THE IMPORTANCE OF TRANSFER PRICING:

A Microeconomic Theory of Multinational Behaviour Under Trade Barriers

by

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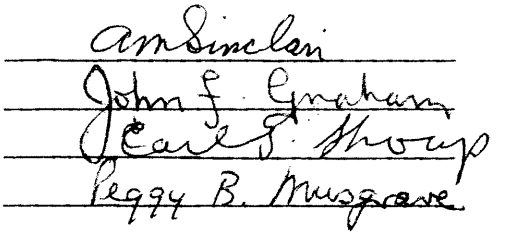

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A Rudimentary Model of Multinational Vertical Expansion

Introduction

The model of multinational behavior under trade barriers developed in this dissertation is based on the assumption that the MNE was formed through horizontal expansion or integration. That is, the enterprise expanded into other countries by "absorbing or constructing additional facilities to take care of an increased volume of the activity in which the establishment was already engaged."[1] In practice most multinationals, however, have expanded both horizontally and vertically. "By gaining control of all the operations involved in the production and sale of its output, from obtaining the original raw materials through fabrication and final marketing,"[2] an enterprise can also reduce costs and increase total profits through vertical expansion or integration. This chapter attempts to outline a model of multinational behavior built on the assumption of both horizontal and vertical expansion. The purpose of the chapter is twofold: first, to show which results of the previous six chapters apply also under vertical expansion and second, to show where and why some results differ. In order to limit the analysis only three cases are considered: first, the behavior of the MNE under free trade; second, its reaction to tariff barriers, and third, its reaction to taxation by the home country. An analysis of the gains from trade is omitted for the sake of brevity.

1. H. S. Sloan and A. J. Zurcher, Dictionary of Economics, 5th Edition, 1970, p. 212.
2. H. S. Sloan and A. J. Zurcher, p. 460.

The Literature

Most theoretical literature on vertically integrated enterprises is found in the industrial organization literature where the work on transfer pricing has been concerned with choosing a transfer price that would permit decentralized decision making by the subsidiaries without loss of control by the parent firm.[3] A few writers, Hirshleifer,[4] Gould,[5] and Solomons[6] have developed graphical analyses of transfer pricing between two divisions, one supplying a raw material as input to the other who sells the final product to consumers. Both Hirshleifer and Solomons have also developed models where one firm, the primary firm, supplies raw material to two final product firms. All of these writers were concerned only with transfer pricing between divisions located in the same country as the parent firm and as a result problems of international tax differentials and tariff barriers did not arise. This analysis has been extended by Copithorne[7] into the international field by considering three firms, each located in a different country, where the primary firm supplies two final product or secondary firms. In none of the above models do the secondary firms engage in trade.

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3. Some examples of this literature are: Mohamed Onsi, "A Transfer Pricing System Based on Opportunity Cost," The Accounting Review, July, 1970; J. Ronen and G. McKinney, "Transfer Pricing for Divisional Autonomy," The Journal of Accounting Research; Spring 1970; D. Dittman, "Transfer Pricing and Decentralization," Management Accounting, Nov. 1972; G. Holstrum and E. Sauls; "The Opportunity Cost Transfer Price," Management Accounting, May 1973.
4. J. Hirshleifer, "On the Economics of Transfer Pricing," Journal of Business, July 1956, and "Economics of the Divisionalized Firm," Journal of Business, April 1957.
5. J. R. Gould, "Internal Pricing in Firms When There are Costs of Using an Outside Market," Journal of Business, Jan. 1964.
6. D. Solomons, Divisional Performance: Measurement and Control, Appendix A to Chapter VI, "A Graphical Treatment of the Theory of Transfer Pricing," 1965.
7. L. W. Copithorne, "International Corporate Transfer Prices and Government Policy," Canadian Journal of Economics, Aug. 1971.

The primary firm supplies the two final product firms who sell only to domestic consumers. This disregard of intrafirm trade by previous writers was not caused by incorrect model-building but by failure of these writers to thoroughly understand the profit maximizing conditions of their models. If marginal costs and revenues differ, the secondary firms must engage in trade for total corporate profits to be maximized in their models and in this dissertation. This chapter therefore seeks to explain the errors of previous analyses, to show how this chapter's results differ, and to extend the model by examining the effects of taxes and tariffs on the corporation. Obviously this model could occupy as many chapters as the previous one; however, the results do not differ significantly. The basic conclusions of the horizontal expansion model apply with equal force in this model of vertical and horizontal expansion. The range of possibilities, however, is considerably increased. For example, tariffs can now apply to either imports of primary or secondary goods or to both. Taxes may apply to one or two or all of three firms depending on which government levies the tax, on what principle, and on the form of organization of the corporation. The scope for transfer price manipulations is increased since the intrafirm trade flows are more numerous. As a result this chapter seeks only to provide a rudimentary analysis limited to fixed transfer pricing (because of the length involved in discussing possible variable transfer prices) under simple forms of taxes and tariffs.

The Vertical Expansion Model Under Free Trade

The multinational corporation consists of three firms, one primary, and two secondary located in different countries. The primary

firm sells only to the secondary firms[8] and faces increasing production costs. One unit of raw material is needed to produce one unit of secondary output.[9] Firms 1 and 2, the secondary firms, can also engage in trade. The goal of the corporation is to maximize long run corporate profits. Price discrimination between the markets is possible.

As shown in Appendix VII.1 there are three conditions that must be satisfied in order to maximize total profits. These conditions are all contained in this expression: $MR_1 = MC_1 + MC_3 = MR_2 = MC_2 + MC_3$. That is, the corporation must equate the marginal revenues from sales of the final products to the marginal costs of production of the final products plus the marginal cost of the primary inputs. Since the marginal cost of the intermediate goods is determined by the total output of firm 3 (or by the total volume of purchases by firms 1 and 2) the cost to each firm is the same. That is, firms 1 and 2 must both include MC_3 in their joint profit maximizing conditions. This statement has been rewritten by Hirshleifer,[10] Solomons,[11] and Copithorne[12] as: $MR_1 - MC_1 = MC_3 = MR_2 - MC_2$. That is, the corporation should equate the net marginal revenue (that is, marginal revenue minus marginal cost) of each firm to the marginal production cost of the primary

8. This is a common assumption in the literature cited above. For a treatment where the primary firm is permitted to sell externally see Gould article previously cited. L. W. Copithorne, op cit., in a footnote on page 325 notes the conditions under which the secondary firms can purchase externally rather than buying from the primary firm.
9. An assumption of Copithorne's, op cit. Letting X_1 be the output of firm 1, X_2 be the output of firm 2 and X_3 be the output of firm 3, the primary firm, $X_1 + X_2 \equiv X_3$. That is, the amount of X_3 produced and sold by firm 3 equals the amount of $X_1 + X_2$ produced and sold by firms 1 and 2. (Since $X_1 + X_2 = Y_1 + Y_2$ is still a constraint of the analysis.)
10. J. Hirshleifer, 1957, pp. 103-104.
11. D. Solomons, op cit., p. 218.
12. L. W. Copithorne, op cit., p. 327.

firm. This statement is correct; however, the matter does not end here. This statement merely determines total final output and sales of the corporation, not the distribution of these sales and output between firms 1 and 2. The previous authors erred in assuming that once total output was determined total profits were maximized. However, Chapter II demonstrates that if there are differences in marginal costs and marginal revenues between the two secondary firms profits can be increased through intrafirm trade. Through trade sales can be reallocated so that marginal revenues are brought into equality; output can be reallocated so that marginal costs are brought into equality; and finally, a further adjustment of sales and output distribution may be necessary in order to equate marginal revenues and marginal costs. The previous writers followed only the third procedure of equating marginal revenues and marginal costs, (since the expression $MR_1 = MC_1 + MC_3 = MR_2 = MC_2 + MC_3$ is the condition for equalizing costs and revenues with intermediate goods). However, there are two other conditions that can be extracted from this expression and must be fulfilled for profit maximization:

1) $MR_1 = MR_2$. The corporation maximizes profits by reallocating sales so as to equate the marginal revenues of the two secondary firms. This is also a necessary condition for profit maximization when the MNE is formed by horizontal expansion only.

2) Since MC_3 is common to both expressions, $MC_1 = MC_2$. The corporation should reallocate output so as to equate marginal production costs of the final product firms. Again, $MC_1 = MC_2$ is a necessary condition for profit maximization in Chapter II.

In summary, there are three conditions that must be satisfied in order for total profit maximization by the multinational:

1) $MR_1 - MC_1 = MR_2 - MC_2 = MC_3$. The net marginal revenue of each secondary firm should be equated with the marginal costs of the primary firm. This determines total output and total sales.

2) $MC_1 = MC_2$. This determines the allocation of total output between the secondary firms.

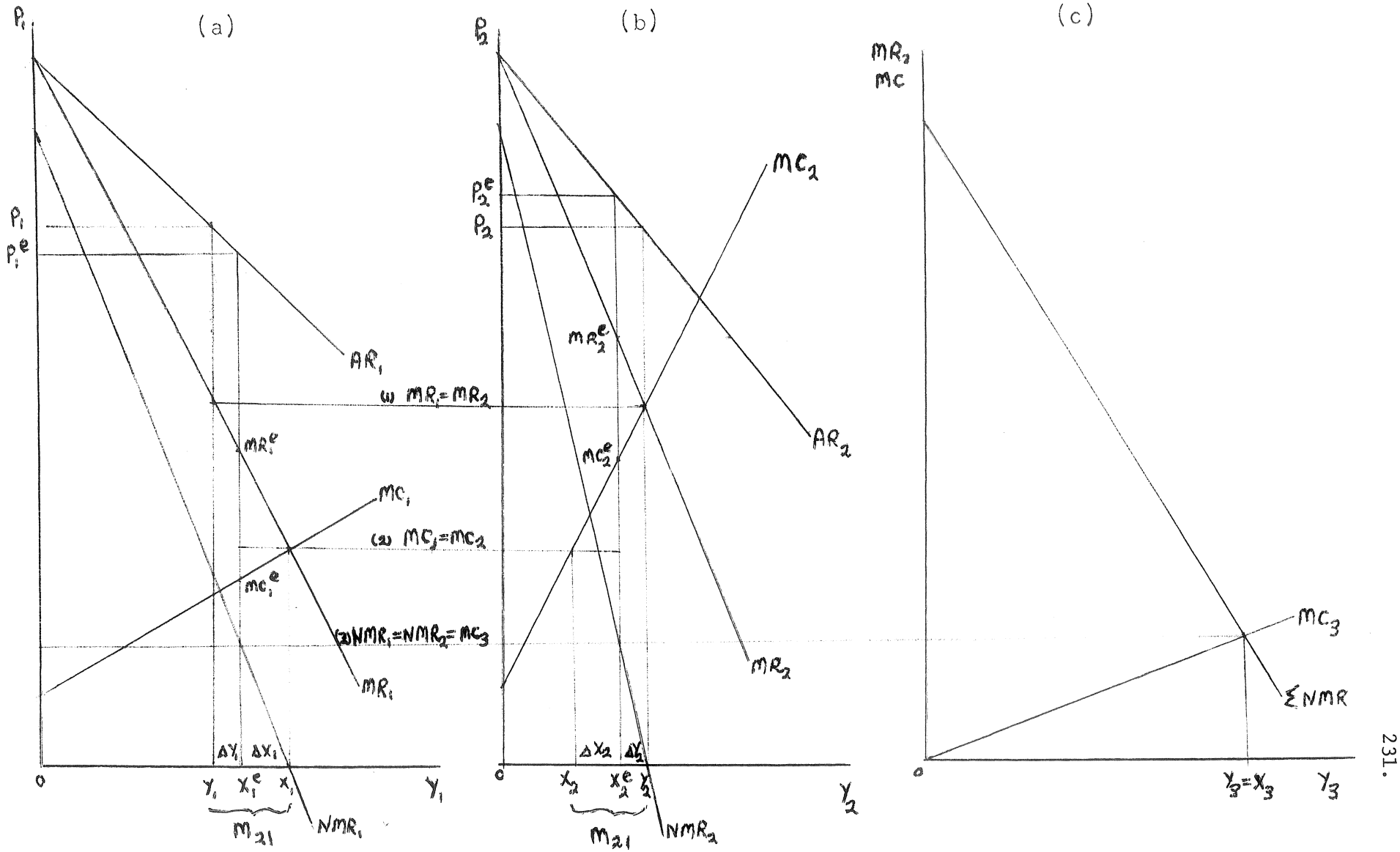
3) $MR_1 = MR_2$. This determines the allocation of total sales between the secondary firms.

Only when all three conditions are satisfied will total profits be maximized. Note that, in general, this implies intrafirm trade between firms 1 and 2 unless $MR_1 = MR_2$ and $MC_1 = MC_2$ in the pretrade situation. That is, trade occurs where one firm is the 'low cost-low revenue' firm while the other can be called the 'high cost-high revenue' firm. Our previous analysis explaining why related final product firms trade is therefore unchanged. Where marginal costs and revenues differ the corporation can increase its profits through intrafirm trade since through trade it brings into equality $MR_1 = MR_2$, $MC_1 = MC_2$, and (with intermediate costs) $MR = MC + MC_3$. Note that where intermediate costs are zero the condition becomes $MR_1 = MC_1 = MR_2 = MC_2$. There is no change from our previous analysis so transfer pricing does not affect total profits. Trade flows from the low cost-low revenue firm to the high cost-high revenue firm. The results of other writers are wrong since they equate $MR_1 - MC_1$ with $MR_2 - MC_2$ and with MC_3 but fail to equate MR_1 with MR_2 or MC_1 with MC_2 and therefore profits are not maximized. As a result their analyses show no intrafirm trade between the secondary firms; each firm produces only for its own local market. Changing these results therefore implies changes in output, sales, and consumer and factor prices for each firm and changes in the gains from trade among countries.

This process is illustrated in Figure VII.1. In (a) are shown the marginal revenue and cost curves of firm 1, which are subtracted vertically to give the net marginal revenue curve, NMR_1. In (b) are the marginal cost and revenue curves of firm 2 which, when subtracted, give NMR_2. In (c) are plotted the horizontal summation of NMR_1 and NMR_2, and the curve MC_3. The horizontally summed curve, ΣNMR, shows for each level of $NMR_1 = NMR_2$ what the total output and sales of the corporation are. The corporation determines the equilibrium volume of total output by equating $NMR_1 = NMR_2 = MC_1$. Total output and sales (since $X_3 \equiv Y_3$) are therefore X_3. By tracking back into (a) and (b) we can see the initial distribution of output and sales by reading down from each firm's respective NMR curve to give X_1^e and X_2^e. Reading up from these outputs we can see that marginal revenues and marginal costs, however, are not equalized. MR_1^e and MC_1^e are less than MR_2^e and MC_2^e--that is, firm 1 is the 'low cost-low revenue' firm. Profits can be increased by shifting sales to firm 2 (the high revenue market) and output to firm 1 (the low cost plant). To do this, we raise MR_1^e and lower MR_2^e until they are equalized where the fall in Y_1 equals the rise in Y_2. Similarly we raise MC_1^e and lower MC_2^e until the rise in X_1 just equals the fall in X_2. As a result firm 1 produces X_1, selling Y_1 in the home market at P_1, and $X_1 - Y_1$ to firm 2. Firm 2 produces X_2, buys $Y_2 - X_2$ from firm 1 and sells the total in the domestic market for P_2. All three conditions for a profit maximum are fulfilled: 1) $NMR_1 = NMR_2 = MC_3$, 2) $MR_1 = MR_2$, 3) $MC_1 = MC_2$. Previous writers assumed firm 1 produced and sold locally X_1^e at P_1^e and firm 2 sold and produced X_2^e at P_2^e so that firm 1's domestic price was somewhat lower and firm 2's somewhat higher than in this analysis.

Figure VII.1

Profit Maximization in the Vertical Integration Model Under Free Trade



Note that transfer prices do not affect this analysis. They do determine the allocation of trade profits but since there are no trade barriers, total profits are not affected by the transfer prices. This is also the result in the horizontal expansion model. There are three possible transfer prices in this model: the price of exports from firm 1 to firm 2, Pm_{21}; of exports from firm 3 to firm 2, Pm_{23}; and of exports from firm 3 to firm 1, Pm_{13}. Even though the marginal cost of intermediate production, MC_3, is identical for both firms the transfer prices charged to firms 1 and 2 by firm 3 need bear no relation to this marginal cost; nor need they be the same for both firms 1 and 2. Under free trade these transfer prices will be set for internal reasons only. Under taxes and tariffs, however, the scope of the corporation for avoiding external costs through transfer price manipulations is greatly increased due to the increased number of trade flows.

Profit Maximization Under Tariff Barriers

Profit Maximization When Country 2 Levies a Tariff on Finished Imports

This model is based on the same assumption as Chapter III that country 2 levies a tariff on finished imports, that is, on firm 2's imports from firm 1. In Chapter III we found that the profit maximizing condition under a fixed transfer price was $MR_1 + rPm_2 = MC_1 + rPm_2 = MC_2 = MR_2$ when firm 1 was the exporter. The lower the per unit tariff the less disturbance to total output and sales and their allocation, to prices, factor flows, and profits and to the gains from trade. The MNE attempts to set as low a transfer price as possible and/or to reduce

the volume of trade. The higher the tariff, the more likely is trade contraction and even trade cessation. These conclusions are also true in the vertical expansion model.

As shown in Appendix VII.2 the three profit maximizing conditions under a tariff with a fixed transfer price are:

1) $MR_1 - MC_1 = MC_3 = MR_2 - MC_2$. The corporation should equate the net marginal revenue of each secondary firm to marginal intermediate costs. That is, the tariff on final goods does not affect NMR of either final product firm and therefore does not affect total output and total sales. Therefore in determining total output and sales the corporation ignores the tariff.[13]

2) $MR_1 + rPm_{21} = MR_2$. The corporation should reallocate final sales so that MR_2 equals MR_1 adjusted by the per unit tariff on imports. Since the MNE equates $MR_1 = MR_2$ under free trade this implies a corresponding fall in MR_1 and rise in MR_2 due to the tariff. That is, sales of Y_1 increase while sales of Y_2 decline, implying fewer exports.

3) $MC_1 + rPm_{21} = MC_2$. The corporation should reallocate output so that MC_2 equals MC_1 adjusted for the tariff. Since under free trade the MNE equated $MC_1 = MC_2$ this implies a fall in MC_1 and rise in MC_2. That is, larger output by firm 2 and smaller output by firm 1, resulting in smaller trade, occurs as a result of the tariff. This is illustrated in Figure VII.2.

In Figure VII.2 under free trade the corporation equates $NMR_1 = NMR_2 = MC_3$ for an output and sales level of Y_3. This is allocated

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13. Note that this is not true with a variable transfer price. Prices with a positive PM_{21}-M_{21} relationship cause output expansion while negatively related transfer prices cause total output contraction. See Appendix VII.2 on this.

between firms 1 and 2 so that firm 1 produces X_1^o and sells Y_1^o at home for P_1^o; while firm 2 produces X_2^o, buys $Y_2^o - X_2^o$ from firm 2 and sells the total for P_2^o.

When government 2 levies a tariff on firm 2's imports from firm 1 it raises the cost of production of X_1 by the per unit tariff on exports and raises the marginal revenue from domestic sales of Y_1 since the per unit tariff applies to sales of M_{21} and Y_1. That is, both MR_1 and MC_1 shift up by rPm_{21} with the result that NMR_1 does not change and total corporate output ramains at X_3. The allocation of this output and of sales, however, is altered by the tariff. It is more profitable for the corporation if firm 1 reduces its exports and sells more in its domestic market since this reduces tariff costs. We therefore reallocate sales until $MR_1 + rPm_{21} = MR_2$ where $+\Delta Y_1 = -\Delta Y_2$ from the original X_1^e and X_2^e sales and reallocate output until $MC_1 + rPm_{21} = MC_2$ where $-\Delta X_1 = +\Delta X_2$ from the initial X_1^e and X_2^e output levels. That is, firm 1 now produces X_1^1 (a smaller amount) and sells Y_1^1 (a larger amount) at home at P_1^1 (a lower price). Firm 2 produces X_2^1 (a larger amount) and imports $Y_2^1 - X_2^1$ (smaller amount) from firm 1 selling the total at a higher price P_2^1. Tariff proceeds of $rPm_{21}(X_1^1 - Y_1^1)$ are paid to government 2. Since trade has contracted the government receives smaller revenues than expected.

In summary, the tariff on finished goods does not affect the total output and sales volume of the corporation (unless transfer prices are variable). It does, however, cause a reallocation of output and sales between the two secondary firms as trade flows from firm 1 to firm 2 decline. Firm 1 sells more at home and firm 2 produces more at home causing consumer prices to rise in country 2 and fall in country 1.

Consumers therefore bear part of the tariff in the importing country while the consumers in the exporting country gain lower prices. If the MNE can affect factor prices real factor incomes rise in country 2 and fall in country 1. The net effect depends on how government 2 spends this tariff revenue but this falls outside the scope of this analysis.

The goal of the MNE faced by tariff barriers is to reduce its tariff costs through lowering transfer prices and/or contracting trade. The lower the transfer price the smaller the unit tariff costs and the less disturbance to the output and sales allocations of the secondary firms.

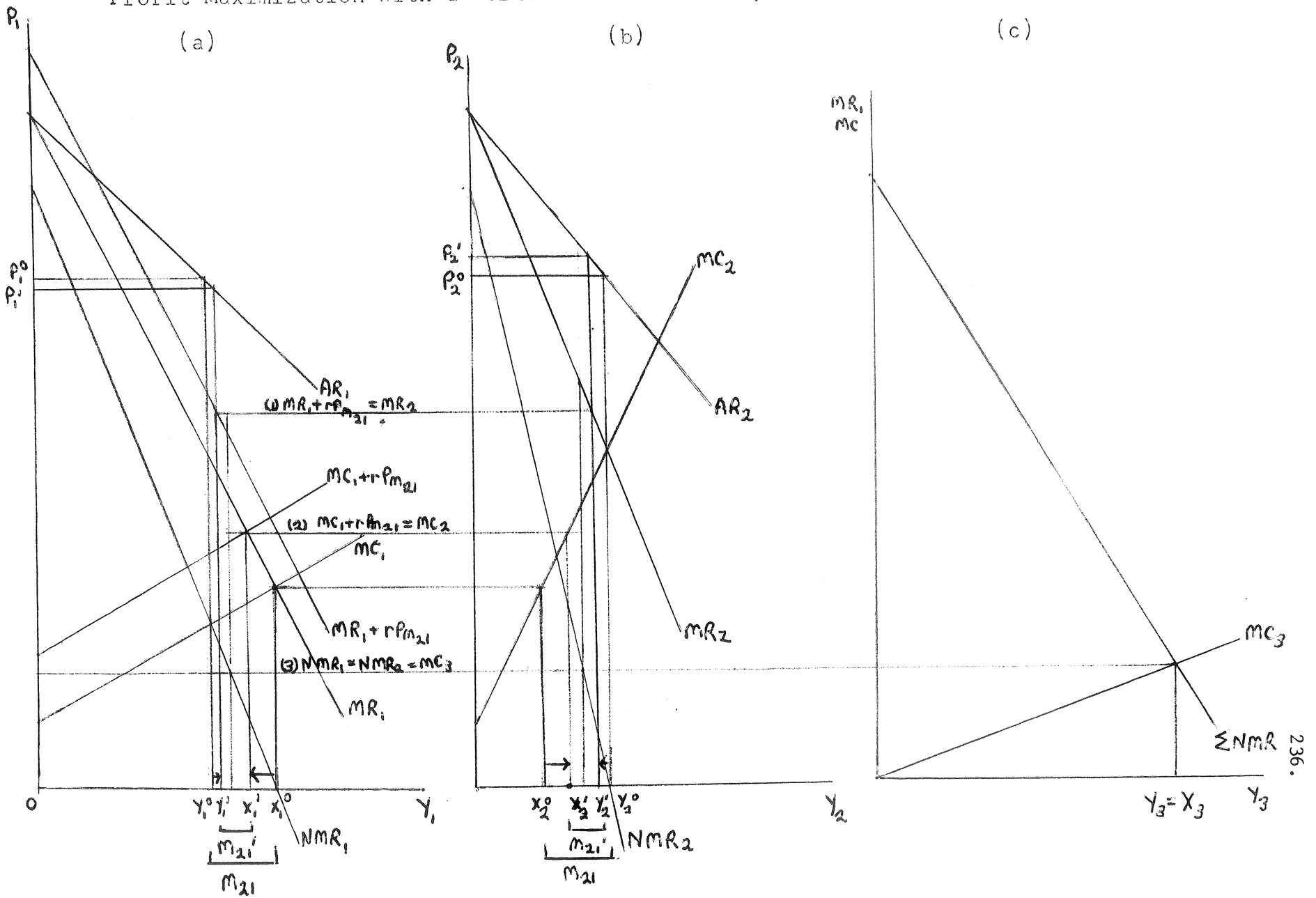
Profit Maximization When Country 2 Levies a Tariff on Unfinished Imports

Assume that instead of levying a tariff on finished goods country 2 levies a tariff on unfinished goods. The tariff therefore applies to firm 2's imports from firm 3, $Pm_{23}M_{23}$ or $Pm_{23}X_2$, (since one unit of input makes one unit of output) and the tariff is thus $rPm_{23}X_2$. Therefore tariff revenue depends directly on firm 2's domestic production. One would expect, a priori, that the corporation would attempt to reduce production in firm 2 and substitute exports from firm 1. Assuming a fixed transfer price, Appendix VII.3 demonstrates that the profit maximizing conditions under this tariff are:

1) $MR_1 - MC_1 = MR_2 - MC_2 - rPm_{23} = MC_3$. The net marginal revenue of firm 2 is affected by the tariff since production costs are now increased. NMR_2 declines with the result the ΣNMR curve shifts to the left, causing

Figure VII.2

Profit Maximization with a Tariff on Finished Imports



a fall in MC_3 and X_3. The tariff raises the cost of intermediate goods to firm 2 and therefore affects the total output of the corporation.

2) $MR_1 = MR_2$. The marginal revenue of firm 2 is unaffected directly by the tariff since the tariff applies only to production, not to sales. However, since total output and sales decline, one may expect adjustments in MR_1 and MR_2.

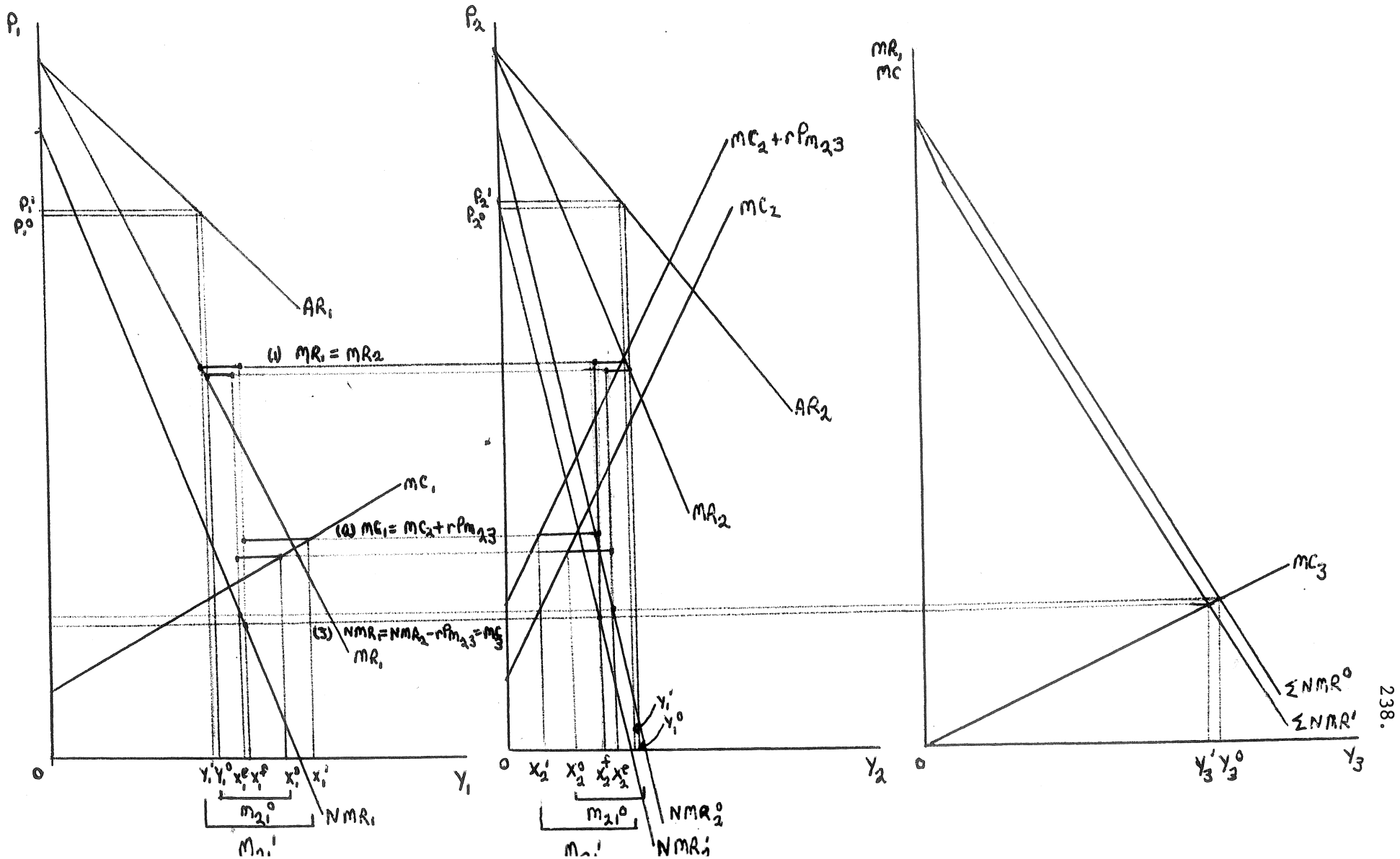
3) $MC_1 = MC_2 + rPm_{23}$. The corporation should equate MC_1 with MC_2 adjusted for the tariff. Under free trade MC_1 equals MC_2 so MC_2 declines and MC_1 rises due to the tariff. That is, output of X_2 falls and of X_1 rises as the firm attempts to minimize its tariff costs by substituting exports of M_{21} for domestic production of X_2.

Figure VII.3 illustrates the effect of the tariff on intermediate goods on the behavior of the corporation. Initially total output is X_3. Firm 1 produces X_1^o and sells Y_1^o at home for P_1^o. Firm 2 produces X_2^o, imports $Y_2^o - X_2^o$ and sells the total for P_2^o. The profit maximizing conditions 1) $NMR_1 = NMR_2 = MC_3$ 2) $MR_1 = MR_2$ 3) $MC_1 = MC_2$ are all fulfilled.

The tariff causes a vertical shift in MC_1 to $MC_1 + rPm_{23}$, causing the NMR_2^o curve to shift down to NMR_2^1. The corporation now equates NMR_1 with NMR_2^1 and MC_3. The new ΣNMR^1 curve therefore lies to the left of the initial curve and total output and sales decline. Since as output falls, MC_3 falls, NMR_1 and NMR_2^1 are equated at a lower level. This implies a larger share of total output to firm 1 and a smaller share to firm 2. That is, X_1^e shifts slightly to the right to X_1^f while X_2^e shifts to the left to X_2^f. At X_1^f and X_2^f, MR_1 is not equal to MR_2 and MC_1 does not equal $MC_2 + rPm_{23}$. The corporation can increase its profits by readjusting output and sales between firms 1 and 2. The corporation equates $MR_1 = MR_2$ cuasing a fall in Y_1 from

Figure VII.3

Profit Maximization with a Tariff on Intermediate Imports



Y_1^o to Y_1^1 and a fall in Y_2 from Y_2^o to Y_2^1. The MNE also equates $MC_1 = MC_2 + rPm_{23}$ causing a fall in X_2 from X_2^o to X_2^1 and a rise in X_1 from X_1^o to X_1^1. Consumers in both countries face higher prices as a result of the tariff. The tariff revenue paid to government 2 equals $rPm_{23}X_2^1$ or the diagonally shaded rectangle in Figure VII.3 which is less than the tariff revenue the MNE would have paid initially of $rPm_{23}X_2^o$.

Summary of Tariff Effects

In summary, the effects on the corporation will differ depending on whether the tariff applies to finished goods (firm 1's exports) or to intermediate goods (firm 3's exports). A tariff on raw materials affects total output and sales while a tariff on final goods does not (assuming a constant transfer price). With the tariff on firm 1's exports to firm 2 the goal of the corporation is to minimize costs by reducing exports and substituting local production by firm 2. When the tariff applies to intermediate costs, however, the corporation now wants to reduce production by firm 2, substituting exports from firm 1. Obviously tariffs on both intermediate and final goods would have conflicting effects on corporate behaviour. The relevant tariff rates, transfer prices and trade volumes would all affect the final result.

Profit Maximization Under Profit Taxation by Country 1

Introduction

The corporation consists of three firms; firm 1, the parent firm, resident in country 1, and firms 2 and 3, resident in countries 2 and 3, respectively. Country 1 can tax either on the residence or

source principle. Under the source principle only firm 1's domestic profits will be taxed and the goal of the corporation would therefore be to shift profits to firms 2 and 3 where they face no tax. This can be accomplished by setting a high transfer price for firm 3's raw material exports to firm 1, and/or by setting a low transfer price for exports by firm 1 to firm 2 (assuming firm 1 is the exporter).

Under the residence principle the form of organization of the affiliates affects the total tax bill. If both affiliates are branches total corporate profits are taxed as earned at the rate t percent. That is, all profits face the same tax rate wherever earned. As a result total profits fall by the tax and the tax incidence falls 100 percent on the MNE. Where both affiliates are subsidiaries foreign profits are only taxed when they are remitted to the parent while retained earnings in the foreign firms face no tax. Where one firm is a branch and the other is a subsidiary the corporation will attempt to shift profits to the subsidiary in order to minimize the tax burden. If firm 3 is the subsidiary the MNE will set high transfer prices on exports to firms 1 and 2. If firm 2 is the subsidiary exports from firms 1 and 3 will carry low transfer prices. The scope for tax avoidance is greatest under source rules, and least under branch rules where both foreign firms are branches.

We therefore have five cases to consider:

1) Government 1 taxes on the source principle and only firm 1's profits are taxed.

2) Residence rules apply and both affiliates are branches.

3) Residence rules apply. Firm 2 is a branch and firm 3 is a subsidiary.

4) Residence rules apply. Firm 3 is a branch; firm 2 is a subsidiary.

5) Residence rules apply and both affiliates are subsidiaries.

Let b represent the percent of firm 2's profits taxable in country 1. Let b' represent the percent of firm 3's profits taxable in country 1. Under source rules, then b and b' equal zero. Under residence rules where both firms are subsidiaries b and b' exceed zero. Where both are branches under residence rules b and b' equal 1. Let us examine the profit maximizing conditions in each of the five cases listed assuming fixed transfer pricing and that final exports flow from firm 1 to firm 2.

Country 1 Follows the Source Principle

The profit-maximizing conditions as shown in Appendix VII.4 are:

1) $(1-t)NMR_1 + tPm_{13} = MC_3 = NMR_2$. In determining total output and sales the corporation should equate NMR_2 to MC_3 to after tax NMR_1 plus the taxed transfer price of exports from firm 3 to firm 1. Under source rules firm 1's marginal revenue and marginal cost are reduced by t percent, but imports by firm 1 from firm 3 are a cost and therefore tax deductible. The higher Pm_{13} the smaller the taxes paid to government 1. The tax therefore has an ad valorem effect that reduces NMR_1 by t percent (causing a fall in total output and sales) and a specific effect that raises NMR_1 by tPm_{13} (causing total output and sales to rise). Whether the ad valorem and specific effect dominates depends on the transfer price set in relation to MC_1 under free trade (high, low, or equilibrium).

2) $(1-t)MR_1 + tPm_{21} = MR_2$. In allocating sales between firms 1 and 2 the MNE should equate MR_2 to after tax MR_1 adjusted for the taxed transfer price tPm_{21}. The tax lowers the marginal revenue from local sales by t percent but this is partly offset by the taxed transfer price. Since

in the no trade barrier case the corporation equated $MR_1 = MR_2$ if the specific effect dominates MR_1 must have fallen compared to its value in the pretax situation and MR_2 must have risen. That is, a high transfer price causes sales of Y_1 to rise while sales of Y_2 decline and intrafirm trade declines as a result. The higher the transfer price the more taxes are paid by the corporation since per unit profits allocated to firm 2 are small. Where the ad valorem effect dominates MR_1 must have risen compared to its pretax value and MR_2 fallen so that sales of Y_1 decline and of Y_2 expand. Ceteris paribus, trade therefore also expands since the low transfer price allows the corporation to shift profits to firm 2 where they face no taxes.

3) $(1-t)MC_1 - tPm_{13} + tPm_{21} = MC_2$. The corporation should allocate output so that MC_2 equals after tax MC_1 minus the taxed Pm_{13} plus the taxed Pm_{21}. Costs allocated to firm 1 are tax deductible. Therefore the cost of producing in firm 1 falls by t percent plus t percent of the cost of imports from firm 3. A high transfer price will therefore raise costs in firm 1 and lower taxes. This is partly offset by the transfer price charged by firm 1 on exports to firm 2 since this constitutes revenue and is taxable. The higher Pm_{21} the more tax must be paid by the corporation. Note that if $Pm_{13} = Pm_{21}$ the corporation equates $(1-t)MC_1 = MC_2$. Here the MNE has two possibilities of reducing taxes by altering Pm_{13} and Pm_{21}. If the net effect is to shift the total cost function of firm 1 up (ie. the specific effects dominate and are positive) MC_1 must have declined compared to its value in the pretax situation and MC_2 must have risen. Therefore output of X_1 declines while output of X_2 expands. This implies smaller exports from firm 1 due to the high transfer price Pm_{21}. Where the ad valorem effects dominate X_1 must have increased while X_2 falls so that trade increases.

In summary where the specific effects dominate 1) sales of Y_1 expand while output of X_1 contracts 2) sales of Y_2 contract while X_2 expands. This implies smaller exports from firm 1 to firm 2 due to the high transfer price on exports. Where the ad valorem effects dominate 1) sales of Y_1 contract while X_1 expands 2) sales of Y_2 expand while output of X_2 contracts. This implies expanding trade due to the low transfer price Pm_{21} and high transfer price Pm_{13}. Total output and sales may either rise or fall. In general one would expect contraction since $(1-t)NMR_1$ will probably exceed tPm_{13}. Finally note that the transfer price Pm_{23} plays no role in this analysis. Intrafirm trade between firms 2 and 3 is not taxed and therefore does not affect output, sales, or profits.

Country 1 Follows the Residence Principle and Both Foreign Firms are Branches

The profit-maximizing conditions are:

1) $NMR_1 = NMR_2 = MC_3$. The condition for determining total output and sales is unchanged in the residence-double branch case from the initial condition under free trade. This is because all profits wherever earned are taxed at t percent and therefore the MNE cannot avoid the tax by shifting profits via transfer pricing and changes in trade flows. The total tax incidence falls on the corporation.

2) $MR_1 = MR_2$. No changes in sales allocation occur.

3) $MC_1 = MC_2$. No changes in output allocation occur.

The Copithorne model[14] is set up quite differently but also concludes that taxes are not shifted by the MNE. The corporation in

14. L. W. Copithorne, op cit., p. 329 and Appendix C.

his model faces continuous progressive tax functions in each country. By equalizing the marginal tax rates levied on the pure profits of the foreign subsidiaries Copithorne concludes that the global tax bill is minimized and that no changes in output or prices occur. The total tax incidence falls on the MNE. From this he moves to the case of fixed tax rates and concludes that the corporation should manipulate transfer prices so as to shift profits to the subsidiary with the lowest tax rate. However, he feels that this does not alter the conclusion that no changes in output or prices occur. Copithorne falsely assumes that the results of the progressive tax case apply with equal force to the fixed tax rate case. As we have seen in Chapter III and also see in this chapter generally the corporation can shift the incidence of the tax onto consumers or factors. Only in the peculiar case where all foreign firms are organized as branches will the corporation pay the full tax with no changes in output or sales. Where tax rates are progressive it is true that equalizing tax rates will minimize the tax burden. However, in most countries corporate tax rates are not progressive. A model based on progressive rates therefore is of less practical interest than a fixed rate model. In general taxes are shifted by the corporation.

The Residence Principle Applies While Firm 2
is a Branch and Firm 3 is a Subsidiary

$$1)\quad \frac{1-t}{1-b't}[NMR_1] + \frac{t-b't}{1-b't}Pm_{13} = MC_3 = \frac{1-t}{1-b't}[NMR_2] + \frac{t-b't}{1-b't}Pm_{23}.$$

The corporation should equate MC_3 to adjusted NMR_1 plus adjusted Pm_{13} to adjusted NMR_2 plus adjusted Pm_{23}. The NMR of firms 1 and 2 are adjusted by the ratio of after tax returns to each firm divided by the after tax return to firm 3. Since firm 2 is a branch both firms 1 and 2 face taxation of t percent. Firm 3, however, is a subsidiary and pays tax only on remitted profits to firm 1. By raising the transfer price charged on intermediate transfers to firms 1 and 2 the corporation can therefore reduce its tax bill. The transfer prices are adjusted by the ratio of the tax differential between each firm and firm 3 divided by the after tax return to firm 3. Where firm 3 remits no profits (so that b' is zero) the condition reduces to $(1-t)NMR_1 + tPm_{13} = MC_3 = (1-t)NMR_2 + tPm_{23}$. In general we may expect the ad valorem effects to predominate and therefore output and sales to decline.

2) $MR_1 = MR_2$. Since both firms 1 and 2 pay taxes on earned profits intrafirm trade between them will not affect taxes. Therefore this condition is unchanged from the pretax situation.

3) $MC_1 - \frac{t-b't}{1-t}Pm_{13} = MC_2 - \frac{t-b't}{1-t}Pm_{23}$. In allocating output the MNE should equate the MC of production in each firm adjusted for the taxed intermediate costs. The intermediate costs are tax deductible and are adjusted for the ratio of the net tax differential between firm 1 (or 2) and firm 3 over the after tax rate of return to firm 1 (or firm 2). Note that where the same transfer price is charged each firm the condition reduces to $MC_1 = MC_2$ so no changes in output allocation occur.

In summary, where firm 2 is a branch transfers between 1 and 2 do not affect after tax profits and therefore play no role in the analysis. The MNE attempts to set high intermediate transfer prices so as to shift trade profits to firm 3, the low tax firm. Where these transfer

prices are the same neither the allocation of output or sales between firms 1 and 2 is affected by taxation.

The Residence Principle Applies Where Firm 3
is a Branch and Firm 2 is a Subsidiary

1) $NMR_1 = MC_3 = \frac{1-bt}{1-t}[NMR_2] - \frac{t-bt}{1-t}Pm_{23}$. In determining total output the MNE equates NMR_1 to MC_3 to adjusted NMR_2 minus the adjusted transfer price Pm_{23}. NMR_2 is adjusted by the ratio of the after tax rate of return to firm 2 divided by the after tax rate of return to either firm 1 or firm 3. Since the after tax return is higher in firm 2 NMR_2 shifts up, expanding output. This is partly or wholly offset by the transfer price effect which lowers NMR_2. The higher the transfer price charged by firm 3 for exports to firm 2 the more profits are allocated to firm 3 and therefore the larger the tax bill of the corporation. The MNE would prefer to set as low a price as possible in order to avoid tax. Note that the price set for exports from firm 3 to firm 1 has no effect on total output since these intrafirm profits face the same tax rate, t percent.

2) $(1-t)MR_1 + (t-bt)Pm_{21} = (1-bt)MR_2$. In distributing sales, the corporation should equate after tax marginal revenue of firm 2 to after tax marginal revenue of firm 1 plus the tax differential on the transfer price Pm_{21}. Since firm 1 is the high tax firm the MNE sets a low price on exports to firm 2 in order to shift trade profits to the lower taxed importer. A high transfer price will result in higher taxation and in order to avoid this the MNE will be forced to reduce exports, selling more locally in country 1 and less locally in country 2. A low Pm_{21} will expand trade, cuasing Y_1 to decline and Y_2 to expand.

3) $(1-t)MC_1 + (t-bt)Pm_{21} = (1-bt)MC_2 + (t-bt)Pm_{23}$. In distributing output the corporation should equate the after tax marginal cost plus the adjusted price of transfers of each firm. The higher the transfer price on exports to firm 2 from either firm 1 or firm 3, the more taxes must be paid by the MNE. Note that where the transfer prices are equal the condition reduces to equating the after tax marginal costs in each firm, and since $t > bt$, output of X_1 rises while X_2 declines. Note that where firm 3 is a branch transfers between the parent firm and the branch do not affect after tax profits. The cost of intermediate goods shipped to firm 2 can, however, affect total output and the division of output. The transfer price charged on exports from the parent firm to the subsidiary can affect the division of sales between these two firms. In general the corporation attempts to set low transfer prices since these shift profits to the importing firm, firm 2, which has the lower rate of tax.

Residence Principle Applies Where Both Foreign Affiliates are Subsidiaries

1) $\frac{1-t}{1-b't}[NMR_1] + \frac{t-b't}{1-b't}Pm_{13} = MC_3 = \frac{1-bt}{1-b't}[NMR_2] + \frac{bt-b't}{1-b't}Pm_{23}$.

Total output and sales are now affected by the adjusted NMR of firms 1 and 2 and by the adjusted transfer prices charged on intermediate goods. The corporation equates MC_3 to the NMR of each firm adjusted by the ratio of its after tax return over the after tax return to firm 3 plus the intermediate transfer price adjusted by the tax differential over the after tax return to firm 3. Note that where $b = b'$ Pm_{23} has no role to play in affecting total profits. Where the MNE is constrained

in setting this transfer price adjustments in b - b' may accomplish the same result of minimizing taxes. Or one host country may have exchange restrictions and not the other so that manipulating Pm_{23} may increase total after tax profits.

2) $(1-t)MR_1 + (t-bt)Pm_{21} = (1-bt)MR_2$. This is the same condition as in the previous case since firm 2 is a subsidiary in both cases. Therefore the same remarks apply here. The corporation will try to set a low Pm_{21} to shift profits to firm 2.

3) $(1-t)MC_1 - (t-b't)Pm_{13} + (t-bt)Pm_{21} = (1-bt)MC_2 - (bt-b't)Pm_{23}$. The allocation of output is affected by the after tax marginal production costs, and by the tax differentials on intrafirm trade. The MNE will attempt to set high transfer prices on exports to firm 1 by firm 3 and low prices on firm 1's exports to firm 2. Where exchange controls exist the corporation can reduce taxes by shifting profits to the firm with the lower allowed rate of repatriation. Where b is less than b', Pm_{23} will be small in order to allocate profits to firm 2.

Summary

In summary, where both foreign firms are subsidiaries the MNE has the greatest scope for minimizing its total tax burden. Transfer prices affect total output and the division of output and sales. Only intermediate transfer prices can affect total output while both transfer prices of finished and unfinished goods can affect the division of output and sales. Where both firms are branches the total incidence of the tax falls on the corporation. There is no scope for minimizing taxes under residence-branch rules. Where one foreign firm is a branch and the other a subsidiary the MNE attempts to shift profits to the subsidiary

through transfer pricing and changes in trade flows. Transfer prices on flows between the parent firm and the branch have no effect on total output and sales or their allocation. Transfer prices of trade flows between the parent and the subsidiary or between subsidiaries can affect total output, sales and their allocation. Note that these are the same results predicted in the horizontal integration model.

Conclusions

The model presented here could obviously be expanded to include such interesting problems as the effect of variable pricing, of differing tariff rates levied by country 2 on intermediate and finished goods; of taxation by the host countries for different forms of tax relief given by the home country, of taxes and tariffs, et cetera on the behavior of the multinational enterprise. However, the basic results of the analysis are clear and do not differ in any meaningful way from the results obtained in the horizontal expansion model though the results are generally more complicated since there are more firms and more trade flows to consider. The possibilities for avoidance of taxes and tariffs are increased since there are more transfer prices to vary. The procedure for maximizing profits differs only slightly from that under horizontal integration since in this model there are intermediate costs to consider. The rules are straight forward:

1) To determine total output the MNE should equate the net marginal revenue of each secondary firm adjusted for any changes in intermediate costs caused by tariffs or taxes to the marginal intermediate cost of firm 3.

2) To allocate final sales the MNE should equate the marginal revenues of firms 1 and 2 after they have been adjusted for taxes and for the tax differential or tariff on transfer prices.

3) To allocate final output the MNE should equate the marginal costs of firms 1 and 2 after they have been adjusted for taxes and for the tax differential or tariff charged on transfer prices.

Previous analyses of the vertical integration model only determined the total output and sales necessary for profit maximization. They did not realize that in order for profits to be maximized this was not enough. All three rules must apply so that profit maximization will generally imply intrafirm trade in final goods.