{\Delta X}$) and dividing by the slope of the ray drawn from X' through B. At B the tangent slopes more steeply than the ray from X'; $\frac{\Delta Y}{\Delta X}$ is greater than Y/X, so that $\frac{\Delta Y}{\Delta X} \Big/ \frac{Y}{X}$ is greater than one. The elasticity of reciprocal demand is greater than unity. By the same reasoning, at J, E is infinite; between J and K it is negative, while beyond K it is once more positive.

The relationship between the elasticity of reciprocal demand (E), and the elasticity of the ordinary demand function (e) derived from the offer curve, may be inferred diagrammatically. For example in fig. 1 we have seen that between X' and J, E is greater than unity. It is also clear that between X' and J, total expenditure on imports (the quantity of exports surrendered) is rising as the price of imports falls, which entails that e also exceeds unity. At J, where E is infinite, expenditure on imports reaches a maximum, from which it follows that e is unity at this point. Between J and K, where E is negative, total expenditure on imports is falling as the quantity demanded rises, i.e. e is less than unity. Beyond K, E is positive once more, while the derived demand curve has begun to turn back towards the origin, making e negative. The exact nature of this relationship is best shown by mathematical means,[3] by which it is easy to prove that $E = \frac{e}{e-1}$, and hence that $e = \frac{E}{E-1}$. A final point which should be mentioned in this context is that if the offer curve should be a straight line radiating from X', it follows from the discussion above that E = 1 and that e = ∞. Clearly an offer curve of this shape could only exist if the two commodities were perfect substitutes in the country's consumption, or if, which is more interesting, there exists a third country which provides an alternative and unlimited source of supply for the country's imports.

4. The Imposition of a Tariff

In fig. 2 we have drawn in a box diagram the offer curves of two countries. One country (which we shall refer to as the 'home' country for the sake of convenience) produces OX' of commodity X; its

3. See Johnson 1958 (5)

offer curve is OH. The other country (the 'foreign' country) produces OY' of commodity Y; its offer curve is OF. We shall refer to commodities X and Y respectively as exports and imports (of the home country).

Under free trade, equilibrium is at J, where the offer curves intersect, with terms of trade given by the slope of OT. The relative price of imports (which is measured by X/Y, the reciprocal of the slope of OT), is the same in both countries, i.e. $P_h = P_f$, where P_h = relative price of imports in the home country, and P_f = foreign price (or international price) - the relative price of imports prevailing in the rest of the world.

The introduction of a tax on international trade introduces a divergence between home and foreign prices, so that $P_h = P_f (1 + t)$, where 100t is the percentage tariff rate. Replacing OT we thus have two price rays, OR and OS, where the reciprocal of the slope of OR measures P_f and the reciprocal of the slope of OS measures P_h. OS slopes <u>less</u> steeply than OR because P_h is <u>greater</u> than P_f (since t is assumed positive).

Now since $P_h = P_f (1 + t)$ and $1/P_h$ = slope of OS and $1/P_f$ = slope of OR,

$$\therefore \frac{\text{slope of OR}}{\text{slope of OS}} = 1 + t$$

Further we may say that since the slope of OR is proportional to the angle $y + \beta$, and the slope of OS is proportional to the angle β,

$$1 + t = \frac{\text{slope of OR}}{\text{slope of OS}} \equiv \frac{y + \beta}{\beta} = \frac{y}{\beta} + 1$$

$$\therefore t = y/\beta$$

The tariff rate determines only on the <u>relative</u> slopes of OR and OS. Thus for any given value of t there are an indefinite number of possible pairs of values for the slopes of OR and OS, and thus an indefinite number of possible points of intersection of OR with OF and of OS with OH.

In fig. 2 we have drawn one of the many possible pairs of values for the slopes of OR and OS which satisfy any given value of t. Foreign residents will be in equilibrium at A, where the foreign price ray cuts the foreign offer curve; and similarly domestic residents will be in equilibrium at C. As is well known the government must therefore consume (i.e. withdraw from the market) AB of imports and

BC of exports, in order to fill the gap between private demand and private supply for each commodity.[4] From examination of fig. 2 it will be seen that as long as C lies below and to the right of A, government consumption of both commodities must be positive. We may make both OR and OS slope more steeply, without altering the given value of t (since t depends only on the relative slopes of OR and OS). As we do so, A will slide down OF, while C will travel up OH. Government consumption of exports (BC) must expand, while government consumption of imports (AB) must contract. The limit is reached when C is directly to the right of A, and the government is consuming nothing but exports. We cannot make OR and OS slope any more steeply than this without arriving at a situation such as is shown in fig. 3. Here A lies below C, so that domestic demand for imports exceeds foreign supply. To maintain this position the government must consume BC units of X and <u>minus</u> AB units of Y; in other words the government must supply to the market a subsidy of AB units of imports, which cannot continue indefinitely unless the government has a previously-accumulated, and inexhaustible, stock of imports. Similarly the opposite extreme is reached when the 'pencil' formed by OR and OS has swung so far to the right that A lies immediately above C, and the government consumes nothing but imports.

In summary, fixing the value of t does not in itself suffice to establish a unique equilibrium; the government must also decide in what proportions it wishes to consume the 2 goods, which implies that it must have some preference ranking of alternative bundles of goods.[5]

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4. This is brought about as follows. The government is an intermediary in all transactions with foreigners. Domestic residents offer the government OG of exports in exchange for CG (=BE) of imports. The government retains EG (=BC) of exports and offers the remainder, OE, to foreigners, who supply in return AE of imports. Of these AE imports, the government retains AB and supplies the remainder, BE, to domestic residents, thus completing the transaction. For subsequent analysis it should be noted that the government's consumption of exports, BC, has a value in the home market of BD imports, so that the absolute amount of the tariff revenue, in terms of imports and valued at domestic prices, is AD. See Lerner, 1936 (6).

5. In our subsequent analysis we shall assume that the way in which the government divides its expenditure between exports and imports is not influenced by their relative prices, though it may be influenced by the desire, for example, to produce a certain impact on the terms of trade. It is a matter for debate whether or not this is a realistic assumption to make about a government's behaviour.

In fig. 2, fixing the tariff rate fixes the value of γ/β, while fixing the proportions in which the government consumes the 2 goods fixes the value of the angle α. Given the positions of the offer curves, these two facts suffice to establish a unique position for A and C.

5. Redistribution of tariff proceeds

In fig. 4 we reproduce the situation of fig. 2, where a given tariff rate induced foreigners to trade willingly at A, and domestic residents at C, provided that the government withdrew from the market AB of Y and BC of X in order to equate private demand and supply for each commodity. We now suppose that these quantities, instead of being withdrawn from the market, are given by the government to domestic residents. Measured at domestic prices (the only prices relevant to domestic residents), BC of X is worth BD of Y, so that domestic residents have received an income subsidy of AD (= AB + BD) measured in terms of imports (or of O'O measured in terms of exports). Recalling fig. 1 it is easy to see that this is equivalent to an outward shift in their budget constraint, from OS to O'S'. The domestic price ratio is initially unchanged, so that O'S' is parallel to OS. Domestic residents therefore move out from C along their Engel curve, seeking a new equilibrium at the point such as J, where a community indifference curve is tangent to the new budget constraing. J is a point on the home country's 'tariff-distorted' offer curve.[6]

If by chance J coincides with A, the new equilibrium is the same as the old, because domestic residents choose to divide their income subsidy between X and Y in exactly the same ratio as the government chose to divide its tariff revenue between X and Y. In fig. 4 we have placed J arbitrarily to the right of A; there is JK excess demand for imports, and AK excess supply of exports. The excess demand will bid up the price of imports, causing the pencil formed by OR and OS to swing clockwise. As well as causing A to travel up the foreign offer curve, this will move J downward and to the left. Point

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6. The 'tariff-distorted' offer curve is frequently used in the literature, but it is a somewhat slippery concept and has not been employed here.

J moves downward because the higher price of imports pushes domestic residents on to a lower indifference curve; it moves to the left because the higher price induces some substitution of exports for imports in domestic consumption. Equilibrium is restored when A and J coincide at a point on the foreign offer curve such as P in fig. 4. Such a point must exist and will be unique.

Taking the shape of the foreign offer curve and of the domestic indifference map as given, the extent to which prices will have to change to restore equilibrium depends on the extent to which J differs in its position from A; that is to say, on the extent to which the slope of JC differs from the slope of AC. We shall see below that both these slopes can be interpreted in economic terms.

6. The Terms of Trade

We will now systematically consider the effects of a marginal tariff on the terms of trade (the slope of OR) and the domestic price level (the slope of OS), assuming first that the tariff revenue is consumed by the government, and then that it is redistributed in the form of an income subsidy. Analytically, the question of the effects of a marginal tariff imposed on an initial situation of free trade breaks down into two distinct questions: (i) whether or not the terms of trade must change in order to restore equilibrium, and (ii) if they must change, in which direction and to what extent. It will be shown that the answer to (i) is quite independent of the shape and position of the foreign offer curve, but that the answer to (ii) is not.

To answer question (i), assuming government consumption of tariff revenue, we draw our prices pencil as before (fig. 5), but to avoid pre-judging the answer we must leave the terms of trade initially unchanged at the free trade level, so that OR passes through A, the free-trade equilibrium. The domestic price thus rises in proportion to the tariff: the slope of OS is determined by the fact that $\gamma/\beta = t$. This rise in the domestic price of imports forces domestic residents back down their offer curve from A to C. The reduction in private demand for imports $(\Delta Y)_p$ is AB, and the reduction in private demand for exports $(\Delta X)_p$ is BC. The slope of AC thus measures $\left(\frac{\Delta Y}{\Delta X}\right)_p$ and this is equal to the average slope of the offer curve between A and C.[7] The government's tariff revenue, measured in terms of imports, is AD, and clearly if the government chooses to spend AB of this on imports and the remainder on BC of exports, this will exactly offset the reduction in private demand and there will be no need for the terms of trade to change. Thus if the ratio $\frac{AB}{BC}$, which necessarily measures $(\frac{\Delta Y}{\Delta X})_p$, is equal to $(\frac{Y}{X})_g$, the ratio in which the government consumes imports and exports, the terms of trade are unchanged by the tariff.

This condition can be expressed in more familiar economic terms. It is clear that $(\frac{\Delta Y}{\Delta X})_p$ depends for its size on the slope of the offer curve in the vicinity of the free-trade equilibrium, which also governs the price elasticity of demand in the way described earlier. Even more obvious is the fact that $(\frac{Y}{X})_g$ is related to the proportion of tariff revenue which the government spends on imports, or its marginal propensity to import.

Hence it may readily be shown that $(\frac{\Delta Y}{\Delta X})_p = (\frac{Y}{X})_g$ (the condition for the terms of trade to be unchanged), is equivalent to $e = M_g$ where e = domestic residents price-elasticity of demand for imports, and M_g = the government's marginal propensity to consume imports.[8] If

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7. Since we are considering only a marginal tariff, C should be considered as being indefinitely close to A, in which case the slope of AC tends to coincide with the tangent to the offer curve at A, and OR tends to coincide with OS. Our conclusions will apply only approximately in a real-world situation in which a finite, and probably large, tariff is imposed.

8. In fig. 5 the terms of trade are unchanged if the slope of AC, which necessarily measures $({}^{\Delta Y}/_{\Delta X})_p$, also measures $({}^{Y}/_{X})_g$. (Actually, we require that the government divides its expenditure out of tariff revenue between imports and exports in the ratio ${}^{AB}/_{BC}$, where both these quantities are positive, so we require minus the slope of AC (= minus ${}^{AB}/_{BC}$) to measure $({}^{Y}/_{X})_g$, since the slope of AC is negative.)
Assume this is the case, i.e. that $({}^{Y}/_{X})_g = -\frac{AB}{BC}$. Then $(\frac{X}{Y})_g = -\frac{BC}{AB} = \frac{-BD}{AB} \cdot \frac{BC}{BD} = \frac{-BD}{AB} \cdot P$, where P = slope of OS = domestic price of imports. Now $\frac{-BD}{AB} \cdot P = -(\frac{AD-AB}{AB})P = -(\frac{AD}{AB}-1)P = -(\frac{1}{M_g}-1)P = (\frac{M_g-1}{M_g})P$. ($\frac{AB}{AD} = M_g$ because AD is the tariff revenue, and AB is the amount of it spent on imports). Thus $({}^{Y}/_{X})_g = (\frac{M_g}{M_g-1})\frac{1}{P}$.

Further, since $(\frac{\Delta Y}{\Delta X})_p = \frac{AB}{BC}$, $\frac{\Delta Y}{\Delta X} = \frac{Y}{X}\frac{X}{Y}\frac{\Delta Y}{\Delta X} = \frac{BC}{BD} \cdot \frac{BD}{BC} \cdot \frac{AB}{BC} = \frac{BD}{BC} \cdot E = \frac{1}{P} \cdot E = \frac{1}{P}(\frac{e}{e-1})$, where E is the elasticity of reciprocal demand between C and A and e is the price elasticity of demand. The fact that $E = \frac{e}{e-1}$ is not proved here; see Johnson 1958 (5). Thus $(\frac{\Delta Y}{\Delta X})_p = \frac{1}{P}(\frac{e}{e-1})$.
Thus we have $(\frac{Y}{X})_g \gtreqless (\frac{\Delta Y}{\Delta X})_p$ according as $M_g \gtreqless e$.

$M_g < e$, government demand for imports out of tariff revenue is less than the reduction in private demand for imports which follows the imposition of the tariff; there is a net reduction in demand for imports at the initial terms of trade, and the terms of trade must change. Similarly, if $M_g > e$, there is a net increase in the demand for imports, and the terms of trade must change.

It should be noted that if the initial position is one of free trade, the government has no initial tariff revenue, and M_g cannot exceed unity. It follows that M_g cannot be equal to e (and therefore that the terms of trade cannot remain unchanged) if e is greater than unity. This may be illustrated in fig. 5; if we had made private demand for imports elastic in the neighbourhood of A, C would have lain to the left of A, and government consumption of minus BC units of exports would have been required to maintain the terms of trade unchanged.

We now answer question (i) (whether or not the terms of trade must change) in the case where the tariff revenue is redistributed to domestic residents. Working with fig. 5, as before, the tariff-induced rise in the price of imports reduces demand for imports and exports in the ratio $\frac{AB}{BC}$; since this measures the slope of the offer curve between A and C this ratio also serves as a measure of the elasticity of demand. To restore demand for imports to its former level, and thus leave the terms of trade unchanged, the public must spend the tariff revenue, which it receives in the form of an income subsidy, in the ratio $\frac{AB}{BC}$. The condition for the terms of trade to be unchanged is thus the same as in the case considered above, except that we substitute M_p, the proportion of income subsidy spent by private citizens on imports, for M_g in our earlier result. Thus the terms of trade will remain unchanged if $M_p = e$, where M_p = marginal propensity to spend on imports out of income subsidy.

Now e and M_p are clearly related, since the way in which consumers respond to a price change is not independent of the way in which they respond to an income change. Following elementary demand theory we may split up e into a pure substitution term (e'), plus an income effect which is the marginal propensity to spend on imports. Provided we may identify this marginal propensity with our M_p, the marginal propensity to spend on imports out of income subsidy, our condition for unchanged terms of trade becomes $M_p = e = e' + M_p$, which requires $e' = 0$. Geometrically, this entails that the offer curve and the Engel curve should coincide between C and A: and the reader will be able easily to verify that with convex indifference curves this is impossible. In fact, e' is necessarily positive.

What we are saying is that the direct effect of the tariff is to raise the price of imports, which affects the demand for imports through both the income effect and the substitution effect. The redistribution of the tariff proceeds, however, cancels out the income effect, leaving only the substitution effect which is necessarily positive. There is necessarily a net reduction in the demand for imports at the initial terms of trade, a reduction which is greater, the greater is the substitutability of exports for imports in domestic consumption.

So far we have shown that the terms of trade must change if the overall effect of the tariff is to increase or reduce demand for imports at the initial terms of trade. If the government consumes the tariff revenue, demand for imports at the initial terms of trade may either rise or fall, but will certainly fall if the initial situation is one of free trade and domestic demand for imports is elastic. If the revenue is distributed, demand for imports at the initial terms of trade will necessarily fall.

We now answer our second question - the direction and extent of the change in the terms of trade necessary to restore equilibrium. Let us assume that the net effect of the tariff is to reduce the demand for imports at the initial terms of trade. Then the prices pencil formed by OR and OS must swing in such a way as to reduce foreign supply of imports and/or to increase domestic demand for imports. Except in an abnormal case which we shall consider below, a swing of the pencil to the left (an improvement in the terms of trade or reduction in the price of imports) is necessary to eliminate a short fall in demand for imports at the initial terms of trade.

In fig. 5 foreign demand for the home country's exports is elastic in the neighbourhood of A; if the pencil formed by OR and OS swings to the left, foreign supply of imports will be reduced. At the same time, the swing of the pencil will increase domestic demand for imports, reinforcing the tendency for the excess supply of imports to be eliminated.

If foreign demand for X is inelastic, as it is in fig. 6 in the neighbourhood of A, a leftward swing of the pencil will <u>increase</u> foreign supply of Y. A larger improvement in the terms of trade is now necessary to restore equilibrium. The pencil must swing a good deal further to the left, until the increased domestic demand for imports 'overtakes' the increased foreign supply. In this case it is possible for the terms of trade to improve so much as to more than offset the effect of the tariff, producing a domestic price of imports lower than it was under free trade.[9]

The boundary case, where the terms of trade improve in exact proportion to the rate of tariff and thus leaves the domestic price of imports unchanged, may be inferred from fig. 7. Here we have drawn our prices pencil in such a way that the domestic price ray OS passes through the free-trade equilibrium, so that if we assume that the government consumes the tariff revenue, domestic residents are quite unaffected by the tariff; 'the foreigner pays the duty'. This situation will be stable if $^{AB}/_{BC}$, the slope of the foreign offer curve between A and C, also measures the proportion in which the government consumes the two goods. (Clearly a necessary condition for this is that foreign demand for X should be inelastic in the neighbourhood of C, otherwise A would lie below C and negative consumption of Y by the government would be necessary to maintain this position.) Thus the boundary case requires $^{AB}/_{BC}$, which necessarily measures the slope of the foreign offer curve, to measure $(^Y/_X)_g$ or $(^Y/_X)_p$, the proportion in which the tariff revenue (consumed either by the government or by domestic residents) is divided between imports and exports. This condition is equivalent to the requirement that $M + e_{fd} = 1$, where M is the proportion of tariff revenue spent on imports, and e_{fd} is the foreign price-elasticity of demand for X.[10]

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9. This is sometimes known as 'the Metzler case'; see Metzler 1949 (7), and Meade 1952 (4) pp. 71-75.

10. This is proved as follows. From fig. 7 the boundary condition requires $(^Y/_X)_t = (\frac{\Delta Y}{\Delta X})_f$ where $(^Y/_X)_t$ = division of tariff revenue (by government or citizens) and $(\frac{\Delta Y}{\Delta X})_f$ = slope of foreign offer curve. But from footnote 8, $(^Y/_X)_t = (\frac{M}{M-1})\,\frac{1}{P}$ where M = proportion of revenue spent on imports. Similarly, following footnote 8, $(\frac{\Delta Y}{\Delta X})_f = \frac{1}{P} \cdot \frac{1}{E} = \frac{1}{P}(\frac{e-1}{e})$ where E = elasticity of foreign reciprocal demand for X and e = foreign price - elasticity of demand.

Thus the boundary condition is $(\frac{M}{M-1})\,\frac{1}{P} = \frac{1}{P}(\frac{e-1}{e})$ which simplifies to $e + M = 1$. The domestic price of imports rises or falls as $e + M$ is greater or less than unity.

There remains the abnormal possibility that imports may be inferior goods in the neighbourhood of the free trade equilibrium.

Let us assume for simplicity in fig. 8 that the government consumes the tariff revenue; that equilibrium before the tariff is imposed is at A; and that a tariff imposed at a given and constant rate (equal to the relative slopes of OR and OS) leaves the terms of trade initially unchanged, with foreign residents in equilibrium at A and domestic residents at C. This situation cannot persist because to maintain it the government must consume <u>minus</u> AB units of Y, which is not permanently possible. In fact there will be excess demand for Y and the terms of trade must change to eliminate it. But in which direction must they change? The condition for equilibrium is that C should lie below and to the right of A and that the slope of the line AC should measure the ratio in which the government is content to consume the two goods. In fig. 8 a swing of the pencil in either direction enables us to find points at which these equilibrium conditions are satisfied. If we swing the pencil to the left ("opening up" the pencil slightly to maintain the tariff rate constant) we find the points A' and C', while swinging the pencil to the right (at the same time closing up the pencil somewhat) brings us to A" and C". In both situations the government is consuming the two goods in the same ratio; A'C' is parallel with A"C". Thus excess demand for imports at the initial terms of trade (whether this excess be positive or negative) may be eliminated either by a rise or a fall in their price. This indeterminacy is a facet of the general instability of the initial equilibrium situation at A in fig. 8.

<u>SUMMARY</u>

If inferior goods are excluded, a marginal tariff imposed on an initial situation of free trade will improve or worsen the terms of trade according as it gives rise to negative or positive excess demand for imports at the initial terms of trade. Where imports are inferior goods in domestic consumption the direction of change in the terms of trade necessary to restore equilibrium is indeterminate.

If the tariff revenue is consumed by the government, excess demand for imports at the initial terms of trade is negative or positive according as the government's marginal propensity to consume imports (M_g)

is less or greater than domestic residents' price-elasticity of demand for imports (e). If the initial situation is one of free trade, it is necessarily true that $M_g \leq 1$, so that $e < M_g \leq 1$ is a necessary and sufficient condition for deterioration in the terms of trade, and $M_g \leq 1 < e$ is necessary and sufficient for an improvement.

If the tariff revenue is redistributed to domestic residents the terms of trade necessary improve since residents' marginal propensity to consume imports (M_p) is necessary less than e.

Given that the terms of trade are to improve, the improvement is greater, the smaller is foreign elasticity of demand (e_{fd}) and the smaller is the marginal propensity of tariff recipients to consume imports (M). If $M + e_{fd} < 1$ the terms of trade improve by so much as to result in a domestic price of imports lower than the price prevailing before the tariff was imposed. This result is guaranteed if exports are inferior goods in foreign consumption, the initial situation is free trade, and the government consumes the tariff revenue, for then $e_{fd} < 0$ and $0 \leqslant M \leqslant 1$.

List of Works Cited

(1) H.G. Johnson, "International Trade, Income Distribution, and the Offer Curve", Manchester School, Vol. XVII No. 3, (September 1959), pp.241-60.

(2) H.G. Johnson, "Income Distribution, the Offer Curve, and the Effects of Tariffs", Manchester School, Vol VIII No. 3, (September 1960), pp. 215-42.

(3) J. Bhagwati and H.G. Johnson, "A Generalised Theory of the Effects of Tariffs on the Terms of Trade", Oxford Economic Papers, N.S. 13 (1961), pp. 225-53.

(4) J.E. Meade, "A Geometry of International Trade", London, Allen and Unwin, 1952.

(5) H.G. Johnson, "Alternative Optimum Tariff Formulae", Appendix to Ch. II of "International Trade and Economic Growth", London, Allen and Unwin, 1958.

(6) A.P. Lerner, "The Symmetry between Export and Import Taxes", Economica, 1936.

(7) L.A. Metzler, "Tariffs, the Terms of Trade, and the Distribution of the National Income", Journal of Political Economy February and October 1949.

Fig. 1.

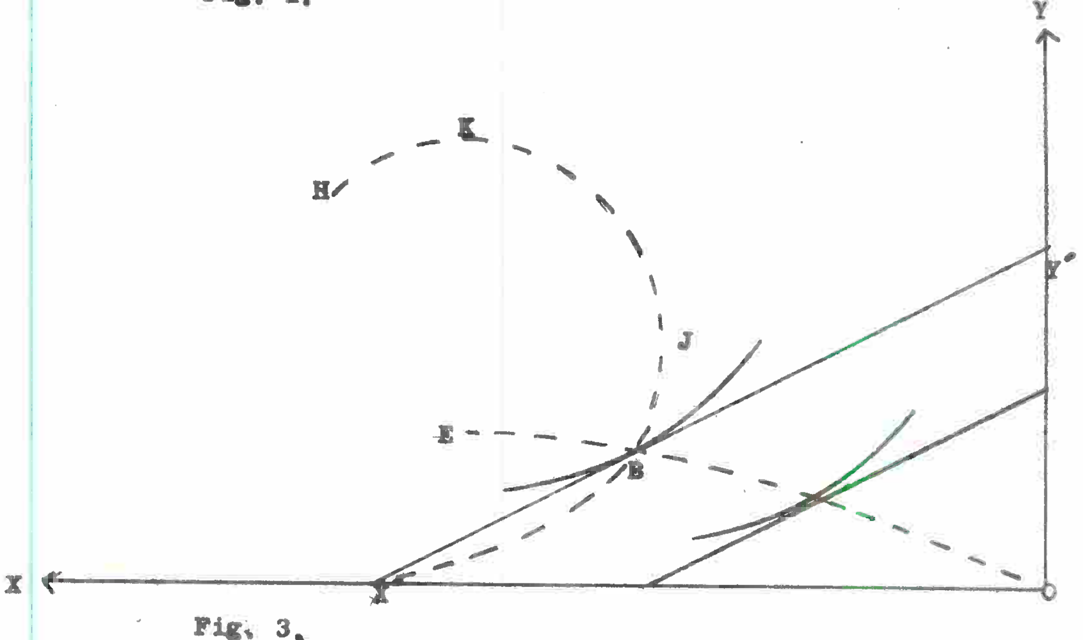

Fig. 2

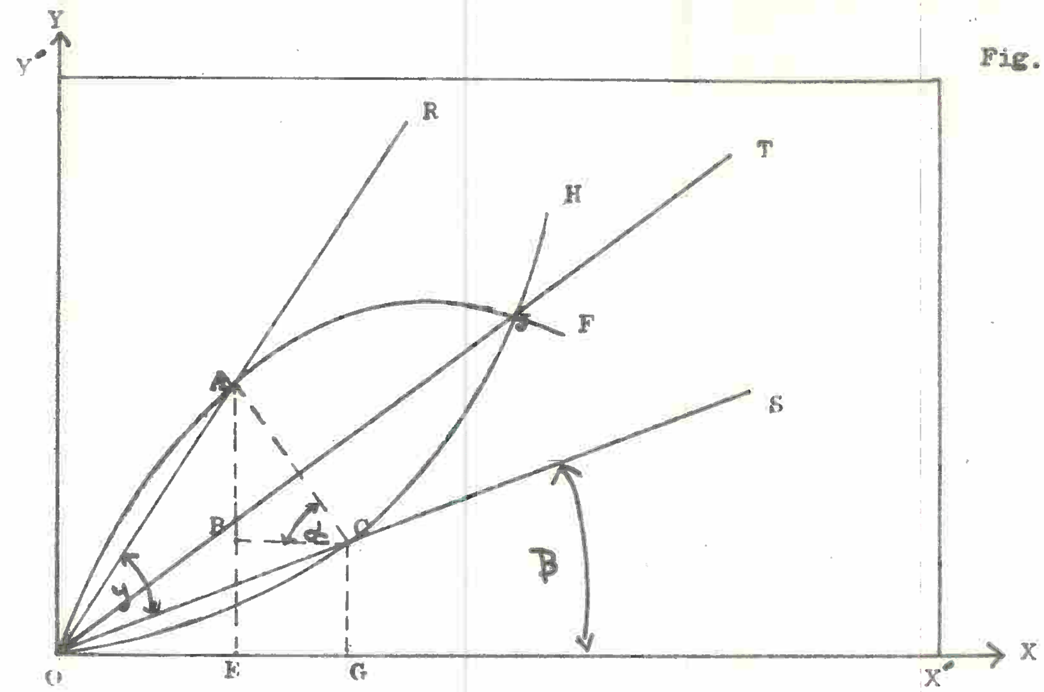

Fig. 3

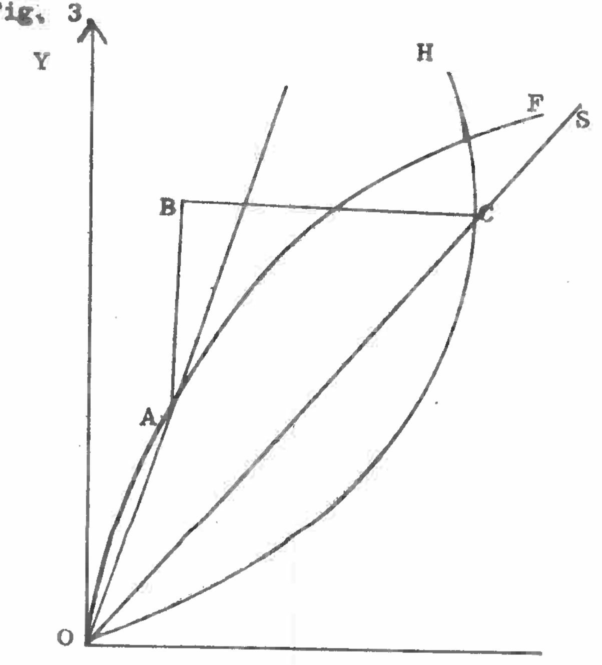

Fig. 4

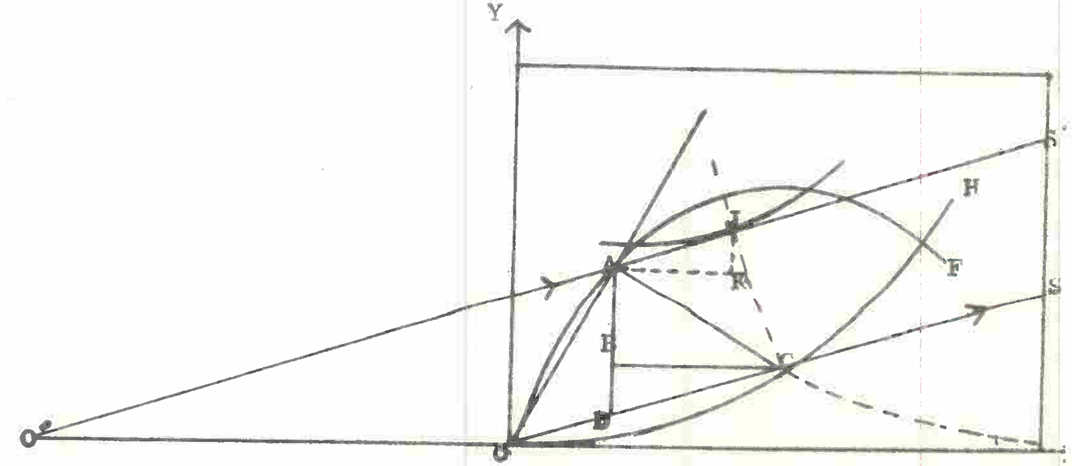

Fig. 5.

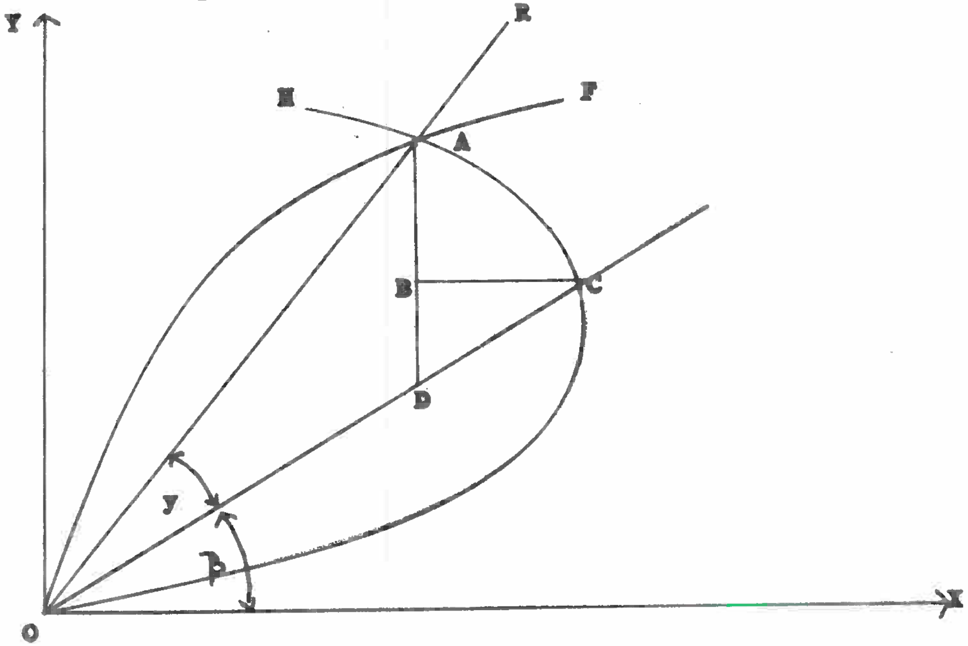

Fig. 6.

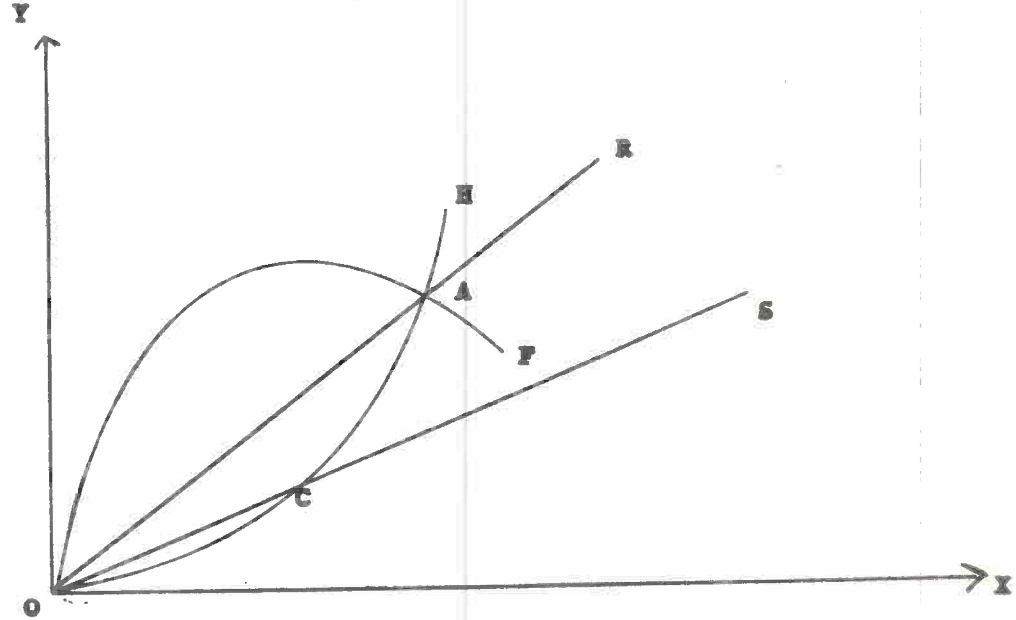

Fig. 7.

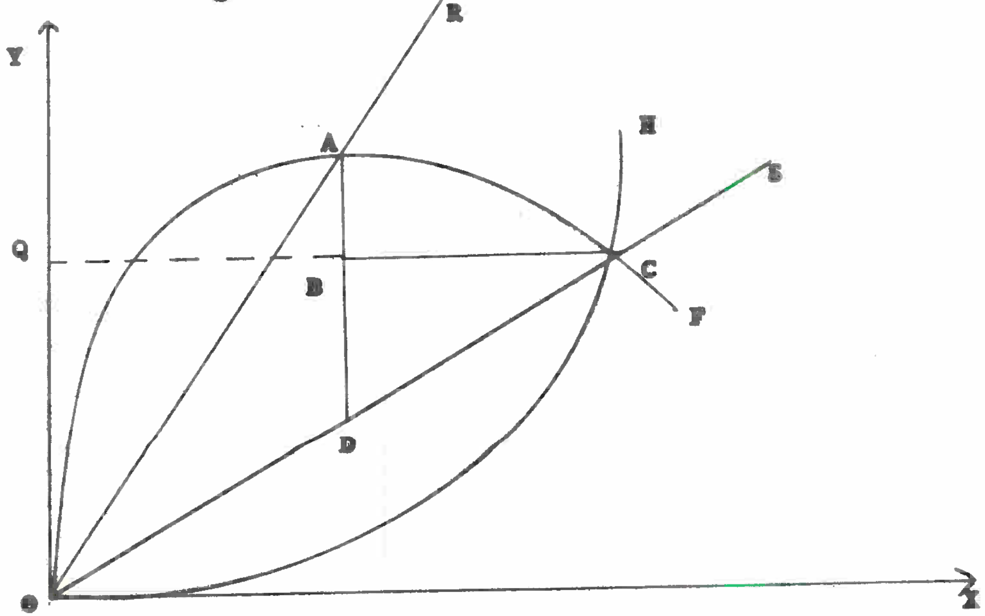

Fig. 8.