NUMBER 38

External Inflation, the Balance of Trade and Resource Allocation in Small Centrally Planned Economies

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Conference on the Impact of International Economics Disturbances on the Soviet Union and Eastern Europe

Sponsored by
Kennan Institute for Advanced Russian Studies
State University of New York at Stony Brook
University of Windsor

September 24-26, 1978
Washington, D.C.

I. Introduction

The centrally planned economies (CPEs) of the Soviet Union and Eastern Europe have become increasingly sensitive to macro-economic disturbances in the West because of the recent rapid growth in East-West trade and the increased number of economic links between some of these economies and the world market. This has generated considerable interest regarding the degree to which the mechanisms commonly believed to transmit inflation internationally among market economies may also be at work in the CPEs.[2] This paper will examine the direct effects of external commodity inflation and changes in the terms of trade on the domestic price level, the balance of payments and domestic resource allocation within small centrally planned economies. Also investigated will be the degree to which exchange-rate policy can mitigate or fully offset these direct effects.

The paper distinguishes between "classical" centrally planned economies (CPEs) and "modified" centrally planned economies (MCPEs), and concentrates primarily on the latter.[3] The MCPE model may be seen as a stylized version of the Hungarian economy since 1968, but it also captures certain important features of the Polish economy since 1971. The stylized MCPE is distinguished from the classical CPE by, inter alia: (a) elimination of detailed central planning of production and foreign trade; (b) a "price reform" designed to move the domestic structure of relative prices closer to world market price relatives; (c) introduction of flexible prices on a wide range of products so as to stimulate more efficient resource allocation; (d) creation of an organic linkage between foreign-currency prices and domestic prices for a subset of traded goods; and (e) despite the retention of exchange

control for all foreign trade, the maintenance of "price-equalization" subsidies (taxes) only on fixed-price traded goods.

Because of these departures from classical, Soviet-type central planning, MCPE enterprises are induced, at least in principle, to maximize profits by responding to changes in relative prices, and in theory will make production and trading decisions on the basis of a comparison of foreign and domestic prices. As shown elsewhere, the introduction of price flexibility and enterprise response to relative prices also gives the exchange-rate an economic significance in a MCPE which it lacks in a classical CPE.[4] The focus of our analysis is a stylized "small" (price-taking) MCPE which has abolished all explicit or implicit foreign trade taxes and subsidies and which thus has "reformed" the domestic price structure in such a way that all domestic relative prices are equal to respective world market, or external relative prices. For simplicity we assume that all products are traded goods, that the MCPE maintains full employment, that trade is initially balanced, and that there are no international capital flows unrelated to the direct financing of trade.

In the face of external inflation, with the possibility of a change in the country's terms of trade, policymakers in the small MCPE are assumed to follow one of three basic strategies. First, they can pursue a passive policy, making neither any "systemic" change nor major policy shift, such as a modification in the exchange-rate. This will be characterized as a "wait and see" strategy. A second strategy would be to attempt to emulate the response of the ideal market economy (ME). Specifically they would ensure that domestic relative prices move in line with world price relatives. In this case revaluation of the currency might be considered,

as well, in order to maintain domestic price stability. Third, the authorities could decide to revert to the classical CPE, and in this case our analysis will be limited to assuming that for the time-horizon considered, the classical CPE would want to fully insulate domestic production and consumption plan-fulfillment from the external disturbance.

Our analysis will consist of comparing the price stability, balance of payments and resource allocation effects of the external disturbance under the three different strategies. Possible alternative mechanisms for following each of these strategies will also be explored. In Section II we consider a two-good general equilibrium model of the MCPE. A four-good model, with two final and two imported intermediate products, is introduced in Section III. This model permits us to more closely evaluate some issues overlooked in the simpler two-good analysis. These issues include the constraints which bilateral trade commitments with other CMEA countries can place on MCPE responses to disturbances on the Western world market, the dilemma for MCPE policymakers when CMEA foreign trade price changes lag behind those on western markets, and the implications for exchange-rate policy of differential rates of external inflation within the groups of fixed or flexibly-priced traded goods respectively. A summary and conclusions are presented in Section IV.

II. Response to External Inflation in a Two-Good Model

In this section we consider a small MCPE with two traded goods, both of which are final products. The price of one good, Type A, is fixed by the authorities domestically. Consequently, the international commodity arbitrage equation does not hold for this product, and we have $P_a = P^*_a e \alpha_a$,

where P_a is the domestic currency price of the A good, P^*_a is the foreign currency price, e is the exchange-rate (domestic currency price of foreign exchange), and α_a is a variable representing the degree of overvaluation of the A good domestically. Observe that α_a also equals $(1 + t_a)$, where t_a is the implicit ad valorem tax equivalent on trade in the A good. The price of the other good, Type B, is flexible, and varies directly with the foreign currency price of this product (i.e., $P_b = P^*_b e$.)[5]

Because P_a and $P^*_a e$ may differ, trading enterprises run the possibility of having a net profit (loss) on price discrepancies, equal to $\pi_a = Q_a(P^*_a e - P_a)$ where Q_a represents net export of the A good. For example, when the A good is imported (net) at a subsidized price, $Q_a < 0$ and $(P^*_a e - P_a) > 0$, and enterprises incur a net loss on price discrepancies. Under the "price equalization" system the government just offsets such losses with a price equalization subsidy, which is "financed" by a decline in the country's net international reserves.[6] Consequently, for the MCPE the difference between the balance of trade evaluated in foreign prices and the trade balance evaluated in domestic prices is equal to the net profit on price discrepancies: $B^*_T = (B_T + \pi_a)e^{-1}$ where B_T and B^*_T represent the trade balance evaluated in domestic and foreign currency prices respectively.[7] When domestic consumers and producers are in equilibrium in the MCPE (zero hoarding), $B_T = 0$ and the so-called valuta or devisa trade balance ($B^*_T e$) is equal to the net government budget surplus.[8]

Initially we assume that the MCPE price reform has left the domestic relative price ($q_o = P_b/P_a$) identical to the external relative price ($q^*_o = P^*_b/P^*_a$), therefore $\alpha_a = 1.00$. Consumers and producers are assumed to

be initially in equilibrium, as is the government budget, so that $B_T^* = B_T = 0$. Producers are at point P_o on the production possibilities frontier in Figure 1, representing the point of tangency of the initial relative price line with the frontier.[9] Consumers are at point C_o on income-consumption path OX_o which corresponds to relative price q_o (for simplicity of exposition we assume homothetic preference sets). Consequently, initial trade is balanced, with C_oR_o of A being imported and R_oP_o of B exported.

Starting from this initial condition we will examine the response of this economy and its economic authorities to a particular pattern of external inflation. The time period under investigation is long enough to permit factor reallocation in response to any change in the domestic relative price. Furthermore, sufficient time is assumed to have elapsed to permit consumers and producers to reattain equilibrium after the external shock. Therefore, disequilibia such as might be caused by a change in the real value of consumers' cash balances are considered as being only transitory. Also, the possibility of persistent disequilibria such as might arise in a MCPE with fixed-priced nontraded goods are also ignored, as we have not included nontraded goods in our analysis.[10] The economy is also assumed to remain fully-employed, so we shall always be assuming movements along the production frontier. The purpose of these simplifications is to focus on the essential different implications for the MCPE of following the earlier-mentioned three basic strategies in the event of external inflation: (1) "wait and see", (2) reversion to the classical CPE, (3) emulation of the ME. In each case it is assumed that the

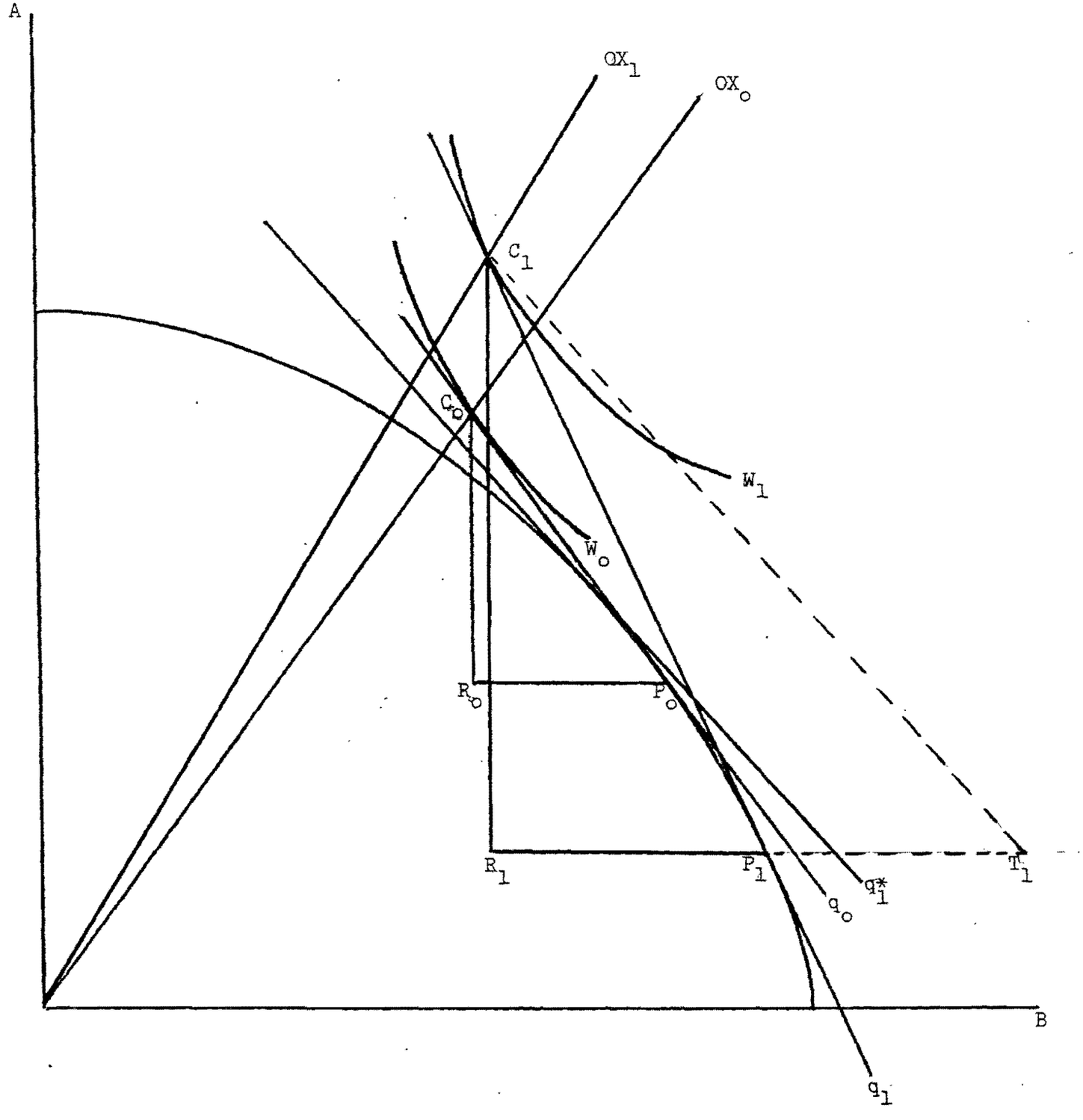

Figure 1

MCPE will borrow abroad to finance a foreign currency balance of trade deficit. Indeed, the "resource costs" to the economy of pursuing the alternative strategies will be measured indirectly by comparing hypothetical foreign currency trade deficits.

External inflation of course can be uniform across commodities, or it can result in a change in the terms of trade of the small country. In order to bring out most clearly the essence of the adjustment problem faced by the MCPE, we will assume that the world market price of the A good increases relative to that of the B good. In other words, $\hat{P}^*_a > \hat{P}^*_b > 0$ where "^" represents a percentage change in a variable. Consequently, $\hat{q}^* < 0$ and the external terms of trade of this small MCPE deteriorate. In Figure 1 this is reflected in a flattening of the external relative price line to q_1^*. Because the authorities have fixed the price of the A good, however, the internal relative price rises to q_1. Domestic producers, reacting to the increase in the domestic relative price, will be induced to shift resources into production of the B good, and move to P_1 on the production frontier. Consumers, faced by a higher relative price for the B good, will shift into A goods, and will choose to consume at C_1 on the steeper income-consumption path OX_1 corresponding to the higher internal relative price q_1. At the new domestic equilibrium (after any real balance effects have run their course), trade will be at a higher level than before but will continue to be balanced in terms of domestic prices ($C_1R_1 = R_1P_1q_1$). But imports are now actually being purchased at a higher relative price. Specifically, the cost of C_1R_1 of the A good in terms of the B exportable is R_1T_1 (i.e., C_1R_1 evaluated at q_1^*). Consequently,

while trade remains balanced in domestic prices ($B_T = 0$), the country will now be running a foreign currency deficit, in terms of the B good, equal to P_1T_1. This deficit is only possible because the authorities are willing to subsidize A good imports (that is, exactly subsidize enterprise losses on price discrepancies), drawing down net international reserves (i.e., borrowing) by an equal amount ($B_T^* = (B_T + \pi_a)e^{-1}$ where $B_T = 0$ but $\pi_a < 0$). Clearly, consumers have been allowed to achieve a higher welfare level (compare C_o on W_o and C_1 on W_1), but at the cost of a foreign currency trade deficit, distortion of domestic prices and thus resource allocation, and an increase in the domestic price level.

Both the change in the price level and relative prices may be intolerable to MCPE authorities sensitive to even minor changes in real income distribution. Thus rather than "wait and see" what the economy's response to external inflation will bring, the authorities might decide early on to pursue strategy II, namely reversion to the classical CPE or at least emulation of the results of acting like a CPE. The objective, in the extreme case, would be to avoid open inflation entirely and to ensure the same real domestic and foreign trade flows that would have occurred in the absence of the external disturbance.

There are several mechanisms by which this result could be achieved. One possibility would be to impose quantity controls on trade such that, despite the domestic relative price and price level change, real trade flows remain unchanged. A second approach would be to fix the domestic price of the B good (in addition to the A good) and impose a price-equalization tax on exports of the B good so as to tax away exporters' windfall profits (observe that fixing P_b would give $P_b < P_b^*e$). A third approach

would be nominally to permit continued B good price flexibility but to impose an ad valorem export tax on the foreign currency value of exports equal to the rate of external inflation of the B good (i.e., $t_b = -\hat{P}^*_b$, so that $\hat{P}_b = 0 = \hat{P}^*_b + t_b$). Finally, the authorities could revalue the currency by this same proportion (i.e., $\hat{e} = -\hat{P}^*_b$). In the latter three cases the nominal domestic price of the B good would effectively be fixed, and consumers and producers would remain in equilibrium at the original consumption and production levels because there would be no change in the domestic relative price and hence no inducement to any real change. In the first case, in which the relative price changes but quantitative controls are imposed, both consumers and producers would be in disequilibrium, with the former left with excess demand for the A good and the latter desiring but not allowed to shift production away from A good.

Under this strategy consumption would remain at C_o and production at P_o, as shown in Figure 2. C_oR_o of the A good could only be imported at relative price q^*_1, however, and while trade would remain balanced in domestic prices, the real trade deficit would be equal to P_oT_o in terms of foreign currency prices. Again, the difference between B_T and B^*_T would be the net loss of enterprises on price discrepancies, financed by international borrowing. Observe that the foreign currency deficit in this case would be less than under the "wait and see" strategy, however, because in that case given this particular disturbance domestic consumption and production actually shift perversely in relation to the change in the country's external terms of trade. In this case, on the contrary, the foreign currency trade deficit simply reflects the terms of trade loss at unchanged real trade flows.

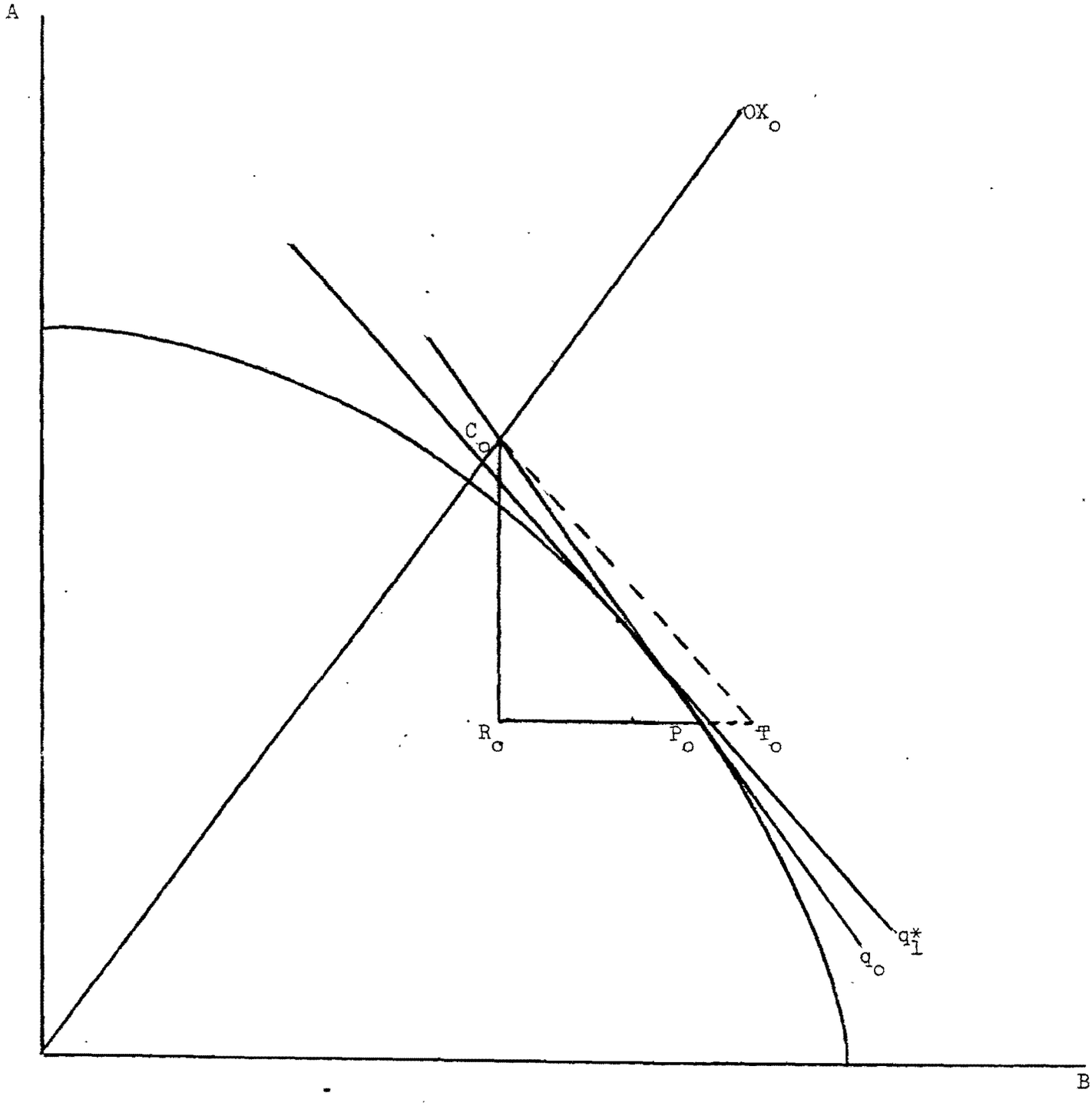

Figure 2

The third basic strategy is of course to emulate the behavior of the free-trading small market economy. In this case the authorities would ensure that no distortions occur between internal and external relative prices. Furthermore, the foreign currency trade balance could be preserved and even an upward movement in the overall domestic price level could be avoided through revaluation. As with the foregoing strategy, emulation of the market economy could be pursued using any one of several approaches. The most straightforward policy, of course, would be simply to permit full domestic price flexibility by removing all controls over the price of the A good. If combined with revaluation of the exchange-rate equal to the weighted average external rate of inflation for the two products, both relative price distortions and overall domestic inflation could be avoided. A second approach would be to tax B good exports at an ad valorem rate equal to the external rate of inflation for the A good (i.e., $t_b = -\hat{P}^*_a$). Because the external terms of trade have deteriorated in the case at hand, this would lead to a reduction in the domestic price of the B good and a decline in its internal relative price, resulting in $q_1 = q^*_1$. Similarly, the currency could be revalued proportionately to the rate of external inflation for the A good (i.e., $\hat{e} = -\hat{P}^*_a$).[11] A fourth possibility would be to permit the increase in the relative price of the B good but to impose quantitative controls on trade so as force a trade pattern similar to that which would occur under free trade at non-distorted prices. This would cause both consumers and producers to be in disequilibrium, however, and would be a rather bizarre policy as well as being very difficult to administer with any precision.

Pursuit of this market economy strategy would lead producers to slide up the production frontier in Figure 3, either because of quantitative controls or the actual decline in the internal terms of trade. Consumers effectively would be facing a lower relative price for the B good (equal to the external relative price), and because of this (or because of rationing, if quantity controls were used) they would be induced to consume at C_1^* on OX_1^* (the income-consumption path corresponding to q_1^*). Trade would now be balanced in both domestic and foreign currency prices, with $R_1^*P_1^*$ of the B good being exchanged at relative price q_1^* for $C_1^*R_1^*$ of the A good. The overall price level could rise, fall or remain unchanged depending on which of the above approaches were followed to ensure balanced trade. A substantial change in relative prices could prove to be intolerable, however, from an income distribution standpoint. Thus despite the appealing features of emulating a market economy, its consequences might be unacceptable to the MCPE authorities.

It is tempting to rank these three strategies in terms of the size of the resultant trade deficit in foreign currency prices. In the case at hand the MCPE with the "wait and see" attitude has the largest deficit, followed by the classical CPE, and emulating a ME would yield balanced trade. But in our example it is precisely under the "wait and see" strategy that consumers reach their highest short-term welfare level, followed by the CPE and the ME (compare C_1 in Figure 1 with C_o in Figure 2 and C_1^* in Figure 3). The real cost to the economy of foreign borrowing would be the real rate of interest to be paid on this debt, after taking into account the nominal interest rate, the future rate of external inflation, and future changes in the MCPE's terms of trade. The greater

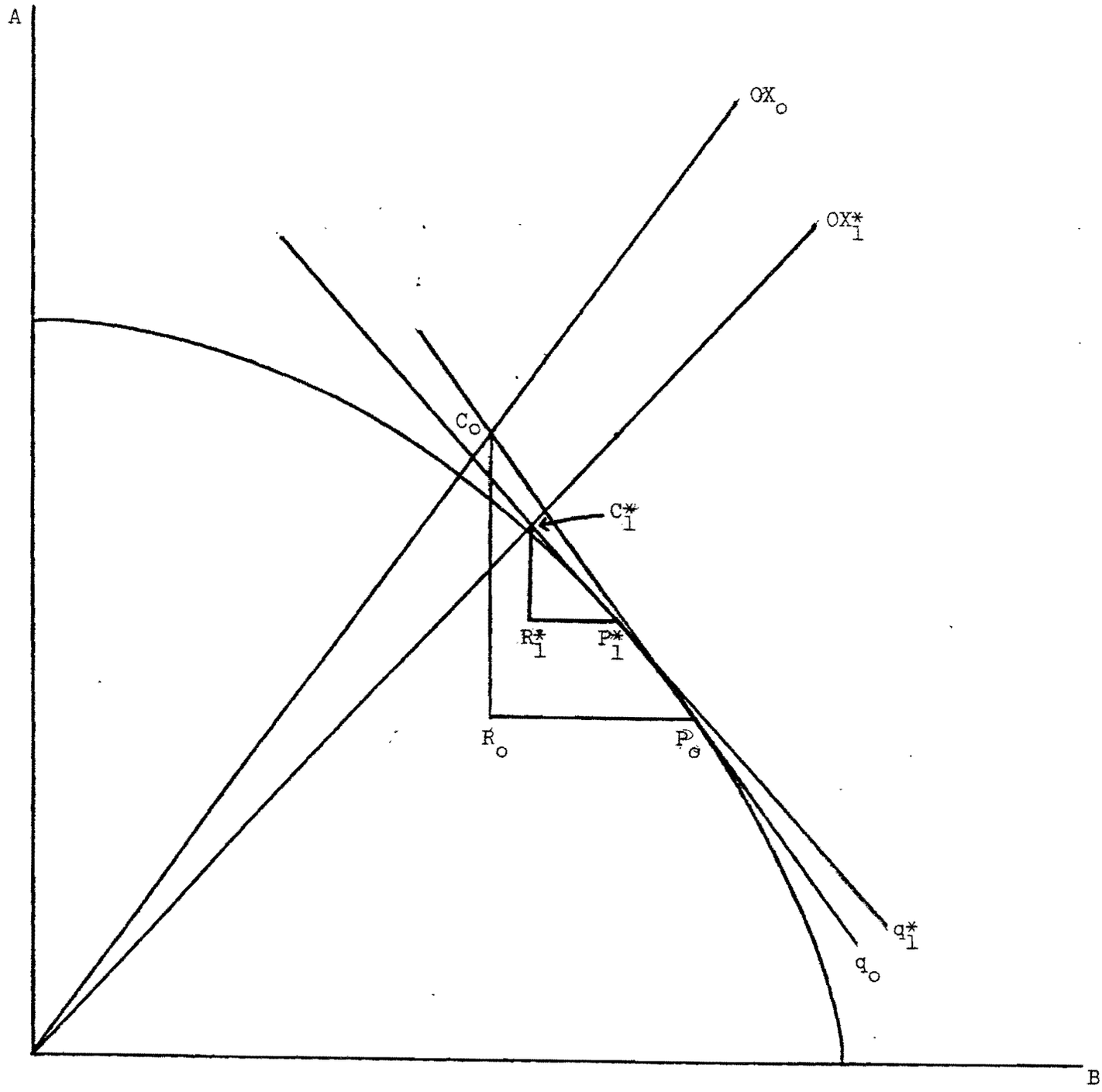

Figure 3

the trade deficit now, the more future consumption will have to be taxed to service the accumulated debt. Therefore attempting to compare the foregoing outcomes would involve us in specific assumptions about and comparisons between the real rate of interest and the rate of consumer time preference.

Fortunately, however, there is a relatively simple and straightforward way to compare the resource costs of the three MCPE strategies. First we assume that the real rate of interest on foreign borrowing and the rate of consumer time preference will be the same regardless of the strategy undertaken by the MCPE authorities. We can then compare the resource costs of the three strategies by asking how large a trade deficit would be necessary under each strategy to achieve a given level of consumer welfare. Because short-run consumer welfare and the real rate of interest are being held constant across strategies, the larger the trade deficit the greater the resource cost to the economy in terms of the loss in future consumption necessary to achieve a given welfare level in the present.

This approach is illustrated in Figure 4. P_1, P_o and P_1^* represent production points under the MCPE "wait and see", CPE and ME strategies respectively. The respective actual consumption points (from Figures 1-3) are C_1, C_o and C_1^*. The resulting trade triangles reflect balanced trade in domestic currency prices in each case. Consumption point C_1 lies on indifference curve W_1, therefore consumption bundles C_o' and $C_1^{*\prime}$ would give comparable consumer satisfaction at domestic relative prices q_o and q_1^* respectively. While consumption at C_1 can be achieved at balanced trade in domestic prices at relative price q_1, C_o' and $C_1^{*\prime}$ could only

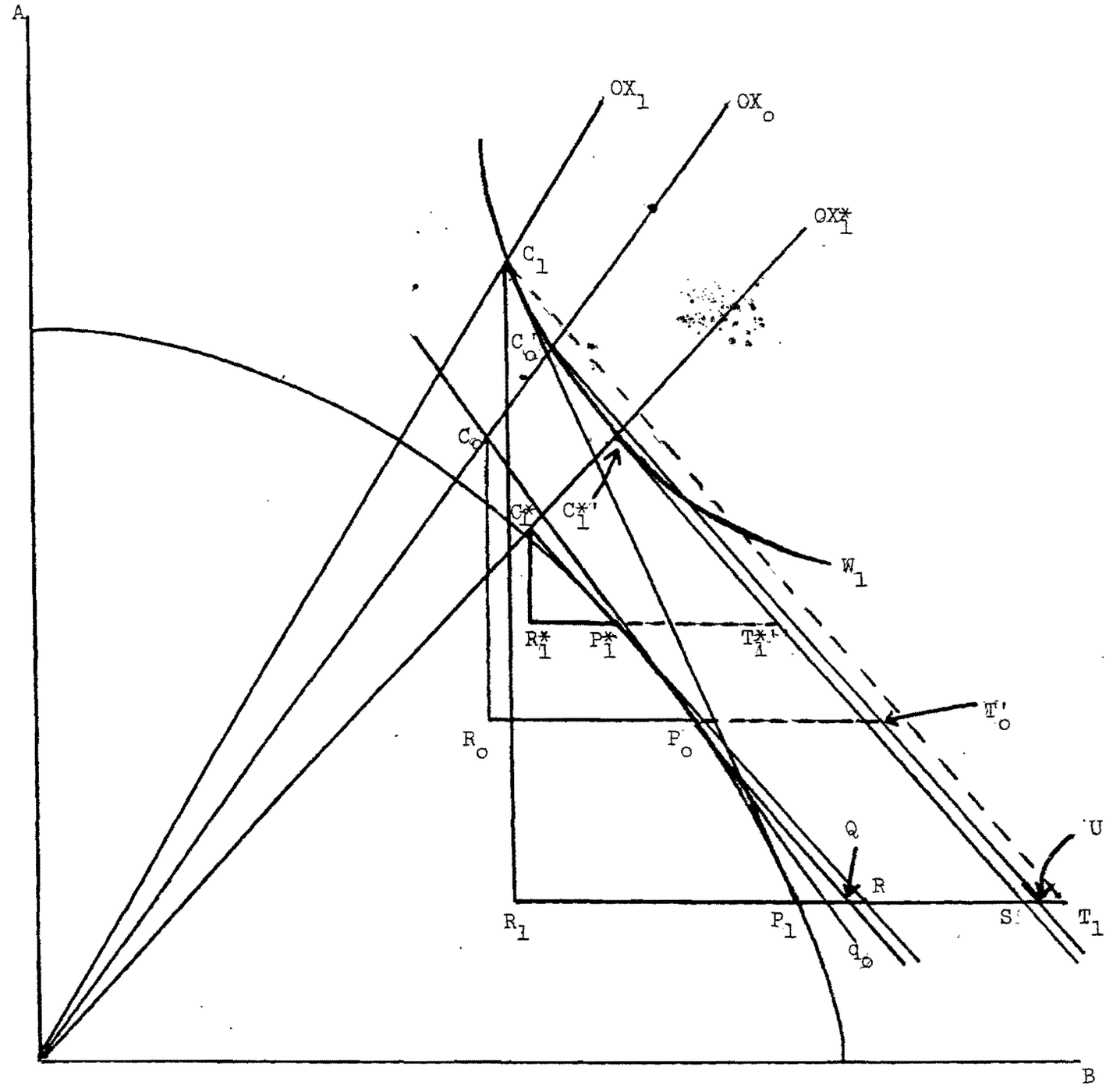

Figure 4

be attained at their respective relative prices (q_o, q_1^*) through expansionary monetary or fiscal policy which shifts the relative price lines (budget constraints) out to C_o' and $C_1^{*\prime}$ respectively. Given increased real spending and unchanged real income, the domestic currency trade balance in both of these cases would be negative.

More important, however, is the foreign currency trade balance, which in each case also deteriorates. Specifically, under the CPE strategy, in which the original domestic relative price is maintained, the trade deficit denominated in foreign currency prices and measured in terms of the B good would be equal to P_oT_o', which is also equivalent in the diagram to QU. Under the ME strategy, where equality of internal and external relative prices is maintained, the foreign currency trade deficit would be equal to $P_1^*T_1^{*\prime}$, which is also equivalent in the diagram to RS. The foreign currency trade deficit given the "wait and see" strategy is, as before, equal to P_1T_1. Observe that the foreign currency trade deficit is largest for the MCPE and smallest for the ME. Comparing the MCPE and ME deficits, the excess of the former over the latter can be broken up into a production and a consumption effect. Specifically, P_1R is the hypothetical increment in foreign borrowing caused by overproducing the B good because of the domestic price distortion - the <u>production</u> effect. ST_1, on the other hand, is the hypothetical increment in foreign borrowing caused by overconsuming the imported A good, again due to the domestically distorted relative price - the <u>consumption</u> effect. At a given real rate of interest on foreign borrowing and a given rate of time preference, the larger the foreign currency trade deficit the larger the future real cost to the economy (in terms of real consumption foregone to service the debt)

of attaining a given level of welfare. As we would expect, the cost to the small country is larger, the greater the distortion of internal from external relative prices. In the case at hand the MCPE incurs higher efficiency costs than the CPE, but this is only because of the particular pattern of external inflation rates. The price distortion could be less in the MCPE than in the CPE if, for example, there were external inflation combined with enough of an improvement in the external terms of trade. Our example clearly illustrates, however, the "perverse" effects which may easily occur in a MCPE which adopts a passive strategy in the face of external inflation. (Observe that the domestic relative price would be distorted under the "wait and see" MCPE strategy even in the event of uniform external inflation.)

The authorities could eschew emulation of either the ME or the CPE and yet pursue an "active" policy in the attempt to maintain balanced trade in foreign currency prices. Two such policies are briefly considered in Figure 5. One approach would be to eliminate price-equalization subsidies on imports of the A good, while keeping the domestic price fixed. Enterprises importing the A good would now suffer an unsubsidized loss on price discrepancies, and presumably would cease trading this product. The A good in effect would become a nontraded good, and consumption would take place either at R_1 (if there is no real-balance effect) or P_1 if the money supply increase arising from the trade surplus leads to an increase in spending on the B good.[12] Consumption and production at P_1 would of course mean balanced trade in both domestic and foreign currency prices. In either case consumers would be left with unrelieved excess demand for the A good.

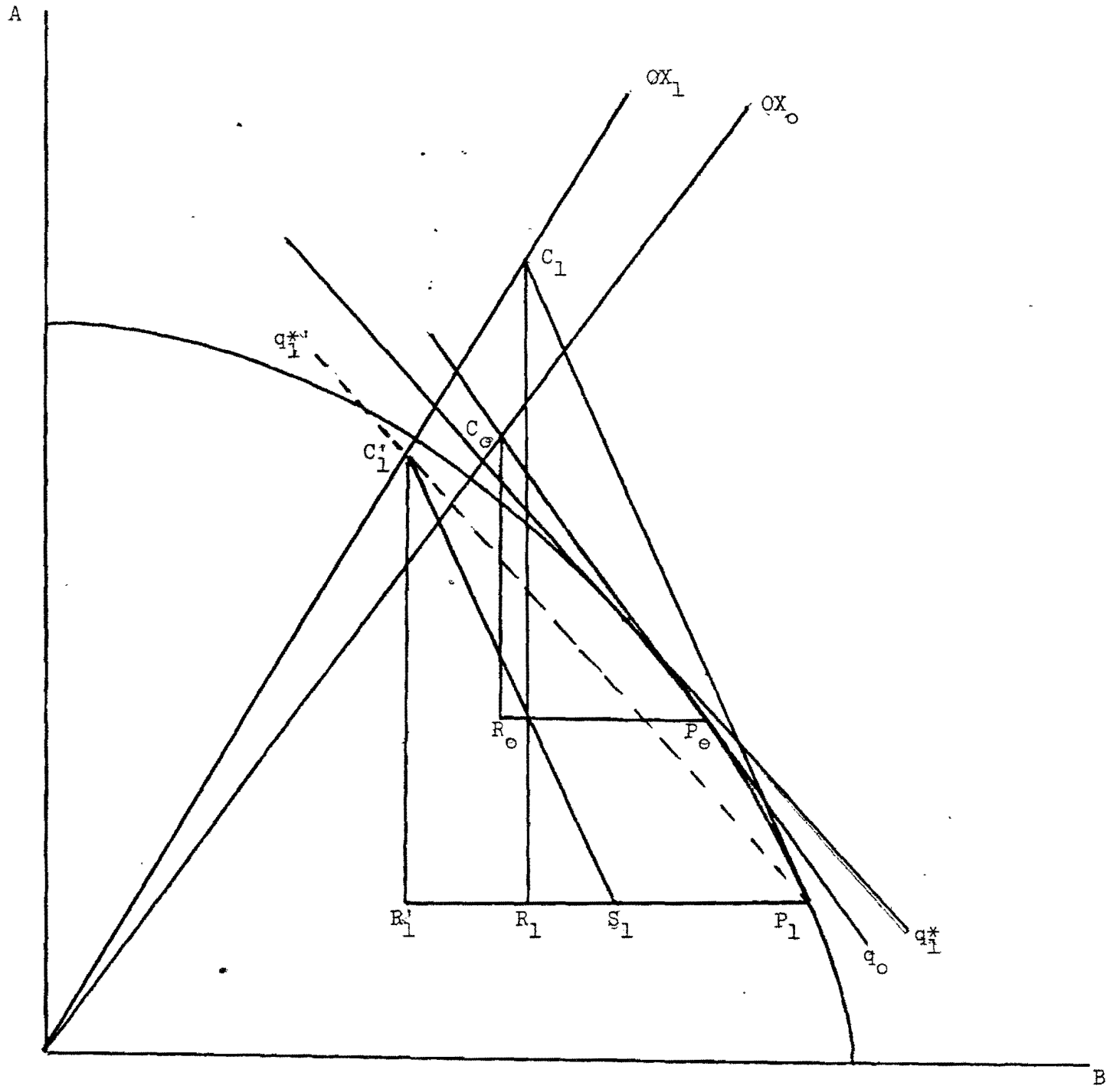

Figure 5

Alternatively, the authorities could pursue a contractionary monetary or fiscal policy designed to reduce aggregate expenditure enough so as to eliminate the foreign currency trade deficit. This is illustrated in Figure 5 by an inward shift in the q_1^* relative price line to $q_1^{*\prime}$, which intersects P_1 and gives consumption point C_1' on OX_1. Trade would now be balanced in foreign currency prices ($C_1'R_1' = R_1'P_1q_1^*$), but there would now be a trade surplus evaluated in domestic prices ($C_1'R_1' < R_1'P_1q_1$), equal to S_1P_1. Observe that this result is analogous to the effect of an import subsidy in a small market economy (at the rate $(-\hat{P}_a^*)$), under the usual assumption that foreign currency trade would be kept in balance by financing the subsidy by a non-distorting tax on incomes.

III. Response to External Inflation in a Four-Good Model

Some very important features of the small MCPE and its response to external inflation are glossed over in the foregoing two-good model. Specifically, the existence of three or more traded goods, and thus the possibility that more than one relative price may be distorted in the MCPE, substantially complicates the task of the policymaker attempting to emulate either the ME or the CPE. Furthermore, for real-world MCPEs such as Hungary, relatively poorly endowed in fuels and industrial crude materials, a trade model which does not include imported intermediate products may give misleading results. Finally, the MCPE trades on two somewhat distinct world markets - the dollar and the ruble. In its trade with the ruble area the MCPE and its trade partners generally strive for bilateral balance and planned bilateral trade flows may be visualized, in the stylized case, as firm commitments in real terms.

In order to capture such features more explicitly, we employ in this section, with some modification, the general equilibrium model which Corden (1971) used to examine "effective protection" in small market economies. We assume four traded goods: (1) two final products, a fixed price A good (A_f) and a flexibly-priced B good (B_f); and (2) two fixed-priced imported intermediate products, A_m which is used in the production of A_f, and B_m used in the production of B_f. Following Corden, we assume that one unit of each final product is produced with one unit of the respective imported intermediate combined with one unit of "value-added" product (A_v and B_v respectively). While import coefficients for the intermediate and value-added products are assumed fixed, for simplicity, variable proportions in the utilization of primary factors, to which the value-added accrues, are permitted. The MCPE is assumed to be a price-taker with respect to each traded good on international markets.

Consumption in this economy is determined by the so-called domestic nominal price ratio, which is the internal relative price of the two final products (P_{fb}/P_{fa}). The nominal price ratio is the slope R_oS_o in the northeast quadrant of Figure 6. Production, on the other hand, is determined by the so-called domestic effective price ratio, which is the internal relative price of the two value-added products (P_{vb}/P_{va}). An increase in the relative price of the B value-added product, for example, means an increase in the return to primary factors in industry B, and should induce factors to move out of A into B. This would be reflected in a northwesterly movement up the production possibilities frontier in value-added space in the southwest quadrant of Figure 6. The effective price ratio is the slope of Q_oW_o. Because we assume that one unit of final product uses

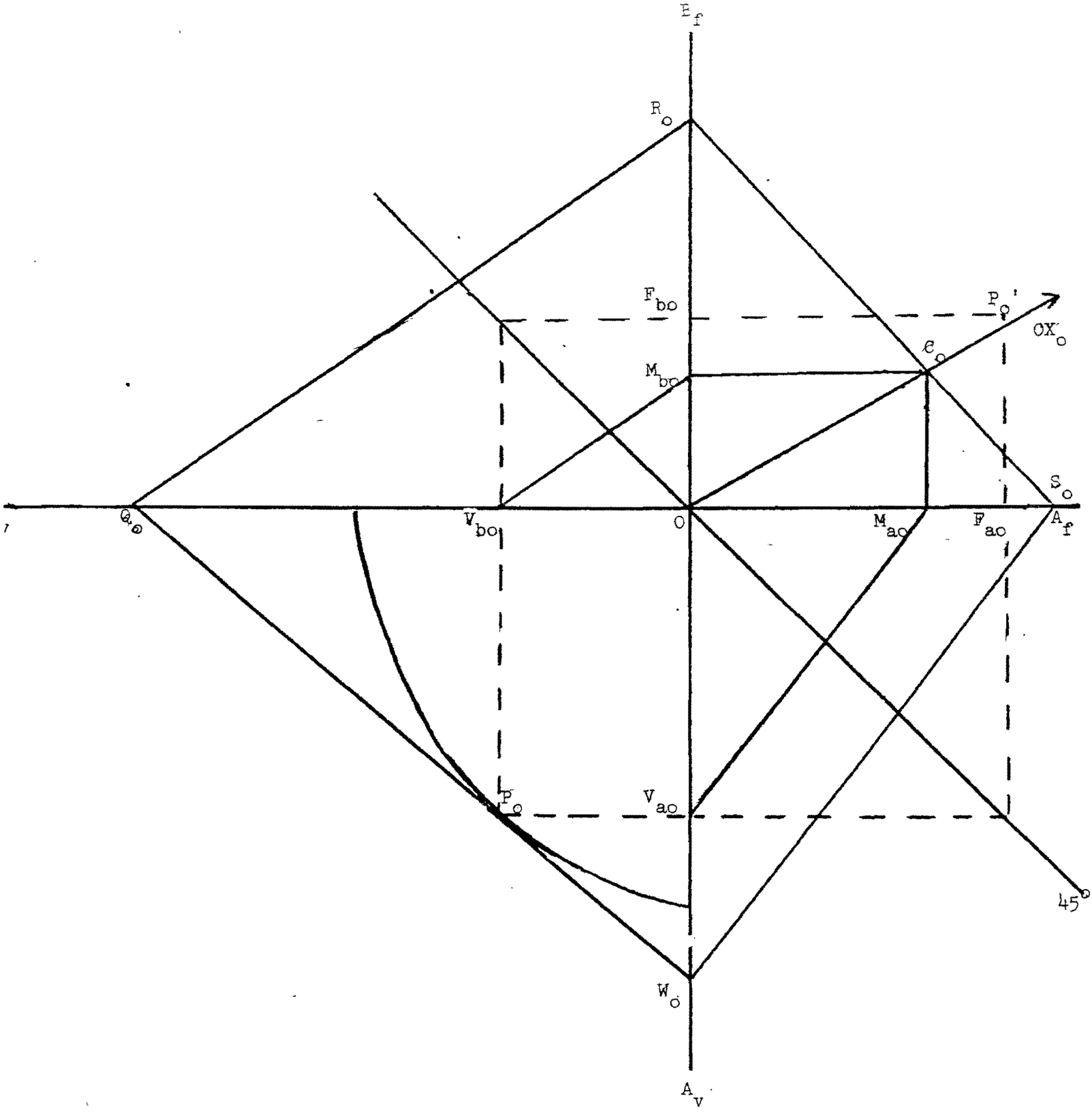

Figure 6

one unit of both the respective imported intermediate and value-added product, production point P_o in the southwest quadrant can be drawn in final-product space in the northeast quadrant as P_o'. Production of the A and B value-added products equal OV_{ao} and OV_{bo} and production of the A and B final products equal OF_{ao} and OF_{bo} respectively.

The B final product shall be used as the numeraire for purposes of analyzing the impact of external inflation under alternative MCPE strategies. By definition, the value of each unit of final product produced domestically is equal to the sum of the values of the value-added and imported intermediate products used in its production ($P_{fb}Q_{fb} = P_{vb}Q_{vb} + P_{mb}Q_{mb}$ and $P_{fa}Q_{fa} = P_{va}Q_{va} + P_{ma}Q_{ma}$). Expressing all values in terms of the numeraire gives:

$$(1)\quad Q_{fb} = \frac{P_{vb}}{P_{fb}} \cdot Q_{vb} + \frac{P_{mb}}{P_{fb}} \cdot Q_{mb} \qquad \text{(B sector)}$$

$$(2)\quad Q_{fb} = \frac{P_{fa}}{P_{fb}} \cdot Q_{fa} = \frac{P_{fa}}{P_{fb}} \left[\frac{P_{va}}{P_{fa}} \cdot Q_{va} + \frac{P_{ma}}{P_{fa}} \cdot Q_{ma} \right] \qquad \text{(A sector)}$$

Production of the B value-added product ($Q_{vb} = OV_{bo}$) can be expressed in terms of the B final product by evaluating OV_{bo} at the relative price P_{vb}/P_{fb}, equal to the slope of Q_oR_o. A line drawn parallel to Q_oR_o from V_{bo} intersects the B_f axis at M_{bo}. With output of B_f equal to OF_{bo} and output of B_v (in terms of B_f) equal to OM_{bo}, $M_{bo}F_{bo}$ equals the value of the imports of the B intermediate evaluated in terms of the B final product. Similarly, $(P_{va}/P_{fa}) \cdot Q_{va}$ is measured by OM_{ao} on the A_f axis. The difference between output of the A final product (OF_{ao}) and output of the A value-added product (OM_{ao}), or $M_{ao}F_{ao}$, must be equal to the value

of imports of the A final product. Evaluation of $M_{ao}F_{ao}$ at the inverse of the nominal price ratio (i.e., at P_{fa}/P_{fb} or the slope of R_oS_o) gives the B final product equivalent of imports of the A intermediate product.

In our analysis we shall assume for illustrative purposes (with no essential loss in generality) that the MCPE imports the B intermediate from and exports the B final product to the dollar area, and that initially there is perfect balance in its hard currency balance of trade in dollar prices ($B^*_{Tb} = 0$). Thus the value of exports of B_f is equal to the value of B_m imports. It is also assumed that the MCPE imports the A intermediate from and exports the A final product to the ruble area, and that this trade is also balanced initially ($B^*_{Ta} = 0$). These balanced trade assumptions are reflected in Figure 6 by drawing the income-consumption path OX_o in the northeast quadrant in such a way as to fix the consumption point C_o directly above M_{ao}, at the intersection of OX_o and the nominal price line R_oS_o. (As in the two-good case we assume for simplicity of illustration that preference sets are homothetic.) As C_o lies inside of P_o", the MCPE is exporting $M_{ao}F_{ao}$ of the A final product to other CMEA countries in return for the equivalent of $M_{ao}F_{ao}$ of the A intermediate. Observe that $M_{ao}C_o$ consumption of B_f is equivalent to OM_{bo}. Consequently, that portion of production of B_f not consumed domestically ($M_{bo}F_{bo}$) is in this case identical to the amount of B_f that must be exported to pay for imports of B_m.

We assume that initially the <u>domestic</u> nominal and effective relative prices ($q_f = P_{fb}/P_{fa}$ and $q_v = P_{vb}/P_{va}$) are identical to the <u>external</u> nominal and effective price ratios ($q^*_f = P^*_{fb}/P^*_{fa}$ and $q^*_v = P^*_{vb}/P^*_{va}$) because of a price reform which has moved the economy to points P_o and C_o. There is

therefore zero effective protection. So as to make interpretation of this rather complex diagram as painless as possible, we shall assume a fairly simple form of external disturbance, although one which captures in a stylized manner the situation of a country such as Hungary in the period 1973-76. For the time period under consideration we assume no change in intra-CMEA foreign trade prices; hence $\hat{P}^*_{fa} = \hat{P}^*_{ma} = 0$. In the dollar area, on the other hand, we assume external inflation combined with a deterioration in the MCPE's terms of trade: $\hat{P}^*_{mb} > \hat{P}^*_{fb} > 0$. Consequently, the external and internal nominal price ratios increase proportionately ($\hat{q}^*_f = \hat{q}_f > 0$). The impact of external disturbances on the external and internal effective price ratios, however, is less straightforward. For very small changes in prices it is[13]:

$$(3a)\quad \hat{q}^*_v = (\hat{P}^*_{fb}-\hat{P}^*_{mb})[(P^*_{fb}/P^*_{mb})-1]^{-1}+(\hat{P}^*_{fb}-\hat{P}^*_{fa})+(\hat{P}^*_{ma}-\hat{P}^*_{fa})[(P^*_{fa}/P^*_{ma})-1]^{-1}$$

$$(3b)\quad \hat{q}_v = (\hat{P}_{fb}-\hat{P}_{mb})[(P_{fb}/P_{mb})-1]^{-1}+(\hat{P}_{fb}-\hat{P}_{fa})+(\hat{P}_{ma}-\hat{P}_{fa})[(P_{fa}/P_{ma})-1]^{-1}$$

In our example we shall assume that the negative first righthandside term in expression (3a) outweighs the second positive term, so that $\hat{q}^*_v < 0$.

We assume that all goods have fixed prices domestically except the B final product. Therefore, $\hat{P}_{fb} = \hat{P}^*_{fb}$ and $\hat{P}_{mb} = \hat{P}_{ma} = \hat{P}_{fa} = 0$. Expression (3b) yields unambiguously in this case $\hat{q}_v > 0$. Consequently, while the external and internal nominal price ratio changes are identical, the internal effective price ratio increases at the same time that the external effective price ratio falls. We shall now analyze the domestic

impact of this particular pattern of external inflation under the three alternative strategies reviewed in Section II: (A) "wait and see", (B) reversion to the CPE, and (C) emulation of the ME.

If the authorities adopt a passive attitude with respect to the direct impact of external inflation on internal relative prices, the increase in the internal effective price ratio means that per unit returns to the primary factors in industry B increase, and factors are induced to move out of A and into the production of the B final product. This is represented in Figure 7 by a steeper effective price line (now Q_1W_1) tangent to the production frontier at P_1. Output of the B value-added product increases to OV_{b1} while output of A_v falls to OV_{a1}. Because the prices of the A intermediate and A final product remain fixed, the relative price P_{va}/P_{fa} also is unchanged. Consequently, corner point S_1 on the new quadrilateral $Q_1R_1S_1W_1$ can be found by drawing a line from W_1 parallel to W_oS_o. In the northwest quadrant, on the other hand, Q_1R_1 will have a steeper slope than Q_oR_o because $(\hat{P}_{vb}/\hat{P}_{fb}) > 0$ due to $\hat{P}_{fb} > \hat{P}_{mb}$.[14] Connecting R_1 and S_1 results in a flatter internal nominal price line than R_oS_o, which reflects the increase in the domestic nominal price ratio.

From V_{b1} a line drawn parallel to Q_1R_1 intersects the B_f axis at M_{b1}, which gives $M_{b1}F_{b1}$ as the real value of B_m imports evaluated in terms of the new domestic relative price for the B final product. From V_{a1} a line drawn parallel to W_1S_1 intersects the A_f axis at M_{a1}, which gives $M_{a1}F_{a1}$ as the real value of A_m imports evaluated in terms of the A_f good. The new income-consumption path corresponding to the higher nominal price ratio can be represented by OX_1^*. Consumption will take place at C_1, at the intersection of OX_1^* and R_1S_1. The MCPE would now want to import both

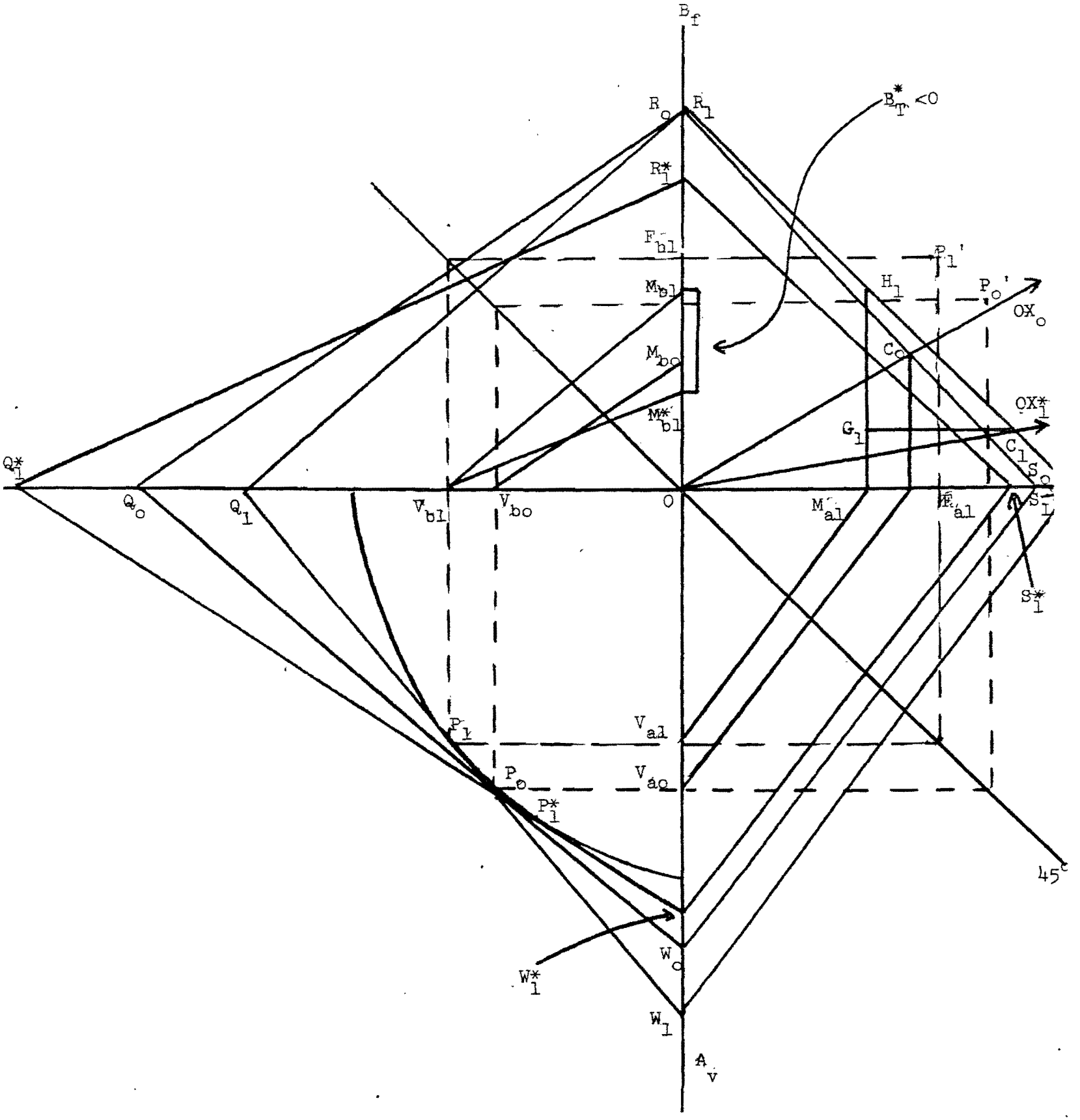
B_f
R_o
R_1
$B_T^* < 0$
R_1^*
F_{bl}
P_1'
M_{bl}
H_1
P_o'
OX_o
C_o
M_{bo}
OX_1^*
M_{bl}^*
G_1
C_1
Q_1^*
S_o
Q_o
Q_1
V_{bl}
V_{bo}
O
M_{al}
F_{al}
S_1
S_1^*
P_1
V_{al}
P_o
V_{ao}
P_1^*
45°
W_o
W_1^*
W_1
A_v

Figure 7

the A final and intermediate products. Evaluated at the new nominal price ratio, these combined imports would require G_1H_1 in real exports of the B final product. This would just exhaust the amount of B_f production left over after meeting the new, lower domestic consumption demand ($M_{a1}G_1$) and the real cost of imports of B_m ($M_{b1}F_{b1}$). Consequently, once any transitory consumer disequilibria disappear, overall trade would be balanced in domestic prices.

In terms of foreign currency prices, however, the real cost of imports of B_m has increased, because of the deterioration in external terms of trade in the dollar area. Specifically, the new relative price P^*_{vb}/P^*_{fb} is less than before and the new quadrilateral in external prices is $Q^*_1R^*_1S^*_1W^*_1$ constructed in the same manner as $Q_1R_1S_1W_1$ but corresponding to the changes in external relative prices. Because the external effective price ratio has fallen, $Q^*_1W^*_1$ is flatter than the initial relative price (Q_oW_o) and is tangent to the production possibilities frontier at P^*_1. Combined with no change in P^*_{va}/P^*_{fa} and a change in the external nominal price ratio equal to the change in the internal nominal price ratio, this gives $Q^*_1R^*_1$ with a flatter slope than Q_oR_o. In order to find the actual cost of B_m imports in terms of the B final product, we must draw from V_{b1} a line parallel to $Q^*_1R^*_1$, which intersects the B_f axis at M^*_{b1}, below M_{b1}. After meeting domestic consumption and exporting G_1H_1 of the B_f to pay for imports of both A goods, the MCPE only has left, as before, $M_{b1}F_{b1}$ of the B final product to meet a foreign currency import bill for B_m equal in real terms to $M^*_{b1}F_{b1}$. The foreign currency trade deficit is thus equal to $M^*_{b1}M_{b1}$. The MCPE, despite the deterioration in international relative value-added for the B industry, which suggests reallocating

resources into production of the A final product (moving to P_1, will in this case subsidize the import of the B intermediate, with price-equalization subsidies exactly offsetting enterprise losses on discrepancies between domestic and world-market prices. There now exists positive relative effective protection of the B final product.

Until now we have ignored the impact of this "wait and see" policy on trade with other CMEA countries. Yet observe that because the A final product has become relatively less expensive, domestic consumption of this product has increased at the expense of exports. At the same time, domestic production has fallen as well, further reducing exports. The net result is that the MCPE would now incur a trade deficit with its CPE partners. (In this particular case, it now would attempt to import both the A final and intermediate products from the CMEA region.) It is questionable, however, whether such a change in real trade flows in the short run, and unbalanced trade, would be feasible. If not, severe domestic disequilibrium could result in both consumption and production.

This consideration in particular, as well as the concern for the distribution of real income domestically, might lead the authorities to consider Strategy II, reversion to the CPE. The authorities in effect would strive to maintain domestic production and consumption fixed at P_o and C_o respectively. As far as domestic consumers and producers are concerned, therefore, the quadrilateral remains as $Q_oR_oS_oW_o$ in Figure 8. In foreign currency prices, however, the economy now faces quadrilateral $Q_1^*R_1^*S_1^*W_1^*$, as explained earlier. While trade will remain balanced in domestic prices ($OM_{bo} = M_{ao}C_o$), the MCPE will now incur a trade deficit in foreign currency prices of $M_{bo}^*M_{bo}$, where M_{bo}^* is found by drawing a line

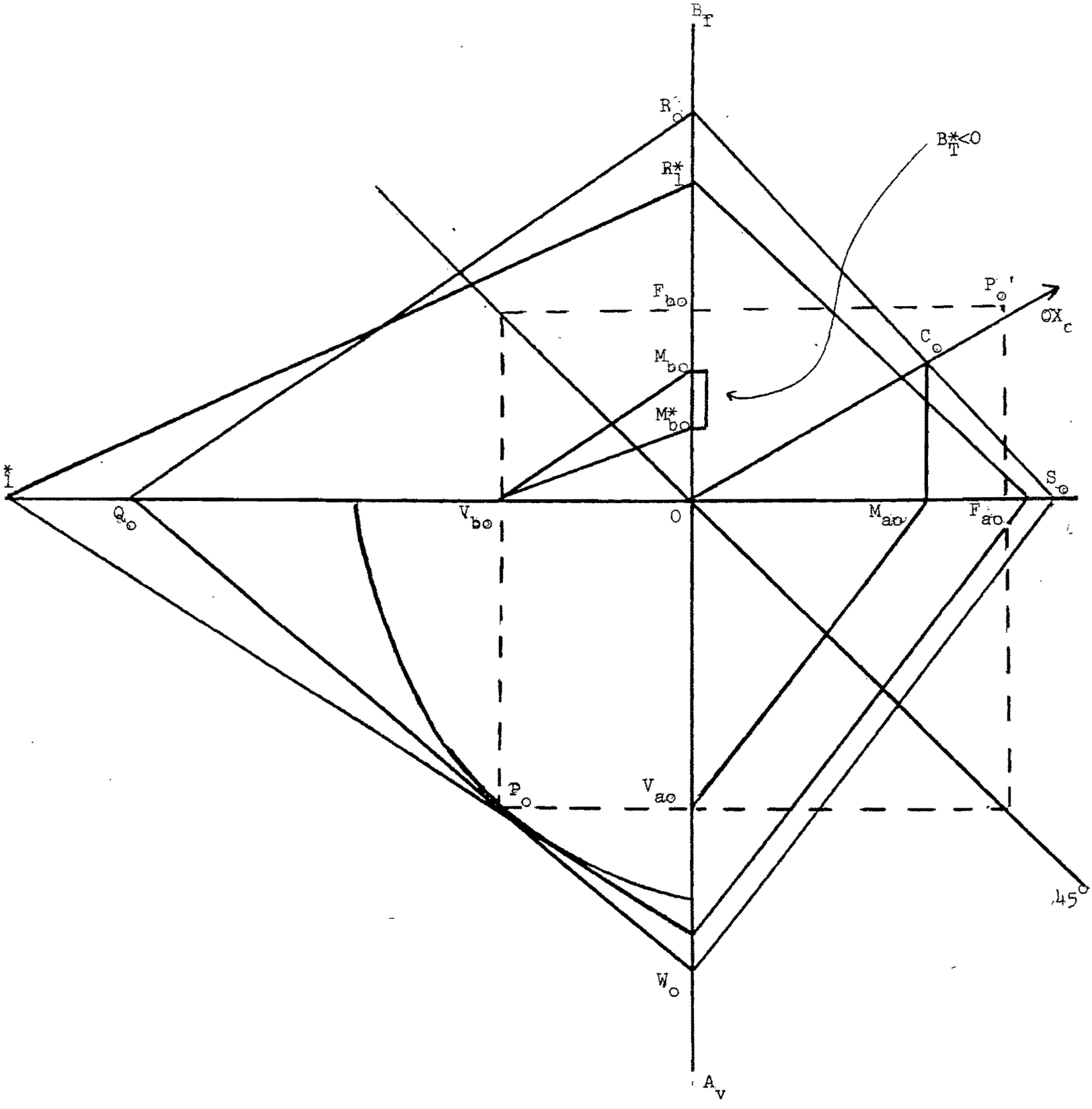
B_T
R_o
R_1^*
$B_T^*<0$
F_{bo}
P_o'
OX_c
C_o
M_{bo}
M_{bo}^*
R_1^*
S_o
Q_o
V_{bo}
0
M_{ao}
F_{ao}
P_o
V_{ao}
45°
W_o
A_v

Figure 8

from V_{bo} parallel to $Q^*_1R^*_1$. In this case balanced trade and unchanged real trade flows are maintained with the rest of CMEA in ruble prices, but there is a dollar trade deficit solely because dollar terms of trade have deteriorated, with unchanged real trade flows.

A third basic alternative, of course, would be to strive for balanced trade in foreign currency prices by attempting to emulate the market economy. In this case, the MCPE authorities ensure that the equality of each internal relative price is maintained with its respective external relative price. Because of this the domestic effective price ratio now declines, inducing factors to reallocate away from B_f and into A_f production (at P^*_1). The new quadrilateral in Figure 9 will be $Q^*_1R^*_1S^*_1W^*_1$, with value-added product output at V^*_{a1} and V^*_{b1}, which is equivalent to OM^*_{a1} and OM^*_{b1} in terms of the respective final products. Consumption is at C^*_1, which is where $R^*_1S^*_1$ intersects the income-consumption path OX^*_1. Because exports of A_f are less than $M^*_{a1}F^*_{a1}$ (the value of A_m imports in terms of the A_f good) the MCPE now has a trade deficit with its CMEA trade partners. At the same time, it is running a trade surplus with the West because the amount available for export of the B final product ($G^*_1H^*_1$ plus $M^*_{b1}F^*_{b1}$) is greater than the value of its imports of the B intermediate product ($= M^*_{b1}F^*_{b1}$). Because this surplus in trade with the West ($G^*_1H^*_1$) is just equal, in real terms, to the deficit in trade with the East ($G^*_1C^*_1$), the final attainment of equilibrium in domestic prices also means overall balanced trade in foreign prices ($B_t = B^*_t = 0$). Because trade is now unbalanced with the separate trading areas, however, as well as the fact that domestic relative prices have changed, this strategy, like the passive MCPE strategy, might not be acceptable to MCPE authorities (or to the MCPE's CMEA trade partners).[15]

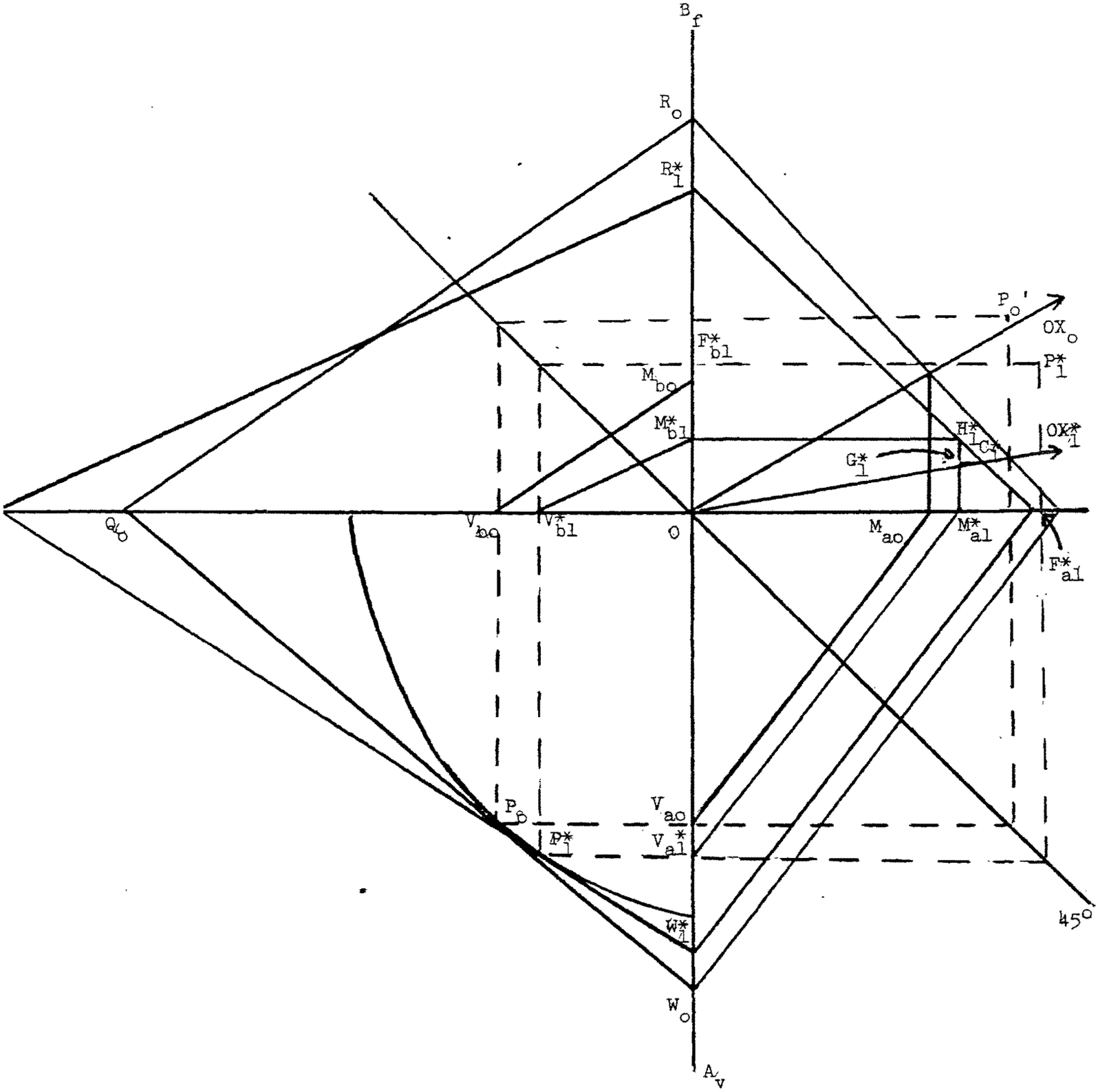
B_f
R_o
R^*_1
P_o'
OX_o
F^*_{b1}
P^*_1
M_{bo}
M^*_{b1}
H^*_1
C^*_1
OX^*_1
G^*_1
Q_o
V_{bo}
V^*_{b1}
0
M_{ao}
M^*_{a1}
F^*_{a1}
P_o
V_{ao}
P^*_1
V^*_{a1}
45°
W^*_1
W_o
A_v

Figure 9

Unlike the two-good case, the resource costs to the economy of consuming at a given welfare level under different "strategies" cannot be easily compared in this four-good model. But the same general results that we obtained for the two-good case should hold. That is, we would expect that for the attainment of any given welfare level that would involve a foreign currency trade deficit under each strategy, the deficit would be greater, and thus the drain on future consumption of servicing external debt would be greater, the greater the distortion of internal from external relative prices.

In order not to unduly complicate the diagrams in Figures 7-9 we assumed that only one important relative price was distorted - the effective price ratio. With distortion of only one relative price we observed in the two-good model, in Section II, that various policy objectives can be attained by imposition of an additional tax (or subsidy) on just one product, or by revaluation equal to the rate of external inflation of one nominal price. For example, emulation of a ME in the two-good case with price equalization on the A good meant either freeing the price of this good, setting an export tax on the B good or revaluing at a rate equal to the rate of external inflation of the A good price. In the four-good case at hand, emulation of the market economy could not similarly be achieved by, say, revaluation equal to the rate of external inflation of the B intermediate product. This is seen by reference to expressions (3a) and (3b). Revaluation equal to $(-\hat{P}^*_{mb})$ would make the first righthandside term identical in both internal and external prices, but revaluation would eliminate the equality of the two nominal price ratios, as $(\hat{P}_{fb}-\hat{P}_{fa})$ would be negative and $(\hat{P}^*_{fb} - \hat{P}^*_{fa})$ would remain positive. This simply

illustrates the more general point that the MCPE policymakers' task is rendered more complicated the more relative prices with which they have to be concerned.[16] Once we move beyond two goods in a MCPE the exchange-rate can no longer be used to automatically emulate either a CPE or a ME without also the imposition of n-1 taxes or subsidies where there are n fixed priced goods. Thus if emulation of the market economy result is desired, this suggests that the least cost approach, certainly in terms of administrative burden, would be to free all prices and use the exchange-rate as a mechanism for achieving approximate overall price stability. Alternatively, if it is desired to fix domestic relative prices, comprehensive administrative price control together with full price-equalization might be the most efficient approach.

The four-good model also points up a further complexity facing MCPE policymakers, namely the possibility that the MCPE at any point in time may face two (more or less) externally given prices for the same product. This is because historically intra-CMEA foreign trade prices have in general not been identical to dollar area prices for equivalent products, and even when rough correspondence has existed the ruble area prices have only adjusted to dollar area price changes with a long lag (the "stop price" system) or more recently, on a basis of a five-year moving average of Western world market prices.[17] In the illustrative case presented in this section we could assume for example, that the two imported intermediates are identical (e.g., a composite industrial primary product), but that over the relevant time period P^*_{fa} and P^*_{ma} are fixed by CMEA pricing rules. While the decline in the external effective price ratio and the increase in the external (and internal) nominal price ratio suggest that the MCPE should reallocate production into the production of and

consumption of A_f, at the expense of B_f, even these relative price changes can be misleading indicators of the optimum longer-run production and consumption bundles.

If there were in fact no costs in such adjustment (and in this paper we have ignored such costs, for simplicity) the problem of lagged adjustment of intra-CMEA foreign trade prices to world market prices would not be particularly serious. The MCPE could, if emulating the ME, reallocate production and consumption to P_1^* and C_1^* respectively in Figure 9, and then, once ruble area prices fully adjust, slide back up the production frontier. In the real world, however, factor reallocation is not likely to be smooth, and MCPE policymakers, faced with radically different speeds of price adjustment in the two markets, would still face a resource allocation dilemma even if they were to attempt to emulate the market economy.

IV. Summary and Conclusions

This paper has examined three basic policy strategies for the small MCPE faced with external inflation. Such inflation may or may not involve a change in the terms of trade. We have focused on the case of external terms of trade deterioration because such a situation brings out most clearly the possibility of "perverse" responses in a MCPE committed to partial introduction of a free market in the context of a centrally planned economy. Furthermore, as the reader has undoubtedly observed, this particular case and the array of possible policy responses appears to roughly correspond with the actual experience of Hungary in the years 1973-1976.

MCPE policymakers are assumed alternatively to adopt a "wait and see" attitude (Strategy I); quickly to revert to the CPE in the sense of attempting to insulate domestic production and consumption from the external disturbance (Strategy II); or to attempt to emulate the response of a market economy, by permitting all external relative price changes to be transmitted to the domestic economy (Strategy III). In each case several different mechanisms exist whereby these strategies may be pursued, as discussed in some detail in Section II.

In the two-good case, in which the country's export is flexibly priced and its import is subject to governmental price control, external inflation for both goods combined with terms of trade deterioration will lead to an expansion of production and exports of the flexibly-priced good, an increase in imports of the fixed-priced good and a deterioration in the foreign currency trade balance, if the authorities follow a passive policy. If the authorities instead seek perfect insulation of domestic production and consumption decisions from the external disturbance, real trade flows are left unaltered and the foreign currency trade balance deteriorates by a lesser amount, in this case not because of "perverse" real effects but simply because of the decline in external terms of trade. The other basic strategy, emulating the market economy by permitting the domestic relative price to change proportionately to the external price ratio, would eliminate the trade deficit but leave the economy with perhaps unacceptable changes in domestic relative prices and real income distribution. It is shown, not unexpectedly, that in general the resource cost to the small MCPE of pursuing a particular strategy to achieve a given

level of consumer welfare will be greater, the more the strategy distorts domestic from external relative prices.

More realism is obtained by examining the effects of the three strategies in a four-good case, in which trade is conducted with the dollar area in one imported intermediate good and one final product, and with the CMEA or ruble region in another imported intermediate and final product. In this case the "wait and see" approach can easily result again in a "perverse" reaction to a pattern of international commodity inflation in which dollar area terms of trade deteriorate while ruble area foreign trade prices remain relatively fixed. Specifically, in this case a passive strategy leads to positive relative effective protection of the industry which is suffering a decline in relative value-added on world markets. Again, the degree of price distortion is key in determining the relative resource cost of obtaining a given welfare level under the different strategies.

Also made explicit in this four-good model are additional complexities regarding: (1) optimal resource allocation in a MCPE forced to trade identical products at different prices on two separate markets; (2) the impossibility of relying exclusively on a uniform exchange-rate change either to offset completely any change in external relative prices or to realign domestic relative prices perfectly with those in external markets; and (3) the possibility that intra-CMEA bilateral commitments regarding real trade flows may severely restrict or eliminate resource and consumption reallocation in the MCPE in response to an external disturbance, resulting in domestic disequilibrium in the event that domestic relative prices are permitted to change.

The models employed in this paper have of course dealt with a "stylized" MCPE, and the simplifying assumptions we have made undoubtedly detract from their straightforward application to a MCPE such as Hungary or to various aspects of the Polish economy.[18] Nevertheless, the models probably do capture much of the essence of the particular dilemmas facing MCPE policymakers in a period of rapid inflation and dramatic relative price changes on world markets.[19] Hungarian policymakers have apparently pursued several of the more specific policies discussed in Section II, including a "wait and see" policy, windfall profit taxes on many flexibly-priced exportables, administered price increases, quantitative controls and revaluation. Hungarian policymakers on balance eschewed either complete reversion to the classical CPE or emulation of the free-trading market economy, and our models suggest that they may have incurred correspondingly higher efficiency losses as a result. In one sense, however, these losses may be seen as the static cost which Hungarian society has had to pay for preserving its interesting dynamic experiment in combining plan and market.

Footnotes

1. The author would like to thank Jozef van Brabant, Edward Hewett and Claus Wittich for criticism of an earlier version of this paper, and Tetsunori Koizumi and Edward John Ray for helpful comments. The author is solely responsible for any errors or omissions and all interpretations.

2. Salant (1977) distinguishes four basic inflation transmission mechanisms among market economies under fixed exchange-rates: (1) direct price effects, (2) the impact on income or expenditure, (3) monetary effects, and (4) direct linkages through labor markets.

3. This basic distinction is developed in some detail in Wolf (7, forthcoming).

4. Wolf (8, forthcoming).

5. Observe that use of this international commodity arbitrage equation implicitly assumes either perfect competition in the domestic market for the B good, or if there is imperfect competition, that firms behave as if they were perfect competitors. This assumption should probably be relaxed in future work on this subject.

6. See the more detailed discussion in Wolf (7, forthcoming).

7. In the market economy, by analogy, $B_T^* = (B_T + T)e^{-1}$, where T represents the domestic currency value of the tariff revenue collected by the government on imports, when the rate of taxation of exports is zero. See McKinnon (1966).

8. This basic relationship was stressed by Peter Kenen in his comments on an earlier paper by this author (Wolf (7, forthcoming)).

9. Throughout it is assumed that a change in domestic relative prices will give rise to factor reallocation in the MCPE. In practice, however, there may be significant formal and informal obstacles to labor and capital mobility. See Granick (1975)

10. Both of these shorter-run disequilibrium possibilities are examined in detail in Wolf (8, forthcoming).

11. If the objective is $\hat{q} = \hat{q}^*$, this implies $\hat{P}_b = \hat{P}^*_b - \hat{P}^*_a$ where in a MCPE the price of the A good is fixed internally and there is complete price equalization for this product. From $P_b = P^*_b e(1+t_b)$ we have $\hat{P}_b = \hat{P}^*_b + \hat{e} + t_b$ when initially $t_b = 0$. Consequently, to achieve $\hat{P}_b = \hat{P}^*_b - \hat{P}^*_a$ we need $(\hat{e} + t_b) = (-\hat{P}^*_a)$.

12. This result is similar to the effect of a devaluation in a MCPE in which the only substituion is between B and fixed-price nontraded goods. See Wolf (8, forthcoming).

13. Expression (3a) can be derived from the relation:

$$\frac{P^*_{vb}}{P^*_{va}} = \frac{P^*_{vb}}{P^*_{fb}} \cdot \frac{P^*_{fb}}{P^*_{fa}} \cdot \frac{P^*_{fa}}{P^*_{va}}$$

For very small changes in price we obtain

$$\frac{\hat{P}^*_{vb}}{P^*_{va}} = \frac{\hat{P}^*_{vb}}{P^*_{fb}} + \frac{\hat{P}^*_{fb}}{P^*_{fa}} + \frac{\hat{P}^*_{fa}}{P^*_{va}}$$

where in general $(\hat{P^*_v/P^*_f}) = (\hat{P}^*_f - \hat{P}^*_m)[(P^*_f/P^*_m)-1]^{-1}$

where $P^*_v/P^*_f = (1 - P^*_m/P^*_f)$ and

where $(\hat{P^*_f/P^*_v}) = -(\hat{P^*_v/P^*_f})$.

14. See footnote 13.

15. Observe, however, that the CMEA trade partners in this particular case might very well be willing to accept "hard" B_f products in lieu of possibly "soft" A_f goods.

16. Se McKinnon (1966) for a generalization of the Lerner symmetry theorem to the case of more than two goods, including intermediate products, for the market economy.

17. See Hewett (1974) and Kohn and Lang (1977).

18. See, for example, footnotes 5 and 9. The author is indebted to Josef van Brabant for his reminders about the limitations of stylized analysis.

19. The MCPE model may be applicable to various third-world "mixed economies" as well.

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